

The 15th

**INTERNATIONAL GRADUATE STUDENTS
CONFERENCE ON POPULATION AND
PUBLIC HEALTH SCIENCES**

IGSCPP: JULY 12, 2024

The College of Public Health
Sciences (CPHS)
Chulalongkorn University

ASEAN Institute for Health
Development (AIHD)
Mahidol University

Institute for Population and
Social Research (IPSR)
Mahidol University

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The 15th IGSCPP (12 July 2024)



WELCOME MESSAGE



Prof. Chitlada Areesantichai, Ph.D.

Chairperson, Executive Committee, 15th IGSCPP

Dean

The College of Public Health Sciences, Chulalongkorn University, Thailand

www.cphs.chula.ac.th

Dear Colleagues,

On behalf of all academic staff and students of the College of Public Health Sciences (CPHS) Chulalongkorn University, I would like to give a very warm welcome to all the participants at the 15th International Graduate Student Conference on Population and Public Health Sciences (IGSCPP), on July 12, 2024

The College of Public Health Sciences (CPHS), Chulalongkorn University, Institute for Population and Social Research (IPSR) and the ASEAN Institute for Health Development (AIHD), Mahidol University have collaborated by taking turns in organizing this international conference for 15 years. Together, we have created an incredible and exciting international conference.

On behalf of the host, I am pleased to see that the conference has brought together both members and non-members including local friends, and colleagues from abroad, all united by a common goal: advancing global health and public advocacy. This conference naturally provides the excellent forum for discussing problems, challenges, and solutions in public health.

I would like to express my sincere gratitude to our distinguished invited speakers for their presence and contributions to the conference. I also thank all program committee members for their efforts in ensuring a rigorous review process in selecting high-quality papers for presentation.

Finally, I sincerely hope that all our participants will benefit from technical contents of this conference. I wish you have received a very productive conference and look forward to further cooperation.

Thank you very much.



WELCOME MESSAGE



Assoc. Prof. Chuthamane Suthisisang, Ph.D.

Acting for Director of ASEAN Institute for Health Development

Mahidol University, Thailand

<https://aihd.mahidol.ac.th/>

Ladies and Gentlemen,

It is with great pleasure that I extend a warm welcome to all participants of the 15th International Graduate Students Conference on Population and Public Health Sciences (IGSCPP). This annual conference is organized by the College of Public Health Sciences (CPHS), Chulalongkorn University, the Institute for Population and Social Research (IPSR), and the ASEAN Institute for Health Development (AIHD) of Mahidol University. This international conference is an excellent platform for graduate students to engage in knowledge sharing and establish new networks for academic collaboration. Throughout this conference, you will learn from one another, carry out fruitful discussions and push boundaries of knowledge in the related fields of interest. Let us foster a spirit of friendship, collaboration and intellectual curiosity that will drive us to find innovative solutions to the complex issues we face today. I wish you all have a memorable and enriching experience at the 15th International Graduate Students Conference on Population and Public Health Sciences. May this conference be an inspiration to all of you in nurturing academic growth and conducting meaningful research that will further strengthen your academic experience. Lastly, I would like to extend my sincere gratitude to the organizing team who have worked tirelessly to make this conference a reality.



WELCOME MESSAGE



Assoc. Prof. Chalernpol Chamchan, Ph.D.

Co-Chairperson, Executive Committee, 15th IGSCPP

Director

Institute for Population and Social Research, Mahidol University

<http://www.ipsr.mahidol.ac.th/>

Dear colleagues,

I warmly welcome all distinguished participants of the 15th International Graduate Students Conference on Population and Public Health Sciences (IGSCPP) with profound gratitude. Over the past 14 years, this annual conference has been dedicated to advancing academic pursuits, fostering networking opportunities, and cultivating partnerships. As we gather today, I celebrate the collaborative efforts of the College of Public Health Sciences (CPHS), Chulalongkorn University; ASEAN Institute for Health Development (AIHD), Mahidol University; and the Institute for Population and Social Research (IPSR), Mahidol University.

On behalf of the Institute for Population and Social Research (IPSR) at Mahidol University, I extend a heartfelt welcome to participants from diverse backgrounds and nations. Through sharing your research, I am confident we will deepen our understanding of population and public health, including emerging domains such as population and sustainable development, digital health and technology.

I extend sincere congratulations and appreciation to our esteemed chairperson, Prof. Dr. Chitlada Areesantichai from CPHS, Chulalongkorn University, and co-chairperson, Assoc. Prof. Dr. Chuthamane Suthisisang from AIHD, Mahidol University, for their dedication in organizing this conference. Gratitude also extends to the IPSR organizing team whose active contributions were instrumental in materializing this event.

Furthermore, I extend sincere appreciation to all graduate students, academics, researchers, and presenters who have contributed their research to this conference. Your invaluable contributions are the cornerstone of this annual collaborative and networking event.

In conclusion, I warmly welcome you to the 15th International Graduate Students Conference on Population and Public Health Sciences (IGSCPP). May this conference enrich your academic journey and leave a lasting impression on your professional growth.

Thank you.



The 15th International Graduate Students Conference on Population and Public Health Sciences (IGSCPP)

July 12, 2024

The College of Public Health Sciences, Chulalongkorn University

Time	Program
8.30-8.45	VDO Presentation & Welcome
8.45-9.00	<p>Conference Welcome Report</p> <p>Welcome keynote:</p> <p><i>Professor Chitlada Areesantichai, Ph.D.</i> <i>Dean, College of Public Health Sciences,</i> <i>Chulalongkorn University</i></p> <p><i>Associate Professor Chuthamane Suthisisang, Ph.D.</i> <i>Director, ASEAN Institute of Health Development,</i> <i>Mahidol University</i></p> <p><i>Associate Professor Chalernpol Chamchan, Ph.D.</i> <i>Director, Institute for Population and Social Research, Mahidol University</i></p> <p>Conference Opening Keynote</p> <p><i>Professor Wilert Puriwat, D.Phil. (Oxon)</i> <i>Acting President of Chulalongkorn University</i></p> <p><i>MC: Asst. Prof. Anchalee Prasansuklab, Ph.D.</i></p>
9.00-9.15	<p>Keynote Speech</p> <p><i>Topic: Visionary Research in Public Health Services</i></p> <p><i>Professor Wilert Puriwat, D.Phil. (Oxon)</i> <i>Acting President of Chulalongkorn University</i></p>
9.15-9.30	Photo Group / Short Break

9.30-12.00	Oral Presentation
Room 1	Track 4: Communicable Diseases (CD) and Non-Communicable Diseases (NCD), Sexual and Reproductive Health and Rights, Gender and Sexuality, Violence Against Women and Children, STIs and HIV/AIDS, Health Promotion, Health Behaviours
	Chairperson & Co-Chairperson <i>Assoc. Prof. Wattasit Siriwong, Ph.D. / Assoc. Prof. Piyapong Janmaimool, Ph.D.</i>
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	2) Association Between Knowledge and Attitude with The Decision to Use Long-Acting Reversible Contraceptive (LARC) Among Women of Reproductive Age in South Kalimantan, Indonesia (#21) <i>by Rizky Yuditasaki</i>
	3) Barriers and Facilitators to Access to Sexual and Reproductive Health (SRH) Services for Myanmar Political Migrants in Mae Sot Thailand (#22) <i>by Win Pike Myo</i>
	4) The Willingness to Pay for Human Papillomavirus (HPV) Vaccine among Parents of Daughters Aged between 10 to 15 Years Old in Vientiane Capital, Lao PDR (#28) <i>by Phimmanivanh Menorath</i>
	5) Stigmatization of Sexual Orientation, Gender Identity, Gender Expression, and Sex Characteristics (SOGIESC) among Myanmar Transgender Women in Samut Sakhon Province, Thailand: Impacts on Access to Sexual Health Services (#30) <i>by Min Khant Nyunt</i>
	6) Association between Sociodemographic Factors and Knowledge related to Human Papilloma Virus infection and Vaccine among Young Adult Women in Mandalay City, Myanmar: A Cross-sectional Study (#31) <i>by Kyi Thu</i>
	7) Factors Influencing Women's Autonomy in Sexual Rights and Reproductive Health Decision-Making in Myanmar (#32) <i>by Thiha Lwin</i>
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	<p>Chairperson & Co-Chairperson: <i>Assoc. Prof. Charamporn Holomyong, Ph.D. / Asst. Prof. Pramon Viwattanakulvanid, Ph.D.</i></p> <p>Committee: <i>Asst. Prof. Seo Ah Hong, Ph.D.</i></p>
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	<p>2) Factors influencing on Frozen Embryo Transfer (FET) outcome after Preimplantation Genetic Testing (PGT) among Chinese women receiving services in Thailand: A Cross-Sectional Study (#11) <i>by Liuxu Chen</i></p>
	<p>3) The Association Between Mental Health Literacy and Help-Seeking Intentions Among Students at a Public University in Thailand (#09) <i>by Nutt Pienwittayapun</i></p>
	<p>4) Assessing the Impact of the 'Teach to Say-No' Intervention on Teachers' Knowledge, Attitudes, and Acceptance of Csa Prevention in Phnom Penh, Cambodia (#19) <i>by Swarnamala Kantipudi</i></p>
	<p>5) Knowledge Regarding Diabetes, Chronic Kidney Disease (CKD), Symptoms and Risk Factors of CKD, Attitude and Self-Care of Prevention on CKD: Clinical and Literature Review (#06) <i>by Zuraini Mohd Yunus</i></p>
	<p>6) Toxic Productivity as a Leading Cause of Burnout Syndrome toward Adolescents' Lifestyle (#03) <i>by Fransina Alfonsina Izaac</i></p>
	<p>7) Nursepreneur's perception of value to improve the quality of health services and its influencing factors: Cross-sectional study (#07) <i>by Indah Nursanti</i></p>
Room 3	<p>Track 2: COVID-19, Public Health, Public Health Sciences and Health Social Science, Digital Health and Technology Track 5: Environmental and Occupational Health, Sustainable Development Goal, Global warming, Disaster management, Resilience</p>
	<p>Chairperson & Co-Chairperson: <i>Assoc. Prof. Mathuros Tipayamongkholgul, Ph.D. / Asst. Prof. Kraiwuth Kallawicha, Ph.D.</i></p> <p>Committee: <i>Assoc. Prof. Marc Voelker, Ph.D.</i></p>
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	<p>2) Factors Associated with Suicidal Risk among Secondary School Students in Nakhon Ratchasima, Thailand (#15) <i>by Sirakrit Rungrojchaiporn</i></p>

	3) Mutiara Medan Plus App for Self-Learning on HIV Prevention Knowledge and VCT Services Among a Key Population: Cohort Study in Medan, North Sumatera (#02) <i>by Siska Evi Martina</i>
	4) Prevalence and risk factors of noise-induced hearing loss among hospital workers in selected affiliate hospitals of Mahidol University (#17) <i>by Tanachot Thanomwong</i>
	5) UX Design for a Mobile Application in Thai Healthcare: A Digital Solution for Elderly Care (#24) <i>by Jaruwan Thongbai</i>
	6) The Association between Couple Decision Making and Mental Health Help Seeking Intention (#27) <i>by Malika Adila Fitra</i>
	7) Association between Sociodemographic factors and Practices related to solid waste management among rural residents of Londhe-Krishnapuri, Jalgaon district in India: A Cross-sectional study (#40) <i>by Priyanka Chavan</i>
12.00-13.30	Poster Presentation (room 1)
	Poster committees: <i>Narumol Bhummapha, Ph.D., Prof. Emeritus Ratana Somrongthong, Ph.D. / Assoc. Prof. Mathuros Tipayamongkholgul, Ph.D. / Nanta Auamkul, M.D, M.P.H.</i>
	1) Diabetes Self Care Practice among Type 2 Diabetes Mellitus with Chronic Kidney Disease Patients in East Coast of Peninsular Malaysia (#P01) <i>by Siti Aisyah Ramli</i>
	2) Unmet Healthcare Needs and Related Factors among Myanmar Migrants in Samut Sakhon Province, Thailand (#P02) <i>by Myat Thinzar Oo</i>
	3) Factors associated with knowledge about antibiotic self-medication by gender among the general public in Northern Iran: a cross-sectional study (#P28) <i>by Anahita Mogharabian</i>
	4) Development of mesoporous silica nanoparticles coated with pH-responsive polymers and encapsulated with kinase inhibitor for the treatment of colorectal carcinoma (#P04) <i>by Kornrawee Srichan</i>
	5) The Evaluation of Pulp Chamber Morphology of the Mandibular First Molar in a Selected Thai Population Using Cone-Beam Computed Tomography (#P05) <i>by Pitcha Suwannasin</i>
	6) Effectiveness of Facebook Breastfeeding Support Group on Exclusive Breastfeeding among Myanmar Migrant Mothers in Samut Sakhon Province, Thailand: A Randomized Controlled Trial (#P06) <i>by Zayar Lynn</i>
	7) Preventing Maternal Deaths for Attaining Sustainable Development Goal 3.1: Analysis of Social Determinants of Non-Utilisation of Skilled Birth and Postpartum Services in North-Western Nigeria (#P07) <i>by Abubakar Yakubu Abbani</i>

	8) The Optimization of M1-Like Macrophage-Derived Extracellular Vesicles Parental Cell Culture Conditions (#P08) <i>by Sa Punyahotra</i>
	9) Household Food Security Status of Myanmar Migrant Workers in Samut Sakhon Province, Thailand (#P09) <i>by Ei Ei Nyein</i>
	10) Knowledge, Attitude, and Practice of WHO Mental Health Guidelines for Non-Specialist Primary Healthcare Providers in Wuhua District, Kunming, China: A Cross-Sectional Study (#P10) <i>by Liesha Luohe</i>
	Poster Presentation (room 2)
	Poster committees: <i>Asst. Prof. Pokkate Wongsasuluk, Ph.D./ Kriangkrai Lerdthusnee, Ph.D. / Assoc. Prof. Chaweewon Boonshuyar/ Tarinee Buadit, Ph.D.</i>
	11) Impact of Service Quality on Out-Patients' Satisfaction, Perceived Value, and Revisit Intention: a Mixed-Method Study from Indonesia (#P11) <i>by Alvera Noviyani</i>
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	13) Unconditional Love: A Mother's Tale in the Dialysis Struggle (#P13) <i>by Bea Henessy B. Villanueva</i>
	14) Hormonal Contraceptive Use and Menstrual Problems Among Reproductive-Age Indonesian Women (#P14) <i>by Era Susanti</i>
	15) Clinical Manifestations of Fatal Dengue Hemorrhagic Fever, Upper Southern Thailand, 2023 (#P15) <i>by Thanapol Chaiprateep</i>
	16) Distribution of the Factors Related to Needle Sticks and Sharp Injuries Among Healthcare Workers in a Teaching Hospital (#P16) <i>by Perawat Wattanasombat</i>
	17) Factors Associated with Human Papillomavirus (HPV) Vaccine Uptake among Female Adults in China: A Preliminary Result from Cross-Sectional Study (#P17) <i>by Cong Liu</i>
	18) Achievement of Malaria Acceleration in Southwest Sumba District in Indonesia: A Review of Electronic-Malaria Surveillance Information System (e-SISMAL) (#P19) <i>by Orpa Diana Suek</i>
	19) Exploring Preventive Behavior Related to Tuberculosis Among Myanmar Migrants in Samut Sakhon Province of Thailand (#P24) <i>by Htet Arkar</i>

	Poster Presentation (room 3)
	<i>Poster committees: Onuma Zongrum, Ph.D. Asst. Prof. Wandee Sirichokchatchawan, Ph.D. / Nuchanad Hounnaklang, Ph.D./ Lect. Nucharapon Liangruenrom, Ph.D.</i>
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	26) Oral Health Care Service Utilization among Pregnant Women Attending Antenatal Care Clinics in Public Hospitals of Thailand (#P26) <i>by Pachareeyaphat Nakwaree</i>
	27) Knowledge and attitude about hypertension and associated factors among people aged 30-64 years in Tonglu County, China (#P27) <i>by Yuanyuan Wu</i>
	26) Optimization of Multi-kinase Inhibitor Encapsulated Polymeric Nanoparticles for Potential Therapy of Hepatocellular Carcinoma (#P03) <i>by Mattika Thaweessuvannasak</i>
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	8) What Drives Women's Choice for Induced Abortion in Nepal? (#36) <i>by Sharmila Bhandari</i>
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	10) Exploring the Impact of Social Media on Stigmatization and HIV Prevention Service Utilization Among MSM in Yangon, Myanmar (#10) <i>by Thet Zaw Naung</i>
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	12) The development of health promoting program to support employees at Chulabhorn Royal Academy (CRA) and build capacity in non-communicable disease prevention (#05) <i>by Worakarn Phimsen</i>
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Room 2	Chairperson & Co-Chairperson: <i>Asst. Prof. Pojjana Hunchangsinh, Ph.D. / Assoc. Prof. Cheerawit Rattanapan, Ph.D.</i> Committee: <i>May Chan O, Ph.D.</i>
	8) Social Participation, Self-Reported Health Status, Life Satisfaction, and Their Associations with Preventive Health Services Utilization Among Older People in Myanmar (#20) <i>by Han Min Htet Aung</i>
	9) Sociodemographic characteristics and sleep quality among urban adults in Mandalay, Myanmar (#26) <i>by Pan Myat Kyaw Zin</i>
	10) Association between Perception of Academic Stress and Family Relationship Toward Mental Well-Being among Pharmacy Students at Chulalongkorn University in Thailand: A Cross-Sectional Study (#29) <i>by Chompunoot Prasongpol</i>
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	14) Factors Associated with Suicide Mortality among Suicide Attempter in Thailand (#14) <i>by Kajohnsak Tangkwampien</i>
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Room 3	Chairperson & Co-Chairperson: <i>Assoc. Prof. Orapin Laosee, Ph.D./ Asst. Prof. Tepanata Pumpaibool, Ph.D.</i> Committee: <i>Lect. Truc Ngoc Hoang Dang, Ph.D.</i>
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	9) Levels of Knowledge, Attitude, and Practice toward atopic dermatitis(eczema) due to indoor environmental factors in young adults of Yangon, Myanmar (#01) <i>by Htoo Tint Tae</i>
	10) Three Common Hand Disease: A Case Series Study about patient's characteristic at a Teaching Hospital (#18) <i>by Amporn Mitprasit</i>
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LEVELS OF KNOWLEDGE, ATTITUDE, AND PRACTICE TOWARD ATOPIC DERMATITIS (ECZEMA) DUE TO INDOOR ENVIRONMENTAL FACTORS IN YOUNG ADULTS OF YANGON, MYANMAR

Htoo Tint Tae^{1*}, Nutta Taneepanichskul¹

¹ College of Public Health Sciences, Chulalongkorn University, Sabbastravicaya Building, Phayathai Road, Bangkok 10330 Thailand

***Corresponding Author:** Htoo Tint Tae, College of Public Health Sciences, Chulalongkorn University Sabbastravicaya Building, Phayathai Road, Bangkok 10330 Thailand, Email: emeraldzan.97@gmail.com

ABSTRACT

Introduction: Indoor air quality and indoor environmental factors become hazardous issues for public health consequences, but little is known about knowledge, attitudes, and practices concerning indoor air pollutants associated with eczema among urban residents in Myanmar. Rapid development in cities like Yangon might exacerbate pollution while increasing time spent indoors.

Objectives: To assess knowledge, attitude, and practice levels toward atopic dermatitis (AD) (eczema) due to indoor environmental factors in young adults of Yangon, Myanmar.

Methodology: A cross-sectional survey was conducted on 480 participants from 45 townships of Yangon, Myanmar. Sociodemographic details, knowledge, attitude, and practices toward atopic dermatitis(eczema) associated with indoor environmental factors were assessed using an online self-reported questionnaire. Knowledge level was classified into three levels (low, moderate, and high) by Bloom's cutoff point based on signs/symptoms and treatment, risk factors of AD, indoor environmental risk factors, and prevention related to eczema. Attitude questions utilized 5-point Likert scales, while practice questions were determined by using 4-point Frequency Scale. Attitude and practices were classified into two levels (poor and good).

Results: Of the 480 participants, only 4.4% have a high level of knowledge,22.9% have a moderate level, and 72.7% have a poor level of knowledge. For the attitude level, 45.8% have a poor attitude and 54.2% have a good attitude in this study. For the practice level,55.8% have poor practice, and 44.2% have good practice. Although most of the participants have poor knowledge and poor practice levels, they have good attitudes.

Conclusion: The majority of respondents have poor knowledge and practice levels on indoor environmental factors associated with AD. However, over half of them have a good attitude. An educational intervention related to indoor environmental factors impacting skin health should be provided to help them better understand the risks of their indoor environment. This will improve their practice behavior and enhance their health outcomes in Myanmar.

Keywords: Indoor environmental factors, atopic dermatitis(eczema), Knowledge, Attitude, Practices, Myanmar

INTRODUCTION

Skin, the largest organ in the human body, serves as the primary defense against environmental stressors such as air pollutants. Prolonged exposure to environmental factors such as UV radiation and climate, use of harsh chemicals in occupational settings and household cleaning agents can impair skin's natural protective functions. This damage can result in dryness, heightened sensitivity, and increased vulnerability to conditions like atopic

dermatitis (AD), the most prevalent form of eczema.

Environmental factors are significant contributors to the development and exacerbation of atopic dermatitis (1). The etiology of AD is multifactorial, involving interactions between genetic, immune, and environmental factors. In adults, AD can be triggered by genetic predispositions, environmental allergens (dust mites, pet



ander, and pollen), irritants (harsh soaps or detergents), stress, and climate.

In highly industrialized countries, indoor air pollution has received significantly less attention than outdoor air pollution. Typically, indoor air pollutant levels are twice higher due to poor ventilation and reduced dilution with outdoor air, which may lead to the accumulation of indoor pollutants (2) that play a key role in the development and aggravation of allergic diseases. Indoor air quality has become an essential role in the management of AD (3).

Eczema, or AD, is common in children but can also affect adults. A 2018 population-based study showed a prevalence of 2.1% to 4.9% among adults in North America, Europe, and Japan (4). While extensive research has been done on eczema in children, parents of children suffering eczema and healthcare workers, there is limited KAP study regarding it to general populations, especially in young adults, in relation to indoor environmental factors. In Myanmar, previous research in Yangon focused primarily on outdoor air quality. However, there needs to be more knowledge concerning indoor air pollutants and their role in causing eczema. The lack of awareness about indoor environmental factors and their complications underscores the need for further study in this area.

This study aims to assess the knowledge, attitude, and practice levels of young adults in Yangon, Myanmar, regarding atopic dermatitis (eczema) due to indoor environmental factors.

METHODOLOGY

The research design is a cross-sectional study. Yangon was selected as the study area. It is the second-largest capital city of Myanmar, the country's industrial and commercial hub and the most urbanized and densely populated region compared to other regions of Myanmar. This study focused on the entire Yangon region, including all 45 townships. The targeted population is young adults (18-35) who are currently residing in Yangon City within these 45 townships.

This study enrolled 480 participants using a convenience sampling method through an online questionnaire. The standard questionnaire, based on previous studies of the (KAP) questionnaire for skin cancer (5), was

constructed into self-administered questionnaires and distributed through social media platforms. A total of 480 individuals met the inclusion and exclusion criteria and were deemed eligible for analysis.

These self-administered questionnaires include five parts: screening questions, general characteristic sociodemographic details, knowledge, attitudes, and practices questions regarding atopic dermatitis associated with indoor environmental factors.

Sociodemographic details include age, sex, education, occupational status, income level, housing type, family history, personal history, and current suffering of the disease. Knowledge level was scored by using Bloom's cutoff point and classified into three levels: low, moderate and high. For attitude-related questions utilized a 5-point Likert scale and divided into two levels (poor) and (good). Both knowledge and attitude-related questions are based on signs/symptoms and treatment, risk factors of AD, indoor environmental risk factors and prevention related to eczema. Practice questions were determined by using a 4-point Frequency Scale and classified into two levels (poor) and (good).

Descriptive statistical analysis was performed, with frequencies and percentages used to summarize sociodemographic data, knowledge, attitudes, and practice level. A pilot test was conducted on 15% of the targeted population, involving 72 participants from Mandalay and Nay Pyi Taw, cities that are culturally and socio-demographically comparable to the study area. For validity, the questionnaire was reviewed by three experts, and the (IOC) score is more than 0.5.

This study was approved by The Research Ethics Review Committee for Research Involving Human Research Participants, Group I, Chulalongkorn University (COA No. 125/67).

RESULTS

Table 1 shows the sociodemographic profile of the participants. The study included 480 participants (n=480) from all townships of Yangon. Over half of the participants were 25 years of age or older (52.1%). The majority of the respondents, 52.5%, were male, and 47.5% were female.

In terms of education, 235 (49%) of the respondents are at the undergraduate level,



followed by graduate and above level with 245(51%). According to occupation status, the majority are unemployed, 43.8% and only 7.9% are health care workers.

Regarding monthly individual income, most of the respondents, 211(44%), earned less than 300,000 MMK, while 106 (22.1%) earned between 300,001 and 500,000 MMK monthly, and the rest, 163 (34%), earned above 500,000 MMK.

For the housing type of condition, nearly half of the respondents 49% lived in an apartment, 38.5% lived in a house, and only 12.5% lived in a condominium.

Only 2.3% of the respondents currently suffer from a disease (eczema), while the majority, 97.7%, do not have a disease.

Table 1 Sociodemographic Profile (N=480)

Characteristics	Variables	Number	Percent (%)
Age	Less than 25	230	47.9
	25 and above	250	52.1
Sex	Male	252	52.5
	Female	228	47.5
Education level	Undergraduate	235	49.0
	Graduate and above	245	51.0
Occupational status	Health Care Workers	38	7.9
	General workers	51	10.6
	Office employee	181	37.7
	Unemployed	210	43.8
Income level (MMK)	Less than 300,000MMK	211	44.0
	300,001- 500,000MMK	106	22.1
	Above 500,000MMK	163	34.0
Housing condition	House	185	38.5
	Apartment	235	49.0
	Condominium	60	12.5
Currently suffering	Yes	11	2.3
	No	469	97.7

Table 2 Number and percentage of corrected answer knowledge (N=480)

Statement	Correct response N (%)	Mean (\pm SD)
Signs/symptoms and treatment of AD (eczema)		0.52(\pm 0.26)
1. Itching is the main symptom of eczema.	338(70.4)	
2. Eczema is an inflammatory skin condition.	280(58.3)	
3. Eczema can be cured.	54(11.3)	
4. Eczema can be recurred or flare up anytime at a certain condition.	268(55.8)	
5. Eczema can be treated with both topical and oral pills for the effective result.	326(67.9)	
Risk factors of AD (eczema)		0.38(\pm 0.27)
6. Genetic and immunological factors cause eczema.	171(35.6)	
7. Environmental factors such as pollutants and irritants can cause a potential risk of eczema.	320(66.7)	
8. Extreme temperatures do not influence the development of eczema.	142(29.6)	
9. Smoking can increase the potential risk of developing eczema.	123(25.6)	



Statement	Correct response N (%)	Mean (\pm SD)
10. Air pollutants such as PM _{2.5} , SO ₂ and NO ₂ is not concern with the potential risk of eczema	165(34.4)	
Indoor Environmental risk factors of AD (eczema)		0.36(\pm0.26)
11. Indoor pollutants such as (VOCs) emitted from building paintings and materials can trigger the cause of eczema	182(37.9)	
12. Presence of pets is not associated with eczema	179(37.3)	
13. Regular cleaning of the curtains, furniture and dust mites cannot reduce the risk of eczema.	55(11.5)	
14. Using harsh chemicals contained in household cleaning products relates to the risk of developing eczema.	235(49.0)	
15. Poorly ventilated room is not associated with the cause of eczema.	215(44.8)	
Prevention related to eczema		0.51(\pm0.32)
16. Using mild soap can prevent the risk of eczema.	195(40.6)	
17. Applying emollients and moisturizers can help skin health and prevent from eczema.	252(52.5)	
18. Keeping the home clean is not important for eczema protection behavior.	283(59.0)	
19. Education is needed for the usage of gloves and masks to prevent occupational hazards that can cause eczema.	317(66.0)	
20. Reducing stress can also reduce the risk of an eczema flare-up.	187(39.0)	

Level of knowledge

Knowledge scores are categorized into three levels, low, moderate, and high, using Bloom's cut of point. Of the 480 respondents, 72.7% have a poor level of knowledge, 22.9% have a moderate level of knowledge, and only 4.4% have a high level of knowledge in this study.

Table 3 Level of knowledge (N=480)

Knowledge level	N	Percent (%)
Poor level	349	72.7
Moderate level	110	22.9
High level	21	4.4

**Table 4** Number and percentage of respondents' attitude towards eczema (N=480)

Statement	Strongly Agree N (%)	Agree N (%)	Unsure N (%)	Disagree N (%)	Strongly Disagree N (%)
Signs/symptoms and treatment of AD (eczema)					
Mean±SD	3.93(±0.56)				
1. if dry, cracked and itchy patches appear on the skin, it can be considered a symptom of eczema.	90 (18.8)	240 (50.0)	121 (25.2)	22 (4.6)	7 (1.5)
2. eczema (AD) can occur in all parts of the body, and it can flare up anytime.	101 (21.0)	249 (51.9)	109 (22.7)	16 (3.3)	5 (1.0)
3. lifestyle change is required for the treatment of eczema.	111 (23.1)	263 (54.8)	85 (17.7)	19 (4.0)	2 (0.4)
4. if an individual suffers eczema, consult with the health care provider if needed.	235 (49.0)	181 (37.7)	53 (11.0)	9 (1.9)	254 (0.4)
5. if an individual suffers eczema, using topical corticosteroids on our own is not a proper treatment.	120 (25.0)	183 (38.1)	119 (24.8)	31 (6.5)	27 (5.6)
Risk factors of AD (eczema)					
Mean±SD	3.44(±0.58)				
6. both genetic, immunological factors and environmental factors can contribute to the cause of AD.	78 (16.3)	203 (42.3)	156 (32.5)	38 (7.9)	5 (1.0)
7. excessive scrubbing while bathing is a concern with the development of AD.	52 (10.8)	111 (23.1)	177 (36.9)	112 (23.3)	28 (5.8)
8. skin barrier dysfunction is one of the causes of AD (eczema).	55 (11.5)	188 (39.2)	193 (40.2)	39 (8.1)	5 (1.0)
9. if people have asthma, they may also have a higher risk of eczema.	38 (7.9)	109 (22.7)	238 (49.6)	82 (17.1)	13 (2.7)
10. although children are at high risk of eczema, it can occur at any age.	76 (15.8)	255 (53.1)	127 (26.5)	18 (3.8)	4 (0.8)
Indoor Environmental risk factors of AD (eczema)					
Mean±SD	3.71(±0.65)				
11. if people are exposed to indoor air pollutants for the long term, they may have the potential risk of eczema.	91 (19.0)	244 (50.8)	122 (25.4)	17 (3.5)	6 (1.3)
12. having pets in the house is possible to increase the risk of eczema.	49 (10.2)	172 (35.8)	190 (39.6)	56 (11.7)	13 (2.7)
13. it is necessary to clean the curtains, furniture frequently to reduce the risk of eczema.	106 (22.1)	238 (49.6)	113 (23.5)	17 (3.5)	6 (1.3)
14. if household cleaning products containing a strong chemical can increase the risk of eczema.	85 (17.7)	201 (41.9)	162 (33.8)	30 (6.3)	2 (0.4)
15. Living in a room with poor ventilation increases the risk of eczema.	95 (19.8)	209 (43.5)	148 (30.8)	19 (4.0)	9 (1.9)
Prevention related to eczema					
Mean±SD	3.78(±0.57)				
16. It is necessary to keep your body moisturized, which can prevent eczema.	106 (22.1)	250 (52.1)	106 (22.1)	17 (3.5)	1 (0.2)
17. chemical-free personal care products can reduce the risk of developing eczema.	93 (19.4)	260 (54.2)	108 (22.5)	19(4.0)	-
18. avoiding allergens can help prevention of eczema.	93 (19.4)	244 (50.8)	115 (24.0)	26 (5.4)	2 (0.4)



Statement	Strongly Agree N (%)	Agree N (%)	Unsure N (%)	Disagree N (%)	Strongly Disagree N (%)
19. it is necessary to use personal protective equipment (e.g., gloves) can prevent eczema from exposure to occupational hazards.	96 (20.0)	267 (55.6)	97 (20.2)	19 (4.0)	1 (0.2)
20. reducing stress is related to the prevention of eczema flare up.	46 (9.6)	160 (33.3)	214 (44.6)	48 (10.0)	12 (2.5)

Level of attitude towards eczema

Attitude scores are categorized into two levels: poor attitude and good attitude, using the median cutoff point (which is 74). Over half of the respondents, 54.2%, have a good attitude, followed by 45.8% who have a poor attitude.

Table 5 Level of Attitude towards eczema (N=480)

Attitude level	N	Percent (%)
Poor Attitude	220	45.8
Good Attitude	260	54.2

Table 6 Number and percentage of respondents's practice towards eczema (N=480)

Statement	Never N (%)	Sometimes N (%)	Often N (%)	Always N (%)
Indoor environment factors				
Mean (\pm SD)	2.92(\pm 0.53)			
1. How often do you usually clean your house from dust mites? (positive statement)	21 (4.4)	186 (38.8)	118 (24.6)	155 (32.3)
2. How often do you stay close in contact with the pet from your own house or other houses? (negative statement)	165 (34.4)	73 (15.2)	107 (22.3)	135 (28.1)
3. How often do you use the air freshener in your home? (negative statement)	156 (32.5)	85 (17.7)	127 (26.5)	112 (23.3)
4. How often do you open the windows to get good ventilation in your room? (positive statement)	24 (5.0)	86 (17.9)	69 (14.4)	301 (62.7)
5. How often do you smoke in your house? (negative statement)	337 (70.2)	38 (7.9)	42 (8.8)	63 (13.1)
6. How often do you stay in close contact with other smokers in your house? (negative statement)	226 (47.1)	56 (11.7)	90 (18.8)	108 (22.5)
Personal hygiene				
Mean (\pm SD)	2.23(\pm 0.73)			



Statement	Never N (%)	Sometimes N (%)	Often N (%)	Always N (%)
1. How often do you use mild, fragrance-free moisturizers to provide skin hydration? (positive statement)	95 (19.8%)	108 (22.5%)	108 (22.5%)	169 (35.2%)
2. How many times do you apply hand cream after washing your hands? (positive statement)	217 (45.2%)	88 (18.3%)	72 (15%)	103 (21.5%)
3. How often do you use masks and gloves while using harsh chemical detergents when cleaning the house? (positive statement)	195 (40.6%)	114 (23.8%)	78 (16.3%)	93 (19.4%)
4. How often do you use gloves while dishwashing? (positive statement)	323 (67.3%)	51 (10.6%)	35 (7.3%)	71 (14.8%)
5. How many times do you change your towel within a month? (positive statement)	88 (18.3%)	197 (41%)	82 (17.1%)	113 (23.5%)
6. How many times do you change your bedlinen within a month? (positive statement)	110 (22.9%)	220 (45.8%)	65 (13.5%)	85 (17.7%)

Protection practice level of atopic dermatitis (eczema)

Practice scores are categorized into two levels, poor practice and good practice, by using the median cutoff point (median is 31). Over half of the participants, 55.8%, have poor practice, while only 44.2% have good practice in this study.

DISCUSSION

This study involved 480 participants, a larger sample size than previous KAP studies on eczema. The study focused on young adults (18-35), differing from other studies that often target children (6), parents(7) and medical personnel(8, 9). Unlike other studies that have primarily focused on dermatologists(10), this study excluded dermatologists and focused on the general population. The participants were predominantly male (52.5%), which can impact the practice of personal hygiene as females are more likely to take care of their hygiene awareness. The majority of the participants are unemployed (43.8%) as they are students, and only 7.9% are healthcare workers, including doctors and other healthcare workers. This statement is a significant difference from other previous studies from Cameroon and South Africa.

In terms of knowledge level, the majority of the participants identified correctly that eczema is an inflammatory disease 58.3%, and the main symptom is itching 70.4%. This result aligns with the study from medical doctors in Nigeria and Malagasy, showing that there is no significant difference in the level of

Table 7 Protection practice level of atopic dermatitis (eczema) (N=480)

Practice level	N	%
Poor Practice	268	55.8%
Good Practice	212	44.2%

knowledge between medical personnel and the general population regarding to signs and symptoms of eczema. Recognizing the condition and its symptoms may be based on personal feelings and perceptions rather than background knowledge. The mean in this part is (0.52), and assumed that half of the participants knew this part, which was similar to the finding from the knowledge of parents of children with atopic dermatitis in Serbia (7). Only 35.6% answered correctly that eczema is due to both genetic and indoor environmental factors. This coincides with the previous study conducted in Cameroon, which is the KAP of medical personnel regarding eczema. Therefore, although the medical personnel cannot correctly describe that genetic factors are one of the causative factors of eczema. The research from Malagasy physicians indicated that only pediatricians and dermatologists correctly defined eczema as a genetic disorder(11). This results in a need for increased education and awareness efforts, as understanding the hereditary nature of eczema is crucial for prevention and its management.

The attitude related to indoor environmental risk factors is positive, the same as in previous studies from different cities in



China. Overall, the attitude towards eczema can be considered a good attitude in this research. However, 44.6% identified being unsure that reducing stress is related to preventing eczema flare-ups. These results differ from those in the previous study, which revealed that psychological stress tends to worsen eczema (12).

Regarding the protection practice behavior, showed high proportion of 62.7% have good practice in opening the windows to get good ventilation, similar to other previous studies from different cities in China. In addition, people who always have close contact with pets are only 28.1% and 21.3% from different cities in China, including Beijing, Shanghai, Chongqing and Changsha (13). Having good practice behavior on indoor environmental factors can reduce the potential of developing eczema. However, the majority of the participants never used gloves for protection while dishwashing and cleaning with harsh chemicals. In addition, nearly half of the respondents have yet to use hand cream after hand washing. Due to a lack of awareness of personal hygiene practices, it can be considered that they are at risk of developing eczema according to hand eczema prevention guidelines (14).

To summarize, in this study, respondents have low levels of knowledge, good attitudes and poor practice behavior. However, in the study conducted in Nigeria, although medical personnel exhibited very poor knowledge and harmful attitudes, their practice behaviors were average. This discrepancy is due to their involvement in training in the hospital environment. Despite their lack of knowledge and negative attitudes, the practice of the medical personnel is influenced significantly by their training, underscoring the importance of context in shaping practical behaviors. Therefore, although knowledge levels were similar to other studies, attitudes and practices varied, demonstrating that levels can be different among medical personnel and general populations.

LIMITATIONS

This is the first study conducted to assess the knowledge, attitude, and practice levels toward atopic dermatitis (eczema) associated with indoor environmental factors in young adults of Yangon, Myanmar,

using primary data. The results are valuable for identifying general trends in risk factors for eczema and for further study related to other types of eczema in Myanmar.

Limitations: This study focuses only on the urban population in Yangon and does not represent the entire young adult community in Myanmar. Moreover, as it is a Google Form online survey, the connection, improper understanding of the usage of Google Forms, and people who need access to the internet can be challenging.

CONCLUSION

The study has revealed a significantly low level of knowledge, good attitude, and poor practice regarding AD (eczema). Addressing these gaps through targeted interventions and policy support, educational efforts will be empowered with high knowledge and fostering positive attitudes can encourage them to improve protection behavior in practice. Strengthening these initiatives is essential to enhance our indoor environment and skin health, ultimately leading to better overall health outcomes in the region and an improved quality of life in Myanmar.

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DEVELOPMENT OF A NUTRITION COACHING PROGRAM AND A SHORT-TERM EVALUATION ON KNOWLEDGE AND GLYCEMIC CONTROL IN TYPE 2 DIABETES MELLITUS PATIENTS

Wachairawit Bunbuchachai¹, Kitti Sranacharoenpong^{2*}, Tippawan Pongcharoen³,
Nuttarat Srisangwan³, Arisa Keeratichamroen

¹ Faculty of Medicine Ramathibodi Hospital, Mahidol University, Bangkok 10400, Thailand

² ASEAN Institute for Health Development, Mahidol University, Salaya, Phuttamonthon, Nakhon Pathom 73170, Thailand

³ Institute of Nutrition, Mahidol University, Salaya, Phuttamonthon, Nakhon Pathom 73170, Thailand

*Corresponding Author: Kitti Sranacharoenpong, ¹ASEAN Institute for Health Development, Mahidol University, Salaya, Phuttamonthon, Nakhon Pathom, 73170, Thailand, Email: ksrnach@gmail.com

ABSTRACT

Introduction: Type 2 Diabetes Mellitus (T2DM) is a chronic disease caused by abnormal glycemic control. T2DM is the most common type of diabetes in Thailand, accounting for over 95% of all people with diabetes. In recent years, technology has been incorporated into the management of diabetic patients. LINE, a widely used application in Thailand, has seen limited research on its effectiveness when combining nutrition coaching with learning technology to manage diabetes patients.

Objectives: To develop the coaching program and a short-term evaluation of nutritional knowledge and glycemic control with learning technology for T2DM patients at the Faculty of Medicine Ramathibodi Hospital, Mahidol University in Bangkok.

Methodology: This study conducted a coaching program involving patients with T2DM who were treated with metformin at the Faculty of Medicine Ramathibodi Hospital, Mahidol University. Participants were randomly assigned to control and intervention groups. The control group received the usual diabetes care at the hospital. The intervention group received six coaching sessions with 30-minute training via Google Meet and weekly diabetes-related knowledge updates through the LINE application for 12 weeks by a trained dietitian. Both groups measured nutritional knowledge, dietary patterns and intake, anthropometry indicators, and biochemical indicators.

Results: A total of 71 eligible participants were applied to join the study. There were 34 and 37 participants in control and intervention groups, respectively. The results showed that at baseline and 12-week, Body Mass Index (BMI), HbA1c, and body weight of the two groups were not significantly different. The total nutritional knowledge scores of the control group at baseline and a 12-week were 20.50 (3.87) and 20.47 (4.05), respectively ($p = 0.972$). In contrast, the total scores of the intervention group increased significantly from 19.43 (4.96) to 21.79 (4.55) ($p = 0.002$). In addition, the means of energy intake at a 12-week were 1,315 (374.21) Kcal/day and 1,279 (345.89) Kcal/day in the control and intervention groups, respectively ($p = 0.683$).

Conclusion: The results indicated that a 12-week coaching program with learning technology was an alternative approach to providing nutrition information and health promotion. However, it was likely that multiple influences resulted in improvements in T2DM patient's knowledge and practice. As expected, no difference between groups in physical measures was observed at a 12-week. Therefore, further research should be conducted on the challenges of learning technology to manage diabetes patients, as well as its impact on long-term health behavior changes.

Keywords: Nutrition / Coaching program / Knowledge / Glycemic control / Type 2 diabetes mellitus

INTRODUCTION

Type 2 diabetes mellitus (T2DM) is a serious public health issue that significantly affects both individuals' quality of life and

overall healthcare costs (1). The incidence of diabetes in Thailand has risen significantly over the last decade, increasing from 7.0% in 2004 to 9.7% in 2014 (2). T2DM is the most common



type of diabetes in Thailand, accounting for approximately 95% of all diabetes cases (3). T2DM increases the risk of cardiovascular disease (CVD), metabolic syndrome, and hyperinsulinemia, being an independent risk factor for coronary heart disease (4). Diabetes self-management education and support (DSMES) is a crucial component in managing diabetes effectively, as it delivers personalized instruction and promotes the necessary behavior changes (5, 6). It also enhances the knowledge, skills, and motivation required for individuals to engage in proper self-care. By focusing on these critical areas, DSMES helps patients better understand their condition, make informed decisions about their treatment, and adopt healthier lifestyles that can lead to improved health outcomes.

The theoretical basis of the DSMES framework for developing and understanding the education process has drawn on psychosocial theories that are related to peer or dietitian-delivered health promotion (7), (8). There are multifaceted interventions extending across numerous demographic variables, disease-related, illness-preventive, and health-promoting aspects. Even though there are many diverse applications of the approach, the actual provision of support consists of characteristics of peers, the selection process, training procedures, and specific common attributes. Selection of peers for health promotion, for example, can be by professionals or lay persons. Their roles within programs may be to deliver health promotion information, serve as role models, and support at-risk populations.

Minimal or extensive training can identify types of peer educators. When peers are professionalized, their talents and accountability to the target population are shifted to the healthcare system and away from target groups (9). However, the amount of training required to create paraprofessionals depends on the objectives of each implementation. The methodology of training (e.g., classrooms and communities) varies accordingly.

Attributes of the support training for peer educators consist of information, emotional, skills, and appraisal support. These supports are essential for peer educators in health promotion intervention programs (9). Training should integrate ongoing and appraisal support using technology to reinforce the at-

risk people or patients and their activities. Information support for peer educators refers to relevant knowledge, relevant and available resources, alternative courses of action, and guidance about effectiveness (10). The support can help peer educators self-evaluate the appropriateness of their emotions, cognition, and behaviours. All support, information, emotions, and appraisal for peer educators can generate positive short-term and long-term outcomes and expectations. In addition, participatory learning approaches, tailor-made training programs, social networks, and national public health policy are essential factors that can support the sustainability of practical peer-delivered approaches.

DSMES-based diabetes therapy is one of the alternative approaches to use, but it needed to have trained diabetic experts in the healthcare system. Several studies in Thailand demonstrated that DSMES was beneficial in improving glycemic control (11). However, the costs of DSMES services in Thailand are not reimbursed by either the government or private organizations (12). Additionally, inadequate diabetic knowledge, poor patient-healthcare provider communication, lacking motivation, insufficient decision-making abilities, and poor responsibilities all contributed to suboptimal DSMES (13). The application of mobile communications and network technologies in healthcare is referred to as Mobile Health (mHealth) (14). The mHealth encompasses the use of mobile communication and network technology in healthcare. The LINE application is widely used by the general public, patients, and healthcare professionals for various purposes, particularly in the field of healthcare, leading to multiple benefits (15). However, there is limited data on the effectiveness of social networking-based health education, particularly regarding the impact of a coaching program using the LINE application combined with diabetes self-management support (15, 16). The study aims to develop the coaching program and a short-term evaluation of knowledge and glycemic control with learning technology for T2DM patients at the Faculty of Medicine Ramathibodi Hospital, Mahidol University.



METHODOLOGY

Study Design

The ethical document was submitted for approval by the committee of Mahidol University, the Central Institutional Review Board (MU-CIRB), and the Institutional Review Board (IRB) of Mahidol University Faculty of Medicine Ramathibodi Hospital. Recruitment began in August 2023 to March 2024. The study included adults aged 30-60 years diagnosed with T2DM who were being treated with metformin at the Faculty of Medicine Ramathibodi Hospital, Mahidol University. Participants needed to use the LINE application and Google Meet, be proficient in Thai, and provide consent to the study. Exclusion criteria included Type 1 Diabetes, Gestational Diabetes, severe illnesses, substance abuse, dementia, major psychiatric disorders, current insulin use, recent COVID-19 diagnosis, or inability to self-manage. Participants were randomly assigned to control and intervention groups. The control group received the usual diabetes care at the hospital. The intervention group received their usual diabetes care plus a 12-week coaching program (Figure 1). After the study concluded, the control group received the same coaching program as the intervention group.

Measurement

For demographic characteristics, such as age, gender, marital status, and educational level, medical records were consulted to review the patient's diabetes history, current therapies, and anthropometric and laboratory results, including blood pressure, height, weight, Body Mass Index (BMI), and HbA_{1c}. The diabetes questionnaire, based on the coaching program curriculum and Thailand's diabetes guidelines, was divided into six parts and reviewed by three experts using the Content Validity Index (CVI). The mean CVI score for the questionnaire was 0.94.

A 24-hour dietary recall (24HR) is a structured interview designed to capture detailed information about all foods and beverages consumed by the respondent in the past 24 hours. The results were used to show nutrient intake. The nutritive values of all foods, including their condiments, were calculated using the Thai food composition software (INMUCAL-v4.0) developed by the

Institute of Nutrition, Mahidol University, Thailand. These values included energy, fat, protein, carbohydrate, sugar, saturated fatty acids (SFA), cholesterol, and sodium (Na).

Coaching Program

The coaching program included six weekly sessions (30-45 minutes each) of online counselling and nutrition education featuring infographics, video clips, and text materials related to diabetes knowledge, delivered by a dietitian via Google Meet. Over 12 weeks, communication was maintained between patients and dietitians through the LINE application once a week, covering dietary recommendations, healthy behaviors, physical activity, and medication management. The contents of the coaching program were developed with guidance from experts experienced in diabetes self-management education and support, including multidisciplinary teams and health coaches.

Sample size calculation and statistical analysis

The participants were uncontrolled T2DM patients at the Faculty of Medicine Ramathibodi Hospital, Mahidol University. G*Power software was used to determine the sample size with a power of 0.95, alpha of 0.05 and an effect size of 0.89 (17). An extra 10% is added to allow for dropout, resulting in 38 samples in each group. The dependent variable in this study was HbA_{1c}, treated as continuous data. Independent variables included age (continuous), sex (categorical), BMI (continuous), and daily energy intake (continuous). Continuous variables were expressed as mean (standard deviation (SD)) or median (interquartile range), while categorical variables were presented as proportions. The normality of data was assessed using the Kolmogorov-Smirnov test. For categorical variables, the Chi-square test or Fisher's exact test was used. Differences in numeric variables between the intervention and control groups were evaluated using independent sample t-tests (parametric) or Mann-Whitney U tests (non-parametric) for knowledge, 24HR, and biomarker indicators. Within-group comparisons of pre- and post-intervention knowledge, 24HR, and biomarker indicators employed paired t-tests (parametric) or



Wilcoxon signed-rank tests (non-parametric). Repeated Measures ANOVA or the Friedman Test was used to examine changes in 24HR within each group. ANCOVA was applied to analyze biochemical tests, anthropometric measurements, blood pressure, mean changes,

and nutrition knowledge scores at 12 weeks, adjusting for baseline values. All statistic significant was performed using the Statistical Package for the Social Sciences (version 26.0; SPSS, Chicago, IL, USA), with a significance level set at $p \leq 0.05$.

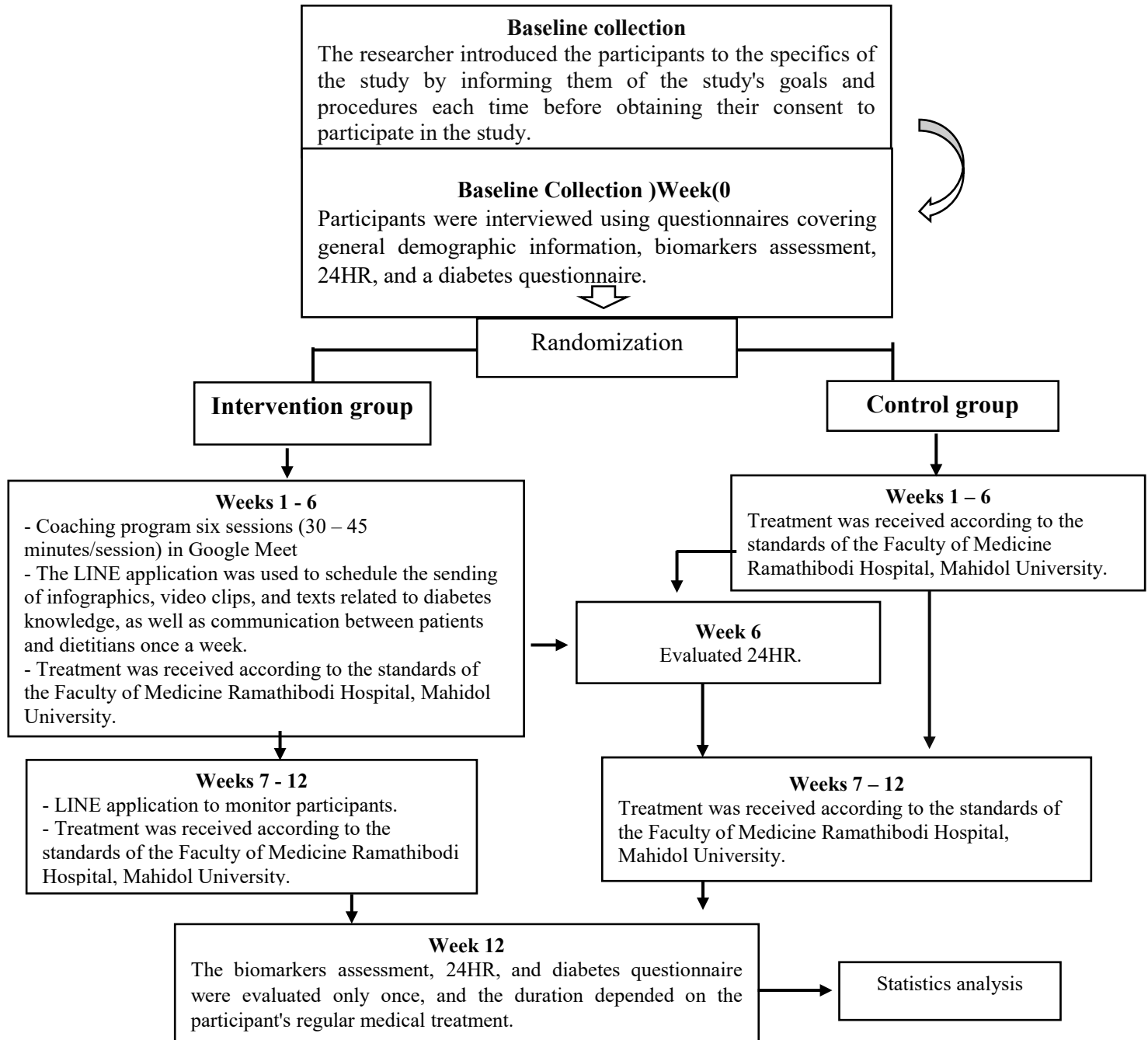


Figure 1: Intervention procedures

RESULTS

A total of 293 people expressed interest in participating in the study, of whom 80 met the criteria, representing 25%. All interested individuals were invited to participate in the

study. All 80 participants attended the orientation session, completed written consent, and were included in the analysis. Five participants dropped out during the study due to loss of contact, resulting in 71 participants



completing the 12-week follow-up surveys (34 in the control group and 37 in the intervention group).

Almost all participants were female (58.8% in the control group and 48.7% in the intervention group), aged over 50 years old, and

marriage status. Most of them were employees with a bachelor's degree or equivalent education, also earning income ranging between 15,001 to 30,000 baht per month. The characteristic variables were not different for both groups at the recruitment (Table 1).

Table 1: Demographic characteristics of control and intervention group (N=71)

Variable	Demographic Characteristics		P-value
	Control (N = 34) (%)	Intervention (N=37) (%)	
Gender			0.390
Male	14 (41.2)	19 (51.3)	
Female	20 (58.8)	18 (48.7)	
Age			0.252
30 – 40 years	4 (11.8)	3 (8.1)	
41 – 50 years	12 (35.3)	11 (29.7)	
51 – 60 years	18 (53.0)	23 (62.2)	
Age; Mean SD (years)	51 (7.2)	52 (7.9)	
Status			0.380
Single	14 (41.2)	14 (37.8)	
Married	14 (41.2)	20 (54.1)	
Widowed / Divorced / Separated	6 (17.6)	3 (8.1)	
Educational level			0.775
Lower than a bachelor's degree	15 (44.1)	18 (48.6)	
Bachelor's degree or equivalent	17 (50.0)	18 (48.6)	
Higher than a bachelor's degree	2 (5.9)	1 (2.7)	
Monthly income (Baht)			0.639
≤ 15,000	9 (26.5)	10 (27.0)	
15,001-30,000	14 (41.2)	11 (29.7)	
30,001-45,000	7 (20.6)	8 (21.6)	
≥ 45,001	4 (11.8)	8 (21.6)	
Occupation			0.546
Private Company Employees	6 (17.6)	3 (8.1)	
State Enterprise or Government	8 (23.5)	13 (35.1)	
Personal business	6 (17.6)	4 (10.8)	
Sales or Hire	8 (23.5)	8 (21.6)	
Other	6 (17.6)	9 (24.3)	

*Chi-square test for nominal, P -value < 0.05

†Independent t-test for continuous variables, P -value < 0.05



At baseline, the mean HbA_{1c} levels for the control and intervention groups were 7.50% (0.70) and 7.65% (0.88), respectively, with no significant difference between the groups ($p = 0.432$). Despite the implementation of the coaching program, ANCOVA analysis at 12 weeks, adjusting for baseline HbA_{1c} levels, showed no significant differences between the groups in HbA_{1c} values ($p = 0.603$). By the end of the study period (12 weeks), the mean HbA_{1c} for the control and intervention groups were 7.78% (0.93) and 7.66% (0.92), respectively. The change in HbA_{1c} levels from baseline was

minimal, with the control group showing a +0.20% change and the intervention group showing a +0.08% change (Table 2). Other variables, such as systolic and diastolic blood pressure, BMI, and weight, showed slight increases in the intervention group from baseline. In contrast, BMI and weight in the control group decreased considerably. However, comparisons within and between groups for these variables showed no significant differences at baseline and after 12 weeks of the intervention program.

Table 2: Physical indicators of control and intervention groups at baseline and 12 weeks.

Indicator	Mean (SD)		P-value
	Control (N = 34)	Intervention (N = 37)	
HbA _{1c} (%)			
Baseline	7.50% (0.70)	7.65% (0.88)	0.432
12 weeks	7.78% (0.93)	7.66% (0.92)	0.603
Δ Mean (SD)	+0.20% (0.93)	+0.08% (0.92)	0.603
Systolic (mmHg)			
Baseline	136 (20.59)	136 (17.09)	0.980
12 weeks	137 (13.64)	138 (13.64)	0.812
Δ Mean (SD)	+1 (13.64)	+2 (13.64)	0.812
Diastolic (mmHg)			
Baseline	80 (9.30)	81 (8.49)	0.621
12 weeks	81 (7.41)	81 (7.41)	0.875
Δ Mean (SD)	+0.19 (7.41)	+0.47 (7.41)	0.875
BMI (kg/m ²)			
Baseline	30.4 (5.86)	30.6 (6.96)	0.932
12 weeks	30.3 (0.86)	30.5 (0.86)	0.279
Δ Mean (SD)	-0.2 (0.86)	+0.01 (0.86)	0.279
Weight (kg)			
Baseline	79.76 (18.13)	79.37 (21.31)	0.934
12 weeks	78.95 (2.16)	79.68 (2.16)	0.156
Δ Mean (SD)	-0.60 (2.16)	+0.10 (2.16)	0.156

*Independent t-test for continuous variables, P -value < 0.05

†ANCOVA test adjusts baseline value, P -value < 0.05

The differences in nutritional knowledge scores within each group at baseline and after 12 weeks showed that the control group's mean total nutritional knowledge scores were 20.50 (3.87) at baseline and 20.47 (4.05) at 12 weeks, with no significant difference ($p = 0.972$). The mean difference score for the control group was -0.26 (3.76). In contrast, the intervention group's mean total nutritional knowledge score increased from 19.43 (4.96) at baseline to 21.54 (4.55) at 12 weeks, showing a significant improvement ($p = 0.002$).

The mean difference score for the intervention group was +1.85 (3.76). Additionally, individual item comparisons revealed significant increases in knowledge about high-sugar and high-fat foods in the intervention group, with P -values of 0.024 and 0.049, respectively. However, the differences in total nutritional knowledge scores between the control and intervention groups were not significantly different at either baseline or after 12 weeks, with P -values of 0.318 and 0.300, respectively (Table 3)

**Table 3:** Nutritional knowledge scores of control and intervention groups.

Indicator	Mean (SD)		P-value
	Control (N = 34)	Intervention (N = 37)	
General knowledge about diabetes			
Baseline	3.15 (1.50)	2.76 (1.06)	0.215
12-weeks	3.09 (0.93)	3.14 (0.98)	0.837
Δ Mean (SD)	-0.08 (0.86)	+0.25 (0.86)	0.390
Knowledge regarding the risk factors associated with diabetes			
Baseline	1.29 (0.68)	1.41 (0.93)	0.563
12-weeks	1.12 (0.88)	1.24 (0.89)	0.553
Δ Mean (SD)	-0.23 (0.89)	-0.11 (0.89)	0.588
General nutrition knowledge			
Baseline	4.32 (1.39)	4.05 (1.49)	0.434
12-weeks	4.26 (1.38)	4.43 (1.32)	0.603
Δ Mean (SD)	-0.04 (1.29)	+0.29 (1.29)	0.416
Knowledge about high-sugar foods			
Baseline	4.65 (2.00)	4.11 (1.84)	0.240
12-weeks	4.53 (1.96)	4.86 (1.69)**	0.441
Δ Mean (SD)	-0.07 (1.73)	+0.58 (1.73)	0.222
Knowledge about high-fat foods			
Baseline	3.53 (0.99)	3.11 (1.15)	0.104
12-weeks	3.71 (0.76)	3.51 (1.24)**	0.429
Δ Mean (SD)	+0.30 (0.94)	+0.29 (0.94)	0.976
Knowledge about sodium-rich foods			
Baseline	3.56 (2.02)	4.00 (2.54)	0.423
12-weeks	3.76 (2.02)	4.35 (2.43)	0.274
Δ Mean (SD)	+0.06 (2.08)	+0.48 (2.08)	0.401
Total nutrition knowledge scores			
Baseline	20.50 (3.87)	19.43 (4.96)	0.318
12-weeks	20.47 (4.05)	21.54 (4.55)**	0.300
Δ Mean (SD)	-0.26 (3.76)	+1.85 (3.76)	0.081

*Independent t-test for continuous variables, P -value < 0.05

**Paired sample t-test for continuous variables, P -value < 0.05

†ANCOVA test adjusts baseline value, P -value < 0.050

The mean daily calorie intake for the control and intervention groups at baseline was 1,305.23 (439.74) kcal/day and 1,311.34 (417.43) kcal/day, respectively, with no significant difference ($p = 0.938$). After a 6-week coaching intervention, there continued to be no significant difference in mean daily calorie intake between the groups ($p = 0.838$). At 12 weeks, calorie intake remained similar within and between the groups. Additional nutrient data is shown in Table 4. The

participants in both groups reported similar intakes, with no significant differences within or between groups. However, the intervention group showed improvements from baseline to 12 weeks, with decreases in fat intake, cholesterol, and saturated fat, whereas fat intake and saturated fat increased in the control group. Both groups reported increases in sugar and sodium intake, while the control group had a higher dietary fibre intake compared to the intervention group (Table 4).



Table 4 shows the nutrient intake of the control and intervention groups at baseline, six weeks, and 12 weeks.

	Nutrients (Mean (SD))		P-value
	Control (N = 34)	Intervention (N= 37)	
Calorie intake (kcal)			
Baseline	1,305.23 (439.74)	1,311.34 (417.43)	0.938
6 Weeks	1,349.00 (423.45)	1,327.30 (463.37)	0.838
12-weeks	1,315.01 (374.21)	1,279.18 (345.89)	0.683
Carbohydrate (g)			
Baseline	194.44 (72.43)	190.57 (70.80)	0.593
6 Weeks	174.08 (64.00)	181.42 (68.86)	0.652
12-weeks	180.50 (59.54)	190.34 (58.73)	0.496
Sugar (g)			
Baseline	33.33 (27.27)	27.24 (27.59)	0.272
6 Weeks	35.00 (26.67)	33.85 (34.92)	0.320
12-weeks	34.11 (25.91)	34.77 (26.49)	0.902
Protein (g)			
Baseline	49.70 (18.25)	49.33 (14.73)	0.925
6 Weeks	64.69 (42.41)	56.00 (27.82)	0.446
12-weeks	53.37 (17.29)	51.58 (14.49)	0.645
Fat (g)			
Baseline	36.52 (23.49)	39.31 (19.86)	0.598
6 Weeks	43.82 (24.11)	41.96 (23.81)	0.722
12-weeks	42.17 (18.00)	34.61 (17.31)	0.082
Cholesterol (mg)			
Baseline	281.91 (236.70)	227.20 (161.86)	0.450
6 Weeks	226.80 (161.86)	230.34 (176.43)	0.961
12-weeks	247.80 (158.17)	224.74 (160.39)	0.484
Saturated fatty acid (g)			
Baseline	10.42 (8.89)	11.31 (10.88)	0.713
6 Weeks	11.34 (7.21)	10.81 (7.78)	0.774
12-weeks	11.39 (7.93)	9.81 (9.01)	0.147
Na (mg)			
Baseline	1,710.71 (991.40)	1,721.42 (833.25)	0.699
6 Weeks	2,396.67 (1,714.92)	2,308.82 (994.83)	0.799
12-weeks	1,918.01 (1,071.47)	2,190.34 (1,745.06)	0.825
Dietary fiber (g)			
Baseline	8.07 (4.32)	8.80 (5.96)	0.811
6 Weeks	10.98 (11.13)	10.74 (13.27)	0.658
12-weeks	11.48 (15.13)	9.09 (5.66)	0.740

*Independent t-test for continuous variables, *P*-value < 0.05

† Mann-Whitney U test, *P*-value < 0.05

DISCUSSION

The study focused on patients with T2DM prescribed metformin. The intervention group received online coaching through the LINE application and Google Meet, while the control group received standard care. The intervention included six online sessions and information on diabetes self-management via the LINE application. Data collected at baseline and after 12 weeks showed no significant changes in HbA1c, weight, or BMI between the groups, similar to findings from previous studies (18). Our study revealed significant increases in total nutrition knowledge scores

within the intervention group before and after the coaching program. Notably, knowledge scores for high-sugar and high-fat foods also showed significant improvement. However, when comparing nutritional knowledge scores between the intervention and control groups, no significant differences were found before and after the coaching program. Previous studies have demonstrated that as many as 80% of mHealth participants engage with the platform fewer than twice, presenting a challenge in fostering long-term usage (19). Additionally, the primary challenge in DSMES lies in successfully implementing dietary regimens



and ensuring that patients can adhere to these standards without disrupting their daily routines and responsibilities. Previous studies have indicated that only a small percentage of individuals are capable of effectively applying nutrition knowledge to their dietary intake (20).

The study also indicated that the 24HR. Data did not show significant improvements in healthy eating behaviours. Specifically, no significant changes were observed in nutritional intake. Carbohydrates significantly impact postprandial glucose levels, which is crucial for T2DM patients. The American Diabetes Association (ADA) 2004 guidelines recommend not exceeding 65% of total calories from carbohydrates and a minimum intake of 130 grams per day (21). The study found both groups' carbohydrate intake within ADA standards, based on a 24HR. Excessive sugar consumption is thought to play an important role in obesity and heart disease risk in individuals with T2DM (3). This study found that individuals with T2DM consumed sugar at levels higher than the recommended intake for the Thai population, averaging 24 grams per day (3). The study found that dietary fibre intake falls below the ADA guidelines, which recommend a minimum of 14 grams of fibre per 1,000 calories, or approximately 25 grams per day for women and 38 grams per day for men (22). Adequate fibre consumption has been shown to reduce the risk of CVD and T2DM (22). However, the dietary fibre intakes of both groups were found to be lower than the ADA recommendations. Despite Thai cuisine's diversity, urban lifestyles may reduce fibre intake, making it crucial to promote fibre consumption in T2DM patients. Adhering to dietary recommendations is essential for managing glycemic levels.

CONCLUSION

The study aimed to evaluate the impact of a coaching program combined with learning technology on glycemic control and nutrition knowledge in T2DM patients at Ramathibodi Hospital. While the study did not show significant improvements in glycemic control compared to the control group, it did enhance nutritional knowledge in the intervention group. This underscores the importance of promoting self-management in T2DM patients to manage blood sugar levels and improve nutrition and healthy eating habits. Adequate

blood sugar control requires integrating self-management with exercise, medication management, and DSMES. However, Thailand faces challenges such as a shortage of knowledgeable personnel, difficulties in accessing online services, and a lack of interest among T2DM patients, which may impede effective blood sugar control. It is essential for healthcare staff, as well as those influencing them (e.g., peers and patients' relatives), to actively participate in planning training content and methods (23). Adequate healthcare staff should have the knowledge and skills to support behaviour change, including goal setting, monitoring, motivating, and addressing community challenges (24). The program should be tailored to patients' needs, adaptable to real-life barriers, and supported by policy changes for long-term sustainability.

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THE DEVELOPMENT OF HEALTH PROMOTING PROGRAM TO SUPPORT EMPLOYEES AT CHULABHORN ROYAL ACADEMY (CRA) AND BUILD CAPACITY IN NON-COMMUNICABLE DISEASE PREVENTION

Worakarn Phimsen¹, Kitti Sranachoenpong^{2*}, Thunwadee Suksaroj², Nuttarat Srisangwan¹, Arisa Keeratichamroen¹

¹ Institute of Nutrition Mahidol University, Salaya, Phuttamonthon, Nakhon Pathom 73170, Thailand

² ASEAN Institute for Health Development, Mahidol University, Salaya, Phuttamonthon, Nakhon Pathom 73170, Thailand

**Corresponding Author: Kitti Sranachoenpong, ASEAN Institute for Health Development, Mahidol University, Salaya, Phuttamonthon, Nakhonpathom, 73710, Thailand, Email: ksrnach@gmail.com*

ABSTRACT

Introduction: Dyslipidemia is one or more combinations of high total Cholesterol, high LDL cholesterol (LDL-C), low HDL-cholesterol (HDL-C), and elevated triglycerides (T.G.). It also is a significant risk factor for coronary heart disease (CHD). An imbalance between LDL-C and HDL-C can increase the risks of myocardial infarction and stroke. Nutritional education and health promotion programs in the workplace are strategies for improving workers' lifestyle behaviors. It could reduce the cost of medical care for employees in the long term.

Objectives: This study aimed to develop nutritional education and health promotion programs and short-term evaluations for at-risk employees with dyslipidemia at Chulabhorn Royal Academy.

Methodology: The participants were at-risk employees with dyslipidemia working at Chulabhorn Royal Academy. One hundred eligible at-risk employees were assigned to the intervention (n=50) and control (n=50) groups. The CRA HEALTH PROGRAM was applied to structure a lifestyle intervention program that consisted of 6 series of lectures, three newsletters, and 3 clip videos online. The evaluation collected data in pre-test and post-test designs, whereby the participants were measured at the end of 12 weeks. The participants in the experimental group participated in activities of the CRA HEALTH PROGRAM for 12 weeks. The control group received only the routine activities at the workplace. Both groups measured knowledge, perception, dietary pattern and intake, anthropometry indicators, and biochemical indicators.

Results: In the 12th Week, the intervention group showed that nutritional knowledge improved from baseline compared to the control group ($p < 0.05$). The cholesterol levels were not significantly different for within-group and between-group comparing at baseline and 12 weeks. The body weight, body mass index, and waist circumference between the intervention and control groups were not significantly different after the 12th Week ($p < 0.05$). There were significantly different at baseline and after the 12th Week of intake of carbohydrate, protein, and fat of the intervention group ($p < 0.05$). The percentage differences in dietary intake of carbohydrate, protein, and fat intake decreased in both groups.

Conclusion: The CRA HEALTH PROGRAM for at-risk employees with dyslipidemia at Chulabhorn Royal Academy could improve nutritional knowledge. Participants reported that program information and activities were fun, practical, culturally relevant and applicable to dyslipidemia prevention in their specific workplace. Participants also appreciated the innovative technology support for providing information. Comfort with the online approach varied among participants. Our program empowered at-risk people with dyslipidemia prevention knowledge.

Keywords: Health promotion program, Dyslipidemia, Nutrition educational program, Chulabhorn Royal Academy



INTRODUCTION

Dyslipidemia is one or more combinations of high total cholesterol, high LDL cholesterol (LDL-C), low HDL-cholesterol (HDL-C), and elevated triglycerides (T.G.) (1). It also is a significant risk factor for coronary heart disease (CHD) (2). An imbalance between LDL-C and HDL-C can increase the risks of myocardial infarction and stroke. High LDL-C is linked to an increased risk of coronary artery disease due to plaque buildup within the arteries (1). LDL-C may be atherosclerosis; however, HDL-C testing plays a protective role in atherosclerosis (3). HDL-C helps remove Cholesterol from the body, which reduces the risk of coronary heart disease (1). Dyslipidemia was positively correlated with smoking, hypertension, diabetes, overweight and obesity, and central obesity and negatively correlated with daily physical exercise (4). Most lipid disorders, about 80%, were related to diet and lifestyle (5), such as high saturated foods, sedentary lifestyles, smoking and obesity. These risk factors have dramatically increased the incidence of hypercholesterolemia, which exacerbates the development of atherosclerosis (6). Dyslipidemia and other non-communicable diseases (NCDs) in Thai people have been linked to obesity, lifestyle changes, increased dietary fat intake, reduced fibre intake and physical inactivity (7).

Moreover, other factors such as low socioeconomic status, poor access to health care and the increased proportion of the population living in an urban environment (8). have been shown to affect health status and the increasing prevalence of dyslipidemia and other NCDs in the population (9). These modifiable risk factors for NCDs need to be the focus of prevention strategies (10). The Thai Ministry of Public Health has developed and implemented a public health policy with the introduction of health promotion programs nationwide. Although particular health promotion programs, such as family planning or immunization services, have been successful, other such as traffic accident prevention, smoking cessation, campaigns against liver cancer, or any chronic disease prevention, have not been proven effective or sustainable (11). In general, health promotion programs are only effective when health practitioners have to follow policy decisions or when it is financed by both government and non-government

organizations (12). Some programs are also short-term in practice because responsible health personnel have to turn their attention to new policies (13).

Workplace nutrition education programs can be effective in reducing risk factors, and short-term absence increases work efficiency and reduces the cost of medical care for employees (14). In addition, educating nutrition in the workplace effectively improves lifestyle behaviors in terms of food and physical activity. This results in a decrease in CVD risk factors (15, 16). It can improve knowledge and reduce important CVD risk factors (17). Nutrition education was suggested to improve serum lipid and metabolic parameters in patients with dyslipidemia (18). Nutritional education and health promotion programs in the workplace are strategies for improving workers' lifestyle behaviors. It could reduce the cost of medical care for employees in the long term.

The theoretical foundation on which the learning program for at-risk employees with dyslipidemia is based is the T5 instructional design model (19). The T5 model draws from constructivism, socially shared cognition and distributed learning theory (20). The underlying premise is that at-risk employees with dyslipidemia learn better through opportunities for interaction, feedback, reflection and active application of concepts. By extension, at-risk employees with dyslipidemia will apply adult learning principles to help their communities and community members to integrate new information, e.g., regarding healthy food choices, nutritional labelling, dietary guidelines and healthy eating index (21, 22).

Designing four learning (D4L) is a process based on the T5 model of learner-centered course design. The traditional approach to learning in Thailand is that teachers play significant roles in the class. The learners are only listeners, absorbing and interpreting foundational knowledge. The starting courses with foundational knowledge/information are used for learners' remembering and understanding. Once the learners can remember and understand, teachers hope that they can move on to the higher skills of learning, such as applying, analyzing, evaluating and creating. However, the problems of the traditional approach to learning are not only that students/at-risk people need more motivation and engagement in mastering the foundational



knowledge/information, but also that they need help remembering and understanding. The D4L process places the learners within a supportive environment that motivates them by engaging them in higher-level applications as a way of mastering each set of primary and ancillary competencies (22). The focus of the dyslipidemia prevention education program will be on engaging the learners in applications where they are asked to apply, analyze, evaluate or create 'somethings' relative to the defined course competency. The ancillary foundational knowledge, which is required in mastering the primary competencies, is, in turn, mastered through the association of mastering the primary competencies. Technology helps to organize learning materials, assignments, and resources to promote the application, integration and synthesis of course content versus memorization of information. The use of learning technology also facilitates ongoing support of at-risk employees with dyslipidemia.

Currently, the approaches for health promotion at the workplace still need to be put in place. The researcher is focusing on how to develop a health promotion program for the employees at Chulabhorn Royal Academy with dyslipidemia to continuously and long-term change their behaviour. Chulabhorn Royal Academy is an advanced research and academic institute to provides academic and professional education in science, technology, environment, medicine, and public health. Its objectives are to research, create, process, apply, promote, disseminate, develop, educate, and produce high-level personnel to create a body of knowledge to be a centre of excellence in science and technology for the public. Chulabhorn Royal Academy is an opportunity as a model workplace for employees. Successful workplace-based training approaches to public health concerns have been addressed through coalitions of health professionals, academicians, community members, and practitioners (21, 23-25). The training program was developed between a partnership of university-affiliated health professionals and trained peer educators. The social network was determined and facilitated the program (26).

This study aimed to develop nutritional education and health promotion programs and short-term evaluations for at-

risk employees with dyslipidemia at Chulabhorn Royal Academy.

METHODOLOGY

Ethical consideration

The study protocol and consent forms were submitted to and approved by the Central Institutional Review Board, Mahidol University (MU-CIRB 203/055.1302). After receiving approval from MUCIRB, before starting the research, authorization must be requested from the Human Research Ethics Committee, Chulabhorn Royal Academy (EC 037/2566). Signed informed consent is obtained from all participants recruited to participate in the project.

Study design and setting

This quasi-experimental study was conducted at Chulabhorn Royal Academy in Thailand. The present study was randomized; stratification factors were gender, age, education level, and level of Cholesterol. In this study, we chose stratification factors such as gender, age, education level, and level of Cholesterol. There are not equal numbers of men and women. Age influences cholesterol levels. The level of Cholesterol is not equal; divide each group equally. All data were collected from August to October 2023. Pre- and post-tests were used to evaluate the participants' improvement in knowledge, biochemical indicators, anthropometric, waist circumference, and dietary intake.

Study population, sample size

The participants were at-risk employees with dyslipidemia working at Chulabhorn Royal Academy, Thailand. Inclusion criteria were being an employee with dyslipidemia, between 30 to 65 years of age, at-risk hyperlipoproteinemia, non-smoker, no medication treatment for dyslipidemia, and no dietary supplement for weight loss. Exclusion criteria were as follows: smoker, pregnant, use medication for weight loss, strict diet, and history of atherosclerotic cardiovascular disease.

The sample size was calculated by the primary outcome of the study (13). This study provided a nutrition education program for a 3-month found that the mean difference of knowledge at the end of this study was 75.29



± 17.07 . Using statistically significant was 0.05, and the power of the test was 0.2 to calculate the number of subjects. The total number of participants was 100 persons. Taking in to account a possible dropout rate of up to 20%. One hundred eligible at-risk employees were assigned to the intervention (n=50) and control (n=50) groups.

Intervention

The intervention programs were provided after the baseline data were collected. The eligible subjects agreed to participate in the study with the provision of informed consent.

The control group received only the routine activities. (Figure 1). The subjects in the intervention group participated in activities of the CRA HEALTH PROGRAM for 12 weeks and received 6 times lectures. Face-to-face CRA HEALTH PROGRAM for 12 weeks for the intervention group was provided with a series of lectures by registered dietitians, physicians, and sports scientists from Chulabhorn Hospital. It took no more than 60 minutes per time at the meeting room at Chulabhorn Royal Academy.

The CRA HEALTH PROGRAM was applied to structure a lifestyle intervention program that consisted of 6 series of lecture, 3 threenewsletters, and three online video clips. The series of lectures used Microsoft PowerPoint slides, video clips, media, and infographical information. These tools were used to explain the intervention group, enhancing cognition and making quick understanding. The lectures were focused on a healthy lifestyle through consuming healthy food, basic nutritional knowledge, nutritional recommendations, food sources, diet-disease association, therapeutic nutritional approach for dyslipidemia, dietary information, and worksheets. In addition, the leaflets focused on key messages of nutritional issues, such as reducing the consumption of high fat, sodium and sugar and increasing daily physical activity.

Newsletters and online video clips provided nutritional knowledge for the intervention group six times (three newsletters and three video clips) during a 12-week program. The newsletter and video clips quickly provided critical messages about nutrition, physical activity and exercise that were distributed to the participants via an online application.

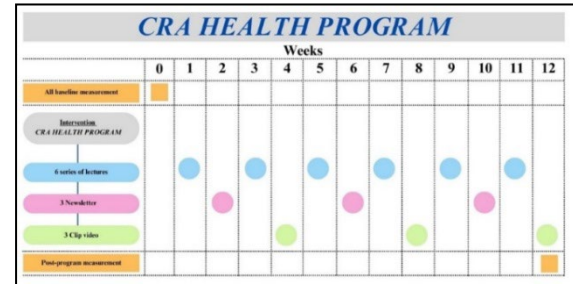


Figure 1 Health promotion program (CRA HEALTH PROGRAM)

Data collection

The instruments for data collection were questionnaires, knowledge, biochemical indicators, anthropometric measurements, and dietary intake. The general characteristics of participants were interviewed using the questionnaire, including gender, age, and education levels. The nutritional knowledge, understanding of the basic knowledge of health, including dyslipidemia knowledge, nutrition flag, nutrition therapy in dyslipidemia, food exchange list, energy requirement, meal plan, food labelling, and diet pattern, were included in the evaluation measurements. Biochemical indicators were collected from the health checking data from Chulabhorn Royal Academy (blood glucose, serum lipid profiles (Cholesterol, HDL-C, LDL-C, and Triglyceride). Trained research assistants assessed anthropometric measurements. In addition, dietary intake and 24-hour dietary recall were interviewed by dietitians. The nutrient database was used to determine energy and nutrient intake and calculated with the INMUCAL-Nutrients V.4.0 program.



Statistical analysis

The characteristics and data of participants are presented as the means and standard deviation (means \pm S.D.) for continuous variables with normal distribution and as the median and interquartile range [median (p25, p75)] for continuous variables with non-normal distribution. Categorical variables are presented in percentages (%). The samples in this study design are two dependent groups. Within groups (compare pre and post),

paired t-tests were used for parametric statistics analysis. Between the control and intervention group, the t-test for the independent samples was analyzed through parametric statistics analysis. Mann Whitney U test was used for non-parametric statistics analysis.

One hundred at-risk dyslipidemia participants were enrolled in this study. Ninety-three subjects completed the study protocol. Seven subjects were inconvenienced to participate. A flowchart in Figure 2 shows the recruitment and dropout of the study.

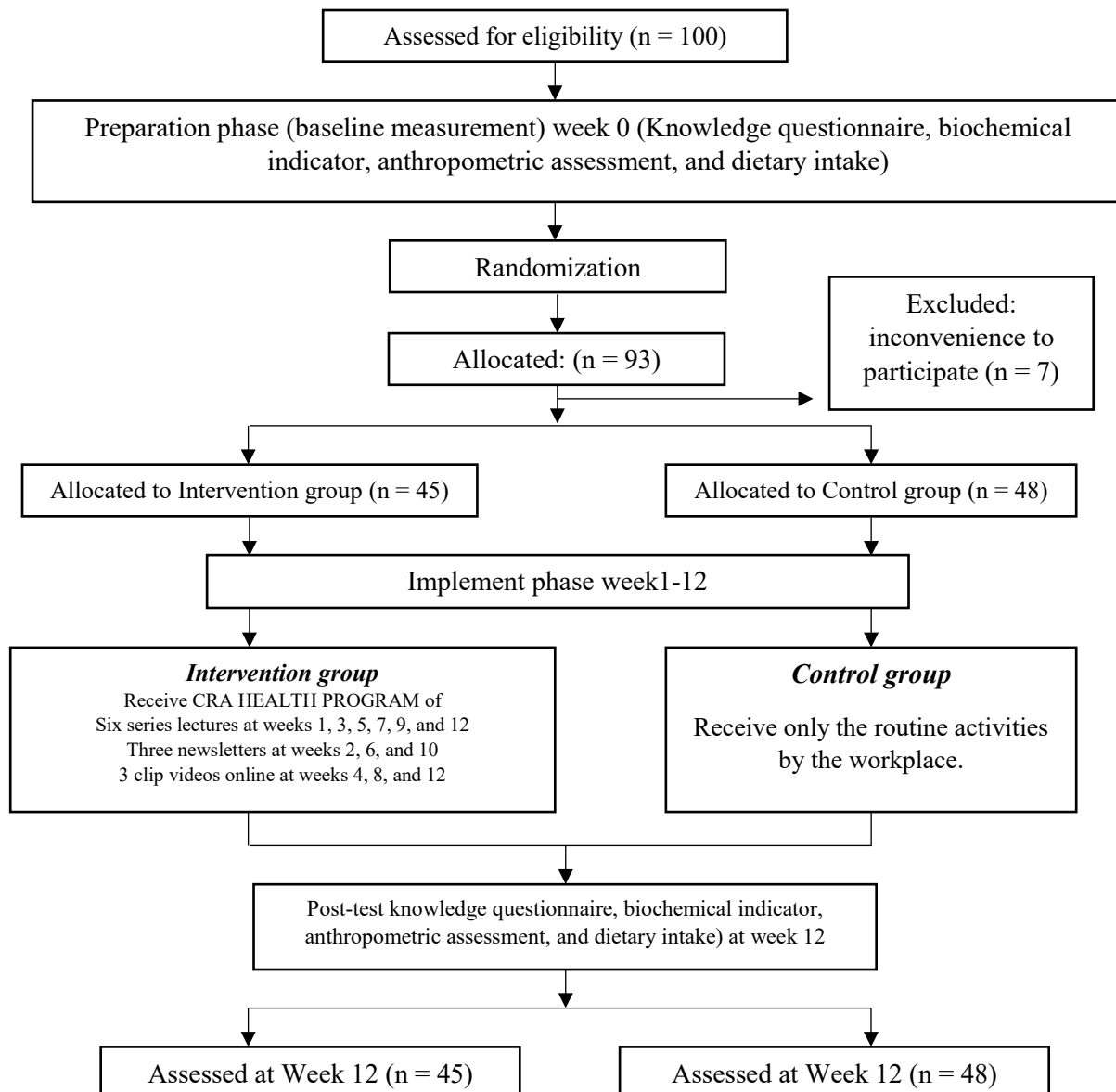


Figure 2: Intervention procedures flow diagram

**RESULTS**

A total of 93 at-risk people for dyslipidemia completed the 12th Week of the study, 45 and 48 subjects in the intervention and the control groups, respectively. The dropout rate was 7%. No significant differences within and between the groups of at-risk people were observed concerning the study for gender, age, educational level and marriage status, except

for age, total Cholesterol, and LDL-C. Participants tended to be female, aged more than 35 years old, married and have a bachelor's degree education (Table 1).

The intervention group's nutrition knowledge scores were higher than those of the control group. The intervention group's total Cholesterol and LDL-C were also lower than those of the control group.

Table 1. Baseline characteristic of individuals in the intervention and control groups (N=93)

Characteristics	Intervention (N= 45)	Control (N=48)	p-value
Age (years), mean	39.82±9.58	35.77±6.28	0.001 ^a
Gender, n (%)			0.167 ^b
Male	14 (31.1)	9 (18.8)	
Female	31(68.9)	39(81.3)	
Marital Status, n (%)			0.012 ^b
Married	22 (48.9)	12 (25.0)	
Single	21 (46.7)	36 (75.0)	
Divorced	2 (4.4)	0	
Education Level, n (%)			0.020 ^b
Lower diploma	0	0	
Diploma	2 (4.4)	0	
B. A	23 (51.1)	37 (77.1)	
M.S. or higher degrees	20 (44.4)	11 (22.9)	
Nutrition Knowledge score (Total score 89), mean±SD	53.96±11.05	47.58±12.35	0.578 ^a
Weight (Kg), mean±SD	62.33±11.80	63.5±10.77	0.690 ^a
Waist circumference (cm), mean±SD	78.57±7.96	81.59± 7.97	0.942 ^a
Body mass index (BMI), mean±SD	23.53±3.57	24.30±3.82	0.785 ^a
Fasting plasma glucose (mmol/L), mean±SD	87.76±6.01	88.19±7.04	0.344 ^a
Triglyceride (mg/dL), mean±SD	104.73±40.33	98.15±43.12	0.999 ^a
Total Cholesterol (mg/dL), mean±SD	217.04±9.85	222.62±13.25	0.003 ^a
HDL-C (mg/dL), mean±SD	60.82±13.62	58.29±14.03	0.939 ^a
LDL-C (mg/dL), mean±SD	137.98±15.17	143.04±18.89	0.039 ^a

^aIndependent t-test for continuous and categorical variables, respectively; mean ± S.D.

Chi-square

(*P* < 0.05)

At the end of 12 weeks, the intervention group showed improving nutritional knowledge from baseline compared to the control group in Table 2. The total score at 12 weeks comparing between the intervention and control groups were 74.60 and 48.42, respectively. Comparing nutritional knowledge within the group at baseline and in the Week of the 12th, the score of the intervention group was increased significantly than the control group. After 12 weeks of educational intervention, the intervention group showed above 50% improvement in their nutrition knowledge. These results of the

present study highlight the importance of applying educational programs to control the risk factors in employees. This outcome could be due to the lack of knowledge about dyslipidemia and prevention methods. Indeed, employee nutrition-related knowledge was increased significantly, and other key determinants such as body weight, BMI, dietary intake and biochemical parameters were also improved.

Although other indicators, such as body weight, waist circumference, and body mass index (BMI), were significantly different within the group of the intervention group,



there were no improvements in the control group. Those indicators of the intervention group appeared to be better than the control group. In addition, biochemical indicators in both groups were not different. The total Cholesterol of both groups was increasing compared to within the group and between the groups at baseline and at the 12th Week.

**Table 2.** Comparing the effects of the CRA HEALTH PROGRAM on the groups at baseline and at the 12th Week

Factor	Intervention (N= 45)				Control (N=48)			
	Baseline	At 12 weeks	Change	95% CI	Baseline	At 12 weeks	Change	95% CI
Nutrition Knowledge (total score 89)	53.96±11.05	74.60±7.03	+20.64±13.28	-24.63, -16.65	47.58±12.35	48.42±11.21	+0.83±12.35	-4.42, 2.75
Weight (Kg),	62.33±11.80	61.76±11.78	-0.57±1.25	0.19, 0.94	63.54±10.77	63.58±10.48	+0.03±1.22	-0.38, 0.32
Waist circumference (cm)	78.57±7.96	77.63±7.77	-0.94±1.93	0.36, 1.52	81.59±7.97	81.43±7.94	-0.15±1.42	-0.25, 0.57
Body mass index (BMI)	23.53±3.57	23.3±3.59	-0.21±0.47	0.06, 0.35	24.30±3.82	24.32±3.78	+0.02±0.45	-0.15, 0.11
Fasting plasma glucose (mmol/L)	87.76±6.01	86.78±5.11	-0.97±5.30	-0.61, 2.57	88.19±7.04	89.89±6.48	+1.69±7.34	-3.83, 0.43
Triglyceride (mg/dL)	104.73±40.33	111.37±55.10	+6.64±34.52	-17.01, 3.72	98.15±43.12	107.95±38.74	+9.80±27.87	-17.90, -1.71
Total Cholesterol (mg/dL)	217.10±9.85	220.70±15.54	+3.66±10.73	-6.88, -0.43	222.62±13.25	227.03±13.78	+4.40±8.19	-6.78, -2.02
HDL-C (mg/dL)	60.82±13.62	62.07±15.05	+1.24±12.66	-5.05, 2.55	58.29±14.03	62.97±14.07	+4.67±9.43	-7.41, -1.94
LDL-C (mg/dL)	137.98±15.17	140.07±17.17	+2.08±12.37	-5.80, 1.63	143.04±18.89	148.34±19.69	+5.30±10.43	-8.33, -2.27

Pair t-test for continuous and categorical variables, respectively; mean ± S.D.

($P < 0.05$)



At the baseline, energy intake was 1,308.25 kcal/day and 1,718.53 kcal/day in the intervention and control groups, respectively (Table 3). Macronutrients, especially carbohydrates, proteins, and fat, were significantly different when comparing at baseline and the Week of the 12th between

groups ($P < 0.05$). Although other nutrients were not different between and within groups, the consumption of sugar and sodium of both groups was higher than recommendation per day. The recommendation per day of sugar and sodium were not more than 30 g and 2000 mg, respectively.

Table 3: Mean of dietary intake of the intervention and control groups at baseline and 12th Week

Nutrient	Intervention (N= 45)			Control (N=48)			<i>p</i> -value after the 12 th Week, Control vs Intervention
	Baseline	12 th Week	<i>p</i> -value Before-After	Baseline	12 th Week	<i>p</i> -value Before-After	
Energy (kcal/day)	1308.25±665.60	1130.58±446.59	0.762	1718.53±598.42	1564.49±560.06	0.285	<0.001
Carbohydrate (g/ day)	161.51±97.51	148.32±62.02	0.153	220.56±92.15	216.25±87.05	0.310	<0.001
Protein (g/ day)	65.26±38.26	47.95±24.25	0.588	70.41±32.47	61.32±28.47	0.385	0.008
Fat (g/ day)	44.56±27.62	38.38±25.40	0.786	61.62±27.35	50.46±24.93	0.273	0.009
Dietary fiber (g/ day)	7.17±5.77	6.22±5.84	0.006	7.40±5.40	8.23±7.22	0.725	0.162
Sugar (g/ day)	61.42±54.26	34.37±28.03	0.718	67.04±51.57	47.86±44.03	0.825	0.134
Cholesterol (mg/ day)	290.36±256.27	209.06±167.07	0.597	352.82±82.14	285.10±262.80	0.816	0.164
Saturated fat (g/ day)	12.87±10.71	10.28±8.60	0.939	17.57±11.01	14.20±11.45	0.582	0.110
Sodium (mg/ day)	3231.60±2713.54	2550±1413.54	0.357	3154±2930.69	2761.63±1645.77	0.668	0.712

Pair t-test for continuous and categorical variables, respectively; mean±SD
Mann-Whitney U test, p -value <0.05

DISCUSSION

The workplace is an opportunity place for health promotion for their employees. The CRA HEALTH PROGRAM for at-risk employees with dyslipidemia at Chulabhorn Royal Academy could be improved nutritional knowledge. Participants reported that program information and activities were fun, practical, culturally relevant, and applicable to dyslipidemia prevention in their specific workplace.

The employee training was different from traditional training in Thailand, given the long period of training, the small groups and interactive in-class and innovative technology approaches. Notably, there were few dropouts in the employees' training program. However, the post-program evaluation and follow-up achieved 100% participation in both intervention and control groups. Coalitions of workplace members, program participants, academicians, and practitioners, e.g., health professionals and lifestyle coaches, have helped in defining the areas of interest, the specific content and the process of dissemination.

Participants also appreciated the innovative technology support for providing information. Comfort with the online approach varied among participants. Our program empowered at-risk people with knowledge about dyslipidemia prevention. We applied a workplace dietary intervention to increase nutrition knowledge and health status and to improve dietary intake among the employees.

The lessons were learned from this study if dietitians and healthcare stakeholders are to play a meaningful role in workplace-based dyslipidemia prevention. The study emphasized the importance of training and supporting program facilitators in planning the content and approaches of the training and support program, dietitians and healthcare stakeholders, as well as those whose decisions influence them (e.g., other health professionals) and those whom they hope to influence (e.g., at-risk employee members) needed to be active participants (27). Employees are also effective in shifting the lifestyle behaviors of community members. They needed knowledge but also appropriate healthy environments in supporting



behavior change that was relevant to their work (22). This is true whether that role allows for intensive individual or group counselling. Thus, behavior change skills are goal setting, monitoring, motivating, and dealing with challenges in the social and physical community environment changes, such as healthy foods available in cafeteria or workplace, setting up walking clubs and rewarding system. The program needs to be structured around employees' needs and be flexible enough to help them deal with real-life barriers in their work in the community on an ongoing basis. Finally, influencing workplace policy is also an essential key component for long-term sustainability.

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THE ASSOCIATION BETWEEN MENTAL HEALTH LITERACY AND HELP-SEEKING INTENTIONS AMONG STUDENTS AT A PUBLIC UNIVERSITY IN THAILAND

Nutt Pienwittayapun¹, Kotchamong Sarakan³, Preeda Kanghae⁴, Aphichaya Polrak⁵,
Wandee Sirichokchatchawan^{1,2*}

¹ College of Public Health Sciences, Chulalongkorn University, Sabbasatavicaya Building, Phayathai Road, Bangkok 10330, Thailand

² Health and Social Sciences and Addiction Research Unit, Chulalongkorn University, Bangkok 10330, Thailand

³ Faculty of Nursing, Ubon Ratchathani Rajabhat University, Ubon Ratchathani 34190, Thailand

⁴ Faculty of Education, Ubon Ratchathani Rajabhat University, Ubon Ratchathani 34190, Thailand

⁵ Prasimahabhodi Psychiatric Hospital, Ubon Ratchathani 34000, Thailand

***Corresponding Author:** Wandee Sirichokchatchawan, College of Public Health Sciences, Chulalongkorn University Sabbasatavicaya Building, Phayathai Road, Bangkok 10330 Thailand,
E-mail: wandee.s@chula.ac.th

ABSTRACT

Introduction: Mental disorders are a global concern. Despite the high prevalence and concern, a significant gap exists in the utilization of professional health services, especially among university students. Fewer than one in four students seek professional help for mental disorders. Therefore, this study focuses on finding the predictors of help-seeking intentions among university students in Ubon Ratchathani, Thailand.

Methodology: A cross-sectional study was conducted in May 2024 at a public university in Ubon Ratchathani province, employing a self-reported online questionnaire. Participants included 290 undergraduate students selected through convenience sampling. The questionnaire assessed demographic and family characteristics, personal experiences with mental health conditions, mental health literacy, and intentions to seek help for suicidal ideation. Data were analyzed using IBM SPSS version 29, with binary and multiple logistic regression analyses identifying factors associated with help-seeking intentions.

Results: The study participants were predominantly female (89.0%), with a median age of 20 years. Most were enrolled in the Faculty of Nursing (60.0%) and lived with families (61.4%). High levels of mental health literacy were reported (54.5% of students), and a significant number reported mental distress (71.4%) and suicidal ideation (13.8%). Students preferred seeking help from parents and mental health professionals. Key predictors of seeking formal help included studying in the Faculty of Nursing (Adjusted Odds Ratio [AOR] 2.00, 95% Confidence Interval [CI] 1.20-3.32), experience of suicidal ideation (AOR 0.30, 95% CI 0.14-0.66), and high mental health literacy (AOR 1.85, 95% CI 1.12-3.04). Predictors for seeking informal help included the experience of suicidal ideation (AOR 0.24, 95% CI 0.11-0.53) and high mental health literacy (AOR 1.72, 95% CI 1.04-2.84).

Discussion: The findings underscore the importance of mental health literacy in promoting help-seeking behaviors among students. The higher likelihood of nursing students seeking formal help may be attributed to their familiarity with and trust in mental health professionals. The identification of suicidal ideation as a barrier to help-seeking highlights the urgent need for targeted interventions to combat stigma and promote mental health services.

Conclusion: This study's findings underscore the importance of mental health literacy and addressing barriers such as suicidal ideation to improve help-seeking intentions among university students. The study recommends specific interventions, including specialized mental health programs, particularly for students in high-stress fields like nursing. These recommendations serve as a practical guide for developing mental health interventions in university settings.

Keywords: mental health literacy, help-seeking intentions, university students, suicidal ideation, Thailand.



INTRODUCTION

Mental disorders are a significant global public health concern, affecting one in eight people, according to the World Health Organization (WHO)(1). These disorders, including depression and schizophrenia, often begin to exhibit symptoms between the ages of 18 and 20, a critical period coinciding with university years (2). The intention to seek help is defined as “an individual’s commitment to plan and take action to seek help” (3). Despite the high prevalence of mental disorders in upper-middle-income countries, fewer than one in seven university students who screened positive for these disorders receive professional health services (4).

This study used a modified help-seeking model in which mental health literacy, encompassing knowledge and attitudes, influences help-seeking intentions both directly and indirectly through attitudes as a mediator (5). Mental health literacy, defined as “knowledge and beliefs about mental disorders aiding their recognition, management, or prevention,” influences help-seeking intentions directly and indirectly by shaping attitudes toward seeking help (6-8). Various factors that influence help-seeking intentions have also been studied within this framework, including gender (8), perceived parent's attitudes about mental health (9), and experiences of mental conditions (10). By integrating these factors, the model provides a comprehensive understanding of how mental health literacy, and these factors contribute to the decision-making process in seeking help for mental health issues (8, 11), as applied by this study (Figure 1).

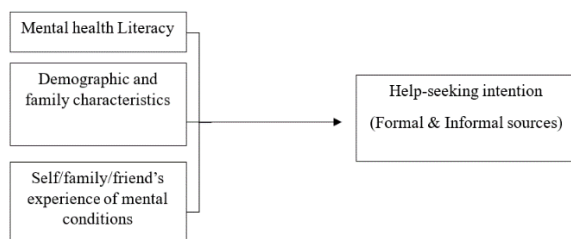


Figure 1 Study's conceptual framework

Ubon Ratchathani, a province in Northeastern Thailand, presents a unique context for this study. Public universities in this region provide free campus mental health

services and referral systems to public hospitals (12). However, mental health literacy in Ubon Ratchathani is comparatively low (13). National surveys reveal that only one in four university students in this province know of accessible, informal help sources, and even fewer are familiar with formal ones (13). Existing studies on help-seeking predictors, primarily conducted in Western countries, often need to account for cultural and health system differences, limiting their applicability to Thai students. Moreover, very few studies in Thailand use standardized questionnaires, further complicating the comparison of findings.

Therefore, this study aimed to explore mental health literacy and help-seeking intentions for mental health problems from formal and informal sources among university students in Ubon Ratchathani province. Additionally, it sought to identify the predictors of these help-seeking intentions to inform targeted mental health interventions in this unique cultural and regional context.

METHODOLOGY

Study design and study population

The study employed a cross-sectional design, with data collected in May 2024 using a self-reported online questionnaire. Ubon Ratchathani province has only two public universities, and this study focused on one of them, chosen for its wide distribution, diverse majors, and lower living costs, making its students representative of the general population in this age group. The selected public university was chosen randomly through multi-stage sampling. Due to the summer semester, voluntary sampling was used to obtain faculties willing to participate, limiting participation to two faculties, with convenience sampling used to recruit participants. Research assistants informed potential participants through QR codes and direct invitations. Inclusion criteria were Thai national undergraduate students fluent in Thai, enrolled in a selected faculty, and accessing the online questionnaire. Students currently receiving treatment from mental health professionals were excluded. The sample size of 242 students was calculated using the Taro Yamane formula (14), with a 95% confidence level and an additional 10% for missing data.

**Measurement tools and data collection**

The data were collected using a structured questionnaire with five sections. Section 1 covered demographic characteristics, including gender, age, living arrangement, actual and perceived financial conditions, and faculty. Section 2 assessed family characteristics, focusing on parents' perceived attitudes towards mental health. Section 3 explored experiences of mental conditions, including personal, familial, and friend experiences with mental conditions, suicidal ideation, and mental disorders. Section 4 evaluated mental health literacy using 16 items from the Mental Health Literacy questionnaire (MHLq) (15), rated on a 5-point Likert scale, with higher scores indicating better literacy. Section 5 assessed the intention to seek help for suicidal ideation, adapted from the General Help-Seeking Questionnaire (GHSQ) (16). Participants answered a question on their likelihood of seeking help from 10 different sources, rated on a 7-point Likert scale, with higher scores indicating greater intention. Helping sources were categorized as formal (mental health professionals, phone helpline, GP) or informal (intimate partner, friends, parents, other relatives, online sources, study).

religious leaders, advisor) and analyzed separately due to their different characteristics and accessibility (17). The pilot test and IOC assessment confirmed adequate reliability and validity. Mental health literacy and help-seeking intentions were categorized into low and high levels using the mean score as a cutoff.

Data analysis and ethical consideration

The data were analyzed using IBM SPSS version 29. Median and interquartile range (IQR) were reported for continuous data. Categorical data were presented as frequencies and percentages. Binary logistic regressions were performed to find an association with the intention to seek help from both formal and informal sources, with a significant level set at less than 0.05. The factors with significant associations were further included in a multiple logistic regression. The results were presented as crude odds ratios (COR) and adjusted odd ratios (AOR) with 95% confidence intervals, respectively. The Research Ethics Review Committee for Research Involving Human Research Participants, Group I, Chulalongkorn University, COA. No. 109/67 granted ethical approval for this

RESULTS**Table 1** Participant Characteristics (n=290)

Variable	Number	Percent (%)
Demographic characteristics		
Gender		
Female	258	89.0
Male	22	7.6
Other	10	3.4
Age (Years)		
20 or less	181	62.4
21 or more	109	37.6
Median = 20.00, IQR = 19, 21, Min = 18, Max = 24		
Living arrangement		
Living with family	178	61.4
Living alone	58	20.0
Living with friends	54	18.6
Personal financial status, Actual financial condition (baht per month)		
3,000 or less	38	13.1
3,000-5,000	137	47.2
5,001-7,000	63	21.7
7,001 or more	52	17.9
Median=5,000, IQR=4,000, 6,000, min=1,300, max=20,000		



Variable	Number	Percent (%)
Personal financial status, Perceived financial condition		
Not enough, has debt	73	25.2
Not enough, no debt	39	13.4
Enough, has debt	111	38.3
Enough, no debt	67	23.1
Faculty		
Faculty of Nursing	174	60.0
Faculty of Thai Traditional Medicine	116	40.0
Family characteristics		
Father's Perceived Attitude Toward Mental Health		
Neutral or Negative	203	70.0
Positive	87	30.0
Mother's Perceived Attitude Toward Mental Health		
Neutral or Negative	193	66.6
Positive	97	33.4
Self/family/friend's experience of mental conditions		
Experience with mental conditions		
No	83	28.6
Yes	207	71.4
Experience of suicidal ideation		
No	250	86.2
Yes	40	13.8
Experience of mental disorders from friends and family		
No	213	73.4
Yes	77	26.6
Mental health literacy		
Low Level	132	45.5
High Level	158	54.5
Median = 70.00, IQR = 64, 75, min = 38, max = 80, range = 16-80		
Intention to seek help for suicidal ideation		
Formal sources ^b		
Unlikely	123	42.4
Likely	167	57.6
Median = 15, IQR = 11, 18, min = 3, max = 21, range = 3-21		
Informal sources ^c		
Unlikely	126	43.4
Likely	164	56.6
Median = 31, IQR = 25, 35, min = 7, max = 49, range = 7-49		

^a = cutoff with mean score (Mean = 69.08); ^b, ^c = cutoff with a mean score of each type (14.00 and 29.97, respectively)

Table 1 presents the descriptive statistics of the 290 study participants. Most students were female (89.0%) and aged 20 years or younger (62.4%). Three out of five students were enrolled in the Faculty of Nursing (60.0%) and lived with family (61.4%). Regarding personal finances, two-thirds (61.4%) reported being financially sufficient and had debt (38.3% in 61.4%). Only three in ten students perceived their parents' attitude toward mental health as positive (30.0% and 33.4% for father and mother, respectively). Most students experienced occasional mental distress in the past six months (71.4%), while a

few reported occasional suicidal ideations during the same period (13.8%). Additionally, one in four students observed or helped friends and family members with mental disorders (26.6%). Most students had a high level of mental health literacy (median score of 70) and a high likelihood of seeking help from formal and informal sources (median scores of 15 and 31, respectively). Among informal sources, parents and friends were most preferred, while mental health professionals were the top choice among formal sources.

**Table 2** The associated factors of intention to seek help from formal sources

Variables	Unlikely to seek help	Likely to seek help	COR (95% CI)	AOR (95% CI)
	N (%)	N (%)		
Gender				
Female	10 (41.5)	151 (58.5)	1	-
Male	11 (50.0)	11 (50.0)	0.71 (0.30, 1.70)	-
Other	5 (50.0)	5 (50.0)	0.71 (0.20, 2.51)	-
Age				
20 or less	76 (42.0)	105 (58.0)	1	-
21 or more	47 (43.1)	62 (56.9)	0.96 (0.59, 1.54)	-
Living arrangement				
Family	70 (39.3)	108 (60.7)	1	-
Alone	29 (50.0)	29 (50.0)	0.65 (0.36, 1.18)	-
Friends	24 (44.4)	30 (55.6)	0.81 (0.44, 1.50)	-
Personal financial status, Actual financial condition				
3,000 or less	14 (36.8)	24 (63.2)	1	-
3,001-5,000	63 (46.0)	74 (54.0)	0.69 (0.33, 1.44)	-
5,001-7,000	25 (39.7)	38 (60.3)	0.89 (0.39, 2.03)	-
7,001 or more	21 (40.4)	31 (59.6)	0.86 (0.36, 2.04)	-
Personal financial status, Perceived financial condition				
Not enough, has debt	31 (42.5)	42 (57.5)	1	-
Not enough, no debt	20 (51.3)	19 (48.7)	0.70 (0.32, 1.53)	-
Enough, has debt	43 (38.7)	68 (61.3)	1.17 (0.64, 2.13)	-
Enough, no debt	29 (43.3)	38 (56.7)	0.97 (0.50, 1.89)	-
Faculty				
Thai med	65 (56.0)	51 (44.0)	1	1
Nursing	58 (33.3)	116 (66.7)	2.55** (1.57, 4.13)	2.00* (1.20, 3.32)
Father's Perceived Attitude Toward Mental Health				
Neutral or Negative	89 (43.8)	114 (56.2)	1	-
Positive	34 (39.1)	53 (60.9)	1.22 (0.73, 2.03)	-
Mother's Perceived Attitude Toward Mental Health				
Neutral or Negative	85 (44.0)	108 (56.0)	1	-
Positive	123 (42.4)	167 (57.6)	1.22 (0.74, 2.01)	-
Experience with mental conditions				
No	26 (31.3)	57 (68.7)	1	1
Yes	97 (46.9)	110 (53.1)	0.52* (0.30, 0.89)	0.70 (0.39, 1.24)

Variables	Unlikely to seek help	Likely to seek help	COR (95% CI)	AOR (95% CI)
	N (%)	N (%)		
Experience of suicidal ideation				
No	94 (37.6)	156 (62.4)	1	1
Yes	29 (72.5)	11 (27.5)	0.23** (0.11, 0.48)	0.30* (0.14, 0.66)
Experience of mental disorders from friends and family				
No	89 (41.8)	124 (58.2)	1	-
Yes	34 (44.2)	43 (55.8)	0.91 (0.54, 1.54)	-
Mental health literacy				
Low level	69 (52.3)	63 (47.7)	1	1
High level	54 (34.2)	104 (65.8)	2.11* (1.31, 3.39)	1.85* (1.12, 3.04)

* p-value less than 0.05, ** p-value less than 0.001, Thai med refers to Thai Traditional Medicine

Table 2 shows the associated factors and predictors of intention to seek help from formal sources. Students enrolled in the Faculty of Nursing were 2.00 times more likely to seek help from formal sources than those in the Faculty of Thai Traditional Medicine (AOR 95% CI 1.20-3.32). For experiences related to mental conditions and suicidal ideation, both were identified as barriers to seeking help in bivariate analysis. However, in multivariate analysis, only the experience of suicidal ideation remained significant, with a 60% reduction in the odds of seeking help (AOR=0.30, 95%CI 0.14-0.66). Lastly, students with a high level of mental health literacy were 1.85 times more likely to seek help from formal sources compared to those with a low level of mental health literacy (AOR 95% CI 1.12-3.04).

Table 3 The associated factors of intention to seek help from informal sources

Variables	Unlikely to seek help	Likely to seek help	COR (95% CI)	AOR (95% CI)
	N (%)	N (%)		
Gender				
Female	116 (45.0)	142 (55.0)	1	-
Male	8 (36.4)	14 (63.6)	1.43 (0.58, 3.53)	-
Other	2 (20.0)	8 (80.0)	3.27 (0.68, 15.69)	-
Age				
20 or less	82 (45.3)	99 (54.7)	1	-
21 or more	44 (40.4)	65 (59.6)	1.22 (0.76, 1.98)	-
Living arrangement				
Family	75 (42.1)	103 (57.9)	1	-
Alone	28 (48.3)	30 (51.7)	0.78 (0.43, 1.41)	-
Friends	23 (42.6)	31 (57.4)	0.98 (0.53, 1.82)	-



Variables	Unlikely to seek help	Likely to seek help	COR (95% CI)	AOR (95% CI)
	N (%)	N (%)		
Personal financial status, Actual financial condition				
3,000 or less	13 (34.2)	25 (65.8)	1	-
3,001-5,000	64 (46.7)	73 (53.3)	0.59 (0.28, 1.26)	-
5,001-7,000	25 (39.7)	38 (60.3)	0.79 (0.34, 1.83)	-
7,001 or more	24 (46.2)	28 (53.8)	0.61 (0.26, 1.44)	-
Personal financial status, Perceived financial condition				
Not enough, has debt	39 (53.4)	34 (46.6)	1	1
Not enough, no debt	15 (38.5)	24 (61.5)	1.84 (0.83, 4.05)	2.06 (0.87, 4.90)
Enough, has debt	48 (43.2)	63 (56.8)	1.51 (0.83, 2.73)	1.39 (0.73, 2.62)
Enough, no debt	24 (35.8)	43 (64.2)	2.06* (1.04, 4.05)	1.73 (0.84, 3.55)
Faculty				
Thai med	39 (53.4)	34 (46.6)	1	1
Nursing	15 (38.5)	24 (61.5)	1.84 (0.83, 4.05)	2.06 (0.87, 4.90)
Father's Perceived Attitude Toward Mental Health				
Neutral or Negative	39 (53.4)	34 (46.6)	1	1
Positive	15 (38.5)	24 (61.5)	1.84 (0.83, 4.05)	2.06 (0.87, 4.90)
Mother's Perceived Attitude Toward Mental Health				
Neutral or Negative	85 (44.0)	108 (56.0)	1	1
Positive	123 (42.4)	167 (57.6)	1.80* (1.09, 2.99)	1.67 (0.76, 3.65)
Experience with mental conditions				
No	26 (31.3)	57 (68.7)	1	-
Yes	97 (46.9)	110 (53.1)	0.61 (0.36, 1.03)	-
Experience of suicidal ideation				
No	94 (37.6)	156 (62.4)	1	1
Yes	29 (72.5)	11 (27.5)	0.21** (0.10, 0.44)	0.24** (0.11, 0.53)
Experience of mental disorders from friends and family				
No	89 (41.8)	124 (58.2)	1	-
Yes	34 (44.2)	43 (55.8)	1.11 (0.66, 1.88)	-
Mental health literacy				
Low level	69 (52.3)	63 (47.7)	1	1
High level	54 (34.2)	104 (65.8)	1.94* (1.21, 3.11)	1.72* (1.04, 2.84)

* p-value less than 0.05, ** p-value less than 0.001

Table 3 details the associated factors and predictors of intention to seek help from informal sources. Students with experience of suicidal ideation were 76% less likely to seek help from informal sources (AOR = 0.24, 95% CI 0.11-0.53). High mental health literacy increased the likelihood of seeking help from

informal sources by 1.72 times compared to students with low mental health literacy (AOR 95% CI 1.04-2.84).

DISCUSSION

This study recruited 290 participants, primarily female, which aligns with the gender distribution in the chosen faculties, Nursing and Thai Traditional Medicine, but differs from national surveys (13). The prevalence of mental health conditions and suicidal ideation was also higher than reports from national surveillance (18). This could be due to the focus on health-related programs and the predominance of female participants, who tend to report higher mental conditions (19).

Our findings showed higher mental health literacy compared to the previous study (15), possibly because the sample consisted mainly of females in health programs (11). Parents and friends were the most preferred informal help sources, aligning with previous research showing friends and family as primary support for Thai nursing students (20). The study also confirmed that informal help sources were preferred due to perceptions of confidentiality (17).

Regarding the model of intention to seek help from formal sources, nursing students showed a greater intention to seek help from formal sources than Thai Traditional Medicine students. This contrasts with prior research where medical students, despite valuing formal help, only sought it occasionally (21). The frequent interactions between nursing students and professors who serve as mental health practitioners likely make formal help sources more culturally accessible (17).

Regarding the model of intention to seek help from formal and informal sources, the study's findings align with previous research, showing that higher mental health literacy is linked to a greater likelihood of seeking help from both formal and informal sources (7, 8). High knowledge and positive attitudes about mental disorders enhance the intention to seek help, consistent with the modified help-seeking model (5). Students with high mental health literacy manage stigma better and are more likely to seek formal help, where stigma is typically higher (17).

Suicidal ideation was a significant barrier to the intention to seek help from both formal and informal sources. Students with



suicidal ideation reported higher levels of stigma (10) and may engage in "help-negation," avoiding help despite its availability (17). This avoidance can be due to negative attitudes toward mental disorders, affecting help-seeking intentions, as noted in the modified help-seeking model (5), (8). Moreover, help-negation affects informal sources more than formal ones, explaining the more substantial impact of suicidal ideation on seeking help from informal sources (17).

CONCLUSION

This study found that health-related students reported more mental conditions and suicidal ideation. Nonetheless, they had higher levels of mental health literacy and preferred to seek help from parents and mental health professionals. High mental health literacy and lack of suicidal ideation were significant factors in promoting the intention to seek help from both formal and informal sources. Additionally, studying in the nursing faculty specifically promoted the intention to seek help from formal sources.

LIMITATION

The study's cross-sectional design limits causal inference. The sampling from only two faculties may only represent part of the university population. The predominance of female participants and the focus on health-related programs limit generalizability. Social desirability bias may have affected self-reported data on sensitive mental health topics.

RECOMMENDATION

Interventions to enhance mental health literacy and reduce stigma should be implemented. Specialized mental health programs, stress management workshops, and peer support groups are recommended for students in high-stress fields like nursing.

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EXPLORING THE IMPACT OF SOCIAL MEDIA ON STIGMATIZATION AND HIV PREVENTION SERVICE UTILIZATION AMONG MSM IN YANGON, MYANMAR

Thet Zaw Naung¹, Wandee Sirichokchatchawan^{1,2*}

¹ College of Public Health Sciences, Chulalongkorn University, Sabbasatracicaya Building, Phayathai Road, Bangkok 10330, Thailand

² Health and Social Sciences and Addiction Research Unit, Chulalongkorn University

***Corresponding Author:** Wandee Sirichokchatchawan, College of Public Health Sciences, Chulalongkorn University Sabbasastravicaya Building, Phayathai Road, Bangkok 10330 Thailand, E-mail: wandee.s@chula.ac.th

ABSTRACT

Introduction: The intersection of social media, stigmatization, and HIV prevention service utilization among men who have sex with men (MSM) presents a critical public health challenge in Yangon, Myanmar. This study explores the role of social media as a platform that can both perpetuate stigmatization and promote acceptance and HIV prevention service utilization among MSM.

Methodology: A cross-sectional qualitative study interviewed 30 MSM residing in Yangon, Myanmar. Participants were recruited through voluntary sampling from HIV prevention clinics. Data were collected via in-depth interviews with open-ended question guidelines emphasizing the impact of social media on stigmatization and HIV prevention service utilization. Thematic analysis was employed to identify recurring themes and patterns within the responses.

Results: Four key themes emerged from the analysis. First, “Stigmatization and Social Media Dynamics” highlighted the participants’ varied experiences with stigmatization on social media, particularly on platforms like Facebook, where discriminatory comments and exclusion were common. However, some participants did not experience stigmatization due to their involvement in supportive online communities or curated social media circles. Second, “Impact of Social Media” revealed social media as a double-edged sword; while it provided a platform for stigmatization, it facilitated supportive interactions and community building. Third, “Utilization of HIV Prevention Services” showed that stigmatization negatively affected MSM’s willingness to use these services, whereas positive online interactions encouraged utilization. Finally, “Potential to Reduce Stigmatization” indicated that social media could reduce stigmatization through education and the fostering of supportive communities, though skepticism persisted due to ongoing negative attitudes.

Conclusion: Social media plays a significant and multifaceted role in stigmatization and HIV prevention service utilization among MSM in Yangon. These findings reveal challenges and opportunities for improving HIV prevention service utilization through social media. Reducing stigmatization should focus on education, community support, and fostering inclusive online spaces. Such interventions can enhance HIV prevention service utilization and improve health outcomes for MSM.

Keywords: MSM, HIV prevention, service utilization, stigmatization, social media

INTRODUCTION

HIV and Global Trend

HIV remains a significant global health challenge. It affects approximately 39 million individuals worldwide (1). Men who have sex with men (MSM) face a higher risk. For example, MSM have a one in six chance of getting HIV in their lifetime compared with

straight men, which the risk drops to one in 524 (2). This disparity is observed globally, with high HIV prevalence among MSM reported worldwide (3).

HIV Trend in Southeast Asia and Myanmar

In the Southeast Asia Region, approximately 3.9 million people were living



with HIV at the end of 2022 [1]. In Myanmar, 8.8% of MSM have HIV. This rate towers above the general population (4). Yangon, Myanmar's biggest city, has it worse, with an HIV prevalence of 27% among MSM (5).

Stigmatization and Utilization of HIV Prevention Services

Stigmatization remains a significant barrier to HIV prevention service utilization among MSM. It limits their access to protective measures and care (6). Additionally, a recent study reported that stigma continues to be a significant obstacle to accessing HIV prevention and treatment services for both HIV-negative and HIV-positive MSM (7). In Myanmar, many MSM conceal their sexual identity to avoid stigma, leading to reduced uptake of HIV prevention services (8).

Growth of Social Media

Social media usage has been rapidly increasing in Myanmar, with 15 million users as of January 2023 (9). Globally, social media has become an essential tool to fight stigma and promote HIV prevention among MSM. These platforms offer unique opportunities to raise awareness about HIV-related stigma and associated risks. They also offer safe, anonymous spaces for MSM to talk about HIV/AIDS, share information, and get support [10].

Research Gap and Originality

Nonetheless, the role of social media on stigmatization and HIV prevention service utilization among MSM in Yangon remains understudied. While previous research has examined social media use, stigmatization, and HIV prevention service utilization among MSM in various global contexts, this study makes several unique contributions to the field. It is one of the initial investigations to explore these intersecting issues in Myanmar, specifically in Yangon, where HIV prevalence among MSM is notably high. Unlike many previous quantitative studies, this study's qualitative approach offers unique insights into the lived experiences of MSM in Yangon, capturing nuances that may be missed in broader surveys. Lastly, this study is original in its potential to inform culturally appropriate, social media-based interventions for HIV prevention among MSM in Yangon, addressing

a critical gap in current public health strategies in Myanmar.

METHODOLOGY

Study design and theoretical framework

The study employed a qualitative research design to explore the role of social media on stigmatization related to HIV prevention service utilization among MSM in Yangon, Myanmar.

Study setting

The study was conducted from April to June 2024 in two Key Population Service Centers (KPSCs) in Yangon's southern and eastern districts.

Sampling, participant recruitment, and data collection

By volunteer sampling, the study recruited 30 Burmese MSM volunteers aged 18 – 60 who visited these KPSCs in Yangon. This sample size was determined based on data saturation, achieved when no new themes emerged from the interviews. Saturation was reached by the 25th interview, with five additional interviews conducted to ensure no new themes emerged. This approach is consistent with similar qualitative studies [11]. Data were collected through online in-depth interviews conducted via Zoom. The principal investigator conducted all interviews, which lasted approximately 40 minutes each. Two trained research assistants provided technical support and coordinated participant scheduling. The interviews took place in private rooms at the study sites to ensure confidentiality. Volunteer sampling may introduce self-selection bias, potentially overrepresenting MSM with solid opinions or more openness about their sexuality. To mitigate this, we communicated study requirements to attract diverse participants and acknowledged this limitation in our analysis.

Data analysis

The interview guideline questions were developed, covering topics such as social media usage, experiences with HIV prevention services on social media, and stigmatization. The guideline was pre-tested and back-translated to ensure content validity. Interviews were audio-recorded, transcribed verbatim, and analyzed using thematic analysis.



The analysis began with familiarization, where all interviews were transcribed verbatim and reviewed multiple times to engage with the content deeply. Initial codes were generated through a combination of inductive and deductive approaches. Each transcript was manually coded line by line to ensure a consistent and thorough analysis. The coding process was iterative, meaning that as new data were analyzed, existing codes were refined, and new codes were developed.

After coding was completed, the next step was identifying themes by grouping related codes. Themes were developed by identifying patterns within the coded data, focusing on recurring ideas or concepts. These themes were organized into a hierarchical structure, with broader themes encompassing several sub-themes, providing a nuanced understanding of the data. To enhance the credibility of the analysis, peer debriefing sessions were conducted, where independent researchers reviewed the coding and thematic development.

Ethical considerations

Ethical approval was obtained from The Research Ethics Review Committee for Research Involving Human Research Participants, Group I, Chulalongkorn University (COA. No. 141/67). Due to the voluntary nature of participation, signing the consent form was waived. Data confidentiality and participant privacy were strictly maintained throughout the study by storing all information in an encrypted folder, protected by a strong password, on the principal investigator's computer.

RESULTS

This study employed thematic analysis to identify key patterns in the interview data. The analysis process involved several steps: familiarization with the data through multiple readings of transcripts, systematic data coding, and developing themes by grouping related codes. Through this iterative process, four main themes emerged: Stigmatization and Social Media Dynamics, the Impact of Social Media, the Utilization of HIV Prevention Services, and the Potential to Reduce Stigmatization. Additionally, the demographic characteristics of the participants were analyzed to contextualize the findings.

Demographic characteristics of the participants

The demographic characteristics of the participants provide an essential context for understanding their experiences with stigmatization on social media. According to Table 1, the majority of participants were young (56.7% aged 20-30), educated (66.7% completed high school), self-employed (60%), and living with family (70%). This profile suggests a specific sociocultural context that may influence their interactions with social media and experiences of stigmatization.

The high proportion of young, educated participants might indicate greater digital literacy and more frequent social media use, potentially exposing them to increased support and stigmatization online. Living with family could impact participants' level of openness on social media, possibly influencing their experiences of stigmatization or willingness to engage with HIV prevention content. The high percentage of self-employed individuals might suggest more flexible schedules and potentially more time spent on social media, affecting their exposure to online interactions. However, without additional data on income levels, social media usage frequency, and internet access, only limited inferences can be made about how these factors might influence stigmatization experiences.

Table 1 Demographic characteristics of the participants (N=30)

Demographic Characteristic	Number	Percent (%)
Age (Year)		
<20	6	20.0
20-30	17	56.7
31-40	7	23.3
Education		
Primary School	1	3.3
Secondary School	4	13.3
High School	20	66.7
Bachelor Degree	5	16.7
Master Degree	0	0.0
Employment Status		
Full-Time	9	30.0



Demographic Characteristic	Number	Percent (%)
Part-Time	0	0.0
Self-Employed	18	60.0
Unemployed	3	10.0
Living Arrangement		
Alone	3	10.0
With Friend	6	20.0
With Family	21	70.0

Stigmatization on Social Media

Figure 1 illustrates the prevalence of social media stigmatization experiences among the participants. A significant 63.3% of participants reported experiencing (23.3%) or witnessing (40%) stigmatization on social media platforms. This high percentage underscores the pervasive nature of online stigma affecting the MSM community in Yangon.

The fact that more participants witnessed stigmatization than they experienced suggests a broader impact of online stigma beyond direct targets. This aligns with the theme “Stigmatization and Social Media Dynamics,” highlighting the complex nature of online interactions.

Notably, 36.7% of participants reported no encounters with stigmatization on social media, suggesting some MSM may be successfully navigating these platforms without experiencing stigma. This relates to the theme “Impact of Social Media,” which explores social media’s dual role as both a platform for stigmatization and a tool for support.

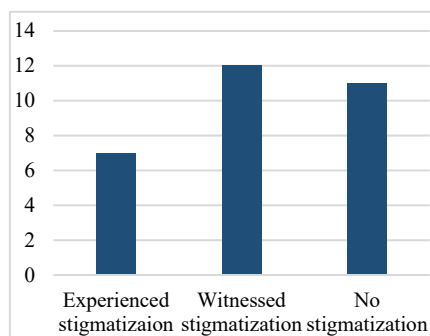


Figure 1: Stigmatization on Social Media

Theme 1: Stigmatization and Social Media Dynamics

Participants reported diverse experiences with stigmatization on social media platforms. Three subthemes emerged: experienced stigmatization, witnessed stigmatization, and absence of stigmatization. Some participants recounted personal experiences of stigmatization, particularly on Facebook. These incidents involved discriminatory comments and social exclusion.

“On Facebook, my friend’s mother told me that my son is a straight guy, you are MSM, so don’t communicate with my son” (A3).

Others reported witnessing stigmatization against third parties, including racist comments and discrimination against LGBT individuals:

“I saw one of my friends had been discriminated against on Telegram because of being MSM/LGBT” (A4).

Several participants reported no experiences or observations of stigmatization: *“No, I haven’t experienced or witnessed any stigmatization” (A1,15,16,18,20).*

Theme 2: Impact of Social Media

This theme highlighted social media as a double-edged sword. It simultaneously serves as a platform for stigmatization while also facilitating supportive interactions and community building.

Many participants reported experiencing positive influences from social media, such as receiving support and reducing feelings of isolation.

“When I uploaded a Facebook post regarding a stigmatization event that I faced, people on social media and my friends always encouraged me” (A3).

“Frankly, I think stigmatization has decreased compared to the past because of social media” (A10).

Conversely, some participants reported that negative interactions on social media intensified feelings of shame and vulnerability, potentially exacerbating stigmatization.

“I think it worsens it. Because when you post on Facebook everyone sees it including your partner and family, it can make you feel more ashamed” (A2).

“On social media, I saw that some cartoonists and scriptwriters made fun of MSM.



If an MSM sees those kinds of things, their feelings may be hurt, I think” (A30).

Theme 3: Utilization of HIV Prevention Services

Social media significantly influenced MSM's utilization of HIV prevention services in Yangon because it improved access to information. Several participants reported that accurate information and positive experiences encouraged their use of HIV prevention services.

“I think social media plays an important role because some sex workers can obtain information through social media that they cannot access in real life” (A15).

“Because of social media, I have gained more knowledge and information about how to prevent and treat HIV, so I feel that I am better informed” (A16).

However, stigmatization on these platforms deterred some participants. This fear of exposure or stigma discouraged them from engaging with HIV prevention services online.

“I think it worsens it. Because when you post on Facebook everyone sees it including your partner and family, it can make you feel more ashamed” (A2).

“On social media, people prohibit the expression of love for the same sex. Moreover, people refuse to accept us and speak negatively about us because we are MSM” (A15).

Theme 4: Potential to Reduce Stigmatization

Analysis revealed diverse perspectives on social media's potential to reduce stigmatization among MSM in Yangon. Many participants believed in social media's positive impact. This view suggests that social media can foster supportive communities and increase access to information, potentially reducing stigma.

“Yes, I believe social media has the potential to reduce stigmatization. Because of social media, I could make more friends and access more opportunities through the people I connected with” (A1).

However, skepticism persisted due to ongoing negative attitudes:

“No, I don't think so in our country. Because of the culture of our country, and even though the current situation is supporting the LGBT community, there is still stigma and discrimination against us” (A5).

RESULTS

In synthesizing the themes that emerged from the interviews, the following key findings can be highlighted:

The study revealed that social media has a dual impact: it can both encourage and discourage HIV prevention service use. Positive interactions and better access to information motivated some participants to use these services, while fear of exposure and online stigma deterred others. Although many participants saw potential in social media to reduce stigma through education and community-building, skepticism remained due to persistent negative attitudes and cultural norms.

DISCUSSION

This research represents one of the initial attempts to investigate the role of social media, stigmatization, and HIV prevention service utilization among MSM in Yangon, Myanmar. It reveals a complex scenario that encompasses both challenges and opportunities. Mainly, 63.3% of participants reported experiencing or witnessing stigmatization on social media, which is consistent with prior studies on the impact of online discrimination on health-seeking behaviors among MSM (12-13). Conversely, 36.7% of those who did not report such experiences indicate that social media can function as a safe space.

Nevertheless, social media appeared as a double-edged sword. It facilitates stigmatization while also supporting interactions between MSM on HIV prevention information. This contrast influenced HIV prevention service utilization, with online stigma discouraging the uptake of the service while positive interactions promoted it. These findings align with Veronese and colleagues' (2019) study on identity concealment among Myanmar's MSM in the digital sphere, emphasizing how online experiences affect health-seeking behaviors. The study identified the potential of social media to reduce stigmatization through education and community-building, which echoes previous research on online support for MSM (10, 14). Nonetheless, concerns about the public nature and extensive reach of harmful content remain (15). Therefore, targeted interventions are required for the MSM.



LIMITATIONS

While this study provides valuable insights, some contextual factors and methodological considerations should be considered when interpreting the results. Firstly, the focus on Yangon limits the generalizability of findings to other regions in Myanmar, particularly other high HIV prevalence areas such as Mandalay and Monywa. While sufficient for qualitative analysis, the sample size of 30 participants may not capture the full diversity of experiences within the MSM community in Yangon. Additionally, the use of volunteer sampling may have introduced self-selection bias, potentially overrepresenting MSM who are more open about their sexuality or have stronger opinions about social media and HIV prevention. The study's cross-sectional nature also limits the ability to observe changes in stigmatization and service utilization over time.

IMPLICATIONS

The findings of this study have significant implications for public health interventions and policy-making in Myanmar, particularly in Yangon. The dual nature of social media as both a facilitator and barrier to HIV prevention service utilization suggests a need for nuanced, targeted interventions. Healthcare providers and policymakers should consider leveraging social media platforms to disseminate accurate information about HIV prevention and create safe, supportive online spaces for MSM. However, they must also implement strategies to mitigate online stigmatization, such as moderating content and providing digital literacy training to MSM users. The potential of social media to reduce stigmatization through education and community-building should be harnessed while addressing the persistent cultural norms that contribute to skepticism. Furthermore, the study underscores the importance of privacy considerations in online HIV prevention initiatives, given the fear of exposure expressed by some participants. These findings can inform the development of culturally sensitive, social media-based interventions that effectively promote HIV prevention service utilization among MSM in Yangon, potentially serving as a model for similar contexts in Myanmar and beyond.

RECOMMENDATIONS FOR FUTURE RESEARCH

Future research should address these limitations and expand on the current findings. Longitudinal studies could provide insights into how social media experiences impact HIV prevention behaviors over time. Comparative studies across different regions of Myanmar would enhance the generalizability of findings. Quantitative studies with more significant, randomly selected samples complement these qualitative insights and provide more representative data. Research exploring the perspectives of healthcare providers, policymakers, and social media platform administrators could offer a more comprehensive view of the challenges and opportunities in leveraging social media for HIV prevention. Ultimately, intervention studies testing the efficacy of social media-based HIV prevention programs for MSM in Myanmar would be valuable, potentially including evaluations of online peer support groups and targeted messaging.

CONCLUSION

This study offers critical insights into the complex roles of social media in influencing stigmatization and HIV prevention service utilization among MSM in Yangon, Myanmar. Social media functions as a double-edged sword, simultaneously facilitating stigmatization and offering support and information. With 63.3% of participants reporting experiences or observations of stigmatization online, these interactions directly impact the use of HIV prevention services, encouraging or deterring utilization based on the nature of the online experience. Despite cultural skepticism, many participants acknowledged the potential of social media to reduce stigmatization through education and community-building. These findings highlight the need for targeted public health interventions, including culturally sensitive social media campaigns, safe online spaces, and privacy-focused digital strategies. The study lays the groundwork for developing context-specific interventions to enhance HIV prevention service uptake and improve health outcomes for MSM in Yangon, with broader applications in similar global contexts.



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FACTORS INFLUENCING ON FROZEN EMBRYO TRANSFER (FET) OUTCOME AFTER PREIMPLANTATION GENETIC TESTING (PGT) AMONG CHINESE WOMEN RECEIVING SERVICES IN THAILAND: A CROSS-SECTIONAL STUDY

Liuxu Chen¹, Tepanata Pumpaibool^{1*}

¹College of Public Health Sciences, Chulalongkorn University, Sabbasastravicaya Building, Phayathai Road Bangkok 10330, Thailand

*Corresponding author: Tepanata Pumpaibool College of Public Health Sciences, Chulalongkorn University Sabbasastravicaya Building, Phayathai Road, Bangkok 10330 Thailand, Email: tepanata.p@chula.ac.th

ABSTRACT

Introduction: The decline in the number of newborns has become an important public issue worldwide. In vitro fertilization (IVF) is a widely used technology to assist women in becoming pregnant. Frozen embryo transfer (FET) combined with preimplantation genetic testing (PGT) is currently a popular method to ensure the quality of the embryo. However, the pregnancy outcome is still affected by a variety of factors.

Objectives: The primary purpose of this study was to determine factors influencing on FET outcome after PGT among Chinese women receiving services in Thailand.

Methodology: This study used a cross-sectional design. The online questionnaire was used to gather data from 423 Chinese women who had received FET services in Thailand between 2019 and 2024. Purposive and snowball sampling were used with the cooperation of the key informants. Demographic characteristics, lifestyle, and fertility-related factors were examined for the association. They identified the predictors that have a significant impact on FET outcomes using the Chi-square test and logistic regression analysis, respectively. This study was reviewed and approved by the Research Ethics Review Committee for Research Involving Human Research Participants, Group 1, Chulalongkorn University.

Results: Out of 423 Chinese women, 385 met the study criteria. Around 86% of them get pregnant confirming by testing the human chorionic gonadotrophin level. The age of participants at the time of FET ranged from 32-48 years old. Half of them received the service for the first time. The majority of them possess an education level at undergraduate (45.5%) and are still working (68.8%). Nearly half of them did not have infertility problems or other related diseases. Chi-square analysis showed that age, BMI, education, and bed rest after FET were significantly associated with FET outcomes. After conducting multivariate regression analysis on the significant variables, it was found that compared with women aged <35 years old, those aged ≥ 40 were 63.3% less likely to succeed in pregnancy (AOR=0.367, 95%CI 0.156-0.863, $p=0.022$). Overweight people were 63.6% less likely to succeed in pregnancy compared to not being overweight (AOR=0.364, 95%CI 0.171-0.776, $p=0.009$). Compared to the Master and PhD groups, the undergraduate group was 7.9 times more likely to succeed in pregnancy (AOR=7.906, 95%CI 2.948-21.198, $p<0.001$). When compared to the non-bedrest group, the 24-hour bed rest group was 82.0% less likely to succeed in pregnancy (AOR=0.180, 95%CI 0.059-0.551, $p=0.003$), and 48-hours were 76.8% less likely to success in pregnancy (AOR=0.232, 95%CI 0.085-0.634, $p=0.004$).

Conclusion: Women should try to complete FET before the age of 40 and control their weight before FET. There is no need to stay in bed after FET.

Keywords: Frozen Embryo Transfer, Preimplantation Genetic Testing, Chinese women, Thailand

INTRODUCTION

The decline in the number of newborns has become an important public issue worldwide. Some of the important reasons were

the postponement of marriage age, obstacles to childbearing at an advanced age, and infertility (1). About 186 million people worldwide are affected by infertility problems (2). In China,



50 million women and 45 million men were troubled by infertility (3). The most widely used technology to assist women get pregnant was in vitro fertilization (IVF). There were about 700,000 IVF cycles in China each year (4). Besides the technology used in infertility issues, bed rest after embryo transfer (ET) caused differences in ET outcomes (5). Women's age and embryo quality are also significant predictors of IVF success (6). In addition to age and fertility diagnosis, lifestyle factors such as smoking and drinking have an impact on IVF outcomes (7). In countries such as the United States and Thailand, frozen embryo transfer (FET) combined with preimplantation genetic testing (PGT) to ensure the quality of embryos is currently popular (8, 9). In China, unfortunately, the use of PGT is strictly restricted, accounting for less than 1% of IVF cycles each year (10). Many Chinese women seeking PGT services choose to go to Thailand (11). There is currently no relevant research on the outcome of FET after using PGT and what factors affect it in this population. Thus, this study investigated how socio-demographic, lifestyle, and fertility factors influence the FET success of Chinese women who received FET services in Thailand after using PGT to determine embryo quality.

METHODOLOGY

This study adopted a cross-sectional design. Data from Chinese women who received FET services after ensuring embryo quality using preimplantation genetic testing (PGT) in Thailand between 2019 and 2024 were collected. Since infertility and IVF-FET were extremely sensitive and private matters, informants such as medical interpreters, health consultants, and doctors who provided services to the target population were used as informants. Purposive sampling and snowball sampling were used to recruit participants. Since the exact proportion of Chinese women in the IVF population in Thailand was unknown, the sample size was determined to be 384 by using Cochran's formula, plus a 10% error tolerance rate for a total of 423.

The online questionnaire was used to gather the socio-demographic characteristics, fertility-related issues, risky behaviors, bed rest after FET, and experience in FET. A Chinese IVF doctor, a Chinese nurse, and a Thai

professor with a nursing background tested and approved the validity of the questionnaire. The stress level was also accessed using the 4-item Perceived Stress Scale (PSS) (12), which was an international standard questionnaire. The reliability of the 4-item PSS was 0.713. The total score of the stress level was finally divided into three groups: high, medium, and low. Four hundred sixty-one women participated in the online questionnaire. Among them, 57 participants were excluded from the screening questionnaire. Eleven were excluded because they potentially did not test the quality of embryos by PGT before embryo transfer. The other eight women were excluded because they gave some contradictory answers. The remaining 385 valid data were statistically analyzed.

Descriptive statistics were used to present the frequencies and percentages of all categorical variables, including age, BMI, education level, family monthly income, employment status, stress level, bed rest after FET, tobacco and alcohol exposure, and fertility-related factors such as cause of infertility, quality of the embryo, number of transferred embryos, ET experience. The associations between demographic characteristics, lifestyle and fertility-related factors and FET outcomes were examined using Chi-square tests and logistic regression analyses, respectively, and predictive factors with significant effects on FET outcomes were identified. This study was reviewed and approved by the Research Ethics Review Committee of Chulalongkorn University Group I involving human research participants with the COA No. 113/67.

RESULTS

Out of 385 women who received the frozen embryo transfer service, 85.7% succeeded in pregnancy. Their socio-demographic characteristics are presented in Table 1. The median age at the time of receiving services was 35 years old. The majority of the women receiving the FET service were less than 35 years old (46.0%), followed by 35-39 years old (36.4%) and 40 and above (17.6%), respectively.

Regarding the body mass index of the participants, the majority of them (74.5%) were in normal BMI. Nearly 20% (17.7%) was overweight and the rest was underweight



(7.8%).

Around half (45.5%) of the participants had a bachelor's degree, followed by college (29.4%), Master's and PhD (9.9%), junior high school and below (8.9%), and high school (6.5%).

More than a quarter of participants chose to keep their family monthly income confidential. Among those who disclosed their income, 71.6% (199) had a family income below 50,000 yuan per month.

In terms of occupation of the participants, possession of a full-time job (43.6%) accounted for the most significant proportion of the participants, followed by unemployed but full-time housewife (18.2%), business owner (16.1%), unemployed and not doing much housework (13.0%), and part-time jobs (9.1%).

During the process of frozen embryo transfer, the majority (59.7%) of the women who underwent the embryo transfer were at a medium stress level. More than a quarter were at a high-stress level, and 43 (11.2%) were at a low-stress level.

Table 1 Socio-demographic characteristics of the participants (N=385)

Socio-demographic characteristics	N	%
Age at the time of FET (years)		
<35	177	46.0
35-39	140	36.4
≥40	68	17.7
Median (IQR) =35 (32,38)		
Minimum-maximum=25-48		
BMI		
Not overweight (<24)	317	82.3
Overweight (≥24)	68	17.7
Education		
Junior high school and below	34	8.9
High School	25	6.5
College	113	29.4
Undergraduate	175	45.5
Master/PhD	38	9.9
Family monthly income (CNY)		
Below20,000	88	22.9
20,001-50,000	111	28.8
50,001-100,000	51	13.2
100,001- 200,000	16	4.2
More than200,000	12	3.1
Not answer	107	27.8
Employment status		

Socio-demographic characteristics	N	%
Business owner	62	16.1
Full-time job	168	43.6
Part-time job	35	9.1
Unemployed but a full-time housewife	70	18.2
Unemployed and not doing much housework	50	13.0
Stress levels		
Low	43	11.2
Medium	230	59.7
High	112	29.1

The majority of the participants chose to stay in bed after FET: 14.3% continued to stay in bed within 24 hours, 31.2% stayed in bed within 48 hours, and 29.6% stayed in bed for a week. The rest basically lived a normal life. In terms of smoking behaviour and secondhand smoke, no participant was still smoking during the FET. Most of them had never smoked. The rest were former smokers who had quit at least one month before the FET (5.5%), and smokers who quit during the FET (1.6%). Only 3.9% of participants confirmed being affected by secondhand smoke.

Of the alcoholic's consumption, the majority of them were never drinkers. Habitual drinkers stopped drinking only during the FET (6.2%), and some (14.8%) had abstained from drinking for more than one month before the FET. None did drink during the FET (Table 2).

Table 2 Rest on the bed and risky behaviors of the participants during the embryo transfer process (N=385)

Factors	N	%
Rest in bed after FET.		
In 24 hours	55	14.3
In 48 hours	120	31.2
In a week	114	29.6
Non-bedrest	96	24.9
Smoking		
Women smoking		
Never smoking	358	93.0
Quit a month or more	21	5.5
Quit during FET	6	1.6
Smoked during FET	0	0.0
Secondhand smoke		
No secondhand smoke	260	67.5
Maybe secondhand smoke	110	28.6



Factors	N	%
Have secondhand smoke Drinking	15	3.9
Never Drinking	304	79.0
Quit a month or more	57	14.8
Quit during FET	24	6.2
Drinking during FET	0	0.0

Among reported causes of infertility, female factors were most frequent (27.5%), followed by unknown reasons (16.1%) and age factors (14.0%). Male or mixed factors were less common (11.7%). Additionally, 42.1% considered IVF to expedite pregnancy, not due to infertility (Table 3).

Nearly 45% of women did not have any physical problems that may affect pregnancy. Ovarian problems accounted for 23.1% of the participants, followed by uterine and fallopian tube problems (17.7 and 16.6%, respectively). A small number of women faced genetic, immune problems, and chronic diseases.

Quality of embryos is one factor related to FET success; 42.9% were transferred for Day 5 embryos, 14.5% for Day 6 embryos, and 7.8% a mixture of Day 5 and Day 6 embryos. Around one-third of women did not know, and some selected "others," which means Day 2-3 and Day 5- 6 embryos mixed used. One or two embryos were transferred.

More than half of women received FET for the first time. Of those who had FET experience, 28.6% were failures, while 19.2% had become pregnant and given birth.

Table 3 Fertility-related factors (N=385)

Fertility related factors	N	%
Cause of infertility		
Infertility factor		
Female factor	106	27.5
Male factor	21	5.5
Mixed	24	6.2
Unexplained	62	16.1
Aging	54	14.0
Not infertile	162	42.1
Related problems or diseases		
Fallopian tube problems	64	16.6
Ovarian problems	89	23.1
Immune problems	16	4.2
Uterine problems	68	17.7
Genetic problems	32	8.3
Basic/chronic diseases	12	3.1

Fertility related factors	N	%
Non-diseases	172	44.7
Quality of embryos		
Day 5 embryo	165	42.9
Day 6 embryo	56	14.5
Day 5 and 6 embryos	30	7.8
Others	33	8.6
Do not know	101	26.2
Number of transferred embryos		
One embryo	228	59.2
Two embryos	157	40.8
ET experience		
Succeeded experience	74	19.2
Failed experience	110	28.6
Non-experience	201	52.2

Associations between factors related to women and FET outcome were first examined using the Chi-square test. Several factors, namely age, BMI, education level, and bed rest after FET, were statistically significantly associated with FET outcomes (Tables 4 and 5). No association was found between fertility-related factors and FET outcome (Table 6).

**Table 4** Associations between socio-demographic characteristics and FET outcome

Socio-demographic characteristics	FET outcome				P- value
	Not Pregnant		Pregnant		
	N	%	N	%	
Age at the time of FET (years)					0.017*
<35	17	9.6	160	90.4	
35-39	22	15.7	118	84.3	
≥40	16	23.5	52	76.5	
BMI					
Not overweight (<24)	17	25.0	51	75.0	0.005
Overweight (≥24)	38	12.0	279	88.0	
Education					<0.001
Junior/below	6	17.6	28	82.4	
High School	7	28.0	18	72.0	
College	18	15.9	95	84.1	
Undergraduate	12	6.9	163	93.1	
Master/PhD	12	31.6	26	68.4	
Employment					0.682
Business owner	11	17.7	51	82.3	
Full-time job	20	11.9	148	88.1	
Part-time job	6	17.1	29	82.9	
Full-time housewife	12	17.1	58	82.9	
Unemployed and no housework	6	12.0	44	88.0	
Stress level					0.754
Low	5	11.6	38	88.4	
Medium	32	13.9	198	86.1	
High	18	16.1	94	83.9	

Statistically significant at p<0.05

Table 5 Associations between lifestyle-associated factors and FET outcome

Lifestyle Factors	FET outcome (N=385)				P-value
	Not Pregnant		Pregnant		
	N	%	N	%	
Bed Rest after ET					0.001
Bed rest for 24 hours	14	25.5	41	74.5	
Bed rest for 48 hours	24	20.0	96	80.0	
Bed rest during the week	11	9.6	103	90.4	
Non-Bed rest	6	6.3	90	93.8	
Smoking					
Women Smoking					0.100
Non-smoking	49	13.7	309	86.3	
Quit before ET	6	28.6	15	71.4	
Quit during ET	0	0.0	6	100.0	
Secondhand Smoke					0.222
Non-secondhand smokes	39	15	221	85	
Maybe secondhand smoke	12	10.9	98	89.1	
Have secondhand smoke	4	26.7	11	73.3	
Drinking					0.551
Non-Drinking	43	14.1	261	85.9	
Quit before ET	10	17.5	47	82.5	
Quit during ET	2	8.3	22	91.7	

*Statistically significant at p<0.05

**Table 6** Association between fertility-associated factors and FET outcome

Fertility related factors	FET outcome(N=385)				P- value
	Not Pregnant		Pregnant		
	N	%	N	%	
Number of transferred embryos					0.310
One embryo	36	15.8	192	84.2	
Two embryos	19	12.1	138	87.9	
ET experience					0.085
Succeed ET experience	16	21.6	58	78.4	
Failed ET experience	11	10.0	99	90.0	
Non-ET experience	28	13.9	173	86.1	

Statistically significant at $p < 0.05$

All variables found to be significantly associated in the univariate analysis were included in the multivariate regression analysis, and the results are shown in Table 7. Respondents aged 40 or above (AOR=0.367, 95%CI 0.156-0.863, $p=0.022$) were 63.3% less likely to succeed in pregnancy compared with those aged less than 35 years old. The overweight people (AOR=0.364, 95%CI 0.171-0.776, $p=0.009$) were 63.6% less likely to succeed in pregnancy compared to those not

overweight. The respondents who completed undergraduate (AOR=7.906, 95%CI 2.948-21.198, $p < 0.001$) were 7.9 times more likely to succeed in pregnancy compared with those who completed Master/PhD. When compared to the non-bedrest group, the 24-hour bed rest group (AOR=0.180, 95%CI 0.059-0.551, $p=0.003$) were 82.0% less likely to succeed in pregnancy, and 48-hours (AOR=0.232, 95%CI 0.085-0.634, $p=0.004$) were 76.8% less likely to success in pregnancy (Table 7).

Table 7 Multivariate logistic regression results

	AOR	95%CI		P-value
		Lower	Upper	
Age at the time of FET (years)				
<35	Ref.			0.071
35-39	0.641	0.306	1.341	0.238
≥ 40	0.367	0.156	0.863	0.022
BMI				
Not overweight (<24)	Ref.			
Overweight (≥ 24)	0.364	0.171	0.776	0.009
Education				
Master/PhD	Ref.			<0.001
Junior/below	3.023	0.860	10.626	0.085
High School	1.476	0.430	5.070	0.536
College	2.190	0.861	5.571	0.100
Undergraduate	7.906	2.948	21.198	<0.001
Bed rest after FET				
Non-Bed rest	Ref.			0.003
Bed rest for 24 hours	0.180	0.059	0.551	0.003
Bed rest for 48 hours	0.232	0.085	0.634	0.004
Bed rest during the week	0.574	0.192	1.718	0.321



DISCUSSION

Although guidelines (1) and a study by Van Loendersloot et al. (6) emphasize that age at 35 or above has an impact on different aspects of IVF, there is no clear guidance on the specific age at which it has a significant impact during the FET stage. The analysis of the impact of age in this study is slightly different from previous studies. At least before the age of 40, age has no significant effect on FET. In these previous studies (1, 6), egg retrieval and ET were mainly performed immediately, but in this study, due to the impact of COVID-19, the interval between egg retrieval and FET was longer. When egg retrieval and ET are performed consecutively, due to the association between age and embryo quality (1, 6), the impact of age on ET outcomes is also affected by embryo quality. When the interval between egg retrieval and FET is longer, the independent impact of age on FET outcomes can be better confirmed. Combining previous studies with this study, we can find that the impact of age on embryo quality begins to be significant at the age of 35 (1, 6), while the impact on the FET stage may only be more evident at the age of 40. A study by Kasum et al. has demonstrated its significant impact on the relationship between weight and pregnancy. Overweight may become a risk factor for pregnancy. Besides that, obesity may have a significant impact on several different aspects of IVF (13). This study found that the success outcome in women with a BMI ≥ 24 was significantly lower than that with a BMI < 24 , and being overweight is still a risk factor during the FET stage. It is a worthy suggestion for overweight women to spend time controlling their weight before FET.

In a study by Jin et al., it was pointed out that people with higher education generally seek medical technology to help them get pregnant earlier (14). Seeking help more actively may mean getting pregnant faster, but this study found that people with graduate education have a lower success than those with undergraduate education, which seems to be different from the conclusions of the previous study. Thinking further about previous studies, if people with higher education work harder to find ways to help themselves get pregnant, then when undergoing IVF-FET, they will also seek more information to improve or guarantee their success. IVF-FET is a project affected by too many confounding factors, and each doctor will

propose different plans from his perspective. In the process of obtaining information from multiple channels, including online channels or different doctors, some conflicts in plans will inevitably occur, which may increase the anxiety of this group of people. People with graduate education are well-trained and may trust their judgment more than the advice provided by others. This may also reduce compliance with medical staff, thereby affecting the treatment effect.

Su et al.'s study found that bed rest and non-bed rest have no effect on FET outcomes (15). However, Küçük found that the outcomes of the non-bed rest group were better than those of the bed rest group (5). This study found that bed rest for 24 or 48 hours after FET significantly reduced the success of FET compared with no bed rest, but there was no significant difference in bed rest for one week. In the group that chose bed rest, the success of bed rest for 24 or 48 hours was lower than that of the group that stayed in bed for one week. Considering that all participants were Chinese women who went to Thailand to receive services, they might need to rest in bed for a short period after completing FET and then return to their city of residence. Based on the self-efficacy theory, we can speculate that the women who chose bed rest believed that bed rest would help them achieve better FET outcomes. If they believe bed rest helps FET outcomes, but they do not have enough time and have to end bed rest within 24 or 48 hours, either because of travel or work, they may have potential concerns and stress. Therefore, it may not be the bed rest duration itself that affects FET outcomes, but maybe because of stress.

STRENGTHS AND LIMITATION

There was no previous literature on the factors that impact the outcomes of Chinese women who received FET services in Thailand, and there was no guidance on whether to reserve time for bed rest after FET. Therefore, this study may provide multiple suggestions to the relevant population, which is the strength of this study. However, this study had some limitations. Collecting data within five years may lead to recall bias. Besides, the online questionnaire limited the population that could be reached, and the quality of the answers could have been better control. The vast majority of people who failed were unwilling to participate



in the study. New methods and strategies need to be considered for the same study.

CONCLUSION

Although 35 years old is defined as an advanced childbearing age, for FET, there is no significant decrease in the success rate before the age of 40. Being overweight may reduce the success rate of FET. Therefore, it is recommended that overweight people spend time controlling weight before FET. If they have enough time to stay in bed after completing FET, women can choose to stay in bed. On the contrary, if they are unable to do bed rest, it does not reduce the success outcome.

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INVESTIGATION OF OCCUPATIONAL DISEASES AMONG HAND- WOVEN CARPET WEAVERS IN HAMADAN, IRAN

Mahdi Reyahi-Khoram^{1*}, Reihaneh Reyahi-Khoram²

¹Department of Civil Engineering, University College of Omran-Toseeh, Hamedan, Iran.

²Department of Food Science and Technology, Faculty of Biological Sciences, Tehran- North Branch, Islamic Azad University, Tehran, Iran.

*Corresponding author: Mahdi Ryahi-Khoram, Department of Civil Engineering, University College of Omran-Toseeh, Hamedan, Iran, Email: phdmrk@gmail.com

ABSTRACT

Introduction: Although the Iranian hand-woven carpet is very beautiful, but its weaving is very hard and Stressful for weavers. According to the studies, hand-woven carpet weavers usually encounter with different harmful occupational diseases and problems caused by ergonomics after a few years.

Objectives: The aim of this research is investigating the occupational diseases such as pain in low back, respiratory diseases, poor eyesight and problems caused by ergonomics after a few years among hand-woven carpet weavers in the study area.

Methodology: This research was carried out in Hamadan Township in Iran. A comprehensive questionnaire was designed for collecting information. In order to determine validity of the questionnaire, it was decided to use opinions of experts and specialists in the field of occupational health. To determine the reliability of questionnaire, Cronbach's alpha coefficient was obtained as 0.82. The data collected from this research was statistically analysed using SPSS software (version 22).

Results: Based on the obtained results, a small number of participants (1%) were smokers. Most participants (59%) were less than 48 years and most participants (63%) had BMI classified as Pre-obesity. A chi-square test of independence revealed a significant relationship between Work Experience and pain in low back ($\chi^2=52.38$, $p<0.001$). Other results shown on tables.

Conclusion: The carpet weavers are involved with various occupational diseases. Although the government sector has made many efforts in this constantly evolving field, the development of carpet weaving, especially in Hamadan region, requires more support.

Keywords: Hamedan carpets, hand- woven carpet, occupational health, weaver

INTRODUCTION

The carpet is a beautiful painting made by the weaver on the horizontal warp and vertical weft and displays a mosaic of Iranian art. Iranian carpet is one of those handicrafts that has a long history and world fame, so that the world knows carpet with Iran and Iran with carpet. Although the Iranian hand-woven carpet is very beautiful and proud, but its weaving is very hard and Stressful for weavers. Hamadan carpets or rugs belongs to one of the oldest cities in the world. This carpet is celebrated for their distinctive designs, vibrant colors, and traditional weaving techniques.

Some of the issues of carpet weavers' occupational health is related to the way the weavers sit in front of the weaving loom. A loom is a wooden or metal frame within which

the carpet is made. The looms classified as vertical loom and horizontal. A vertical is more satisfying for workers and better able to meet their physical activity needs. It should be noted that, this kind of loom was used by the carpet weavers who produce in Hamadan province in Iran.

According to the studies, hand-woven carpet weavers usually face different harmful occupational diseases such as poor eyesight, respiratory diseases, osteoporosis, and problems caused by ergonomics after a few years (1, 2, 3, 4, 5, 6).

Srivastava and Kumari commented that the carpet weavers are suffering from physical and occupational health issues. Based on the research, it was concluded that weavers are suffering from occupational health problems



and their condition of working are not at all good even not favourable at some places. High risk factors are the reasons to develop low back pain, sitting in hunch back position, laterally bent or twisted trunk postures, high pressure on hands, neck, shoulder, spine and other parts of the body (3).

In the another study done in home carpet weaving workshops in rural areas of Isfahan province in Iran, researchers found that Mean aerosol and bioaerosols concentration in workshops was 2.4 ± 1.6 and 430 ± 332 colony/m³ respectively. In this research it is stated that there was a direct but no statistically significant relationship between aerosol and bioaerosols concentration. Based on the reaserch, there was significant correlation between mean concentration of bioaerosols and the presence of animals and birds in the yard ($P = 0.03$) (6).

In this research an attempt has been made to investigate the occupational diseases such as pain in low back, respiratory diseases, poor eyesight and problems caused by ergonomics after a few years among hand-woven carpet weavers in Hamadan Township in Iran.

METHODOLOGY

Study Area

Hamadan Province, with an area of 19493 Km², is located 320 Km from Tehran, in

the West of Iran. The mentioned province is one of the most important centers for producing hand-made carpets and rugs in Iran, whose economy is strongly dependent on agricultural activities and hand- made carpet weaving. According to the general population and housing census in 2016, the population of Hamadan Township is equal to 676101people, and about 85% of the population lives in cities and the rest in 101 villages. In fact, due to the lack of proper definition of employment in rural areas, only 15% of the Townships population lives in the villages, and according to the available information, the population of the villages in the mentioned Township is between 5 and 8000 people. The location of the area is shown in figure (1).

According to the available information, more than two million carpet weavers are engaged in carpet weaving in Iran. Hamadan province is the seventh province of Iran in terms of carpet production and has 59,948 carpet weavers, of which the most carpet weavers in the province are in Hamedan Township with 31,370 weavers. It is necessary to remember that about half of this number are continuously engaged in carpet weaving. The result of the work of carpet weavers in Hamadan province is the annual production of about 45000 square meters of carpet in the study area.

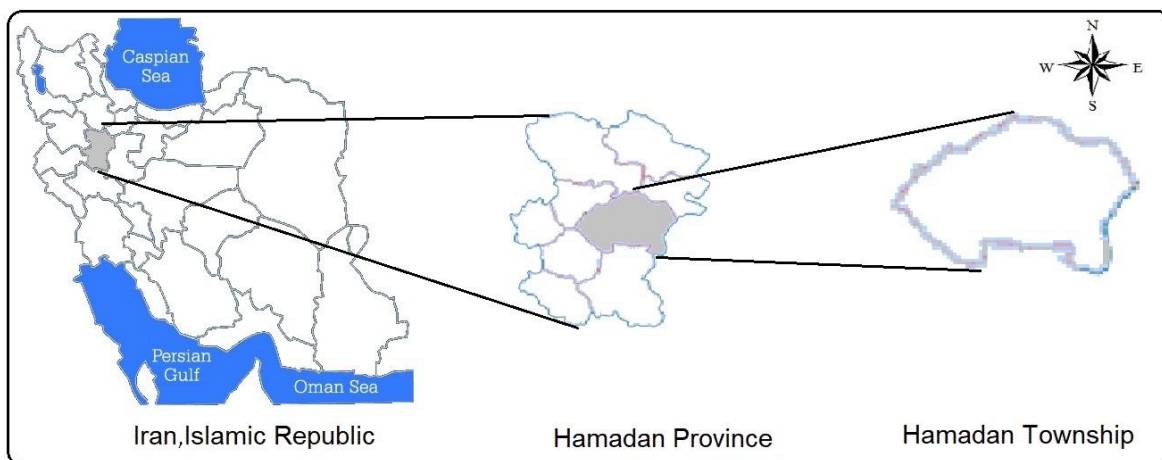


Figure 1: Geographical situation of the studied area



Sample size

This research survey was carried out in Hamadan Township located in Hamadan province, during 2023 to 2024. A cross sectional study with simple random sampling was performed in this research.

Sample size was calculated using Yamane's formula. mentioned formula are as follows (7):

$$n = \frac{N}{1 + N(e)^2} \quad (1)$$

N: Population Size

e : level of precision (usually set the value of 0.05)

n : Sample Size

As said before, Hamadan Township with 31,370 weavers (population size) has the most number of carpet weavers in the mentioned province. Consequently, the calculated sample size for this study was obtained as 395 weavers. However, a total of 400 questionnaires were distributed and 269 completed questionnaires were received.

A comprehensive questionnaire was designed for the purpose of collecting information. Questionnaires were distributed among the carpet weavers of Hamadan Township. The used questionnaire was include two sections; personal information(with eleven questions) and occupational status information(with sixteen questions). personal information was including age, gender, education level, work experience, body weight, height, The amount of carpet weaving (square meter per year), How to weave a carpet (seasonal, permanent) and Number of weaving days per week. Occupational status information was including the issue of pain in each one of 10 body sites (namely low back, neck, both right and left shoulders, right and left elbows,

right and left wrists/hands, Shortness of breath, Smoking, Skin and eye inflammation, Use of face mask, glasses and gloves while weaving, chronic cough, formation of occupational cramps. In this situation, the total numbers of variables of this research were twenty-five. considering the importance of Body Mass Index (BMI) in diabetes management and human health, BMI of the participants was calculated according to their body weight and height and based on WHO normative standards for monitoring health systems and services.

The questionnaire was modified after pre-testing to identify the reliability and obtain internal consistency. In order to determine validity of the questionnaire, it was decided to use opinions of experts and specialists in the field of occupational health. To determine the reliability of questionnaire, Cronbach's alpha coefficient was obtained as 0.82. In order to perform statistical analysis, the information related to age, BDI and Work Experience of the participants were classified. The data collected from this research was statistically analyzed using SPSS (version 19). Also, excel software was used for primary analysis of raw data.

RESULTS

Results related to personal information

Based on the obtained results, the mean age (Standard deviation) of participants was 47.21 (6.95) years; the maximum age 60, the minimum age 30, the Median age 48 and the mode was 48 years. The mean (Standard deviation) of Work Experience (years), BMI (kg/m²) and Carpet weave per year (m²) was 24.46(10.72), 26.79(3.14) and 1.90(0.75), respectively. Details of personal information related to participants are shown in the table 1.

Table 1: summary of personal information collected from participants' interviews (N=269)

Sociodemographic characteristics	Number	Percent (%)
Age		
Under 18	0	0
18-48	158	59
Over 48	111	41
Gender		
Female	260	97
Male	9	3

**Table 1:** summary of personal information collected from participants' interviews (N=269)

Sociodemographic characteristics	Number	Percent (%)
Smoking		
Absent	264	99.0
Present	5	1.0
Location		
Urban	252	94.0
Rural	17	6.0
Working Status		
Full-Time	240	89.0
Part-Time	29	11.0
Education level		
Illiterate	83	31.0
Elementary school	62	23.0
Junior high school	38	14.0
Senior high school	74	28.0
Bachelor's degree	12	4.0
Work Experience		
1- 10 years	5	2.0
11-20 years	69	26.0
21-30 years	18	6.0
Over 30 years	177	66.0
BMI		
Below 18.5 (Underweight)	0	0.0
18.5–24.9 (Normal weight)	66	25.0
25.0–29.9 (Pre-obesity)	172	63.0
30.0–34.9 (Obesity class I)	26	10.0
35.0–39.9 (Obesity class II)	5	2.0
Above 40 (Obesity class III)	0	0.0

Results related to occupational status information

Based on the obtained results, the number (percentage) of participants suffering from pain in wrists and hands, pain in shoulders

and elbows, pain in low back and pain in neck was equal to 216(80), 244(90), 252(93) and 228(84) respectively. Details of occupational status of participants' interviews was presented in the table 2.

Table 2: Summary of occupational status collected from participants' interviews (N=269)

Symptoms and signs among	Number	Percent (%)
Cough		
Absent	161	59
Present	108	41
Pain in low back		
Absent	17	6
Present	252	94
Pain in neck		
Absent	41	15
Present	228	85
Pain in shoulders and elbows		
Absent	25	9

**Table 2:** Summary of occupational status collected from participants' interviews (N=269)

Symptoms and signs among	Number	Percent (%)
Present	244	91
Pain in wrists and hands		
Absent	53	19.0
Present	216	81.0
Shortness of breath		
Absent	121	45.0
Present	148	55.0
Skin inflammation		
Absent	41	15.0
Present	228	85.0
Eye inflammation		
Absent	69	25.0
Present	200	75.0
Use of face mask		
Absent	221	82.0
Present	48	18.0
Use of glasses		
Absent	113	42.0
Present	156	58.0
Use of gloves		
Absent	265	98.0
Present	4	2.0
Occupational cramps		
Absent	261	97.0
Present	8	3.0

Results related to Statistical analysis

Kolmogorov–Smirnov test was performed and differences were considered significant at $P < 0.05$. Based on the research, A chi-square test of independence revealed a significant relationship between Work Experience and pain in low back ($\chi^2 = 52.38$, $p < .001$). In addition, A chi-square test of

independence revealed a significant relationship between Work Experience and pain in shoulders and elbows ($\chi^2 = 150.69$, $p < .001$). Whereas the mentioned test did not indicate a relationship between Age and Skin inflammation ($\chi^2 = 15.65$, $p < .405$). Other results shown on table 3.

Table 3: Results of ANOVA Analysis of hand- woven carpet weavers based on age, Work Experience and literacy. (n=269)

Dependent variables	Factor	χ^2	P-value
Pain in low back	WE	214.26	0.001
Pain in neck	WE	72.48	0.001
Pain in shoulders and elbows	WE	150.69	0.001
Pain in wrists and hands	WE	58.93	0.001
Shortness of breath	WE	36.05	0.002
Skin inflammation	WE	15.65	0.405
Eye inflammation	WE	50.40	0.001
Pain in low back	Age	44.95	0.001
Pain in neck	Age	48.22	0.001
Pain in shoulders and elbows	Age	34.82	0.001



Dependent variables	Factor	χ^2	P-value
Pain in wrists and hands	Age	37.32	0.001
Shortness of breath	Age	91.94	0.001
Skin inflammation	Age	37.32	0.001
Eye inflammation	Age	50.18	0.001
Pain in low back	Education	52.38	0.001
Pain in neck	Education	33.13	0.001
Pain in shoulders and elbows	Education	45.54	0.001
Pain in wrists and hands	Education	66.01	0.001
Shortness of breath	Education	59.80	0.001
Skin inflammation	Education	39.67	0.001
Eye inflammation	Education	124.07	0.001
Pain in low back	BMI	41.22	0.001
Pain in neck	BMI	36.48	0.001
Pain in shoulders and elbows	BMI	19.46	0.078
Pain in wrists and hands	BMI	26.82	0.008
Shortness of breath	BMI	65.57	0.001
Skin inflammation	BMI	38.54	0.001
Eye inflammation	BMI	38.05	0.001

Significant; p<0.05

WE: Work Experience

DISCUSSION

It seems that carrying out field research on the status of occupational diseases among carpet weavers and assessing the health of the work environment will promote the culture of health and safety among weavers and will also cause more attention from government officials in following up on the general insurance status of carpet weavers. Several studies have been done in these fields (8, 9, 10, 11, 12, 13, 14, 15 and 16). For example, Nadjarzadeh et.al (2011) in their research project in Yazd city in Iran, investigated the weight status and amount of nutrients in women carpet weavers in the studied area. In this survey, 300 women were studied and the results showed that although about one third of the surveyed people were overweight, more than 11% of them were underweight (10). In another study, Akbarzade et al. (2007) investigated the vision problems of carpet weavers in a historical cohort study in Hamadan in Iran. The results of this research showed Mean cycloplegic refractive error was more negative in carpet weavers and blue-collar workers ($p<0.05$) and the prevalence of myopia in carpet weavers was higher than blue-collar workers. On the contrary, the prevalence of hyperopia in blue-collar workers was more than carpet weavers ($p<0.05$). The axial length of eye and corneal refractive power in carpet

weavers was more than blue-collar workers (11).

CONCLUSION

Carpet weaving in Iran has a long history. The mentioned industry has been very prosperous in the past and Iranian hand-made carpets were exported to different countries. Today, Iran's international carpet market has lost its importance due to political reasons. Accordingly, many carpet weavers have also lost their jobs. The old carpet weavers also continue the art of carpet weaving under difficult conditions. According to the results of this research, the mentioned workers are involved with various occupational diseases. This article tries to pay attention to the issues and problems related to the occupational diseases of carpet weavers in Hamadan and find the root of these problems and provide suggestions to solve them. Although the government sector has made many efforts in the above field, the development of carpet weaving, especially in Hamadan region, requires more support. It is hoped that with the improvement of the conditions and investment of the private sector and the support of the government, as well as the expansion of universal insurance coverage, Iranian handwoven carpet weavers will be able to



develop this original art with more hope and interest.

RECOMMENDATIONS

Carpet weaving is essentially a sedentary profession and requires long hours of static work in a day. In addition, the mentioned work is very sensitive and requires mental precision, accuracy and patience. The occupational health risks of the industry including ergonomics and designing the workplace environment. In order to effectively manage the mentioned risks, it is recommended that Universal insurance coverage for carpet weavers with the cooperation of the government have been implemented so that carpet weavers can pass this valuable art to the next generation.

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DETERMINANTS OF COMPLETED IMMUNIZATION AMONG CHILDREN UNDER FIVE YEARS OLD IN OUDOMXAY PROVINCE, LAO PEOPLE'S DEMOCRATIC REPUBLIC

Santhana Manivanh¹, Orapin Laosee^{1*}, Thunwadee Suksaroj¹,
Cheerawit Rattanapan¹, Jeevan Bhatta¹

¹ASEAN Institute for Health Development, Mahidol University, Salaya, Phutthamonthon, Nakhonpathom, 73710, Thailand

***Corresponding Author:** Orapin Laosee, ASEAN Institute for Health Development, Mahidol University, Salaya, Phutthamonthon, Nakhonpathom, 73710, Thailand
E-mail: Orapin.lao@mahidol.edu

ABSTRACT

Introduction: Routine immunization was initiated in Lao PDR in the early 1970s; however, achieving complete vaccination targets has remained challenging. A previous study in Laos in 2022 identified that 67% of children aged 12 months to 5 years completed vaccination. Therefore, many children in the country are left vulnerable to vaccine-preventable diseases.

Objectives: This study aimed to explore the factors associated with full immunization in Oudomxay province, Lao PDR.

Methodology: A quantitative, cross-sectional study was conducted. One semi-urban and two rural districts were randomly selected to serve as the study areas. A total of 374 mothers with children under five years old were approached and interviewed. According to WHO guidelines, completed immunization refers to receiving all required vaccine types and doses within the correct timeframe. Descriptive statistics and bivariate and multivariate logistic regression analyses were performed to identify predictive factors influencing full immunization.

Results: The result revealed that 288 (79.6%) of children had completed immunizations. The majority of mothers (84.8%) were aged 20 to 35 (with a median of 27 years), and 31% completed primary and lower primary education. Over half (61%) were farmers with 1-2 children. Multiple logistic regression indicated that mothers and caregivers aged 25 and older (AOR: 1.99, 95%CI: 1.03-3.83), having non-poverty status (AOR: 4.55, 95%CI: 2.30-8.98), having good knowledge about vaccination (AOR: 2.33, 95%CI: 1.15-4.70), having a perception of the availability of vaccines (AOR: 13.40, 95%CI: 5.10-35.18), living more than 5 kilometers from the immunization center (AOR: 3.12, 95%CI: 1.21-8.05), and having strong community norms and support (AOR: 3.13, 95%CI: 1.52-6.44) were identified as significant predictors of complete immunization.

Conclusions: The findings highlighted the key success factors for improving immunization among children under five years old in Oudomxay province, Lao PDR. The implementation of a health education program to increase caregiver knowledge about the importance of vaccination for every child to prevent infectious diseases, particularly among young mothers (less than 25 years old), is crucial. Strengthening mobile vaccination clinics and rural outreach programs can improve accessibility for poorer communities and those with transportation barriers. Additionally, health staff at health centers could promote the advantages of completing vaccine doses and timely immunization through various media (such as radio, television, mobile phones, etc.). Moreover, encouraging family support, engaging community members to promote vaccination knowledge, and improving vaccine stock management systems are essential to prevent stockouts and ensure a continuous supply of vaccines.

Keywords: Immunization, Children, Knowledge, Poverty, Lao PDR

INTRODUCTION

Immunization is a critical public health initiative that aims to reduce mortality and

morbidity from vaccine-preventable diseases (VPD) (1). The World Health Organization (WHO) launched the Expanded Program on



Immunization (EPI) in 1974 to increase global vaccination rates (2). Despite these efforts, 67 million children missed essential vaccinations between 2019 and 2021 (3).

In the Lao People's Democratic Republic (Lao PDR), routine immunization began in the early 1970s. However, target coverage has yet to be achieved. As of 2022, only 67.6% of children were fully vaccinated in Lao PDR (4). The literature revealed that low vaccination included geographical difficulties, poor healthcare infrastructure, socioeconomic challenges, and sociocultural perceptions were key barriers to accessing EPI (4, 5). From 2011 to 2017, there were outbreaks of polio, measles, and diphtheria, highlighting the urgency of improving immunization coverage.

Oudomxay province, located in the northern part of Lao PDR, stands out due to its low vaccine coverage compared to other provinces in the country. It falls short of the 85.71% full immunization coverage, which includes BCG, MCV1, and Penta3, while provinces like Louangphabang have surpassed their vaccination targets for BCG, MCV1, and Penta3. Oudomxay also has a high mortality rate for children under five, partly due to vaccine-preventable diseases (VPDs). Socioeconomic factors such as a high incidence of multidimensional poverty, low maternal education, and large family sizes further complicate immunization efforts in Oudomxay province (6).

There is limited research regarding the factors associated with low vaccine coverage in Lao PDR. A previous study in 2022 identified household characteristics and contextual factors such as childbirth and immunization at hospitals, immunization in outreach clinics, and caregivers' perceptions as predictors of low vaccine coverage in Lao PDR (4). However, household and community factors like poverty, accessibility, household perceptions, knowledge, attitude and other enabling and reinforcing factors have not been studied.

This research aims to fill this knowledge gap in the selected areas of Lao PDR to explain factors affecting full immunization in the country, adopting the PRECEDE-PROCEED model. The PRECEDE-PROCEED model provides a structured framework for planning and evaluating health programs. It helps identify predisposing, reinforcing, and enabling factors

that influence health behaviors and outcomes. By using this model, the research can systematically assess community needs, design targeted interventions to improve immunization rates, and evaluate the effectiveness of these interventions in achieving desired health outcomes, ensuring a comprehensive approach to improving child vaccination in Oudomxay province.

METHODOLOGY

Study design and area

This study employed a quantitative cross-sectional design to gather data on the factors influencing immunization among children under five years old. Three districts, Xay district, Nga district, and Houn district of Oudomxay province, were selected randomly for the survey.

Research instruments

The questionnaire utilized in this study was adapted from an existing one and modified according to the study's objectives, region, population, and language. It was translated from English to Lao and validated by experts, including lecturers of Epidemiology at the University of Health Sciences and an English literature teacher from Lao PDR. The questionnaire consisted of four parts: predisposing factors such as child and caregiver characteristics, poverty, knowledge and attitude. Enabling factors included availability of health services and vaccines, distance, waiting time, mode of transportation, travel time, and quality of service. Reinforcing factors included positive health experiences, information exposure, family support, community support, and health worker support. The dependent variable was complete immunization status.

Poverty status was measured using poverty dimensions based on the Alkire and Foster method, adapted from tools used in China by Wenxian et al. This tool comprised three domains: 1) Health status, 2) Education, and 3) Living standards. The total score ranged from 0.17 to 3.0, with the incidence of poverty considered as any household with a score equal to or greater than 1 (7). Attitudes towards immunization and community norms and support were measured using a 5-point Likert



scale (8). Other independent variables in the study were recorded on nominal or continuous scales.

In the context of immunization status, data recorded and verified using vaccination cards or mother and child handbooks showed whether each child under 5 years had received the 10 vaccines (BCG and Hepatitis B at birth; OPV, Penta, and PCV at 6, 10, and 14 weeks; IPV at 14 weeks; MR1 and JE1 at 9-11 months; and MR2 at 12-18 months), with children receiving all recommended doses for their age categorized as '1' = complete immunization, and those missing one or more doses or vaccinated after the scheduled date categorized as '2' = incomplete immunization.

Data Collection Procedures

Face-to-face interviews were conducted with mothers/caregivers aged 18 years and above who had at least one child under five years old. The researcher obtained permission from the Provincial and District Health Offices and trained research assistants, who were staff members from the District Health Office (DHO). A total of 374 participants were enrolled, and data from 362 completed cases were used for analysis. Ethical approval was sought from the Mahidol University Social Sciences Institutional Review Board (MUSSIRB) certificate number No.2023/162.2609.

Validity and reliability

The questionnaire was examined for validity and reliability by specialists from the ASEAN Institute for Health Development (AIHD), Mahidol University. According to the opinions and suggestions of the experts, the researcher revised and strengthened the weak points of the questions. Questionnaires were translated into Lao using back translation and were verified by the experts. Inconsistent or hard-to-understand items were replaced or removed from the questionnaire for the final survey. Cronbach's alpha value for attitude was 0.877, and for community norms was 0.707.

Statistical Analysis

The completed data collection was checked regularly to ensure all data and errors were present. Data were entered into SPSS version 26. Descriptive analysis analysis was used to describe the sample characteristics and

percentage of completed immunization. Bivariate multiple logistic regression analyses were conducted to examine factors associated with completed immunization. Variables with $P < 0.25$ in the bivariate analysis were considered for the multivariate logistic regression analysis to find the predicting factors of incomplete immunization.

RESULTS

Descriptive statistics highlighted that the majority of mothers (84.8%) were aged 20 to 35 years, with a median age of 27 years, and 31% had completed primary or lower primary education. Over half (61%) were farmers with 1-2 children. The majority were categorized as non-poor (72.1%), while 27.9% were classified as poor. Most participants demonstrated a good level of knowledge about immunization (75.7%), despite 55% holding a negative attitude towards immunization (Table1)

Table 1 Description of socio-demographic characteristics and predisposing factors (N=362)

Variables	Number	Percent (%)
Age of the youngest child (in months)		
Less than 11	133	36.7
11-23	105	29.0
≥24	124	34.3
Median=14, QD=30.02, Minimum=1, Maximum=60		
Number of children		
1	221	61.0
2	133	36.7
3	6	1.7
5	2	0.6
Median=1, QD=3, Minimum=1, Maximum=5		
Child's weight at birth		
<2500 grams	21	5.8
≥2500 grams	341	94.2
Median= 2900, IQR=1225, Minimum=1600, Maximum=4050		
Child's height at birth		
<48 cm	146	40.3
≥48 cm	216	59.7



Variables	Number	Percent (%)
Median= 48, QD=48, Minimum=32, Maximum=64		
Place of delivery of the child		
Health facility	336	92.8
Home	26	7.2
Age of the mother/caregiver		
<20 years	18	5.0
20-35 years	307	84.8
>35 years	37	10.2
Median= 27, QD=40, Minimum=18, Maximum=62		
Gender of caregiver		
Male	3	0.8
Female	359	99.2
Relationship with the child		
Mother	352	97.2
Caregiver	10	2.8
Ethnicity		
Laoloum	122	33.7
Laotherng	219	60.5
Laosoung	21	5.8
Education level of mother/caregiver		
None	9	2.5
Primary	103	28.5
Secondary	78	21.5
Higher Secondary	152	42.0
Diploma level	20	5.5
Occupation of mother/caregiver		
Unemployed	54	14.9
Farm/Agriculture	221	61.0
Worker	5	1.4
Government staff	46	12.7
Private employee	12	3.3
Others	24	6.6
Family size		
1-3members	26	7.2
4-7 members	286	79.0
8-10 members	35	12.4
>10 members	5	1.4
Median= 6, QD=8.5, Minimum=3, Maximum=14		
Poverty Status		

Variables	Number	Percent (%)
Poor	101	27.9
Non-poor	261	72.1
Knowledge of immunization of the mother/caregiver		
Poor Knowledge	88	24.3
Good Knowledge	274	75.7
Attitude toward immunization of the mother/caregiver		
Negative	163	45.0
Positive	199	55.0

The majority of individuals accessed immunization services at public hospitals (60.5%), while 9.7% reported the unavailability of vaccines. Immunization centers were located within a 5-kilometer distance from homes for 79.3% of participants, and 67.1% used private vehicles as their mode of transportation. The waiting time at immunization centers was brief, with 92.5% waiting for 30 minutes or less. Additionally, 41.2% of respondents expressed satisfaction with the services received at immunization centers. While 39.0% of respondents reported weak support, the majority (61.0%) demonstrated strong community norms and support, as shown in Table 2.

Table 2: Description of enabling and reinforcing factors (N=362)

Variables	Number	Percent (%)
Vaccine location		
Public hospital	219	60.5
Outreach clinic	134	37.0
Mobile Camps	9	2.5
Vaccine card availability		
Yes	364	97.3
No	10	2.7
Vaccine availability		
Readily not available	35	9.7
Readily available	327	90.3
Distance		
≤5 kilometers	287	79.3
>5 kilometers	75	20.7
Median=2, QD=8.5, Minimum=0, Maximum=17		
Mode of transportation		
Private vehicle	243	67.1
Walking	118	32.6
Public vehicle	1	0.3
Waiting time		



Variables	Number	Percent (%)
≤30 minutes	335	92.5
>30 minutes	27	7.5
Median=15, QD=25.5, Minimum=1, Maximum=50		
Cost of transportation		
None	239	66.0
≤30,000 kip	88	24.3
>30,000 kip	36	9.7
Median=0, QD=25.5, Minimum=0, Maximum=50,000		
Satisfaction with the services		
Strongly dissatisfied	9	2.5
Somewhat dissatisfied	14	3.9
Neutral	77	21.3
Somewhat satisfied	113	31.2
Strongly satisfied	149	41.2
Community norms and support		

Variables	Number	Percent (%)
Strong	221	61.0
Weak	141	39.0

79.6% of children under 5 had full immunization, while 20.4% had incomplete immunization.

Chi-square analysis on independent variables and immunization status in Table 3 showed that the factors of Number of children, Child's height at birth, Age of the mother, Education level, Occupation, Poverty status, Knowledge, Attitude, Vaccine location, Vaccine availability, Distance, transportation mode and Cost, Satisfaction and Community norms and support were associated ($p < .05$).

Table 3 Association between independent variables and immunization status

Independent variables	Immunization status		Chi-square	P-value
	Incomplete N (%)	Complete N (%)		
Number of children			6.01	0.014
One child	36(16.3)	185(83.7)		
More than one child	38(27.0)	103(73.0)		
Child's height at birth			20.77	<0.001
<48 cm	47(32.2)	99(67.8)		
≥48 cm	27(12.5)	189(87.5)		
Place of delivery			3.46	0.063
Health facility	65(19.3)	271(80.7)		
Home	9(34.6)	17(65.4)		
Age of the youngest child			0.048	0.826
<1 year	28(21.1)	105(78.9)		
≥1 year	46(20.1)	183(79.9)		
Age of the mother			16.73	<0.001
<25 years	47 (30.5)	107(69.5)		
≥25 years	27(13.0)	181(87)		
Education level of mother/caregiver			30.49	<0.001
Secondary or less	60(31.6)	130(68.4)		
Higher secondary or more	14(8.1)	158(91.9)		
Occupation of mother/caregiver			13.79	<0.001
Farm/Agriculture	60(26.5)	166(73.5)		
Other	14(10.3)	122(89.7)		



Independent variables	Immunization status		Chi-square	P-value
	Incomplete N (%)	Complete N (%)		
Family size			0.78	0.377
≤ 5 members	33(18.5)	145(81.5)		
>5 members	41(22.3)	143(77.0)		
Family income			3.25	0.071
<1.6 million kip	33(25.6)	96(74.4)		
≥1.6 million kip	41(17.6)	192(82.4)		
Number of employed persons			0.64	0.424
≤ 2 persons	60(21.4)	221(78.6)		
> 2 persons	14(17.3)	67(82.7)		
Poverty status			50.08	<0.001
Non-Poor	29(11.1)	232(88.9)		
Poor	45(44.6)	56(55.4)		
Knowledge about immunization			36.96	<0.001
Low	38(43.2)	50(56.8)		
High	36(13.1)	238(86.9)		
Attitude towards vaccination			6.42	0.011
Negative	31(15.6)	168(84.4)		
Positive	43(26.4)	120(73.6)		
Vaccine location			19.98	<0.001
Public hospital	28(12.8)	191(87.2)		
Outreach and mobile clinic	46(32.2)	97(67.8)		
Vaccine availability			55.18	<0.001
Readily not available	24(68.6)	11(31.4)		
Readily available	50(15.3)	277(84.7)		
Distance			7.17	0.007
≤5 kilometers	67(23.3)	220(76.7)		
>5 kilometers	7(9.3)	68(90.7)		
Waiting time			1.15	0.283
≤15 minutes	32(23.4)	105(76.6)		
>15 minutes	42(18.7)	183(81.3)		
Mode of transportation			12.8	<0.001
Walking	37(31.4)	81(68.6)		
Private/public vehicle	37(15.2)	207(84.8)		
Cost of transportation			9.4	0.002
Walk	60(25.1)	179(74.9)		
Vehicle	14(11.4)	109(88.6)		



Independent variables	Immunization status		Chi-square	P-value
	Incomplete N (%)	Complete N (%)		
Satisfaction with the services			16.76	<0.001
Unsatisfied	59(27.7)	154(72.3)		
Satisfied	15(10.1)	134(89.9)		
Community norms and support			45.27	<0.001
Weak	54(38.3)	87(61.7)		
Strong	20(9.0)	201(91.0)		

Note: n=362. P-value <0.05 is significant.

Table 4 shows the results of the logistic regression analysis. Multiple logistic regression results showed that mothers and caregivers aged 25 and older (AOR: 1.99, 95%CI: 1.03-3.83), having non-poverty status (AOR: 4.55, 95%CI: 2.30-8.98), having good knowledge about vaccination (AOR: 2.33, 95%CI: 1.15-4.70), having a perception of the availability of vaccines (AOR: 13.40, 95%CI:

5.10-35.18), living more than 5 kilometers from the immunization center (AOR: 3.12, 95%CI: 1.21-8.05), and having strong community norms and support (AOR: 3.13, 95%CI: 1.52-6.44) were identified as significant predictors of complete immunization. Although the mother's education level was significant in the full model, it did not emerge as a predictor of full immunization in the final model.

Table 4: Full and final model of multivariate logistic regression analysis

Independent variables	Full immunization			
	Full model AOR (95% CI)	P-value	Final model AOR (95% CI)	P-value
Age of the mother (Ref:<25 years)				
≥25 years	2.34(1.14-4.80)	0.019	1.99(1.03-3.83)	0.040
Education level (Ref: Secondary or less)				
Higher secondary or more	2.97(1.07-8.21)	0.036		
Poverty status (Ref: Poor)				
Non-Poor	3.92(1.60-9.58)	0.003	4.55(2.30-8.98)	<0.001
Knowledge (Ref: Poor)				
Good	2.18(1.02-4.67)	0.043	2.33(1.15-4.70)	0.018
Vaccine availability (Ref: Not available)				
Readily available	18.56(6.22-55.39)	<0.001	13.40(5.10-35.18)	<0.001
Distance from home (Ref: ≤5 kilometers)				
>5 kilometers	4.34(1.34-14.02)	0.014	3.12(1.21-8.05)	0.018
Community norms and support (Ref: Weak support)				
Strong support	3.16(1.25-8)	< 0.015	3.13(1.52-6.44)	<0.002

Note: N=362. P-value < 0.05 is statistically significant., Adjusted Odds Ratio = AOR, CI = Confidence Interval,

DISCUSSION

The study on immunization rates among children under five in Oudomxay province revealed both successes and challenges in the program. Among the 362 surveyed mothers/caregivers, 79.6% reported

fully immunized children, which, although an improvement from previous studies in Lao PDR (4), was lower than in Malaysia (86.4%) (9). It did not meet the Lao national target of 95% (10).



The study found that mothers aged 25 and older were more likely to achieve full immunization, consistent with a study in Ethiopia, possibly due to older mothers having more knowledge, awareness, and better access to healthcare due to their life experience. In comparison, younger mothers may face barriers like limited information and competing responsibilities (11). Knowledge about immunization is critical, as mothers with good knowledge were 2.3 times more likely to immunize their children entirely. This finding underscores the importance of maternal education programs and effective communication between healthcare providers and mothers. Similar to a study conducted in Nigeria, this may be due to mothers with good knowledge being more likely to prioritize immunization, understanding its benefits, safety, and importance in protecting their child's health (12).

This study revealed that households classified as poor were more likely to have incomplete immunization, consistent with a previous study by Merten (2015), which noted that women's low social status can hinder vaccination access. Financial difficulties may cause parents to deprioritize their children's health and undervalue vaccination (13). A significant portion of participants in the current study fell below the poverty line, highlighting the need for interventions targeting economic empowerment. Tailored educational programs to enhance immunization awareness, improved housing conditions, better access to safe drinking water, and cleaner energy sources like gas stoves are necessary to address these issues. Addressing these key factors may alleviate poverty and enhance childhood immunization rates.

Furthermore, mothers' access to vaccines available at healthcare centers during visits significantly increased the likelihood of vaccinating their children, as highlighted by studies in Ethiopia, where vaccine unavailability was considered a significant reason for incomplete vaccination (14). Therefore, ensuring consistent vaccine supply at healthcare facilities is essential for promoting uptake and achieving optimal immunization rates

Participants residing more than 5 kilometers from health facilities were 3.1 times more likely to have higher immunization rates,

differing from findings in Eastern Ethiopia, where shorter travel times to nearby facilities increased vaccination rates (15). This study noted a significant urban-rural disparity, with 32% of children in the Xay district and 13.5% in the Houn and Nga districts living over 5 km away and not completing vaccination. Socioeconomic factors like education and income also influenced access to vaccination services, particularly with 67.1% using private vehicles for hospital visits.

Community norms and support significantly predicted immunization status, with 40.0% of respondents experiencing weak community norms and insufficient support. Only half received adequate immunization information from the media, and approximately 25% needed more family help with household duties during vaccination visits. Additionally, 35.0% perceived inadequate community acceptance of childhood immunization as a shared responsibility. These findings align with Dhaliwal (2021), emphasizing the influence of stakeholders such as community health workers, fathers, and religious leaders on caregivers' vaccination perceptions. Strengthening community norms through dialogues and involving leaders can enhance vaccine coverage among children (16).

Other factors considered in the study included household size, place of delivery, education level, occupation, family income, attitudes toward immunization, and transportation to immunization centers. While not all were statistically significant, they offer insights into the complex factors affecting immunization rates and suggest areas for further research and intervention in Oudomxay province.

CONCLUSION

The findings highlighted the key success factors for improving immunization among children under five years old in Oudomxay province, Lao PDR. A multifaceted approach is essential. Implementing a targeted health education program that emphasizes the importance of vaccination is crucial, particularly for young mothers under 25 who may benefit from increased awareness about protecting their children from preventable diseases. Strengthening mobile vaccination clinics and rural outreach programs will improve accessibility for underserved



communities, addressing transportation barriers and reaching poorer populations. Health centers should utilize various media platforms, including radio, television, and mobile phones, to promote the benefits of timely and complete vaccination doses, ensuring the message reaches a broad audience. Engaging family support and community members in these efforts can create a supportive environment that encourages vaccine acceptance and adherence. Additionally, enhancing vaccine stock management systems is vital to prevent stockouts and ensure a reliable and continuous supply of vaccines. This comprehensive strategy not only educates caregivers but also builds a robust infrastructure to sustain high vaccination coverage and prevent infectious diseases.

RECOMMENDATION

Future studies should integrate mixed methods research to combine quantitative vaccination data with qualitative insights on beliefs and barriers. Additionally, research should focus on optimizing vaccine supply chains using blockchain, predictive analytics, and real-time monitoring to enhance efficiency, reduce wastage, and ensure equitable access.

LIMITATIONS

The cross-sectional nature of the study design allows for the identification of associations but does not establish causality. Moreover, the study focused on specific geographic areas within Oudomxay province, limiting the generalizability of findings to other regions or populations with different socio-demographic characteristics.

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FACTORS ASSOCIATED WITH SUICIDE MORTALITY AMONG SUICIDE ATTEMPTER IN THAILAND

Kajohnsak Tangkwampien^{1*}, Nutta Taneepanichskul¹

¹ College of Public Health Sciences, Chulalongkorn University, Sabbasatavicaya Building, Phayathai Road, Bangkok 10330, Thailand

**Corresponding Author: Kajohnsak Tangkwampien, College of Public Health Sciences, Chulalongkorn University Sabbasatavicaya Building, Phayathai Road, Bangkok 10330 Thailand, E-mail: kajohnsakmax@gmail.com*

ABSTRACT

Introduction: Suicide is a global public health problem that affects individuals, families, and communities. The World Health Organization (WHO) estimates that more than 700,000 people die of suicide worldwide each year, making it the leading cause of death in all age groups. Like many countries, Thailand has not been immune to the tragic impact of suicide. Despite research efforts to understand and prevent suicide, suicide rates are still rising.

Objectives: The study aimed to find the associated factors (sociodemographic factors, mental and physical problems, economic factors, history of self-harm, and warning signs) of suicide mortality among the Thai population in 2022.

Methodology: A secondary data analysis was performed. All suicide attempt cases in 2022 were classified based on either the intention to die or the presence of a recorded warning sign in the 506.S report obtained from Thailand's National Suicide Prevention Center. Associated factors, including sociodemographic factors, mental and physical problems, economic factors, history of self-harm, and warning signs, were extracted from the 506.S report of the individual. The descriptive statistic was analyzed. Binary logistic regression was modeled to find the associated factors.

Results: The suicide mortality rate for individuals who attempt suicide in Thailand is 25.6%. Males (OR = 10.151, 95% CI: 9.284 to 11.098) and older adults (age > 65) (OR = 59.534, 95% CI: 45.520 to 77.862) are significant risk factors. Regarding occupation, the agriculture sector presents the highest risk (OR = 9.129, 95% CI: 8.029 to 10.380) compared to other occupations. People who are divorced, widowed, or separated (OR = 3.656, 95% CI: 3.263 to 4.097) are the most vulnerable to suicide. The presence of a history of self-harm (OR = 0.218, 95% CI: 0.197-0.242), mental disorders (OR = 0.312, 95% CI: 0.279-0.348), and experience with relationship problems (OR = 0.228, 95% CI: 0.211-0.247) are protective factors of suicide mortality.

Conclusions: Male and older adults were at risk of suicide mortality. Working in the agriculture sector is most susceptible to mortality. A history of self-harm and mental disorders was noted, and their role in preventing suicide mortality should be explored further. Preventive measures should focus on older males working in the agriculture sector.

Keywords: Suicide, Suicide mortality, Suicide attempter, Thailand, sociodemographic factors

INTRODUCTION

Suicide mortality has an impact on family members and those who are left behind. There are 700,000 people or more who die from suicide worldwide each year. Suicide is the fourth leading cause of death among 15-29-year-olds. Suicide attempt is a factor that should be monitored to prevent suicide due to its strong relationship with committed suicide (1-3). It is estimated that there are 20 suicide

attempts per suicide case (3). Since completed suicides are rare, they are difficult to recognize in time, and prevention is no longer an option once death has occurred. Thus, suicide attempts are easier to identify than completed suicides and are also preventable.

According to the statistics for Thailand's suicide rate from 2018 to 2021, it has risen from 6.03 to 7.38 per 100,000 population(4). Despite several suicide studies



and data collection in Thailand, the trend of suicide rate is still increasing (5). Foreign countries also researched associated factors of suicide. The elderly who are 70 or older have the highest suicide rates (6). Men and boys are more isolated than girls and women (7), and this makes men more vulnerable than women (6). There is also a study in Ethiopia that shows that the prevalence of suicide behavior is double among patients than among the residents, and depression is one of the main risk factors in these patients that is associated with suicide behavior (8). Associated factors about suicide may need to be reevaluated to prepare an effective preventive measure and to determine whether the variables have a significant association with suicide mortality. This research aimed to identify the associated factors (sociodemographic factors, mental and physical problems, economic factors, history of self-harm, and warning signs) of suicide mortality among suicide attempters in Thailand.

METHODOLOGY

This cross-sectional study, which used secondary data, was conducted in June 2024. A data set was retrieved from the 506.S report of the entire country in the year 2022, which was collected by the Thailand National Suicide Prevention Center at the Khon Kaen Psychiatry Hospital. The data in this study includes 76 provinces of Thailand. Bangkok was not included in this study because of a separate record system. Therefore, this study did not include suicidal behavior cases in Bangkok due to the inaccessibility of information. The study utilized purposive sampling and included 14,833 cases of all suicide attempts reported in the Thai 506.S reports from 1 January 2022 to 31 December 2022, regardless of whether the individuals survived or not. The conceptual framework in this study was created by incorporating most factors from the 506.S report developed by Khon Kaen Hospital. The

506.S report is involved with risk factors, protective factors, stimulating factors, barriers, and preventive measures. This study put all factors in the independent variable in order to find the association between the independent variable and suicide mortality.

These cases were classified based on either the intention to die or the presence of a recorded warning sign in the 506.S report by the author (only for non-death cases), obtained from Thailand's National Suicide Prevention Center. The process of collecting data for a 506.S report involved trained healthcare providers conducting interviews with patients and recording the information in 506.S reports. Healthcare providers obtained information directly from the individual who attempted suicide, whereas information regarding suicide mortality was gathered from relatives, neighbors, and eyewitnesses by healthcare providers. The data were sourced from the Khon Kaen Psychiatry Hospital, excluding the jurisdiction of Bangkok, regardless of whether the individuals survived or not. In this study, the 506.S Questionnaire report served as the measurement tool. It is the standard instrument utilized for gathering data on suicidal attempts in Thailand. The data of the age, gender, occupation, marital status, economic problems, history of alcohol, substance abuse, Underlying disease (history of physical illness and mental disorders), relationship problems, history of self-harm, warning signs, and suicide attempt were extracted from the 506.S questionnaire.

For categorical data, frequency and percentage were reported, and binary logistic regression was conducted for each independent variable against the outcomes (Suicidal attempted (0) and Suicide mortality (1)). The odds ratio was reported for each outcome, with a p-value less than 0.05 considered significant. This study was approved by the Department of Mental Health for ethics review and given to DMH.IRB.COA 010/2567.

**RESULTS****Table 1** Association between demographic data and suicide mortality

Factors	Suicide mortality			
	Suicide N (%)	Odds Ratio	95% CI	P-value
Gender				
Male	3016(49.7)	10.151	9.284-11.098	<0.001
Female	776(8.9)		Reference	
Age group				
Youth <18	70(2.3)		Reference	
Adults 18-65	3146(29.3)	17.825	14.013-22.673	<0.001
Older adults > 65	576(58.0)	59.534	45.520-77.862	<0.001
Occupation				
Full-time employees, Employees, Repairman/Technician	85(28.1)	3.840	2.937-5.020	<0.001
Government sector / State enterprise sector	138(33.6)	4.955	3.954-6.209	<0.001
Private sector	1350(31.9)	4.597	4.098-5.155	<0.001
Agriculture sector	989(48.2)	9.129	8.029-10.38	<0.001
Local private sector	211(23.2)	2.955	2.466-3.540	<0.001
Religion / Unemployment / Others	548(29.8)	4.155	3.620-4.768	<0.001
Student	471(9.3)		Reference	
Marital status				
Single	1260(17.4)		Reference	
Married	1698(29.9)	2.028	1.866-2.204	<0.001
Widowed/Divorced/Separation	736(43.5)	3.656	3.263-4.097	<0.001
Monk/unspecified	98(42.1)	3.444	2.637-4.499	<0.001

Table 1 presents the association between demographic data (gender, occupation, and marital status) and suicide mortality using the binary logistic regression technique. All subsets of demographic data demonstrated a significant association with suicide mortality.

Gender was significantly associated with suicide mortality. Male suicide attempters increased 10.151-fold odds of mortality than female suicide attempters (OR = 10.151, 95% CI 9.284-11.098, p-value < 0.001). Adult suicide attempters (age 18-65 years) and older

adult suicide attempters (age > 65 years) increased 17.825-fold odds (OR = 17.825, 95% CI 14.013-22.673, p-value < 0.001 and 59.534-fold odds (OR = 59.534, 95% CI 45.520-77.862, p-value < 0.001) of mortality than youth suicide attempters (age 5- <18 year) respectively. Compared with being single, widowed, or divorced, and increased 3.656-fold odds of mortality (OR = 3.656, 95% CI: 3.263-4.097, p-value < 0.001), and working in the agriculture sector increased by 9.129-fold odds of mortality (OR = 9.129, 95% CI: 8.029-10.38, p-value < 0.001),

Table 2 Association between economic problems, history of alcohol use, substance abuse, underlying (mental and physical illness), relationship problems, history of self-harm, warning signs, and suicide mortality



Factors	Suicide N (%)	Suicide mortality		
		Odds Ratio	95%CI	P-value
Economic Problems				
No	2897(25.3)	Reference		
Yes	895(26.4)	1.061	0.973-1.158	0.18
History of alcohol use				
No/unspecified	3066(23.4)	Reference		
Yes	726(41.8)	2.354	2.123-2.611	<0.001
Substance abuse				
No/unspecified	3484(24.6)	Reference		
Yes	308(45.4)	2.550	2.181-2.980	<0.001
Underlying Disease				
No	1912(24.9)	Reference		
Yes	1880(26.3)	1.077	1.000-1.160	0.48
Mental disorder				
No	937(42.9)	Reference		
Yes	943(19.0)	0.312	0.279-0.348	<0.001
Physical illness				
No	685(16.5)	Reference		
Yes	1195(40.0)	3.391	3.038-3.784	<0.001
Relationship problems				
No	1976(47.4)	Reference		
Yes	1816(17.0)	0.228	0.211-0.247	<0.001
History of self-harm				
No/unspecified	3323(33.1)	Reference		
Yes	469(9.8)	0.218	0.197-0.242	<0.001
Warning sign				
No/unspecified	2762(24.5)	Reference		
Yes	1030(29.0)	1.258	1.156-1.368	<0.001

Based on Table 14, The association between economic problems, history of alcohol use, substance abuse, underlying (mental and physical illness), relationship problems, history of self-harm, warning signs, and suicide mortality using the binary logistic regression technique was examined. All factors demonstrated a significant association with suicide mortality except for economic problems and underlying disease.

The presence of physical illness was found to be the highest risk factor. Suicide attempters who had a history of physical illness increased 3.391-fold odds of mortality (OR = 3.391, 95% CI: 3.038-3.784, p-value < 0.001), followed by substance abuse (OR = 2.550, 95% CI: 2.181-2.980, p-value < 0.001) and a history of alcohol use (OR = 2.354, 95% CI: 2.123-

2.611, p-value < 0.001). In contrast, the history of self-harm is the most potent protective factor (OR = 0.218, 95% CI: 0.197-0.242, p-value < 0.001).

DISCUSSION

This study identified the association between various factors and suicide mortality among suicide attempters, regardless of whether they resulted in suicide mortality, in all provinces of Thailand except Bangkok. Our finding indicated that gender, age group, occupation, marital status, economic problems, history of alcohol use, substance abuse, underlying (mental and physical illness), relationship problems, history of self-harm, and warning signs are significant associated factors. The suicide mortality among suicide attempters in Thailand is 25.6%. However, the age-



standardized suicide rates per 100,000 people in 2019 are as follows: 8.0 in Thailand, 3.0 in Myanmar, 2.6 in Indonesia, and 4.5 in Timor-Leste (9).

This study found that suicide risk among males is higher than among females either due to a lack of social interaction among males (6, 7) or because men are less likely to seek help due to the stigma of men being strong and stoic (10). Older adults (>65 years old) have the highest suicide mortality rate (58%), with a risk of suicide mortality 59.534 times higher than that of youth since older adults experience more social isolation due to the loss of interpersonal relationships (6). There is also a study in Malaysia on suicide-related deaths in elderly individuals aged 60 years and above that reported a male-female relative risk (RR) of 1.89(11).

Students have the lowest suicide risk, as schooling is one of the protective factors in suicide prevention (6). In contrast, those in other occupations, especially in the agriculture sector, have the highest suicide risk (12-14). The agricultural occupation is considered blue-collar work, which has a high risk of accidental injury (14) and is associated with lower socioeconomic status (13).

As for the widowed, divorced, and separated group, it aligns with other studies (15, 16). The dissolution of high-quality social ties, as seen in divorce and separation, causes psychological stress (15), and the widowed also experience crises and lead stressful lives (16).

Many studies report mental disorders as a risk factor (10, 17). There is also a study done on adolescents in Sarawak, Malaysia, that reports depression (OR=1.919) is significantly associated with an increased risk of suicide (18). However, this study found that individuals with a diagnosed mental disorder (OR = 0.312) have a lower suicide risk than those without a diagnosed mental disorder. This may be due to mental health literacy, as the population in the 506.S questionnaire can only be recorded as having a mental disorder if diagnosed by a doctor. People with a mental health diagnosis receive information from doctors to prepare preventive measures. This situation is reflected in the data: 32.1% of warning signs were detected in suicide mortality cases of individuals with mental disorders, whereas only 25.5% were detected in suicide mortality cases of individuals without mental disorders.

Physical illness is reported as a risk factor (OR = 3.39). However, it is not the number of physical illness conditions itself that increases the suicide risk, but rather the disruptive effect of physical illness on daily activities (19).

The history of self-harm (OR = 0.218) results was not similar to previous studies, as self-harm is generally viewed as a risk factor for suicide. This study found that warning signs that could be detected in suicide mortality cases without a past injury are lesser than warning signs that could be detected in suicide mortality cases with a past injury. As mentioned before, warning signs should be detected in about 93% of cases (20). This situation suggests that there may be an effect of modification for the history of past self-injury in suicide attempters with warning signs. However, this topic may need to be explored further to be clarified.

Several limitations should be noted in this study. Since this study uses secondary data and the 506.S report is separated into suicide attempt files and committed suicide files, there may be individuals who have both attempted and committed suicide in the same year, resulting in double counting. Additionally, this study cannot represent all of Thailand and the central Thailand region due to a lack of information on suicidal behavior in Bangkok. The data was collected through interviews, which introduces the possibility of recall bias. However, this study is reliable because it used the entire population of suicide attempters in Thailand and a large sample of over 14,800 people. Additionally, trained healthcare providers collected the data, making it concrete and reliable.

The study results suggest that the preventive intervention of suicide mortality should focus on Male focusing on male individuals who are older adults, working in the agriculture sector, being widowed, divorced or separated, using alcohol, substance abuse, and having physical illness need more preventive measures such as access to medical care, stress management programs or curing addition of using alcohol, and substance abuse.

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FACTORS ASSOCIATED WITH SUICIDAL RISK AMONG SECONDARY SCHOOL STUDENTS IN NAKHON RATCHASIMA, THAILAND

Sirakrit Rungrojchaiporn^{1*}, Wetanee Ubonsri², Nutta Taneepanichskul¹

¹ College of Public Health Sciences, Chulalongkorn University, Sabbasatracivaya Building, Phayathai Road, Bangkok 10330, Thailand

² Nakhon Ratchasima Rajanagarindra Psychiatric Hospital, Nai Mueang, Mueang Nakhon Ratchasima, Nakhon Ratchasima 30000 Thailand

**Corresponding Author: Sirakrit Rungrojchaiporn, College of Public Health Sciences, Chulalongkorn University, Sabbasatracivaya Building, Phayathai Road, Bangkok 10330, Thailand, E-mail: 6674023953@student.chula.ac.th*

ABSTRACT

Introduction: Suicide is one of the leading causes of death among adolescents worldwide. In Thailand, Suicide is the third leading cause of death among young people aged 15 to 19 years, with a large impact on individuals, families, society, and the nation. During adolescence, significant changes in thoughts, decision-making, behavior, and emotions can potentially lead to suicidal risk. A suicide risk assessment is a comprehensive assessment that determines the risk of a person's Suicide at a given time. It would be beneficial to identify the adolescents who are at risk of Suicide and to intervene appropriately in prevention.

Objectives: The objective of this study is to investigate the factors associated with suicidal risk among secondary school students in Nakhon Ratchasima, Thailand.

Methodology: A cross-sectional study was conducted in grades 10-12 at a public school in Muang District, Nakhon Ratchasima Province, Thailand. Sociodemographic status, substance use, family characteristics, peer and school-related characteristics, including bullying and sense of belongingness at school, self-esteem, and suicidal risk, were assessed using a self-report questionnaire. The assessment of bullying and sense of belonging at school was carried out using a Programme for International Student Assessment (PISA) student questionnaire. The revised Thai version of the Rosenberg Self-Esteem Scale assessed self-esteem. Suicide risk was examined by eight questionnaires of suicide assessment (8Q) from the Department of Mental Health, Thailand. Descriptive statistics and chi-square tests were performed. A p-value of < 0.05 was considered statistically significant.

Results: The study included 397 students aged between 15 and 19 years. The total prevalence of suicide risk was 19.6%. Suicide risk was significantly associated with GPA (p-value = 0.044), academic satisfaction (p-value < 0.001), smoking (p-value = 0.022), family history of self-harm (p-value = 0.005), family relationships (p-value < 0.001), peer support (p-value = 0.033). Self-reports of bullying at school, sense of belonging at school, and self-esteem were linked to the suicide risk of participants.

Conclusion: Academic performance, smoking behavior, history of self-harm in the family, peer support, family relationship, school bullying, and self-esteem are the predictors of suicide risk among students in grades 10-12 at a public school in Nakhon Ratchasima Province, Thailand. Therefore, addressing academic, familial, and social factors to mitigate suicide risk in adolescents requires multisectoral collaboration. By working together to create a supportive school environment and monitor and identify at-risk students, they can be referred to appropriate treatment and support systems.

Keywords: Suicide Risk, Secondary School Students, Adolescents, Nakhon Ratchasima

INTRODUCTION

Suicide is a significant global issue, claiming a life every 40 seconds. Among adolescents aged 15-19, it is the fourth leading

cause of death overall, following road traffic injury, tuberculosis, and interpersonal violence. Specifically, Suicide is the third leading cause of death among males and fourth among



females in this age group (1). In Thailand, a previous study indicated that the suicide rate has increased from 6.12 per 100,000 people in 2013 to 8.95 per 100,000 people in 2019. The age group of 15-24 years is identified as the highest susceptibility to suicidal attempts (2).

Additionally, a recent report from mental health and psychosocial support (MHPSS) systems and services in 2022 found that Suicide is the third leading cause of death for 15-19-year-olds in Thailand (3). A single factor does not cause Suicide. It is a multifactorial phenomenon influenced by a combination of genetic, biological, psychological, and social factors, making these adolescents experience potential risk factors (4).

Secondary school students who are in the late adolescence period experience intense academic stress and worry about their future career path along with the desired university. Adolescence is a period of significant change, both physical and psychological, and is crucial for the development of identity, self-esteem, and peer relationships (5). These challenges increase their risk of engaging in risky behavior, which can lead to emotional and behavioral problems, mental health issues, and suicidal behavior (6).

According to previous literature, suicide risk among adolescents is complex and cannot be fully understood by looking solely at the individual. It is important to consider the broader context in multifactorial factors, including individual-level factors (e.g., demographic characteristics, substance use, self-esteem), family-level factors (e.g., family environment), and societal-level factors (e.g., school environment, peer relationship) (7-9). By integrating these factors, the conceptual framework offers an understanding of suicide risk in secondary school students, as shown in Figure 1.

A recent report from the suicide prevention center in Thailand (10), the suicidal attempt rate in young people aged 15 to 19 years in Nakhon Ratchasima is more than average for the country, and there has been an also increase in suicide cases in Nakhon Ratchasima (11-13). Males were significantly more likely than females to engage in fatal suicidal behaviors (14). Given the limited studies about suicide risk in Nakhon Ratchasima. So, this study aims to investigate the factors associated with suicidal risk among secondary school students in Nakhon Ratchasima, Thailand.

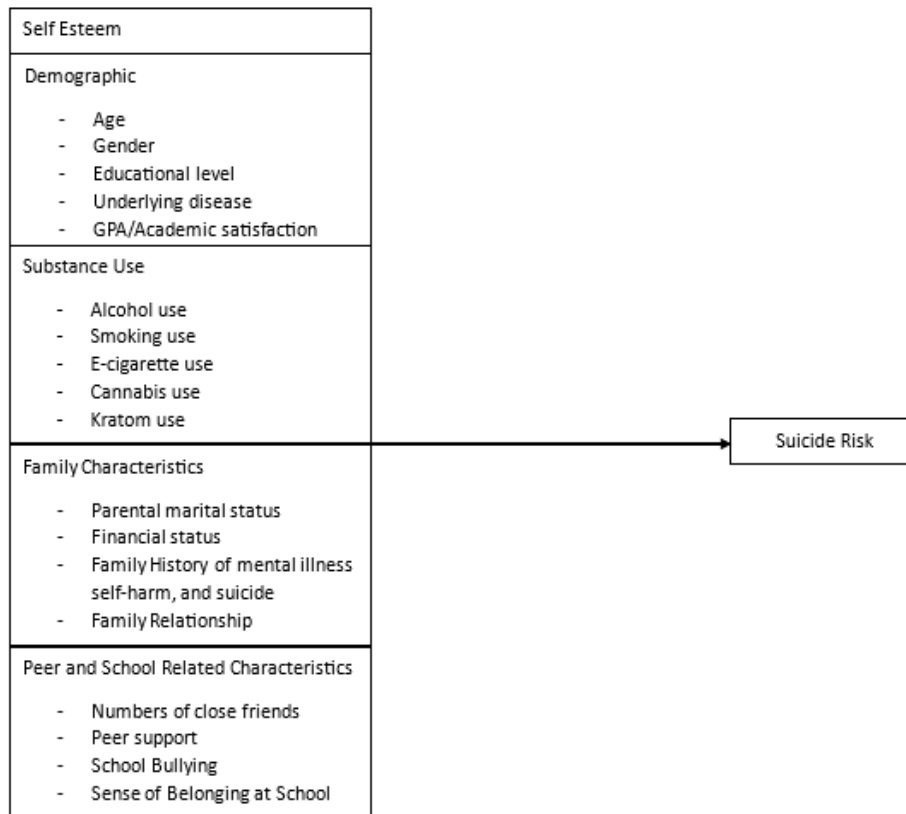


Figure 1: Conceptual Framework of the study

METHODOLOGY

Study Area and Study Participants

A cross-sectional study was conducted to assess the associated factors among secondary school students in a public school in Muang district, Nakhon Ratchasima, Thailand, from May to June 2024. The school was selected through purposive sampling. Data were collected via a self-report questionnaire at the school.

Sample Size and Sample Population

The study focused on students in grades 10-12 at a public school in Muang district, Nakhon Ratchasima. Cluster sampling was used to ensure a representative sample. The sample size of 435 students was calculated by using the Taro-Yamane formula with a 95% confidence interval and an additional 10% of missing data. The inclusion criteria were students currently enrolled in grades 10-12 and willing to participate in this study. Students who did not have parental or guardian consent, were unwilling to participate, or were undergoing treatment for psychiatric conditions were excluded from this study.

Measurement tools.

A self-report questionnaire was utilized as a tool in this study. The questionnaire includes sociodemographic characteristics, substance use, family characteristics, peer and school-related characteristics, self-esteem scale, and suicide risk assessment.

Sociodemographic characteristics comprised of gender (male/female/other), age (years), educational level (Grade 10/11/12), GPA (grade point average), academic satisfaction (yes/no), and underlying disease (yes/no).

Substance use in the past month was assessed, including alcohol (yes/no), smoking (yes/no), electronic cigarettes (yes/no), cannabis (yes/no), and kratom (yes/no).

Family characteristics were collected, including parental marital status (married/separated/divorced/widowed/both deceased), financial status (Insufficient and Debt, Insufficient and No Debt, Sufficient and Debt, Sufficient and No Debt, Do not know), family history of psychiatric illness(yes/no), self-



harm(yes/no), and Suicide (yes/no), and family relationship(good/moderate/severe).

Peer and school-related characteristics included a number of close friends and peer support(never/rarely/sometimes/often/always). Bullying and a sense of belonging at school were assessed using a standardized questionnaire from the Programme for International Student Assessment (PISA) (15, 16). The standard questionnaire was assessed using a 4-point Likert scale of 6 items, including positive and negative statements. Bullying scores were categorized as either low or high by using the third quartile for the cut-off point. At the same time, the sense of belonging scores were classified as low, moderate, or high level by dividing them into three equal intervals.

The participants' self-esteem levels were asked to fill in the validated revised Thai version of the Rosenberg self-esteem scale (17). The Rosenberg self-esteem scale was originally designed to measure the self-esteem of secondary school students. The scale has ten items, with a 5-point Likert scale ranging from strongly disagree to agree strongly. Scores were divided into two groups, high and low, by using the third quartile as the cut-off point.

Suicide risk was evaluated using the eight-question assessment tool developed by the Department of Mental Health, adapted from part of the Mini Suicidal Risk Assessment (18). The cut-off scores for risk levels were defined as follows: 0 (no risk), 1-7 (low risk), 8-16 (moderate risk), and ≥ 17 (severe risk). In this study, scores were divided into three groups: no risk, low risk, and moderate to severe risk.

Data analysis

The data were analyzed using the IBM SPSS Statistic version 29.0 to examine the suicide risk among secondary school students. Descriptive statistics included frequency and percentage for categorical data, mean and standard deviation for quantitative variables with a normal distribution, and median and interquartile range (IQR) for quantitative variables without normal distribution. The normality test was conducted using the Kolmogorov-Smirnov test using a threshold of 0.05. To obtain the association between suicide risk and potential risk factors, the Chi-square test was carried out, while Fisher's exact test was used if the assumption was not met. The p-value was set at <0.05 .

RESULTS

Table 1 Frequency and Percentage of Characteristics of Participants (N=397)

Characteristics	Number	Percent (%)
Gender		
Male	391	98.5
Other	6	1.5
Age		
< 17 (15-16 Year)	129	32.5
17 Year	143	36.0
> 17 Year (18-19 Year)	125	31.5
	(Median 17, IQR, 2, Min 15, Max 19)	
Educational level		
Grade 10	111	28.0
Grade 11	147	37.0
Grade 12	139	35.0
GPA		
< 3.00	45	11.3
3.01 – 3.50	91	23.0
3.51 – 4.00	261	65.7
	(Median 3.56, Min 2, Max 4, IQR 0.51)	



Characteristics	Number	Percent (%)
Academic Satisfaction		
Yes	310	78.1
No	78	21.9
Underlying disease		
No	351	88.4
Yes	46	11.6
Alcohol		
Yes	58	14.6
No	339	85.4
Smoking		
Yes	16	4.0
No	381	96.0
Electronic Cigarette		
Yes	31	7.8
No	366	92.2
Cannabis		
Yes	6	1.5
No	391	98.5
Kratom		
Yes	21	5.3
No	376	94.7
Parental Marital Status		
Married	278	70.0
Separate	18	4.6
Divorce	74	18.6
Widowed	27	6.8
Financial Status		
Insufficient and Debt	40	10.1
Insufficient and No Debt	7	1.7
Sufficient and Debt	193	48.6
Sufficient and No Debt	127	32.0
Do not know	30	7.6
Family History of Psychiatric Illnesses		
No	376	94.7
Yes	21	5.3
Family History of Self-Harm		
No	378	95.2
Yes	19	4.8
Family History of Suicide		
No	390	98.2
Yes	7	1.8
Family Relationship		
Severe	2	0.5
Mild	95	23.9
Good	300	75.6
Number of Close Friends		
No	19	4.8
1	19	4.8
2	42	10.6
Three and more	317	79.8
(Median 5, IQR 7, Min 0, Max 31)		



Characteristics	Number	Percent (%)
Peer Support		
Minimal	65	16.4
Often	169	42.5
Always	163	41.1
Bullying at School		
Low	268	67.5
High	129	32.5
(Median 6, IQR 2, Min 6, Max 19)		
Sense of Belonging at School		
Low	9	2.3
Moderate	114	28.7
High	274	69.0
(Median 20, IQR 3, Min 10, Max 24)		
Self-esteem		
Low	291	73.3
High	106	26.7
(Median 30, IQR 7, Min 12, Max 40)		

Table 1 presents the characteristics of the 397 participants. Most participants were male (98.5%) and aged 17. Most students were enrolled in grade 11 (37%). Approximately four-fifths (78.1%) were satisfied with their academic performance, with most grades falling between 3.51 and 4.00. The majority of participants (88.4%) reported having no underlying disease.

Regarding substance use among participants in the past month. More than 95% of students reported abstaining from both cannabis and smoking. Similarly, approximately 90% indicated that they did not use electronic cigarettes or kratom. Alcohol use was the most common, with around 15% of participants reporting consumption.

In terms of family characteristics of participants, approximately 70% of participants reported that their parents are married. Most report having sufficient income with no debt at 48.6%, followed by those with sufficient

income and debt at 32.0%. However, a small proportion, around 7.6%, did not know about the economic situation in their family. More than 95% reported no family history of psychiatric illnesses, self-harm, or Suicide. Three out of four students described their family relationship as having a good status, while only 2 participants reported severe family relationship issues.

Regarding peer and school-related characteristics, four-fifths of participants reported having three or more close friends, and around five percent reported no friends or having only one close friend. Most participants received significant support from friends, with only about 1 in 6 reporting minimal support. Approximately one-third of students experienced high levels of bullying in school. More than 70% also feel connected or integrated into their school community. Around a quarter (26.7%) had high levels of self-esteem.

Table 2 Frequency and percentage of suicidal risk assessment (N=397)

Suicide risk assessment (8Q)	Number	Percent (%)
Level of Suicide risk		
No risk	319	80.4
Low risk	45	11.3
Moderate risk	25	6.3
Severe risk	8	2.0
(Median 0, IQR 0, Min 0, Max 38)		



Table 2 provides the suicide risk levels among participants as assessed by the eight-question suicide risk assessment (8Q) tool. Based on scoring criteria, the risk levels were classified as no risk, low risk, moderate risk,

and severe risk. The data revealed that most participants reported no risk, around 80 percent. Low risk, moderate risk, and severe risk were reported by 11.3%, 6.3%, and 2.0% of participants, respectively

Table 3 Association Between General Characteristics and Suicide Risk Level (N=397)

General Characteristics	Suicide Risk						P-value
	No Risk		Low Risk		Moderate to Severe Risk		
	N	%	N	%	N	%	
Gender							0.733 ^F
Male	314	80.3	44	11.3	33	8.4	
Other	5	83.3	1	16.7	0	0	
Age							0.955
<17 year (15-16 Year)	102	79.1	15	11.6	12	9.3	
17 Year	116	81.1	17	11.9	10	7.0	
>17 Year (18-19 Year)	101	80.8	13	10.4	11	8.8	
Educational level							0.709
Grade 10	87	78.4	15	13.5	9	8.1	
Grade 11	116	78.9	16	10.9	15	10.2	
Grade 12	116	83.5	14	10.1	9	6.5	
GPA							0.044
< 3.00	35	77.8	3	6.7	7	15.6	
3.01 – 3.50	66	72.5	14	15.4	11	12.1	
3.51 – 4.00	218	83.5	28	10.7	15	5.7	
Academic Satisfaction							<0.001
Yes	255	82.3	38	12.3	17	5.5	
No	64	73.6	7	8.0	16	18.4	
Underlying disease							0.719
No	284	80.9	39	11.1	28	8.0	
Yes	35	76.1	6	13.0	6	10.9	
Alcohol							0.067
Yes	41	70.7	8	13.8	9	15.5	
No	278	82.0	37	10.9	24	7.1	
Smoking							0.022 ^F
Yes	9	56.3	5	31.2	2	12.5	
No	310	81.4	40	10.5	31	8.1	
Electronic Cigarettes							0.292 ^F
Yes	22	71.0	6	19.3	3	9.7	
No	297	81.1	39	10.7	30	8.2	
Cannabis							0.093 ^F
Yes	3	50.0	2	33.3	1	16.7	
No	316	80.8	43	11.0	32	8.2	
Kratom							0.760 ^F
Yes	16	76.2	3	14.3	2	9.5	
No	303	80.8	42	11.2	31	8.2	
Parental Marital Status							0.963 ^F
Married	226	81.3	30	10.8	22	7.9	
Separated	14	77.8	2	11.1	2	11.1	
Divorced	57	77.0	10	13.5	7	9.5	
Widowed	22	81.5	3	11.1	2	7.4	
Financial Status							0.129 ^F
Insufficient and Debt	28	70.0	5	12.5	7	17.5	
Insufficient and No Debt	5	71.4	2	28.6	0	0.0	



General Characteristics	Suicide Risk						P-value
	No Risk		Low Risk		Moderate to Severe Risk		
	N	%	N	%	N	%	
Sufficient and Debt	151	78.2	27	14.0	15	7.8	0.571 ^F
Sufficient and No Debt	110	86.6	9	7.1	8	6.3	
Do not know	25	83.3	2	6.7	3	10.0	
Family History of Psychiatric Illnesses							0.571 ^F
No	303	80.6	43	11.4	30	8.0	
Yes	16	76.2	2	9.5	3	14.3	0.005 ^F
Family History of Self-Harm							
No	309	81.8	41	10.8	28	7.4	0.572 ^F
Yes	10	52.6	4	21.1	5	26.3	
Family History of Suicide							<0.001 ^F
No	313	80.3	45	11.5	32	8.2	
Yes	6	85.7	0	0.0	1	14.3	0.119 ^F
Family Relationship							
Severe	1	50.0	0	0.0	1	50.0	
Mild	60	63.2	19	20.0	16	16.8	0.033
Good	258	86.0	26	8.7	16	5.3	
Number of Close Friends							<0.001
No	18	94.7	0	0.0	1	5.3	
1	11	57.8	4	21.1	4	21.1	
2	35	83.3	5	11.9	2	4.8	
Three and more	255	80.4	36	11.4	26	8.2	0.033
Peer Support							
Never-Rarely-Sometimes	49	75.4	5	7.7	11	16.9	
Often	143	84.6	17	10.1	9	5.3	<0.001
Always	127	77.9	23	14.1	13	8.0	
Bullying at School							<0.001 ^F
Low level	235	87.7	26	9.7	7	2.6	
High level	84	65.1	19	14.7	26	20.2	<0.001 ^F
Sense of Belonging at School							
Low level	3	33.3	2	22.2	4	44.5	
Moderate level	84	73.7	18	15.8	12	10.5	<0.001
High level	232	84.7	25	9.1	17	6.2	
Self-Esteem							<0.001
Low level	221	75.9	38	13.1	32	11.0	
High level	98	92.5	7	6.6	1	0.9	

F = Fisher's Exact Test, P<0.05 is statistically significant.

Table 3 shows the association between the characteristics of participants and suicide risk among the participants. Factors associated with a suicide risk level (p-value < 0.001) include experiencing bullying at school, a sense of belonging at school, self-esteem level, family relationships, and academic satisfaction. Additionally, GPA (p-value = 0.044), smoking behavior (p-value = 0.022), peer support (p-value = 0.033), and family history of self-harm (p-value < 0.005) were also found to be associated with suicide risk, although at a slightly less significant level.

DISCUSSION

This study, conducted in Thailand, aimed to investigate the factors associated with suicidal risk among secondary school students in Nakhon Ratchasima, Thailand.

The findings revealed that 19.6% of participants were at risk of Suicide. This prevalence aligned with a previous study conducted among Thai adolescents, which found a risk prevalence of 18.9% among male participants (19). However, it was higher than the Global School-Based Student Health Survey 2021, where 11.6% of male students in grades 7-12 reported being at risk of Suicide (20). Comparisons between studies are



complex due to regional variations, population differences, and the use of different measurement tools and methodologies.

Factors associated with suicide risk were GPA, academic satisfaction, smoking behavior, family history of self-harm, bullying at school, sense of belonging at school, and self-esteem.

Research studies have found that students who perceive their academic performance as poor are at increased risk of Suicide (21, 22). This heightened risk may stem from dissatisfaction arising from past and current academic challenges, as indicated by previous research (23, 24). When students fail to achieve their academic expectations, they may lack the coping skills to deal with disappointment, which can lead to negative psychosocial consequences and risk of Suicide (25). Moreover, parental pressure on academic success, including attending a top university and securing a stable career, which is prevalent in Thai society, may further exacerbate this risk. Poor school performance during adolescence period in Sweden increased the risk of suicide attempts in adulthood (26). Correspondingly, our research findings demonstrate a significant association between GPA, academic satisfaction, and suicide risk.

Family relationships demonstrated an association with suicide risk in this study, similar to findings in France (27), where problematic family relationships increased the risk of suicidal behavior. Good family relationships promote a sense of togetherness, encouraging shared activities, shared experiences, and open communication (28). This relationship strengthens adolescents and supports them in dealing with challenging situations.

The studies indicated that family history of psychiatric illness and suicidal behaviors are associated with an increased risk of suicidal behaviors in adolescents (7). The influence of family history on offspring can manifest through both genetic predisposition and imitation behavior, potentially shaping their coping mechanism in response to stressful events (5). Our findings solely demonstrated a significant association with self-harm. The possible reason may be that this research focused solely on healthy male adolescents, and men may be more inclined to engage in risky behaviors as a solution to stress. This study also

highlights how bullying and a sense of belonging at school affect suicide risk. Both school bullying and sense of belonging at school were associated with suicide risk among adolescents (29, 30). Peer bullying can profoundly impact a student's self-esteem, leading to feelings of humiliation and worthlessness. These negative emotions may foster social isolation and detachment from the school community, potentially leading students to withdraw from school activities and increasing their susceptibility to suicidal thoughts and actions. Social withdrawal from school can also exacerbate suicide risk by diminishing access to peer support and trusted individuals who can offer guidance and assistance (31). This aligns with the findings of our study.

Our findings on the association between self-esteem and suicide risk were consistent with a study conducted in Vietnam (32), where low self-esteem groups have higher rates of suicidal ideation compared to normal or high groups. These results support Joiner's Interpersonal Theory (33), which posits that low self-esteem contributes to perceived burdensome and, when combined with thwarted belongingness, leads to an increased risk of Suicide.

Numerous research studies have consistently shown a strong association between smoking behavior and increased risk of Suicide (34). Nicotine, the primary addictive component in tobacco, disrupts brain systems, potentially causing mood disturbance, negative mental health outcomes, and difficulty controlling impulses. These factors may increase the risk of Suicide (34).

The observed association between the identified factors and suicide risk highlights the importance of identifying at-risk adolescents and the need for comprehensive suicide prevention programs in educational settings and schools.

LIMITATIONS

There are some limitations of this study. First, the study employed purposive sampling, which resulted in a selection bias toward exclusively choosing all-male schools. Second, a cross-sectional study prevents a causal relationship between identified factors and suicide risk. Third, self-report questionnaires raise concerns about responses



being more based on social desirability bias than on true experience, and they may induce recall bias. Fourth, this study indicates only the association between variables without providing information about the strength or effect of each variable. All of the limitations must be considered when interpreting and generalizing the findings.

CONCLUSION AND RECOMMENDATIONS

This study, conducted in grade 10-12 students in a public school in Muang District, Nakhon Ratchasima, Thailand, found that academic factors, smoking behavior, peer support, school bullying, sense of belonging at school, and self-esteem were associated with suicide risk. To create a supportive school environment and promote student well-being, it is crucial to address these factors through multisectoral collaboration and develop effective school-based programs. At-risk students should be connected to appropriate intervention and support services.

The recommendation for further study is that the appropriate sampling method should be used, as this will result in a generalized and comprehensive understanding of Thai adolescents.

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ASSOCIATION BETWEEN HOUSEHOLD WATER MANAGEMENT AND DIARRHOEA AMONG UNDER FIVE CHILDREN IN THE GAMBIA: AN ANALYSIS OF NATIONAL SURVEY

Alagi AB Jarju¹, Kraiwuth Kallawicha^{1*}

¹College of Public Health Sciences, Chulalongkorn University, Sabbasatracicaya Building, Phayathai Road, Bangkok 10330, Thailand

***Corresponding Author:** Kraiwuth Kallawicha, College of Public Health Sciences, Chulalongkorn University Sabbasatracicaya Building, Phayathai Road, Bangkok 10330, Thailand, E-mail: Kraiwuth.k@chula.ac.th

ABSTRACT

Introduction: Diarrhoeal diseases are the second leading killer of children under five years old in The Gambia, causing approximately 9% of deaths in children under five years. Reducing child mortality from diarrhoeal diseases is essential for the achievement of the targets set by the Sustainable Development Goals. SDG 3 aimed at lowering preventable deaths of newborns and children under five years by 2030. In the Gambia, 73.2% of the households and 45.3% of the country's water sources are at risk of Escherichia coli faecal contamination.

Methodology: The study utilized secondary data from the 2019/20 Gambia Demographic Health Survey (GDHS), with 5016 included in the final analysis after cleaning using SPSS version 28. Descriptive (Frequency and percentage), bivariate, and multivariable analysis was conducted to establish the association between household water management and the occurrence of diarrhoeal diseases in children less than five years old. The study investigates the association between household water management and childhood diarrhoea.

Results: The prevalence of diarrhoea among children under five years was 19.6%; the majority (72.8%) of these children belong to households that do not treat their household drinking water. There is a significant association between the time spent to get to an improved water source (aOR=0.73; 95% CI (0.69-0.84) and the location of the water source (aOR=0.83; 95% CI (0.70-0.98) with the occurrence of childhood diarrhoea after controlling for other possible confounders. Poor household water treatment method applied by household members (AOR=1.619; 95% CI: 1.069-1.238).

Conclusion: The study indicates that household water treatment methods and the time spent accessing improved water sources significantly impacted the risk of childhood diarrhoea in the Gambia. Therefore, tackling these adjustable factors can improve the success of household water quality in the Gambia.

Keywords: Household water management, Diarrhoea, Under five children, The Gambia, Water Treatment

INTRODUCTION

Diarrhoea, as defined by WHO, is the passage of three or more loose or liquid stools within a period of 24 hrs; it is the consistency of the stools rather than the number that is most important in determining severity (1). Diarrhoeal disease is the second most common cause of death in children under five years, behind pneumonia, killing at least one in nine children or a total of 525000 children each year, with 88% of these deaths occurring in Africa and Southeast Asia(2).

The primary factor behind the 1.8 million annual deaths due to diarrheal disease is the lack of access to safe drinking water, combined with inadequate sanitation and hygiene and around 4 billion cases of illness each year. It disproportionately affects children, with each episode hindering calorie and nutrient absorption, thus impeding growth and development. Children under five years old, primarily in developing countries, account for 90% of diarrheal deaths (3). The evidence suggests that improving water quality at the



point of consumption can protect children from diarrhoeal diseases, as the specific water improvement strategies, such as the use of water filters and provision of high-quality piped water, were associated with greater reductions in diarrhea compared with other known interventions (4). Access to safely managed drinking water is crucial for a child's health, both at the household and community level (5, 6).

Inadequate water management remains a significant global risk factor as 30% of the world's population lacks access to a safely managed drinking water service, an on-site source available when needed, and free for contamination (1, 7, 8). However, there is evidence suggesting that improving water quality at the point of consumption can protect children from diarrhoeal diseases(4, 9); WHO stated that systematically managed piped water from an improved point source of water reduces diarrhoeal disease risk by an estimated 73%. In comparison, that same water source is likely only to provide a 28% reduction if treated at the point of use and stored in the household (3).

In the Gambia, as indicated by the two concluded surveys of 2013 and 2019/2020, the country witnessed a rise in under-five mortality rates from 54 to 56 deaths per 1000 live births (10, 11). The above statistics indicate that The Gambia is not in line towards achieving the SDG target of 25 deaths per 1000 live births by 2030, with only diarrhoea killing 9% of children under five years (12). The quality of the drinking water is a significant and crucial issue, with *Escherichia Coli* faecal contamination detected in 45.3% of the country's drinking water sources and 73.2% of households' drinking water (13).

There exists an information gap, including research to aid interventions at national and regional levels on the association between household drinking water sources with diarrhoea in under five years old children in The Gambia, despite the significant amount of data collected by surveys like the GDHS, MICS, etc. The objective of this study is to investigate the association between household water management and diarrhoeal diseases in children under five years in the Gambia. The findings will guide public health policies and help to shape programs and interventions geared towards the prevention and control of

childhood illnesses, including diarrhoeal diseases.

METHODOLOGY

Data source and study design

This study employed a cross-sectional analysis method to examine population-based data derived from the 2019/20 Gambia Demographic and Health Survey (GMDHS). GMDHS is a comprehensive survey conducted at the national level every five years. It aims to gather data on various sociodemographic and health-related indicators, including but not limited to childhood diarrhoea. GMDHS data was collected from the entire eight administrative areas of the Gambia using a sampling procedure consisting of three strata.

The primary sampling unit of the survey comprised randomly selected samples from clusters. The study conducted in 2019/20 involved the participation of 8362 women between the ages of 15-49 with at least one child under five years. In this current study, a total of 5016 children were included, indicating that almost 60% of the mothers had children less than five years old. The data on the occurrence of diarrhoea was obtained from the mothers or caregivers of the children who were 5 years or less prior to the survey and were born alive.

The conceptual framework for this research is designed to explore the linkage between water-related variables, including access and quality of clean water, and children's health outcomes, particularly focusing on the prevalence of diarrhoeal diseases. This research hypothesized that there is an association between these water-related variables and the occurrence of childhood diarrhoea in The Gambia.

Study variables

Dependent variables

In the GMDHS, diarrhoea was assessed based on the mother's responses to the question: Has the (NAMED) child had 1, 2, or 3 episodes of diarrhoea in the last two weeks? The mother's response to the above question was recorded, with an option of either No or Yes (10).

Independent variables

The 11 independent variables included were from the Gambia Demographic and



Health Survey data set, and all were identified from the literature review. The variables included Source of drinking water, location of drinking water source, time taken to get to water source, water treatment and the six methods of household water treatment (boil, add chlorine, strain through a cloth, water filters, solar disinfection, and allow it to stand and settle), and water not available at least a day last two weeks. All these variables were from the GDHS 2019/20 in the data set of the child and the mother's data set. The files were merged, and the above variables were extracted, coded and analyzed.

Operational definitions

Household: A person or group of related or unrelated persons who live together in the same dwelling unit(s) (GDHS, 2019-2020)

Source of drinking water: It was categorized as 1. Improved Source, which included piped, public tap, tube well or borehole, protected well, protected spring, rainwater, and bottled water, and 2. Unimproved sources included unprotected wells, unprotected springs, tanker trucks, surface water, sachet water, and others (10, 14). **Location of drinking water source:** The location of the drinking water source is listed as either being at the dwelling yard, Own Yard, or elsewhere (10, 13). In this research, the dwelling yard and own yard were coded into the same variable as they all mean within the compound.

Time spent to get to a drinking water source: The responses are usually recorded in time intervals (minutes) and can be used to analyze the average time spent per trip and the Frequency of trips per day. This variable was recoded as ≤ 30 minutes and >30 minutes based on the WHO standards of improved water source as a source free from contamination and accessible less than 30 minutes round trip (13, 14).

Water treatment and methods: This study utilizes the HWTS and the six methods of treatment used in the Gambia (boiling the water, adding chlorine, straining the water through a cloth, water filters, solar disinfection, and letting the water stand and settle). as outline in the Gambia Demographic and Health Survey (Bayable, Desta, & Fassil, 2020;

World_Health_Organization, 2007; GDHS 2019/20)

Water not available for at least a day in the last two weeks: This variable was included in the DHS survey to understand the Frequency and duration of water unavailability, and it provides insights into how often households are unable to meet their daily water needs for Drinking, cooking, cleaning, and personal hygiene. The variable included in this research investigates the association between the significant impact of Water shortages on health and hygiene practices, leading to increased risks of waterborne diseases and other health issues, particularly under five diarrhoeal diseases (15, 16).

Data analysis

The analysis of the secondary data was conducted using SPSS version 28 software. The data was summarized using descriptive statistics, specifically frequencies and percentages, and simple logistic regression at a cut-off point of $p < 0.2$. Variables included in the multivariable logistic regression analysis and at the multivariable logistic regression level, variables with $p < 0.05$ were regarded as statistically significant. The adjusted odds ratio (AOR) with a 95% confidence interval (95% CI) was used to present the final results.

Ethical consideration

Ethical approval for this study was obtained from the office of the Research Ethics Review Committee of Chulalongkorn University for Research Involving Human Subjects on March 14, 2024, with COA 10/2567.

RESULTS

Table 1 summarizes the percentage and frequency distribution of the variable in this study. Out of the total respondents (N=5016), 82% used improved drinking water sources. The majority of households used drinking water situated elsewhere, and more than half, 61%, spent more than 30 minutes accessing improved drinking water sources.

The prevalence of diarrhoea among children under five years old in the 2019/20 study is 19.6%, which is slightly above the rate reported for the same age group in the 2013 Gambia DHS (17%). In terms of water treatment, almost three-quarters (72.8%) do not



treat their household drinking water, and more than half strain the water through a cloth, as shown in Table 1 and Figure 2.

Table 1 Distribution of water variables in the study (N=5,016)

Variables	Number	Percent (%)
Had Diarrhoea		
No	4035	80.4
Yes	981	19.6
Source of Drinking Water		
Unimproved	904	18.0
Improved	4112	82.0
Location of Drinking Water Source		
Own Yard/Plot	1131	22.5
Elsewhere	3885	77.5
Time spent to Get to the Water Source		
≤ 30 Min	1957	39.0
> 30 Min	3059	61.0
Water has not been available for at least a day in the last two weeks*		
No (water available)	4450	73.3
Yes (water not available)	1623	26.7
Treatment of Water for safe Drinking		
No	3652	72.8
Yes	1364	27.2
Boiling	135	8.6
Adding bleach/chlorine	320	20.4
Straining through a cloth	938	59.8
Water filters	59	3.8
Solar disinfection	10	0.6
Letting water stand and settle	106	6.8

*Variable with missing values

Note: The method applied sums up to 1568, as others used more than one method

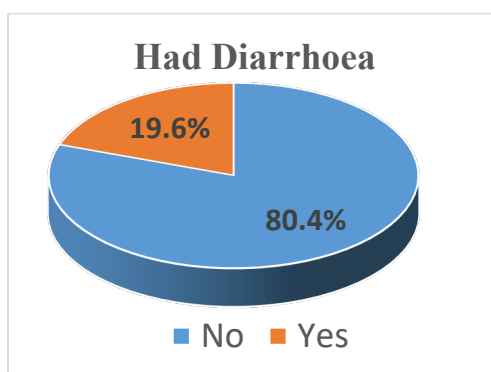


Figure 1: Showing the percentage of children under five with diarrhoea in the GDHS 2019/20.

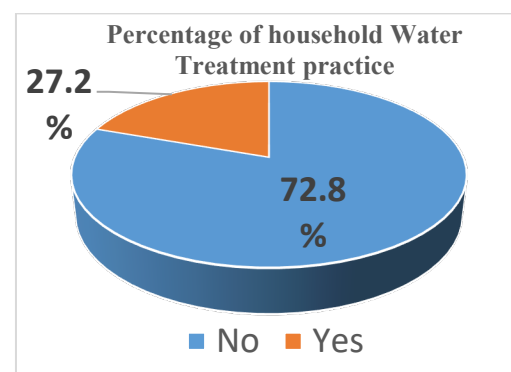


Figure 2: shows the percentage of household water treatment done in Gambia.



Associated factors of childhood diarrhoea and household water management. The simple logistic regression analysis was followed by a multivariable analysis, as shown in table 2 below. The results with statistical significance at multiple logistic levels were first described and followed by the non-associated results as follows:

Children whose household's drinking water source is located elsewhere or outside their yard have a 17% less likelihood of acquiring diarrhoea compared to those whose household water source is located in their yard/plot (AOR=0.83; 95% CI: 0.703-0.981). For the time spent getting to a drinking water source, the odds of having diarrhoea were 26.8% less likely for children whose households spent more than 30 minutes to get

to a drinking water source compared to those who spent 30 minutes or less (AOR=0.732; 95% CI: 0.693-0.842). The odds of acquiring diarrhoea were 1.6 times higher in children whose households use the water treatment method of straining the water through a cloth than in children whose households don't use the method (AOR=1.619; 95% CI: 1.069-1.238).

The following results were not significant in this study: Source of drinking water (AOR=0.977; 95%CI: 0.810-1.179); water not available for at least a day (AOR=0.893; 95% CI: 0.757-1.054); and all the water treatment methods except straining the water through a cloth were found not to be associated with the occurrence of childhood diarrhoea in this study.

Table 2 Bivariate and Multivariable Logistic Regression analysis on factors associated with diarrhoea in children less than five years (N=5,016).

Variables	COR	95% CI		P-value	AOR	95% CI		P-value	
Source of Drinking Water									
Unimproved	Ref.				Ref.				
Improved	1.042	0.868	1.042	0.198	0.977	0.810	1.179	0.810	
Location of drinking water									
Own Yard/Plot	Ref.				Ref.				
Elsewhere	0.887	0.752	1.045	0.152	0.830	0.703	0.981	0.016	
Time spent to get to the water									
≤ 30 Min	Ref.				Ref.				
> 30 Min	0.795	0.647	0.857	<0.001	0.732	0.693	0.842	<0.001	
Water not available for at least a day last two weeks*									
No (available)	Ref.				Ref.				
Yes (not available)	1.904	0.767	1.064	0.201	0.893	0.757	1.054	0.181	
Household Water Treatment									
No	Ref.				Ref.				
Yes	0.897	0.765	1.052	0.18	0.955	0.744	1.226	0.719	
Boiling									
No	Ref.								
Yes	0.887	0.567	1.386	0.597					
Adding bleach/chlorine									
No	Ref.								
Yes	1.012	0.73	1.317	0.897					
Straining through a cloth									
No	Ref.				Ref.				
Yes	0.898	0.745	1.083	0.101	1.619	1.069	1.238	0.046	
Water filter									
No	Ref.								
Yes	1.051	0.555	1.988	0.879					
Solar disinfection									
No	Ref.								



Variables	COR	95% CI		P-value	AOR	95% CI		P-value
Letting it stand and settle								
Yes	0.456	0.058	3.607	0.457				
No	Ref.							
Yes	0.609	0.339	1.096	0.980				

*Variable with missing values

Variables with $p \leq 0.2$ at COR were included in the multivariable logistic regression.

Variable with $p \leq 0.05$ and at 95% CI were regarded as statistically significant.

DISCUSSION

Comparatively, the prevalent rate of diarrhoea in children under five in this study was higher (19.6%) compared to similar studies conducted in other sub-Saharan African countries (17) despite using the same DHS data source. These differences may be due to seasonal trends in diarrhoea disease or differences in the study design, data collection methods applied, study setting, and sample population used.

Household water management and water facilities are an integral part of societal growth and health. They are part of the developmental agenda in Gambia and many other sub-Saharan African countries. In this research, the number of variables showing statistically significant at $p < 0.05$ and 95% CI were few. This shows that childhood diarrhoea is multifactorial, and other variables not included in this research might have a significant influence on the dependent variable (diarrhoea).

The majority of the variables in this study were not statistically significant. This could be correlated with the numerous WASH interventions in place by the Ministry of Health, other sectors, NGOs, and partners such as UNICEF. These interventions had a profound positive effect on the prevention of childhood illness, especially diarrhoea, the second leading killer disease in the Gambia.

Variables such as the location of the drinking water source, time spent accessing drinking water, and the water treatment method of straining water through a cloth have all been found to be statistically significant and were associated with the occurrence of childhood diarrhoea in the Gambia, as detailed below.

The study found no significant association between diarrhoeal diseases and the Source of drinking water; this study is in line

with a study conducted in The Gambia on associated factors of under-five diarrhoea (21). This current finding is different from some research conducted in sub-Saharan African countries with regard to the Source of drinking water's association with diarrhoea (22) and not in line with a study conducted in Egypt (23). This finding shows the effectiveness of most of the interventions done towards the usage of improved water sources in the Gambia, as 82% of the households used improved Sources of water for Drinking.

Furthermore, with regards to the time taken and the location of drinking water sources, the state/community-managed drinking water sources provide safer or better-protected water sources than those managed at the household level, as outlined in this current research. Water sources away from households or from elsewhere have less likelihood of being associated with diarrhoeal diseases. This is in line with the country's quality of drinking water sources as outlined in the MICS report of The Gambia (13) regarding the Escherichia Coli contamination of drinking water at both household and source levels of the country. This finding is in agreement with a randomized control trial conducted by Cha et al. (24) in Ghana and Gascon et al. in Tanzania (25). The results of their findings indicate that the available drinking water source close to one's yard or dwelling is not a protective drinking water source. This means that the farther the water source from the household, the more protective the water is to the users. This current research finding is also in line with pooled estimates from 12 studies reporting rate ratios of under-five diarrhea (4, 9, 26).

Furthermore, the current finding is not in line with WHO regulation of the quality of improved water sources. WHO states that a drinking water source less than 30 minutes



round trip and free from contamination is an improved source (WHO, 2017b), and this current study is not in line with a study conducted by Hussein using the DHS data of Nigeria (1, 7, 27).

The main water treatment method applied (59.8%) by households in the Gambia is a serious public health concern, and the majority (72.8%) of the households do not treat their household water source. This explains the fact that there is poor household water management practice in place, and the water treatment methods used by household members are not in conformity with the contamination level of the treated waters.

This finding indicates that there is a need for a robust health promotion campaign and stakeholder engagement on household water treatment techniques and the purification of water prior to consumption. This is greatly important, as even if water comes from a protected source, it could be at high risk of contamination due to unhygienic drawing from wells or storage at home, which explains the presence of diarrhoea among children in households that used protected sources for drinking water (3, 13).

STRENGTH AND LIMITATION

Strengths of the Study

The study data allows the findings to be generalized and generate essential statistical information that decision-makers depend on for policy formulation, planning and implementation, and monitoring. The quality of data is assured as the DHS guide on merging data sets and coding variables was followed in this research. The DHS uses a complex sampling strategy to reduce bias, and the availability of a repeat survey every five years allows for continuous quality data check-ups.

Limitations of the study

The secondary data may need to align more perfectly with the research question or objectives that have been set. The data set limited us only to the variables that were originally collected, and any modification will distort the real content of the data. Moreover, integrating multiple secondary datasets can be complex due to differences in data formats, definitions, and collection methodologies that have been used. Furthermore, the data set used is limited in period and to certain geographic areas, which may be different from broader

trends in real-time. There was no clinical assessment of the child's diarrhoeal status, recall bias, or reporting of conditions based on different sociocultural settings.

Finally, the study design could not address the seasonal variation in the occurrence of childhood diarrhoea, and causality could not be established due to the cross-sectional nature of the research.

CONCLUSION

This study showed a high prevalence of diarrhoea among children under five years of age in The Gambia, and diarrhoeal diseases account for 9% of all childhood deaths in the Gambia. The study's cross-sectional design limits its ability to establish causality between the identified risk factors and the occurrence of diarrhoeal diseases. The data provides a snapshot at a single point in time, which restricts the ability to observe temporal changes and causal relationships. Despite these limitations, the study has investigated and established associated factors with diarrhoeal diseases in children under five years old. The variables that were found to be statistically significant in this study were the location of the drinking water source, the time taken to get to a water source, and the poor water treatment method of straining the water using cloth as the main water treatment method in the country.

The findings of these results conclude that the associated factors of diarrhoeal disease in children are multifactorial, complex, and intertwining. Addressing diarrhoeal diseases requires coordinated efforts at multiple levels, including policy reform, water infrastructure investment, and international support. The Governments of the Gambia and international organizations must prioritize WASH improvements as part of broader public health, highlighting a critical policy direction in the area of health promotion intervention on household water management.

Finally, this research recommends that further research should consider choosing different designs, such as a longitudinal study design, so as to address the seasonal variation of diarrhoea in children under five years old. The Gambia government and its partners should conduct a robust nationwide campaign on household water treatment, as 72.8% of the households in the country do not treat their household drinking water. This might be due to



factors such as educational level, access to water treatment materials, lack of available standards for household water usage, and higher contamination of other foreign materials.

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PREVALENCE AND RISK FACTORS OF NOISE-INDUCED HEARING LOSS AMONG HOSPITAL WORKERS IN SELECTED AFFILIATE HOSPITALS OF MAHIDOL UNIVERSITY

Tanachot Thanomwong^{1*}, Wichai Aekplakorn¹, Chathaya Wonrathanandha¹, Narongpon Dumavibhat²

¹Department of Community Medicine, Faculty of Medicine Ramathibodi Hospital, Mahidol University, 270 Rama VI Road, Ratchatewi, Bangkok 10400, Thailand

²Department of Preventive and Social Medicine, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok 10700, Thailand

*Corresponding Author: Tanachot Thanomwong, Faculty of Medicine Ramathibodi Hospital, 270 Rama VI Road, Ratchatewi, Bangkok 10400, Thailand, E-mail: nine.chote@gmail.com

ABSTRACT

Introduction: Occupational noise-induced hearing loss (ONHL) is a significant global disease. Previous studies have shown a high prevalence of ONHL among hospital workers exposed to high noise levels. The laundry department's washing machine and the nutrition department's cleaning container process were various sources of loud noise in the Hospital. This study aims to determine the prevalence and associated factors of ONHL among hospital workers exposed to high noise levels in Ramathibodi and Siriraj Hospital, Mahidol University.

Methodology: This is a cross-sectional study. A total of 239 participants from both hospitals who attended annual audiometry between 2016 and 2023 due to occupational noise exposure were selected from all available data together with annual noise levels monitoring in workplaces as an 8-hour Time Weighted Average. ONHL was defined according to the American College of Occupational and Environmental Medicine (ACOEM) ONHL guidance 2018 and Cole's criteria. The associated factors of ONHL data were collected through a face-to-face interview. A bivariate analysis using Chi-square and Fisher's Exact test was used to examine the association between risk factors of ONHL and ONHL diagnosis. A P-value of less than 0.05 was indicated as statistically significant.

Results: The overall prevalence of ONHL among workers exposed to high noise levels was 38.5% (with 29.25% and 49.5% in Ramathibodi and Siriraj Hospital, respectively); the workers in the washing unit of the laundry department of Siriraj Hospital and the engineering service departments of Ramathibodi Hospital had the highest prevalence, with more than two-thirds of workers affected. Factors of ONHL such as sex, age, occupational noise exposure level, job years, smoking, and hypertension were significantly associated with ONHL. Despite the high prevalence of ONHL (38.5%), most workers (44.3%) did not use personal protective equipment (PPE) such as earmuffs or earplugs. However, some workers had noise exposure levels over 85 dBA (5.0%), which contradicts the high prevalence of ONHL.

Conclusion: This study suggests that organizations should develop more effective engineering control and hearing conservation programs. The program should emphasize regular PPE use by providing properly fitting PPE and demonstrating the correct way to use it.

Keywords: Occupational-noise-induced hearing loss, hospital workers, risk factors of noise-induced hearing loss

INTRODUCTION

Hearing loss is a global problem, with a global prevalence of 20%, according to the WHO report (1). Noise-induced hearing loss (NIHL) is one of the most common occupational diseases globally, with a

prevalence of 16%. NIHL causes financial and disease burdens at individual and country levels (2, 3). NIHL is an incurable disease but can be preventable. The cause is permanent damage to hair cells in the inner ears from loud noise exposure, which the primary sources come



from occupation. Occupational noise-induced hearing loss (ONIHL) usually develops after 10-15 years of noise exposure. The risk of hearing loss starts at 80 dBA with long-term noise exposure and significantly increases at 85 dBA. ONIHL can be diagnosed from a pure tone audiogram (4).

To prevent ONIHL, noise exposure must be reduced by applying the hierarchy of controls. This approach starts with engineering controls, administrative controls, and personal protective equipment (PPE) usage. In the workplace, earplugs and earmuffs are commonly used as PPE.

According to the Department of Labor Protection and Welfare 2018 announcement, employers must conduct hearing conservation programs when occupational noise exposure level equals 85 dBA 8 hours time-weighted average (TWA) or more. The hearing conservation program consists of noise level monitoring in workplaces and hearing monitoring of employees at least once a year when noise exposure level equals 85 dBA and above 8 hours TWA (5). In 2017, the Thai Bureau of Occupational and Environmental Diseases showed 42,946 ONIHL cases (71.29:100,000 workers) or 0.07% (6). The prevalence is relatively low due to under-reporting because of the higher prevalence of ONIHL in previous studies, especially among hospital workers. The Bangkok Metropolitan Administration General Hospital had a prevalence of ONIHL among high-risk workers at 37.9% in 2019 (7). Chonburi Hospital had a prevalence of ONIHL among high-risk workers of 47.6% in 2021 (8).

Ramathibodi Hospital and Siriraj Hospital, Mahidol University, are tertiary care hospitals that serve many patients yearly. Hospital workers are exposed to various sources of noise, e.g., the laundry department's washing machine, the nutrition department's cleaning container process, and the central sterile services department's washing machine. No previous study of ONIHL among high-risk workers in both hospitals has been conducted. This study aims to find the prevalence and risk factors of ONIHL among high-risk workers in both hospitals.

METHODOLOGY

Study Design

This is a cross-sectional study of workers exposed to occupational noise at Ramathibodi and Siriraj Hospital, Mahidol University, Thailand.

Study population

The study population was only the data available from the occupational health units of both hospitals. The data included 308 workers who were exposed to loud noise in the workplaces: 168 and 140 workers from Ramathibodi and Siriraj Hospital, respectively. Due to occupational noise exposure and noise levels in the workplace, the workers must have annual audiograms.

Inclusion criteria

Ramathibodi and Siriraj Hospital workers who attended pure tone audiometry due to occupational noise exposure between 1 January 2016 and 30 September 2023, and these workplaces would have annual noise level monitoring between 1 January 2016 and 30 September 2023. The lists of the departments of both hospitals that had the workers following the criterion above are shown in Table 1. Exclusion Criteria

- Workers who retired or quit their jobs in both hospitals.
- Workers with pre-employment permanent hearing loss or permanent ear disorder in both ears.
- Workers with permanent hearing loss in both ears from other causes: ototoxic drug/chemical, HEENT trauma/diseases, congenital disease, history of acoustic trauma, inherited diseases, and others.
- Workers who do not give informed consent or resign from this study.

Of the 308 workers (all available data), there were 239 total participants (77.6%; acceptable response rate (9)), and no participants were excluded from this study.

Power of study

After collecting data, the researchers used OpenEpi (10) to calculate the power of the cross-sectional study by inputting the prevalence of ONIHL and the number between the exposed group (noise level \geq 80 dBA) and the non-exposed group (noise level $<$ 80 dBA).



Lastly, the power was 0.7 or 70%, acceptable in the statistical study (11).

Data collection tool

Data was collected through a face-to-face interview questionnaire. The interviewers recorded data themselves through a Google form. The study questionnaire consisted of demographic data and health status corresponding to the latest audiogram of workers.

Validity of questionnaire

The questionnaire's contents were developed from the literature review. The three expert occupational physicians verified its validity using the content validity index (CVI). All questionnaire items must pass the CVI and be properly adjusted according to the experts' comments.

Reliability of questionnaire

The questionnaires were pretested on 30 non-participant workers with occupational noise exposure at Ramathibodi Hospital. The pilot test results were used to adjust the final questionnaire.

Operational definition

- Occupational noise exposure was the median value of all annual noise monitoring levels as 8 hours TWA in workplaces.
- Smoking was a cigarette habit, not including e-cigarettes.
- Diabetes Mellitus (DM) was self-reported physician diagnosis of DM or history of hypoglycemic drug use.
- Hypertension (HT) was self-reported physician diagnosis of HT or history of antihypertensive drug use.
- Firearm was history of firearm noise exposure at least once a month for one year.
- Loud noise exposure outside work was a history of non-occupational noise exposure, not including firearm and earbuds/earphone usage at least once a month for one year.
- History of previous loud job was history of occupational noise exposure at least one year in the old workplace.

- Solvent was a history of solvent (fuel or solvent or paint that might have had ototoxicants such as toluene or thinner) exposure in the current department during the past year.

Data collection process

Data collection was started after the approval of the human ethics committee of the Faculty of Medicine Ramathibodi Hospital and the Faculty of Medicine Siriraj Hospital, Mahidol University, with COA No. MURA2023/783.

1. The researchers contacted the occupational health units of both hospitals to obtain the following data:
 - annual noise level monitoring as 8 hours TWA in a dBA unit from various departments
 - individual annual audiogram of workers from occupational noise exposure (Pure tone audiograms were tested at frequencies of 500, 1000, 2000, 3000, 4000, 6000, and 8000 Hz in both ears.).
2. After matching annual noise level monitoring in the workplaces and annual audiograms of workers, the selected workers were interviewed face-to-face.

Diagnosis of ONIHL from audiogram

The audiograms of participants were diagnosed ONIHL in any ear according to ACOEM guidance statement 2018 and Coel's criteria:

1. notch at frequencies 3000, 4000, or 6000 Hz with a hearing threshold of more than frequencies 1000 or 2000 Hz at least 10 dB
 2. notch at frequencies 3000, 4000, or 6000 Hz with a hearing threshold of more than frequencies 6000 or 8000 Hz at least 10 dB
- Three board-certified occupational physicians validated the diagnosis.

Data analysis

The analysis was performed by STATA software. The Chi-square test and Fisher's exact test were performed with a significant level of $p \leq 0.05$ to determine the associations between exposure variables and the outcome variables.

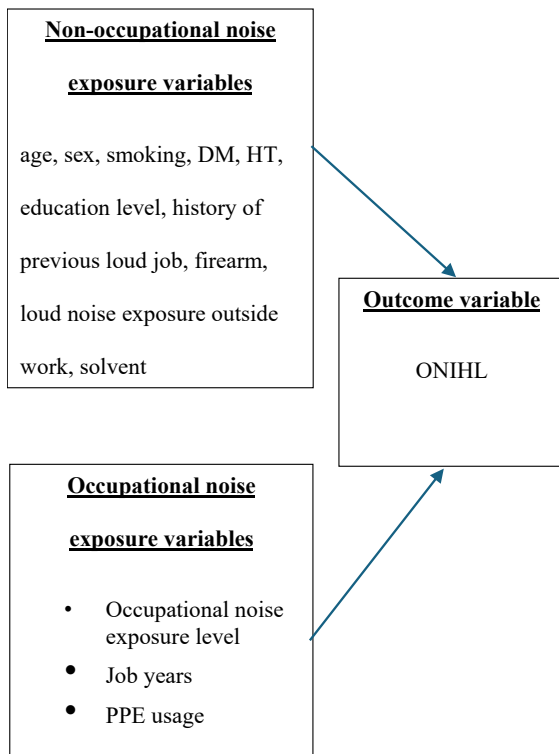


Figure 1 Conceptual framework

RESULTS

Of the 308 workers (all available data), there were 239 total participants (77.6%; acceptable response rate (9)), and no participants were excluded from this study.

Baseline characteristics of participants

The participants were 54.4% and 45.6% from Ramathibodi and Siriraj Hospital, respectively. Table 1 shows the details of participants for each department.

Table 1 participants separated by department (N=239)

Department	Number (%)
Ramathibodi Hospital	130
Engineering service*	12 (9.2)
Nutrition Department	20 (15.4)
Central Sterile Supply	23 (17.7)
OR OB-GYN	23 (17.7)
Rehabilitation Medicine*	2 (1.5)
Laundry	50 (38.5)
Siriraj Hospital	109
Nutrition	8 (7.3)
Publishing Unit	8 (7.3)
Medical Gas System Division	6 (5.5)

Department	Number (%)
Laundry*	2 (1.8)
Central Sterile Supply	63 (57.9)
School of Prosthetics and Orthotics	22 (20.2)

* Engineering service referred to the workers in the grinding room, vacuum generator room, chiller room, and boiler room.

*Rehabilitation medicine referred to the Prosthetics and Orthotics unit.

*Laundry referred to Washing unit.

Most workers (71.1%) had occupational noise exposure levels less than 80 dBA. Almost half of workers (44.4%) didn't use PPE. Table 2 shows the details of the samples' characteristics.

Table 2 Characteristics of samples (N=239)

Characteristics	Number (%)
1. Sex	
Female	130 (54.4)
Male	109 (45.6)
2. Age	
< 35 years	70 (29.3)
35 – 44 years	75 (31.4)
≥ 45 years	94 (39.3)
(median = 41, IQR 17, min= 22, max =59)	
3. Occupational noise exposure level	
< 80 dBA	170 (71.1)
≥ 80 dBA	69 (28.9)
(median = 78, IQR 8, min=55.6, max= 87.2)	
4. Job years	
< 10 years	102 (42.7)
10-19 years	60 (25.1)
≥ 20 years	77 (32.2)
(median = 11, IQR 16, min = 0 , max = 40)	
5. PPE usage	
None	106 (44.3)
Sometimes (<50% of noise exposure)	44 (18.4)
Frequently (≥50% of noise exposure)	36 (15.1)
Every time	53 (22.2)



Characteristics	Number (%)	Characteristics	Number (%)
6. Smoking		13. History of previous noisy job	
None	177 (74.1)	No	188 (78.7)
< 20 pack-year	55 (23.0)	Yes	51 (21.3)
≥ 20 pack-year	7 (2.9)		
7. DM			
No	224 (93.7)		
Yes	15 (6.3)		
8. HT			
No	195 (81.6)		
Yes	44 (18.4)		
9. Education level			
Under high school	53 (22.2)		
High school/Vocational/High vocational	119 (49.8)		
Bachelor's degrees or more	67 (28.0)		
10. Solvent			
No	203 (84.9)		
Yes	36 (15.1)		
11. Firearm			
No	230 (96.2)		
Yes	9 (3.8)		
12. Loud noise exposure outside work			
No	225 (94.1)		
Yes	14 (5.9)		

The prevalence of ONIHL in both hospitals was 38.5%. The prevalence of ONIHL was 29.2% and 49.5% in Ramathibodi and Siriraj Hospital, respectively. The highest prevalence of ONIHL in Ramathibodi Hospital was in engineering service (66.7%), nutrition (40%), laundry (30%), and central supply department (17.4%). The highest prevalence of ONIHL in Siriraj Hospital was in the laundry (100%), nutrition (62.5%), publishing (62.5%), central supply (50.8%), and prosthetics and orthotics department (40.9%).

Table 3 illustrates factors associated with ONIHL. Significant differences (p -value < 0.05) between the hearing loss and non-hearing loss groups were found regarding sex, age, occupational noise exposure level, job years, smoking, and hypertension.

Table 3 Factors and the prevalence of noise-induced hearing loss (N=239)

Factors	Hearing loss N (%)	Non-hearing loss N (%)	P-value
Sex			0.007
Female	40 (30.77)	90 (69.23)	
Male	52 (47.71)	57 (52.29)	
Age			<0.001
< 35 years	11 (15.71)	59 (84.29)	
35 – 44 years	28 (37.33)	47 (62.67)	
≥ 45 years	53 (56.38)	41 (43.62)	
Occupational noise exposure level			0.013
< 80 dBA	57 (33.53)	113 (66.47)	
≥ 80 dBA	35 (50.72)	34 (49.28)	
Job years			<0.001
< 10 years	23 (22.55)	79 (77.45)	
19-10 years	27 (45.00)	33 (55.00)	
≥ 20years	42 (54.55)	35 (45.45)	
PPE usage			0.152
None	49 (46.23)	57 (53.77)	
Sometimes (<(%50	13 (29.55)	31 (70.45)	
Frequently (≥(%50	11 (30.56)	25 (69.44)	
Every time	19 (35.85)	34 (64.15)	



Factors	Hearing loss N (%)	Non-hearing loss N (%)	P-value
Smoking			0.010**
None	59 (33.33)	118 (66.67)	
< 20 pack-year	28 (50.91)	27 (49.09)	
≥ 20 pack-year	5 (71.43)	2 (28.57)	
Diabetes Mellitus			0.077*
No	83 (37.05)	141 (62.95)	
Yes	9 (60.00)	6 (40.00)	
Hypertension			<0.001
No	64 (32.82)	131 (67.18)	
Yes	28 (63.64)	16 (36.36)	
Education level			0.190
Under high school certificate	24 (45.28)	29 (54.72)	
High school/Vocational/High vocational certificate	48 (40.34)	71 (59.66)	
Bachelor's degrees and above	20 (29.85)	47 (70.15)	
Solvent			0.056
No	73 (35.96)	130 (64.04)	
Yes	19 (52.78)	17 (47.22)	
Firearm			0.312**
No	87 (37.83)	143 (62.17)	
Yes	5 (55.56)	4 (44.44)	
Loud noise exposure outside work			0.729
No	86 (38.22)	139 (61.78)	
Yes	6 (42.86)	8 (57.14)	
History of previous loud job			0.657
No	71 (37.77)	117 (62.23)	
Yes	21 (41.18)	30 (58.82)	

Statistically significant is at P-value < 0.05 from pearson chi-square.

**Fisher's exact

DISCUSSION

The prevalence of ONIHL in high-risk workers exposed to loud noise in this study was 38.5%, but it was not conducted in every high-risk department of both hospitals because some departments needed noise level monitoring data. The prevalence corresponded with previous studies in hospital workers of Bangkok Metropolitan Administration General Hospital (37.9%) and Pakchong na na Hospital (38.9%) (7, 12). However, the prevalence was lower than that of Chonburi Hospital (47.6%) because the average noise exposure level of 85 dBA or more was higher than in this study(8). On the other hand, a previous study of Bhumibol Adulyadaj Hospital had a lower prevalence (21.2%) than this study because they used an otoscope before attending audiometry to exclude other ear causes (13). Prevalence in this study was higher than all industry workers in the US (16%) (14) because the Occupational Safety, Health, and

Environment Act B.E. 2554 (15) was legislated for the past 10 years in Thailand, and public Hospitals were not compulsory by this act. Hence, the hearing conservation programs in public hospitals could have been more effective.

According to a previous study of Bangkok Metropolitan Administration General Hospital (7), the engineering services department had the highest prevalence in Ramathibodi Hospital. The laundry unit had the highest prevalence in Siriraj Hospital and in a previous study of Chonburi Hospital (8).

Age was significantly associated with ONIHL, especially the workers aged 45 years or more who had a high prevalence (56.4%) of hearing loss, so it might indicate that the occupational physician needs to differentiate between ONIHL and age-related hearing loss, which audiogram configuration has a down-sloping pattern, at 8000 Hz (4). A noise exposure level of 80 dBA or more was



significantly associated with ONIHL, but only 5% had a noise exposure level of 85 dBA or more. However, it was in contrast to the high prevalence of hearing loss; it could be described from underestimating noise exposure level in some workers because some workers had rotation work, changing job sites in the same department corresponding with the study of Maitree et al. (8). PPE usage was not associated with hearing loss, it might be from improper PPE usage. Interestingly, most workers (44.3%) never use earmuffs or earplugs to prevent occupational noise exposure, corresponding to the high prevalence of hearing loss (38.5%).

Both hospitals have already implemented hearing conservation programs, so it might indicate that the hearing conservation programs of both hospitals should be improved. Smoking was significantly associated with ONIHL, especially 20 pack-year or more group had a high prevalence of ONIHL (71.4%), corresponding to study of Agrawal et al. (16). Hypertension was significantly associated with ONIHL and had high prevalence (63.6%) contrast to study of Agrawal et al. and Zaw et al. (16, 17). Hypertension might not be directly associated with hearing loss, but noise exposure was associated with hypertension (18). Solvent exposure was not significantly associated with ONIHL, even though hearing loss was high (52.8%). This might be due to the overestimation of solvent exposure because this study did not use chemical data from the workplace. History of firearm wasn't associated with ONIHL even though quite a high prevalence of hearing loss (55.6%) because the small numbers of this group correspond to the study by Agrawal et al. (16). It could be described as firearm cause severe high-frequency hearing loss due to impulse noise (3). Those factors associated with hearing loss could affect ONIHL prevention in the workplace.

LIMITATIONS

1. This study was cross-sectional, so determining the causal relationship between risk factors and NIHL required extensive work.

2. This study was retrospective so that it could cause recall bias.

3. Many workers had no baseline audiograms, so it was not easy to ascertain the cause of NIHL.

CONCLUSION

The high prevalence of ONIHL in this study can help to encourage hospitals to implement effective noise hazard measurements according to the hierarchy of controls, including engineering control, e.g., machine maintenance, and a hearing conservation program, which consists of providing health education on hearing loss, proper PPE usage by providing proper fitting PPE, and demonstration of corrective methods to use it. The organization might promote the health promotion of hypertension and smoking to prevent risk factors of hearing loss.

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THREE COMMON HAND DISEASE: A CASE SERIES STUDY ABOUT PATIENT'S CHARACTERISTIC AT A TEACHING HOSPITAL

Amporn Mitprasit MD.^{1*}, Wichai Aekplakorn MD. PhD.¹,
Chathaya Wongrathanandha MD.¹, MSc., Thepparat Kanchanathepsak, M.D.¹

¹Faculty of Medicine, Ramathibodi Hospital, Mahidol University, 270 Rama VI Road, Ratchatewi, Bangkok 10400, Thailand

**Corresponding Author: Amporn Mitprasit, Faculty of Medicine, Ramathibodi Hospital, Mahidol University, 270 Rama VI Road, Ratchatewi, Bangkok 10400, Thailand, Email: amporn.mit@student.mahidol.ac.th*

ABSTRACT

Introduction: Biomechanical hazards are increasingly attributed to diseases globally; working age groups (25 - 54) account for 79% of musculoskeletal diseases. In Thailand, Statistics from the Social Security Office have shown that nearly 5,000 workers suffered from work-related musculoskeletal diseases (WRMSDs) from 2019 to 2023. Musculoskeletal hand diseases are common in clinical settings; however, information on work-related conditions has been limited.

Objectives: To examine the prevalence and characteristics of three major work-related hand diseases among patients aged 18-65 years old at Ramathibodi Hospital.

Methodology: This is a cross-sectional, case series study, recruiting patients with selected ICD-10 diagnosis code [G56.0 (Carpal tunnel syndrome), M65.3 (Trigger finger), and M65.4 (De Quervain's tenosynovitis)] aged 18-65 years old who visited the hand clinic in Orthopedics OPD, Ramathibodi hospital between October 25 2023 and March 15 2024. Patients' data had been reviewed before their visit to confirm the diagnosis. Patients selected by convenient sampling were asked to answer specifically designed questionnaires about sociodemographic history and working history by telephone and face-to-face interviews using a standard questionnaire. A statistical test is a chi-square to compare continuous variables. Data was analyzed by STATA version 17.

Results: A total of 270 patients were included: Carpal tunnel syndrome = 127 cases, Trigger finger = 96 cases, and de Quervain's tenosynovitis = 47 cases. 52% of patients were in the age group of 41 - 59 years old. Patients had various occupations; the commonest group was professionals, such as healthcare personnel and teachers, followed by the clerk group and sales/services staff. 84% of all patients had repeated movement more than six times per minute. Ninety-five patients still felt pain and numbness, and 22% claimed they still could not use their hands properly.

Conclusions: 80% of all cases of people who used their hands with different tools repetitively developed three common hand diseases. This study showed patients' prevalence and suggestive characteristics; data can help us understand patients and give better work-related advice and proper ergonomic tools/interventions to prevent further diseases or complications.

Keywords: Work-related hand disease, Carpal tunnel syndrome, Trigger finger, De Quervain's tenosynovitis.

INTRODUCTION

The International Labor Organization (ILO) found that 400 million workers were suffering from unsafe and unhealthy working conditions in 2020. (1) The U.S. Centers for Disease Control (CDC) stated that musculoskeletal disorders (MSDs) are associated with high costs to employers, such as absenteeism, lost productivity, increased health

care, disability, and worker's compensation costs. MSDs caused a median of 8 sick leave days away from work, compared with six days for all nonfatal injury and illness cases(2) Occupational safety and health laws should encourage and strengthen the notification and recording of occupational injuries and diseases due to its importance that patients would get proper treatment and fairer compensation. (3, 4)



INTRODUCTION

The full scope of occupational injuries and diseases is often underestimated due to under-reporting. (5, 6) Traditional methods, such as analyzing workers' compensation data, medical case series, or industry surveys, need to capture the complete picture. For instance, Thailand's Workmen Compensation Fund shows that hand and finger injuries are prevalent. However, many cases go unreported, as reflected in the Social Security Office's (SSO) annual report, which shows only a few thousand cases. (4)

Upper extremities musculoskeletal disorders are particularly common among the working population, often resulting from repetitive strain movements. The three most common work-related hand diseases are carpal tunnel syndrome (CTS), de Quervain's tenosynovitis, and the trigger finger. (7) CTS is caused by compression of the median nerve, leading to numbness and pain in the Hand. (8, 9) De Quervain's tenosynovitis results from tendon entrapment in the wrist, causing pain with gripping and twisting motions. (10, 11) Trigger finger involves inflammation of the tendons, leading to stiffness and a locking sensation. (12)

Previous study indicates that under-reporting of work-related MSDs is common and varies by factors such as gender, age, and education level. (6, 13) Workers in physically demanding jobs that involve repetitive or forceful hand movements are at higher risk. (14, 15) Studies showed work-related risk factors are working in physically demanding jobs requiring the use of their hands/arms, jobs with heavy loads, and jobs with repeated hand/arm movements. Most affected workers worked with computerized machines, and the mouse scrolling task was perceived as the most strenuous by the participants. An association between occupational exposure to biomechanical factors: cycles times of <10 seconds were more harmful than cycles times of < 30 seconds or when the same movements were performed in >50 % of working time, higher hand repetition rates (>18 repetitions/min) or working more or less than 30 hours per week. (15, 16) Understanding and improving reporting practices are crucial for better recognizing the extent of MSDs and implementing effective interventions.

METHODOLOGY

Research design and setting.

The research design is a cross-sectional, specifically a case series (clinical series) study based on data from medical records extracted from the Informatics Department, Ramathibodi Hospital, and information retrieved from telephone and face-to-face interviews using a questionnaire designed in OPD Hand (Somdech Phra Debaratana Medical Center) SDMC Ramathibodi Hospital, Phayathai Campus.

Participant selection and sampling technique

The targeted population was patients aged 18-65 years old who visited the hand clinic in Orthopedics OPD, Ramathibodi Hospital between October 25, 2023, and March 15, 2024, included in the study in Outpatient Hand clinic, Orthopedic departments, Faculty of Medicine Ramathibodi Hospital, Mahidol University. Due to the indefinite population, the author conducted the study in a single center and estimated sample size from one group of the population. Sample size will be added by 25%. N = 480 in case of uncertainty. Inclusion criteria were 1) Patients with selected ICD-10 diagnosis code, G56.0 (Carpal tunnel syndrome), M65.3 (Trigger finger), and M65.4 (De Quervain's tenosynovitis) in Ramathibodi Hospital in the year 2022 2) Aged between 18-65 years old. The exclusion criteria were 1) Cases that cannot be contacted by phone and 2) Cases that are not willing to participate in this study. The total population sampling recruited participants. The researcher selected this technique because it could reflect the real situation of under-diagnosis of work-relatedness.

Questionnaire

It was designed based on the Repetitive Strain Injury questionnaire, which is available online for everyone from the Centers for Disease Control and Prevention (CDC), United States. It consisted of 30 questions, including asking for consent for question 1. It was tested on a pilot group of 15 participants with similar characteristics (working population).

Data collection

The authors collected data from patients as specified above. Patients' data was reviewed before their visit to confirm a selected



diagnosis and selected age group. A total of 270 patients consented to answer a specifically designed questionnaire (via face-to-face interviews or consented to a telephone survey later. The questionnaire retrieved working-related information.

Statistical analysis

Pearson's Chi-square test was used to compare two nominal variables. The results were shown as P-values. The data were analyzed by STATA version 17.

RESULTS

Demographic data were analyzed prevalence between diseases using Pearson's chi-square and using P-value to show significance. From 270 cases that visited Ramathibodi hospital with specific ICD-10 diagnoses code, patients divided into Carpal tunnel syndrome = 127 cases (47%), trigger finger = 96 cases (36%), and de Quervain's tenosynovitis = 47 cases (17%). Age from total participants, median = 58 years old (IQR = 50,62); the youngest patient was 20 years old, and the oldest was 65 years old. Half of the participants (52.2%) were in the age group "41 – 59 years old." The majority group of patients for each disease were in this age group as well. This result was statistically significant (p-value

= 0.013). Two hundred twenty-eight participants were female (84.4%).

The mean BMI for all participants was 25.6 kg/m². Patients who were cut out as obese (BMI > 24.9) were 132 patients (48.9%), and 16.7% were in the morbid obesity group. The largest group was BMI 25–<30, and the second group was BMI 18.5 – <23. This result was similar for all three diseases. This result was statistically significant (p-value < 0.001).

Participants were in the Civil Servant Medical Benefits Scheme (CSMBS) for 170 cases (63%) and more than 50% for each disease, Social Security Scheme (SSS) for 31 cases (11.5%), and patients who paid cash by themselves for 43 cases (16.7%). One hundred forty-two participants had educational levels of graduates and above level (52.5%). For their monthly income level, the first group with the most participants was in the 15,000 – 29,999 baht level (40%). The second group was 30,000 – 49,999 baht level (34%).

Patients with Type 2 Diabetes Mellitus had 45 cases (16.7%), and only three cases were in the postpartum period when they had been diagnosed with de Quervain's tenosynovitis. Participants who smoked were enrolled for four cases. They were also significant statistically (p-value < 0.001).

Table1. Demographic data of patients by disease

Demographic characteristics	Carpal N = 127(%)	Trigger N = 96 (%)	De Quervain N = 47(%)	Total N = 270 (%)	P - value
Age (year)					
Median 58 (IQR = 50,62), Min = 20, Max = 65					
20 – 40	15 (11.8)	5 (5.2)	7 (14.9)	27 (10)	0.013*
41 – 59	76 (59.8)	44 (45.8)	21 (44.7)	141 (52.2)	
60 – 65	36 (28.4)	47 (49.0)	19 (40.4)	102 (37.8)	
Sex					
Female	110 (86.6)	78 (81.3)	40 (85.1)	228 (84.4)	0.544
Male	17 (13.4)	18 (18.7)	7 (14.9)	42 (15.6)	
BMI					
<18.5	3 (2.4)	2 (2.1)	3 (6.4)	8 (2.9)	0.920
18.5 – <23	37 (29.1)	30 (31.3)	12 (25.5)	79 (29.3)	
23 – < 25	25 (19.7)	17 (17.7)	9 (19.2)	51 (18.9)	
25 – < 30	39 (30.7)	32 (33.3)	16 (34.0)	87 (32.2)	
≥ 30	23 (18.1)	15 (15.6)	7 (14.9)	45 (16.7)	
Health Scheme					
CSMBS	88 (69.3)	54 (56.2)	28 (59.5)	170 (63.0)	0.385
SSS	10 (7.9)	14 (14.6)	7 (14.9)	31 (11.5)	
UC	11 (8.6)	9 (9.4)	6 (12.8)	26 (9.6)	
Out-of-pocket	18 (14.2)	19 (19.8)	6 (12.8)	43 (15.9)	



Demographic characteristics	Carpal N = 127(%)	Trigger N = 96 (%)	De Quervain N = 47(%)	Total N = 270 (%)	P - value
Educational level					
Never	7 (5.5)	4 (4.2)	0 (0.0)	11 (4.0)	0.256
Primary	18 (14.2)	7 (7.3)	4 (8.5)	29 (10.7)	
Secondary	7 (5.5)	6 (6.2)	3 (6.4)	16 (5.9)	
Elementary	13 (10.2)	8 (8.3)	4 (8.5)	25 (9.3)	
High school	12 (9.4)	9 (9.4)	3 (6.4)	24 (8.9)	
Associated degree	11 (8.7)	7 (7.3)	6 (12.8)	24 (8.9)	
Graduates	57 (44.9)	47 (49.0)	27 (57.4)	131 (48.5)	
Post-grad	2 (1.6)	8 (8.3)	0 (0.0)	11 (4.0)	
Income (month)					
10,000 – 14,999	6 (4.7)	6 (6.2)	5 (10.6)	17 (6.3)	0.325
15,000 – 29,999	49 (38.6)	44 (45.8)	15 (31.9)	108 (40)	
30,000 – 49,999	52 (40.9)	26 (27.0)	14 (29.8)	92 (34.0)	
50,000 – 69,999	10 (7.9)	10 (10.4)	7 (14.9)	27 (10.0)	
70,000 – 99,999	9 (7.0)	8 (8.3)	6 (12.8)	23 (8.5)	
100,000 and above	1 (0.8)	2 (2.0)	0 (0.0)	3 (1.1)	
DM					
Yes	17 (13.4)	18 (18.7)	10 (21.3)	45 (16.7)	0.367
No	110 (86.6)	78 (81.3)	37 (78.7)	225 (83.3)	
Hypothyroidism					
Yes	4 (3.2)	2 (2.1)	2 (4.3)	8 (3.0)	0.761
No	123 (96.8)	94 (97.9)	45 (95.7)	262 (97.0)	
Postpartum					
Yes	0 (0.0)	0 (0.0)	3 (6.4)	3 (1.1)	0.001*
No	127 (100.0)	96 (100.0)	44 (93.6)	267 (98.9)	
Smoking					
Yes	0 (0.0)	0 (0.0)	4 (8.5)	4 (1.5)	<0.001*
No	127 (100.0)	96 (100.0)	43 (91.5)	266 (98.5)	
Obese					
Yes	62 (48.8)	47 (49.0)	23 (48.9)	132 (51.1)	<0.001*
No	65 (51.2)	49 (51.0)	24 (51.1)	138 (48.9)	

For the working history retrieved from the questionnaire, the prevalence data was also analyzed using Pearson's chi-square and P-value to show significance. Patients were affected by these diseases and felt numbness or pain for ninety-five cases (35.2%). The affected hand on the left side had significant statistical results (p-value = 0.019). More than half of patients (58.9%) told the primary investigator that they could use their hands the same as before, whereas around 40% said that they still could not use them properly or in the same manner.

Table 2 shows that the job groups that have the highest percentages of cases are Professionals, e.g., doctors, nurses, and teachers (20.7%), followed by Clerks are the second highest job group in this study (18.5%), and Services/Sales (13.7%) in order. For the workplace, participants from public

administration and defense had 49 cases (18.2%). Human health / social work activities and education had the same number of participants, 40 cases (14.8%).

In the hand-using category, we found that participants who used tools or equipment in their jobs were in the highest group (37.4%). Tool-using and computer-using account for more than half of patients. The second group was computer-using (27.8%). Computer-using participants would mostly do their job with repetitive movements, for instance, mouse clicking/scrolling more than 6 times per minute or keyboard typing more than 18 times per minute. Patients with repetitive hand movements were 171 cases (63.3%).

Most participants had break time (more than ten consecutive minutes per day). Patients who had more than one job enrolled in this study for 18 cases (6.7%), and patients who



used their hands in their hobby/free time were 42 cases (15.6%). Patients who worked with vibrating tools were only nine cases (3.3%)

Although the results other than those for the affected hand were not statistically

significant, the results for the hand-using categories and break time had p-values of p-values less than 0.5.

Table2. Working characteristics of patients by disease (N=270)

Working characteristics	Carpal N = 127(%)	Trigger N = 96 (%)	De Quervain N = 47(%)	Total N (%)	P - value
Affected Hand					
Right	64 (50.4)	50 (52.0)	21 (44.7)	135 (50.0)	0.019*
Left	35 (27.6)	38 (39.6)	21 (44.7)	94 (34.8)	
Both sides	102 (80.3)	8 (8.3)	5 (10.6)	41 (15.2)	
Hand domination					
Right	22 (17.3)	20 (20.8)	9 (19.1)	51 (18.9)	0.428
Left	3 (2.4)	0 (0.0)	2 (4.3)	5 (1.8)	
Both sides	28 (22.0)	76 (79.2)	36 (76.6)	214 (79.3)	
Current symptom					
Pain/Numbness	44 (34.6)	31 (32.3)	20 (42.5)	95 (35.2)	0.475
Symptom-free	83 (65.4)	65 (67.7)	27 (57.5)	175 (64.8)	
Current hand use					
Can use normally	74 (58.3)	58 (60.4)	27 (57.5)	159 (58.9)	0.926
Can use less	53 (41.3)	38 (39.6)	20 (42.5)	111 (41.1)	
Job group (ISCO-08)					
Educational skilled labor					
Managers	12 (9.4)	10 (10.4)	2 (4.3)	24 (8.89)	0.738
Professionals	26 (20.5)	17 (17.7)	13 (27.7)	56 (20.7)	
Armed forces	5 (3.9)	2 (2.1)	2 (4.3)	36 (13.3)	
Skilled labor					
Technicians	6 (4.7)	5 (5.2)	4 (8.5)	15 (5.6)	
Clerks	27 (21.3)	16 (16.7)	7 (14.9)	50 (18.5)	
Service/Sales	18 (14.2)	14 (14.6)	5 (10.6)	37 (13.7)	
Agricultures	6 (4.7)	1 (1.0)	0 (0.0)	7 (2.6)	
Crafts/Trades	5 (3.9)	8 (8.3)	4 (8.5)	17 (6.3)	
General Labor					
Elementary jobs	7 (5.5)	8 (8.3)	4 (8.5)	19 (7.0)	
Housework/Maids	15 (11.8)	15 (15.6)	6 (12.8)	36 (13.3)	
Workplace (TISC)					
Services					
Human health and social work activities	18 (14.2)	14 (14.6)	8 (17.0)	40 (14.8)	0.890
Education	22 (17.3)	11 (11.5)	7 (14.9)	40 (14.8)	



Working characteristics	Carpal N = 127(%)	Trigger N = 96 (%)	De Quervain N = 47(%)	Total N (%)	P - value
Wholesale and Manufacturing					
Wholesale and retail trade	20 (15.8)	16 (16.7)	6 (12.8)	42 (15.6)	
Manufacturing	4 (3.1)	4 (4.2)	4 (8.5)	12 (4.4)	
Others	6 (4.7)	6 (6.3)	5 (10.6)	17 (6.3)	
Agriculture, forestry, and fishing	6 (4.7)	2 (2.1)	1 (2.1)	9 (3.3)	
Supportive organization					
Administrative and support services	11 (8.7)	9 (9.4)	3 (6.4)	23 (8.5)	
Public administration and defense	25 (19.7)	17 (17.7)	7 (14.9)	49 (18.2)	
Housework	15 (11.8)	17 (17.7)	6 (12.8)	38 (14.1)	
Hand using					
Tool-using	41 (32.3)	45 (46.9)	15 (31.9)	101 (37.4)	
Computer-using	37 (29.1)	23 (24.0)	15 (31.9)	75 (27.8)	0.342
Writing	23 (18.1)	11 (11.4)	6 (12.8)	40 (12.8)	
General using	26 (20.5)	17 (17.7)	11 (23.4)	54 (20.0)	
Hand using timework					
≥ 50%	108 (85.0)	82 (85.4)	38 (80.8)	228 (84.4)	0.754
< 50%	19 (15.0)	14 (14.6)	9 (19.2)	42 (15.6)	
Computer Using					
≥ 50%	48 (37.8)	28 (29.1)	16 (34.0)	92 (34.1)	
< 50%	27 (21.3)	23 (24.0)	11 (23.4)	61 (22.6)	0.765
none	52 (40.9)	45 (46.9)	20 (42.5)	117 (43.3)	
Mouse click/scroll					
≥ 6 per min	48 (37.8)	28 (29.1)	16 (34.0)	92 (34.1)	0.765
< 6 per min	27 (21.3)	23 (24.0)	11 (23.4)	61 (22.6)	
none	52 (40.9)	45 (46.9)	20 (42.5)	117 (43.3)	
Keyboard typing					
≥ 18 per min	48 (37.8)	28 (29.1)	16 (34.0)	92 (34.1)	
< 18 per min	27 (21.3)	23 (24.0)	11 (23.4)	61 (22.6)	0.765
none	52 (40.9)	45 (46.9)	20 (42.5)	117 (43.3)	
Hand movement					
Repeat ≥ 6 per min	77 (60.6)	62 (64.6)	32 (68.1)	171 (63.3)	0.631
Repeat < 6 per min	50 (39.4)	34 (35.4)	15 (31.9)	99 (36.7)	
Break time					
Yes	119 (93.7)	88 (91.7)	46 (97.9)	253 (93.7)	0.357
No	8 (6.3)	8 (8.3)	1 (2.1)	17 (6.3)	
Hand vibration					
Yes	4 (3.2)	3 (3.1)	2 (4.3)	9 (3.3)	0.928
No	123 (97.8)	93 (96.9)	45 (97.)	261 (96.7)	



Working characteristics	Carpal N = 127(%)	Trigger N = 96 (%)	De Quervain N = 47(%)	Total N (%)	P - value
Single job					
More than one job	10 (7.9)	4 (4.2)	4 (8.5)	18 (6.7)	0.468
Single job	117 (92.1)	92 (95.8)	43 (91.5)	252 (93.3)	
Hand use in hobby					
Yes	19 (15.0)	14 (14.6)	9 (19.2)	42 (15.6)	0.754
No	108 (85.0)	82 (85.4)	38 (80.8)	228 (84.4)	

DISCUSSION

Patients who cut out as obese (BMI > 24.9) were 132 patients (48.9%); this result was significant, and Roquelaure, Ha (15), van den Berge, van der Beek (17) studies also found high BMI associated with upper extremities musculoskeletal disorders” This study found characteristics, repetitive hand movements, accounting for more than 60% in all three diseases. This was supported by previous studies that showed an association between repetitive movements or cumulative forces and hand MSKDs (Iqbal and Alghadir (18), Matthew F. Garnett (19)).

Job groups such as Professionals also had a high prevalence, which was supported by previous studies about healthcare professionals in other countries (Yizengaw, Mustofa (20)).

For Handhand-using group categories such as tool-using also had a high prevalence; this was similar to Özdemir (16), Langer, and Maier (21) studies that showed physically demanding jobs or hand overuse associated with these hand MSKDs.

LIMITATIONS AND STRENGTHS

This study asked about personal factors and working history, and it was done with patients with variable occupations. However, this study only analyzed the prevalence; it did not analyze for association. Also, the information relied on patients' answers, which might introduce some recall bias.

Contribution

The results could be useful for planning preventive measures such as health promotion, occupational health and safety measures, work training, and health surveillance for each group of occupations. Some factors, such as the association between factors and work-

relatedness, were interesting to explore in further studies.

CONCLUSION

Significant differences in age, postpartum status, and smoking prevalence among the conditions highlight the importance of demographic and lifestyle factors. Similarities in sex, BMI, health scheme, educational level, income, diabetes, hypothyroidism, and obesity Prevalence suggest these factors influence the conditions similarly. Implementing targeted interventions based on identified factors could alleviate symptoms or decrease diseases.

Ethics consideration

The Ethical Review Committee at the Faculty of Medicine Ramathibodi Hospital approved this study, and all participants gave consent.

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Conflicts of interest

All authors have no conflicts of interest to declare.

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SOCIAL PARTICIPATION, SELF-REPORTED HEALTH STATUS, LIFE SATISFACTION, AND THEIR ASSOCIATIONS WITH PREVENTIVE HEALTH SERVICES UTILIZATION AMONG OLDER PEOPLE IN MYANMAR

Han Min Htet Aung^{1*}, Sarunya Sujaritpong¹, Pojjana Hunchangsith¹, Rossarin Gray¹

¹*Institute for Population and Social Research, Mahidol University, Salaya Campus 999, Phuttamonthon, Nakhon Pathom 73170, Thailand*

**Corresponding Author: Han Min Htet Aung, Institute for Population and Social Research, Mahidol University, Salaya Campus 999, Phuttamonthon, Nakhon Pathom 73170, Thailand, Email: hanminhtet27@gmail.com*

ABSTRACT

Introduction: The population in Myanmar is rapidly aging due to declining fertility and mortality. The increasing number of elderly people poses a growing challenge to the healthcare system. This challenge is exacerbated by healthcare providers' limited resources and the accessibility and utilization of healthcare users. Evidence from previous studies suggests that older people who participated in social activities could be more satisfied with their lives and have better health, resulting in more utilization of healthcare services. Nevertheless, more research is needed to provide evidence in developing countries.

Objectives: To examine the relationship between social participation, self-reported health status, life satisfaction, and preventive health services utilization among older people in Myanmar. The study limited health services to those for preventive and maintenance purposes, including regular consultations, laboratory tests, and receiving continuous medication for chronic diseases.

Methodology: The study utilized secondary data from the 2019 Myanmar Intercensal Survey with a sample size of 19785 older people aged 60 years and above. Binary logistic regression adjusted for covariates was used to address the objective of this study. Social participation was categorized as religious, community, and no participation based on the type of participation in the past 12 months. Health status and life satisfaction were measured using a 5-point scale self-rating and further classified as dichotomous in the analysis.

Results: Most respondents were young adults, female, and residing in rural areas. Among the participants, only 16.1% utilized the health services. Engagement in religious activities was 33.3%, while 3.2% participated in community activities. 80.4% of older people were satisfied with their lives, and 64.2% rated their health as good. Binary logistic regression analysis showed that older people who participated in religious activities utilized more health services than their counterparts. Better self-rated health status was negatively associated with lower health services utilization. There was no significant association between participation in community activities, life satisfaction, and health services utilization.

Conclusion: The findings of this study suggest that participation in religious activities and self-reported health status were significantly associated with the utilization of preventive health services among older people in Myanmar. Creating health-related events for older people and integrating health promotion programs such as health education and health information sharing sessions into social activities should be implemented to increase social interaction and health knowledge among older people, leading to increased utilization of preventive health services. Future interventions, particularly in developing countries, should promote older people's social participation to foster a healthier, more self-care, and active aging lifestyle.

Keywords: Social Participation, Self-reported Health Status, Life Satisfaction, Preventive Health Services Utilization, Older People

INTRODUCTION

The population of older adults in Myanmar is increasing, and there are many

challenges in providing adequate healthcare services. The main barriers to accessibility and utilization of healthcare services are the lack of



sufficient health services, lack of health knowledge, poverty, and insufficient social protection schemes, resulting in high out-of-pocket expenses (1). Preventive care emerges as a more efficacious approach to preserving health before it deteriorates, thereby avoiding the need for costlier treatments. Nevertheless, the adoption of preventive health services in Myanmar remains low, with most older adults seeking medical attention only upon falling ill (2).

The Ministry of Health implemented the elderly healthcare project in Myanmar from 1992-1993 to promote active and healthy aging. This project comprised comprehensive healthcare services and preventive, curative, and rehabilitative care for older people through a primary healthcare approach. This program was implemented in 161 townships by the end of 2013 but has yet to be nationwide (3). Moreover, Myanmar has committed to achieving Universal Health Coverage by 2030 to ensure that the whole population will access basic essential health services by 2020 and to prevent the risk of financial issues. Moreover, the budget allocation to health increased 3.4% of total government expenditure in the fiscal year 2014-2015. However, public healthcare utilization in Myanmar still needs to improve due to the absence of health insurance, cost-sharing policies, and high out-of-pocket payments for healthcare (4). Other economic factors, such as the availability of healthcare facilities and the well-being of individuals, influence the utilization of health services. Those factors also include how people are satisfied with their lives. People who are satisfied with their lives tend to take better care of themselves, including receiving preventive healthcare, leading to better health outcomes. Previous studies indicate that the physical aging process affects the perception of health status and life satisfaction (5, 6). Promoting an active aging lifestyle, such as engaging in social activities, can enhance life satisfaction and improve health status among older adults (7, 8). Additionally, research has shown that participation in social activities increases the utilization of health services (9, 10).

While numerous studies have established the benefits of active aging on health in developed countries (11, 12), only a few have explored societal factors such as social participation, life satisfaction, and self-

reported health status regarding health service utilization among older individuals in Myanmar. This study addresses this gap by investigating the relationships between these societal factors and their impact on health service utilization among older people in Myanmar. By doing so, it seeks to provide valuable insights into this region's unique context of aging.

METHODOLOGY

Data Source and Sampling Design

This study utilized secondary data from the 2019 Myanmar Intercensal Survey (ICS) conducted by the Department of Population, Ministry of Labor, Immigration and Population. The survey was undertaken between November 2019 and January 2020. The data collection was not affected by COVID-19 since COVID-19 started to spread in Myanmar in March 2020. The objectives of the survey were to produce updated population and socioeconomic data, to determine the growth and changes of population, and to provide inputs for monitoring and implementing policies. Extensive field testing and consultations with government ministries, development partners, universities, research institutions, and other data users ensured the validity and reliability of the census measurement. Additionally, monitoring teams from the Department of Population (DOP) and the United Nations Population Fund (UNFPA) provided oversight during the initial stages of the survey to ensure compliance with planned procedures and guidelines.

A stratified two-stage sampling method was used to select the sample. Enumeration areas (EAs), a primary sampling unit, were defined based on the EA maps of the 2014 Myanmar Population and Housing Census. Then, EAs were stratified into urban and rural areas within each district. EAs were selected systematically within each stratum sample with probability proportional to size based on the number of private households in each EA. From each sampled EA, at the second sampling stage, 35 households were selected for the interview process.

At the first stage of sampling, 4,316 EAs were selected, and 4,028 were listed for interview, but actual data collection was made from 3,960 EAs. A 95% response rate was achieved among sampled households. The ICS



covered only conventional households and excluded institutional and homeless populations. Nationally representative samples of 548,553 individuals in 132,092 households were interviewed.

This study's population of interest consists of 19,785 older people aged 60 years and above who utilized preventive healthcare services, excluding those who are disabled. This study primarily utilized data from a specific section of the survey focused on the older population.

Measurements

The variables included in this study are based on the literature review and Andersen's Health Services Utilization Model. The model aimed to measure equitable access to health services and explore relationships between predisposing, enabling, and needs factors and healthcare utilization (13). Social participation was considered an enabling factor, self-reported health status life satisfaction were needs factors, and socioeconomic variables were considered predisposing factors.

Outcome Variable

The outcome variable is preventive health services utilization. Healthcare utilization refers to using healthcare services for many reasons, including preventive and curative purposes, promoting good health and well-being, or obtaining information about one's health status and prognosis (14). In the survey, older people were asked, "Did you visit any healthcare facility during the past 12 months?" and "What was the main reason you last visited the healthcare facility?" Older people who answered "Yes" for the visit and selected one of the following reasons — routine consultations, regular laboratory tests, receiving continuous medication for chronic diseases — were regarded as the use of preventive health services. Older people who did not visit health facilities in the last 12 months were considered as having no service utilization.

Exposure Variables

The primary exposure variables for this study are social participation, self-reported health status, and life satisfaction. Social participation is defined as a person involved in activities interacting with others in the

community outside the home (15). The questionnaire asked older people about "Participation in any community/ social/ religious activity during the last 12 months" and "Type of Participation." The variable on social participation was categorized into religious activities, community activities (participating in recreation activities, socialization, political meetings, art, educational, and humanitarian activities), and no participation.

Life satisfaction is a person's evaluation of their well-being, including mood, relationships, goals, self-concept, and coping ability (16). Life satisfaction in this study refers to assessing older people by themselves in terms of satisfaction with their lives by asking, "Are you basically satisfied with your life?". The response was on a scale of 1 to 5 from "All the time to "None of the time." This study categorized life satisfaction as dichotomous, either satisfied or not satisfied.

Self-reported health status is defined as a personal perception of general health status. It was rated on a 5-point scale from very good to very poor by asking the participants, "How do you rate your health?" This study categorized self-reported health status as poor by combining fair, poor, very poor, very good, and sound as good health status.

Covariate Variables

Several socioeconomic and demographic variables were included based on theoretical and empirical links with social participation and health services utilization among older people. The age of older people was categorized as young-old (60 - 69 years), middle-old (70 - 79 years), and oldest-old (80 years or over). Gender was classified as male versus female. Place of residence was grouped as urban versus rural. Educational attainment was classified as no primary, secondary, or higher levels. Marital status was classified as single (including widowed, separated, and divorced) and married. Employment status was categorized into employed and not employed. The pension or allowance received was categorized as received or not received. The last covariate, financial support, was based on information about receiving either family or community support; hence, it was classified as received or not.



Data Analysis

Descriptive analyses and regression methods were used for data analysis. Binary logistic regression was the model of choice for regression modeling due to the dichotomous categorization of the outcome. Simple and multivariate regression models were constructed to determine changes in the extent of associations of the main variables of interest. R statistical software version 4.3.1 (2023-06-16 ucrt) was used for data management and analysis. A statistical significance level was set at p -value < 0.05 in all the analyses. In the multivariate logistic model, whereby all the exposure variables were entered simultaneously, multi-collinearity was checked by examining the variance inflation factors (VIFs) in which the cut-off for all the variables

was less than 10, indicating the low risk of multi-collinearity.

Ethical Consideration

The Department of Population Myanmar has permitted the use of the data. Moreover, this study obtained ethical clearance from the Institute for Population and Social Research Review Board, Mahidol University (IPSR-IRB-2024-033).

RESULTS

Table 1 shows the descriptive statistics of preventive health services utilization, self-reported health status, life satisfaction, and socioeconomic and demographic characteristics among the surveyed older people in Myanmar.

Table 1: Descriptive Statistics of socioeconomic status, health services utilization, self-reported health status, and life satisfaction of older persons (N = 19,785¹)

Variable	Number (%)
Health services utilization	
Not Utilize	16,603 (83.9)
Utilize	3,182 (16.1)
Social participation	
No Participation	12,557 (63.5)
Community Activity	649 (3.3)
Religious Activity	6,579 (33.2)
Life satisfaction	
Not Satisfied	3,881 (19.6)
Satisfied	15,904 (80.4)
Self-reported health status	
Poor	7,079 (35.8)
Good	12,706 (64.2)
Gender	
Female	10,840 (54.8)
Male	8,945 (45.2)
Marital status	
Single	6,749 (34.1)
Married	13,036 (65.9)
Education	
No education	1,728 (8.7)
Primary	11,121 (56.2)
Secondary	5,558 (28.1)
Higher	1,378 (7.0)
Place of residence	
Rural	12,550 (63.4)
Urban	7,235 (36.6)
Age	
Young-old	14,471 (73.1)
Middle-old	4,339 (21.9)



Variable	Number (%)
Oldest-old	975 (5.0)
Pension	
Not Received	16,930 (85.6)
Received	2,855 (14.4)
Financial support from the community family	
Not Received	15,865 (80.2)
Received	3,920 (19.8)
Employment status	
Not Employed	12,313 (62.2)
Employed	7,472 (37.8)

Note: ¹ The percent presented in bracket (%) is reported with rounding to have one decimal point.

Among the older adults of interest, 83.9% did not use preventive health services. Most participants who engaged in social activities leaned towards religious activities (33.2%) than community activities (3.3%). Most (80.4%) were satisfied with their lives, and 64% reported good health. The demographic profile showed 54.8% female respondents and 73.1% younger seniors. Most lived in rural areas (63.4%) and were married (65.9%). 56.2% had primary education, 28.1% secondary, and 7.0% higher education. Financially, many faced challenges, with only 14.4% receiving a pension, 80.2% lacking financial support from their community and family, and 62.2% being unemployed, highlighting their economic vulnerability.

Table 2 shows the associations between social participation, self-reported health status, life satisfaction, and preventive health services utilization among older people. Both unadjusted odd ratios (UOR) from the single logistic models and adjusted odd ratios (AOR) from the multivariate logistic model suggested that participating in only religious activity, not community activity, and the self-perception of good health were significantly associated with preventive health services utilization. In the

multiple logistic model, older people who participated in religious activities were 1.30 times (95% CI: 1.19-1.42) more likely to use preventive health services than those without activities. Adjusting for the covariates, older people who reported their health as good were 0.30 (95% CI: 0.28 – 0.33) times less likely to use preventive health services than those who reported poor health status. Although life satisfaction was significant with preventive health services utilization in the single model, the association was insignificant when controlling for the covariates.

In a multiple logistic regression model analyzing socioeconomic status and utilization of preventive health services, men and married older adults showed a lower likelihood of using preventive health services than their counterparts. Conversely, older individuals with higher education levels and those residing in urban areas were more inclined to utilize preventive health services. Additionally, older adults receiving pensions or financial support from their community or family demonstrated higher preventive health service utilization rates. However, being employed was associated with reduced utilization of preventive health services.

**Table 2:** Associations Between Social Participation, Self-reported Health Status, Life Satisfaction and Preventive Health Services Utilization of Older People (N=19,785)

Exposure variable	Health services utilization	
	UOR (95% CI)	AOR (95% CI) ¹
Social participation		
No Participation	1.00	1.00
Community Participation	1.06 (0.85, 1.30)	1.24 (0.99, 1.55)
Religious Participation	1.11 (1.02, 1.21)	1.30 (1.19, 1.42)
Life satisfaction		
Not Satisfied	1.00	1.00
Satisfied	0.71 (0.65, 0.78)	0.97 (0.88, 1.07)
Self-reported health status		
Poor	1.00	1.00
Good	0.30 (0.28, 0.33)	0.30 (0.28, 0.33)
Place of residence		
Rural	1.00	1.00
Urban	1.67 (1.54, 1.80)	1.53 (1.40, 1.68)
Age		
Young-old	1.00	1.00
Middle-old	1.21 (1.11, 1.32)	1.08 (0.98, 1.19)
Oldest-old	1.36 (1.15, 1.60)	1.10 (0.92, 1.31)
Gender		
Female	1.00	1.00
Male	0.71 (0.65, 0.76)	0.78 (0.72, 0.86)
Education status		
No Education	1.00	1.00
Primary	1.16 (1.00, 1.35)	1.15 (0.98, 1.34)
Secondary	1.43 (1.23, 1.68)	1.28 (1.08, 1.51)
Higher	1.75 (1.44, 2.11)	1.33 (1.07, 1.66)
Marital status		
Single	1.00	1.00



Exposure variable	Health services utilization	
	UOR (95% CI)	AOR (95% CI) ¹
Married	0.73 (0.67, 0.79)	0.84 (0.77, 0.96)
Pension		
Not Received	1.00	1.00
Received	1.52 (1.38, 1.68)	1.13 (1.00, 1.27)
Employment status		
Not Employed	1.00	1.00
Employed	0.70 (0.60, 0.71)	0.87 (0.79, 0.96)
Financial support from the community & and family		
No Received	1.00	1.00
Received	1.84 (1.69, 2.01)	1.75 (1.60 1.92)

¹ For the multiple logistic models, pseudo R² and log-likelihood are 0.08 and - 8026.33, accordingly.

Notes: Bold, odd ratios indicate their p-value is less than 0.05, UOR = Unadjusted Odd Ratios, AOR = Adjusted Odd Ratios, CI = Confidence Interval

DISCUSSION

This study explored the association between three societal factors: social participation, self-reported health status, life satisfaction, and preventive health services utilization among older people in Myanmar based on the 2019 Intercensal Survey. According to the survey, only a minority of older people in Myanmar utilized preventive health services. Among the three societal factors explored, a significant association with preventive health services was found for participation in religious activities and self-perception of having good health.

The findings from this study showed a positive association between religious activities and preventive health services utilization. Previous studies explained that religious attendance may motivate individuals to lead healthier lives and share health information during attendance, leading to more regular use of healthcare (17, 18). Nevertheless, the lack of association between participation in community activities and health services utilization contradicts previous studies, suggesting that the more engagement in community activities, the higher the utilization of health services (9). Such contradicting results may be because only 3% of older people

in Myanmar participated in community activities, according to the 2019 ICS survey. As a result, older people participating in community activities could have fewer opportunities to exchange health information. They may be less likely to receive financial or functional support to use health services from those attending the same activities. Another possible explanation is that older people participating in community activities are physically and mentally healthy and do not need healthcare services (19).

Previous research revealed that older people who reported their health status as good used more health services than those who perceived their health as poor (20, 21). The association between self-rated health and health services utilization found in this study is consistent with findings from a previous study in China (22). Despite the vital role of life satisfaction in healthcare utilization among older people found in earlier studies, this study did not find a significant association between life satisfaction and health services utilization in the multivariate model, but only in the simple logistic model. A potential explanation for this discrepancy is that the effect of life satisfaction on health service utilization in Myanmar is weaker than the other covariates, resulting in



the absence of significant association when considering other covariates in the multivariate regression analysis. Another possible reason is that older people in Myanmar reported being satisfied with their lives, and those who are happy with their lives are healthy and can manage their lives effectively. Hence, they utilize fewer health services (23).

This study found that older individuals residing in urban areas, females, single individuals, those with higher education levels, and those receiving pensions and financial support utilized more preventive health services than their counterparts, consistent with previous studies (10, 20, 24-26). However, this study's negative association between being employed and health service utilization contradicts the previous study (26). This discrepancy may be attributed to the fact that many respondents in this study are in the young-old stage, where their perception of healthcare utilization may be less important compared to other life priorities, such as earning income. Additionally, older individuals without employment may have more free time to receive health services and devote more attention to their health.

One strength of this study is that it uses nationally representative data derived from the latest ICS survey. A large sample size of nearly 20,000 respondents has resulted in more robust findings that could be generalized in a border context of other countries with similar socioeconomic status as Myanmar. However, due to the nature of the cross-sectional study, which is a limitation, a causal relationship between the exposure variables and the outcome could not be confirmed. Instead, the study could only examine the statistical association between them. Another drawback of this study is the reliance on self-reported data in the past 12 months on multiple question items, which may lead to recall bias. The study did not include data on other potential predictors such as religion, ethnicity, diet, level of physical activity, and status of having chronic diseases for the analysis because they were not collected in the survey. Including these variables and the reasons behind the less community participation among older people in future studies could provide a more comprehensive understanding of the factors influencing preventive health service utilization.

The study's findings indicated that societal factors and socioeconomic status significantly influence health services utilization among older people. Health promotion programs such as providing health education and information-sharing sessions should be integrated into religious gatherings to enhance the use of preventive healthcare services. Health education programs should emphasize the benefits of utilizing preventive healthcare services regularly, regardless of one's health status. Information about affordable health check-ups at health centers should be regularly communicated through the media. This would encourage older people to use preventive healthcare services more frequently and facilitate more accessible access to these services regularly. Government and non-government organizations should collaborate to create health-related events and workshops for older people, promoting social interaction and exchanging health information.

Additionally, policy recommendations for active and healthy aging in Myanmar include enhancing primary healthcare services specifically tailored to the needs of older adults, promoting greater engagement in social and community activities, ensuring income security, and facilitating increased participation in the labor force (27). These policies should be implemented universally to benefit all older adults nationwide. By doing so, older people's socioeconomic status, social engagement, and healthcare utilization could be enhanced, leading to healthy and active aging.

CONCLUSION

The finding of this study highlights the crucial role of societal factors, including social participation and perceived health status, associated with protecting the health of older people in Myanmar through the utilization of preventive health services. Since the older population in Myanmar is gradually increasing, implementing non-medical measures, including but not limited to participation in social activities, should be substantially promoted to reduce the health burden of older adults in couples with an increase in the healthcare system's capacity. Doing so could improve the physical health and mental and emotional well-being of the older population by increasing physical activities and reducing stress. Future interventions, particularly in developing



countries, should focus more on protecting the health of older adults through preventive approaches, which could reduce the incidence of chronic diseases, lower healthcare costs, and enhance the quality of life for older adults. Moreover, older people who participate in social activities are more likely to remain active, independent, and engaged in their communities, leading to a healthy and aging process.

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ASSOCIATION BETWEEN KNOWLEDGE AND ATTITUDE WITH THE DECISION TO USE LONG-ACTING REVERSIBLE CONTRACEPTIVE (LARC) AMONG WOMEN OF REPRODUCTIVE AGE IN SOUTH KALIMANTAN, INDONESIA

Rizky Yuditasari¹, Nuchanad Hounnaklang¹, Onuma Zongrum^{1*}

¹College of Public Health Sciences, Chulalongkorn University, Sabbastravicaya Building, Phayathai Road, Bangkok 10330, Thailand

*Corresponding Author: Onuma Zongrum, College of Public Health Sciences, Chulalongkorn University Sabbastravicaya Building, Phayathai Road, Bangkok 10330, Thailand, E-mail: Onuma.z@chula.ac.th

ABSTRACT

Introduction: Indonesia, the fourth most populous country globally, faces rapid population growth driven by a high total fertility rate, prompting the government to initiate the Family Planning program called “Keluarga Berencana” to manage reproductive health and contraception and reduce maternal and child mortality. Despite efforts, the usage of Long-Acting Reversible Contraceptives (LARC) remains low, presenting challenges in meeting the national targets for modern contraceptive prevalence and highlighting the need for intensified promotion and targeted interventions. The low usage of LARC is due to limited knowledge and negative attitudes in the community.

Objective: To determine the association between knowledge and attitude with the decision to use long-acting reversible contraceptives in women of reproductive age in South Kalimantan, Indonesia.

Methodology: The quantitative cross-sectional study was conducted among married women of reproductive age 15-49. The data were collected using a self-administered online questionnaire in South Kalimantan Province using non-probability sampling. Quantitative methods, including descriptive statistics and binary and multivariable logistic regression, were utilized in the analysis using SPSS 29.

Result: This study involved 372 women in South Kalimantan. Most were aged 31-40 years (52.2%), held a bachelor's degree (60.2%), had around two children (46.5%), and had a monthly household income of \geq Rp. 3,149,977 (85.2%). Additionally, 67.7% had never used LARC. Bivariate logistic regression showed that age, education, previous LARC use, knowledge, and attitudes were associated with LARC use. Multivariable logistic regression found that age and previous LARC use strongly correlated with LARC adoption (p-value < 0.001).

Conclusion: The most significant factors associated with the decision to use LARC are age and previous use of LARC. Therefore, to enhance the use of LARC, it is recommended that the South Kalimantan Government must target educational campaigns for women aged >40, promote positive testimonials from previous LARC users, ensure that LARC methods are accessible and affordable, engage community leaders and healthcare providers in advocacy efforts, and continuously monitor and adjust strategies based on the feedback.

Keywords: LARC, Decision, Knowledge, Attitude

INTRODUCTION

Some countries struggle with rapid population growth due to factors like lower death rates, high birth rates, lack of birth control, and limited education for girls (1)(2). Indonesia faces this issue, with a high total fertility rate (TFR) of 2.2 in 2021, above the stable level of 2.1, making it the fifth highest in Southeast Asia (3)(4).

To address population challenges, the Indonesian government, through the National

Population and Family Planning Board (BKKBN), launched the Family Planning (Keluarga Berencana or KB) program in 1970 (5). The program improves reproductive health, reduces mortality, addresses reproductive issues, and helps families plan children with contraceptive services, promoting quality families (6).

In Indonesia, contraceptive methods are categorized into traditional, modern, and permanent methods. Traditional methods



encompass periodic abstinence and coitus interruptus. Modern contraception is further classified into Long-Acting Reversible Contraceptives (LARC), which include implants and Intra-Uterine Devices (IUDs); Short-Acting Reversible Contraceptives (SARC), which comprise injections, condoms, and pills; and Permanent methods (male and female sterilization) (7).

According to Indonesia's Ministry of Health and the National Population and Family Planning Board, the family planning program faces several challenges. The modern contraceptive prevalence rate (mCPR) decreased from 57.2% in 2017 to 54.55% in 2019, short of the 2024 target of 63.4%. Unmet needs for family planning have stagnated at 11% over the past decade, with a 2024 goal of 7.4%. Participation in long-acting reversible contraceptives (LARC) is low, dropping from 18.3% in 2012 to 9.4% in 2017, well below the 2024 target of 28.9%. To meet the 2024 targets, the government recommends focusing on increasing LARC use due to its effectiveness, affordability, and benefits in managing pregnancies and improving maternal health (7). According to the 2017 Indonesian Demographic and Health Survey, among the 57.2% of modern contraceptive users, only 9.4% use long-acting reversible contraceptives, with 13.2% being women of reproductive age and 0.2% being men of reproductive age. The majority prefer short-acting reversible methods, with 29.0% choosing injections, 12.1% pills, 4.7% implants, 4.7% IUD, 3.8% female sterilization, 2.5% condoms, and 0.2% male sterilization (8).

Data from this survey highlights the top five provinces with the highest contraceptive use rates among couples aged 15-49: South Sumatra (74.37%), Bengkulu (73.31%), Central Kalimantan (72.93%), North Sulawesi (72.78%), and South Kalimantan (72.45%). South Kalimantan and Banten have the lowest LARC utilization rates, at 7.60% and 7.40%, respectively (9).

The low usage of LARC can be attributed to various factors, including poor knowledge and attitude about LARC, particularly among women of reproductive age. This study aims to examine the association between knowledge and attitude with the decision to use long-acting reversible

contraceptives in women of reproductive age in South Kalimantan, Indonesia.

This research helps to understand contraceptive use and the factors influencing decisions about contraceptives among married women aged 15-49 in South Kalimantan. It is hoped that the South Kalimantan government will support healthcare providers in implementing regulations to raise awareness and interest in using LARC.

METHODOLOGY

Study Design, Study Area, and Study Population

This quantitative cross-sectional study was conducted in South Kalimantan in April 2024. An online questionnaire via Google Forms was distributed through social media (Instagram, Facebook, and Whatsapp) to the targeted women aged 15-49. Inclusion criteria were married, residing in South Kalimantan, having internet access, consenting, and understanding Indonesian. Exclusion criteria were sterilization users and incomplete questionnaires. Four screening questions ensured that participants met the criteria.

Sampling

The sampling technique in this study used non-probability sampling. The sample size of 372 participants was calculated using the Cochran formula.

$$n = \frac{Z_{\alpha/2}^2 P(1-P)}{(e)^2}$$

Note:

n = sample size

$Z_{\alpha/2}^2$ = standard value of 95% confidence interval = 1.96

P = the prevalence of contraceptives among women of reproductive age in South Kalimantan = 72.45% = 0.72

1-P = 1-0.72 = 0.28

e = error allowance = 0.05 (95% CI)

Measurement Tools

This study used self-administered questionnaires. The questions were adapted and modified from research by Aziza and Alfiah. The questionnaire has four sections: sociodemographics, knowledge, attitudes about LARC, and decision to use LARC. The IOC index from three experts was 1.0.



Data Analysis

SPSS version 29 analyzed the data, including descriptive statistics like percentages, mean, and standard deviation (SD). Binary logistic regression examined variable associations, followed by multivariable logistic regression to identify the strongest predictors of LARC use.

Ethical Approval

The ethics for this research have been approved by the Faculty of Public Health, Universitas Muhammadiyah Jakarta: No. 10.078.B/KEPK-FKMUMJ/III/2024.

RESULTS

Characteristics of Participants (Sociodemographics)

According to Table 1, the average age of participants is 31-40 years (52.2%) with a mean \pm SD of (37.00 \pm 6.469). More than half of the respondents hold a bachelor's degree (60.2%). On average, respondents have two children (46.5%) and a monthly family income of \geq Rp. 3,149,977 (85.2%), and have not previously used LARC (32.3%).

Table 1. Sociodemographics of Participants (n = 372)

Variables	Number	%
Age		
20-30	68	18.3
31-40	194	52.2
>40	110	29.6
Range	21- 49	
Age (Mean \pm SD)	37.00 \pm 6.46	
Education		
Elementary, Middle, and High School	71	19.1
Diploma degree	50	13.4
Bachelor's degree	224	60.2
Higher	27	7.3
Number of Children		
0	16	4.3
1	101	27.2
2	173	46.5
\geq 3	82	22.0
Family Monthly Income		
< Rp. 3.149.977	55	14.8
\geq Rp. 3.149.977	317	85.2
Previous Use of LARC		
No	252	67.7
Yes	120	32.3

Knowledge of LARC of Participants

Table 2 summarizes participants' LARC knowledge. Key findings: 85.8% defined LARC correctly; 62.9% misunderstood contraceptive pills as LARC; 94.4% knew about healthcare professionals managing LARC insertion and removal. Regarding IUDs, 55.6% correctly answered a negative statement; 57.3% were unaware that IUDs cause breakthrough bleeding. For implants, 58.3% knew their definition, 64.2% its duration, and 54.0% correctly answered a statement about implants and sexual intercourse. Knowledge categories were based on a mean cutoff of 6.1, with 50.8% having above-average knowledge.

Table 2. Participant's Knowledge Towards LARC (n=372)

Item	Number (%)	
	Correct answer	Incorrect answer
1 LARC is a contraceptive tool used to delay space pregnancy for the long term.	319 (85.8)	53 (14.2)
2 Pill is one of the methods in LARC	138 (37.1)	234 (62.9)
3 The insertion and removal of LARC can be done only by the trained healthcare provider	351 (94.4)	21 (5.6)
4 IUD is placed under the skin in the upper arm.	207 (55.6)	165 (44.4)
5 IUD can cause breakthrough bleeding	159 (42.7)	213 (57.3)
6 IUD can be stopped at any time if you want to have another child	296 (79.6)	76 (20.4)
7 The implant is a hormonal contraceptive in the form of small tubes	217 (58.3)	155 (41.7)
8 The implant can be replaced	239 (64.2)	133 (35.8)



Item	Number (%)	
	Correct answer	Incorrect answer
9	201 (54.0)	171 (46.0)
10	147 (39.5)	225 (60.5)
Total score		
≤ 6.1	183 (49.2)	
> 6.1	189 (50.8)	
Mean (SD)	6.1 (2.50)	
Min-Max	0-10	

Attitude Towards LARC of Participants

Table 3 summarizes participant attitudes across seven statements. Key findings include: 29.8% agreed on LARC's effectiveness in preventing pregnancy; 32.5% agreed due to its long-lasting efficiency. Regarding negative statements, 30.9% were unsure about LARC placement, and 30.1% were uncertain about its suitability only for women not wanting more children. Concerning side effects, 37.9% were uncertain, while 38.4% strongly disagreed with the statement on implants causing infertility. Attitudes were categorized based on a mean cutoff of 23.4, with 52.2% classified as having lower or equal attitudes than the mean.

Table 3. Participants' Attitude Towards LARC (n=372)

Item	Frequency (%)				
	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
1 LARC is more effective at preventing pregnancy than SARC	23 (6.2)	45 (12.1)	109 (29.3)	111 (29.8)	84 (22.6)
2 LARC is more efficient because the insertion is only done once and can last for a long time	22 (5.9)	54 (14.5)	82 (22.0)	121 (32.5)	93 (25.0)
3 I worry about LARC because it is placed inside the body	35 (9.4)	75 (20.2)	115 (30.9)	89 (23.9)	58 (15.6)
4 LARC can help me plan my pregnancy	25 (6.7)	49 (13.2)	100 (26.9)	107 (28.8)	91 (24.5)
5 LARC can only be used by women who no longer want children	70 (18.8)	92 (24.7)	112 (30.1)	48 (12.9)	50 (13.4)
6 I am worried about using LARC because it has many side effects	41 (10.8)	76 (20.4)	141 (37.9)	76 (20.4)	39 (10.5)
7 I believe implants can cause infertility	143 (38.4)	67 (18.0)	111 (29.8)	27 (7.3)	24 (6.5)
Total Score					
≤ 23.4	194 (52.2)				
> 23.4	178 (47.8)				
Mean (SD)	23.4 (5.11)				
Min-Max	11-35				

**Decision to Use LARC**

Table 4 shows that, on average, participants do not plan to use LARC in the future (70.7%).

Table 4. Decision to Use LARC (n=372)

Question	Frequency (%)	
	No	Yes
Do you have plans to use LARC in the future?	263 (70.7)	109 (29.3)

Association between Sociodemographics, Knowledge, and Attitude with Decision to Use LARC

The study used binary logistic regression to analyze the association between sociodemographic factors, knowledge, and attitudes with LARC usage decisions. Results from Table 4 show that women aged 20-30 and 31-40 are more likely to use LARC compared to those over 40 (OR = 4.70, 95% CI = 2.27-9.73 and OR = 3.19, 95% CI = 1.71-5.93). Those with elementary to high school education are also more likely to use LARC than those with higher education (OR = 4.34, 95% CI = 1.19-15.87 and OR = 4.50, 95% CI = 1.18-17.04). Previous LARC users are significantly more inclined to use it again than those who have never used it (OR = 9.31, 95% CI = 5.60-15.50). Additionally, women with above-average knowledge about LARC (>6.11) and more positive attitudes towards it (>23.40) are more likely to choose LARC (OR = 2.17, 95% CI = 1.37-3.44 and OR = 2.57, 95% CI = 1.62-4.09, respectively).

Table 5. Association between Sociodemographics, Knowledge, and Attitude with Decision to Use LARC (n=372)

Variables	Unadjusted odds ratio (95%CI)	P-value
Age (year)		
20-30	4.70 (2.27-9.73)	<0.001
31-40	3.19 (1.71-5.93)	<0.001
>40	Ref.	
Education		

Variables	Unadjusted odds ratio (95%CI)	P-value
Elementary, Middle, and High School	4.34 (1.19-15.87)	0.026
Diploma degree	4.50 (1.18-17.04)	0.027
Bachelor's degree	3.13 (0.91-10.76)	0.070
Higher	Ref.	
Number of Children		
0	Ref.	
1	2.19 (0.58-8.24)	0.243
2	1.96 (0.53-7.18)	0.306
≥ 3	1.21 (0.31-4.74)	0.776
Family Monthly Income (Rp.)		
< 3.149.9	0.98 (0.52-1.85)	0.970
≥ 3.149.9	Ref.	
Previous Use of LARC		
No	Ref.	
Yes	9.31 (5.60-15.5)	<0.001
Knowledge regarding LARC (scores)		
≤ 6.11	Ref.	
>6.11	2.17 (1.37-3.44)	<0.001
Attitude regarding LARC (scores)		
≤ 23.40	Ref.	
> 23.40	2.57 (1.62-4.09)	<0.001

Binary logistic regression identified age, education, previous LARC use, knowledge, and attitude as significant factors influencing LARC usage. These factors were further analyzed using multivariable logistic regression in two models.

**Table 6.** Multivariable Logistic Regression Analysis of Association Between Factors and The Decision to Use Long-Acting Reversible Contraceptive (LARC) Among Women of Reproductive Age (n=372)

Variables	Model 1		Model 2		Model 3	
	AOR (95%CI)	P-value	AOR (95%CI)	P-value	AOR (95% CI)	P-value
Age (year)						
20-30			10.67 (4.31-26.40)	<0.001	10.80 (4.38-26.62)	<0.001
31-40			5.65 (2.66-12.00)	<0.001	5.44 (2.59-11.42)	<0.001
>40			1.00			
Education						
Elementary, Middle, and High School			5.24 (1.10-24.95)	0.037	4.41 (0.95-20.36)	0.057
Diploma degree			4.51 (0.92-22.03)	0.059	4.50 (0.93-21.78)	0.061
Bachelor's degree			4.48 (1.03-19.54)	0.045	4.03 (0.94-17.23)	0.059
Higher			1.00			
Previous Use of LARC						
No			1.00			
Yes			12.24 (6.61-22.66)	<0.001	14.50 (7.94-26.50)	<0.001
Knowledge (scores)						
≤ 6.11(≤mean)	1.00		1.00			
> 6.11 (>mean)	1.79 (1.10-2.89)	0.017	1.55 (0.87-2.74)	0.131		
Attitude (scores)						
≤ 23.40	1.00		1.00			
> 23.40	2.24 (1.39-3.61)	<0.001	1.58 (0.88-2.74)	0.122		

Table 5 consists of three models. The first model includes only knowledge and attitude. The second model includes sociodemographics (age, education, and previous use of LARC), knowledge, and attitude, while model 3 includes only sociodemographics (age, education, and previous use of LARC). In model 1, knowledge and attitude are significantly associated with the decision to use LARC with p-values 0.017 and <0.001, respectively. In Model 2, age, education, and previous LARC use are significantly associated with the decision to use LARC ($p < 0.05$). Women aged 20-30 and 31-40 were more likely to use LARC than those over 40 (OR = 10.80, 95% CI = 4.38-26.62 and OR = 5.44, 95% CI = 2.59-11.42). Lower education levels also increased likelihood (OR = 5.24, 95% CI = 1.10-24.95 and OR = 4.48, 95% CI = 1.03-19.54). Previous users were significantly more likely to reuse LARC (OR = 12.24, 95% CI = 6.61-22.66).

Model 3 confirmed age and previous use as significant factors, with women aged 20-30 having an OR of 10.80 (95% CI = 4.38-26.62) and women aged 31-40 having an OR of 5.44 (95% CI = 2.59-11.42) for LARC usage. Previous users had an OR of 14.50 (95% CI = 7.94-26.50) for reusing LARC.

DISCUSSION

Association Between Sociodemographics and Decision to Use LARC

The participants in this study, predominantly aged 31-40 years, aligned with the findings of the research conducted in Jakarta Timur in 2023 (10). Multivariable logistic regression revealed significant associations between choosing LARC and age groups 20-30 and 31-40 years ($p < 0.001$). Women aged 20-30 are 4.59 times more likely, and those aged 31-40 are 3.54 times more likely to choose LARC than those over 40. This aligns with studies conducted in the Health Center at



Batang Hari and Totorejo, indicating that age is a critical factor in LARC use (11)(12). Younger women in this study showed a tendency towards LARC. It can be influenced by factors such as knowledge, attitudes, support, information access, and local family planning services (13).

More than half of respondents (60.2%) have a bachelor's degree. Multivariable logistic regression showed no significant association between education and LARC use (p-values 0.057, 0.061, 0.059). This aligns with the research conducted at Tajurhalang Village, where education did not significantly influence LARC selection, suggesting education is not the primary factor in contraceptive decisions. Contraceptive information needs to be integrated into Indonesia's curriculum, limiting education's impact on family planning knowledge (14).

Most respondents (67.7%) had never used LARC. Multivariable logistic regression showed a significant association between previous LARC use and choosing it again (p-value <0.001), with previous users being 14.5 times more likely to choose LARC. This is consistent with research in Uganda (15). Researchers suggest that the high likelihood of women who have used LARC before deciding to use it again stems from their positive experiences with the method. Experience with contraceptive methods is crucial, as most contraceptive users seek the best option without side effects (16).

Association Between Knowledge and Decision to Use LARC

The study found no association between knowledge and the decision to use LARC (p-value 0.131) in multivariable logistic regression analysis, consistent with the research in Bontang (17). Research at Palembang also found no significant association between knowledge and the decision to choose LARC (p-value 0.255). Participants were likely influenced by other factors (18).

This study found that most participants had knowledge scores above the mean (50.8%), with participants generally understanding that LARC requires insertion and removal by trained healthcare providers. Participants with knowledge scores higher than the mean of 6.11 were 1.55 times more likely to decide to use LARC than those with scores lower or equal to

the mean. However, Susanti found a significant association between knowledge and LARC use (p-value 0.003), with good knowledge respondents 7.5 times more likely to choose LARC (7).

The lack of association between knowledge and decision-making may be influenced by factors such as religion, partners, education, age, occupation, and socio-cultural factors. Despite this, most participants had above-average knowledge scores, which can facilitate informed decision-making and shape beliefs about contraception methods.

Association Between Attitude and Decision to Use LARC

This study found no association between attitudes and the decision to use LARC (p-value 0.112) in multivariable logistic regression analysis. This is in contrast with previous research in Lumajang, which found a significant association between attitude and LARC selection (p-value 0.002) (19). According to previous research conducted at the Community Health Center in Tanah Bumbu, attitude was found to be a significant variable influencing contraception choice among women of childbearing age who visited the community health center (p-value 0.000 < 0.05) (20).

This study found that 52.2% of participants had attitude scores less than or equal to the mean value of 23.4. Participants with attitude scores higher than the mean were 1.58 times more likely to decide to use LARC compared to those with lower or equal attitude scores (20). The lack of association between attitudes and the decision to use LARC could be due to factors such as attitudes influenced by personal experiences, the influence of relatives, other people, mass media, and many other factors.

CONCLUSION

The most significant factors that are associated with the decision to use LARC are age and previous LARC use, with women aged 20-30 and 31-40, as well as those who have used LARC before, more likely to opt for LARC. Therefore, to increase LARC utilization, it is suggested that the South Kalimantan Government focus on educational campaigns for women over 40, highlight positive experiences of past LARC users,



ensure affordability and accessibility of LARC methods, involve community leaders and healthcare providers in advocacy, and regularly adapt strategies based on feedback.

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BARRIERS AND FACILITATORS TO ACCESS TO SEXUAL AND REPRODUCTIVE HEALTH (SRH) SERVICES FOR MYANMAR POLITICAL MIGRANTS IN MAE SOT, THAILAND

Win Pike Myo¹, Kanokwan Tharawan^{1*}, Nara Khamkhom¹

¹*Institute for Population and Social Research, Mahidol University, 999 Phutthamonthon 4 Road, Phutthamonthon, Nakhon Pathom 73170 Thailand*

**Corresponding Author: Kanokwan Tharawan, Institute for Population and Social Research Mahidol University, 999 Phutthamonthon 4 Road, Phutthamonthon, Nakhon Pathom 73170 Thailand, E-mail: kanokwan.thr@mahidol.ac.th*

ABSTRACT

Introduction: This thesis examines barriers and facilitators to accessing sexual and reproductive health (SRH) services for Myanmar political migrants in Mae Sot, Thailand. This research differs from most existing research, which focuses on economic migrants, by addressing the unique needs of Myanmar political migrants. This study provides a critical analysis of the specific challenges these migrants face and the support systems available to them.

Objectives: The study aims to identify the legal, cultural, financial, and linguistic barriers that hinder SRH service accessibility for Myanmar political migrants. It also explores the role of community networks, non-governmental organizations (NGOs), and informal support systems in facilitating SRH service access and provides evidence-based recommendations for improving it.

Methodology: This qualitative study employed in-depth interviews as a data collection technique. Participants included 26 Myanmar political migrants from various demographic backgrounds, including men, women, and LGBT individuals. In addition, five key informants were healthcare professionals and NGO representatives from Mae Sot. The multilevel approach allows for a comprehensive assessment of factors affecting SRH service access, from individual to policy level.

Results: The study findings highlight significant legal documentation challenges, cultural and language barriers, and financial barriers to accessing SRH services. This is particularly true for undocumented political migrants who face severe legal and security concerns when seeking these services. However, the Civil Disobedience Movement (CDM) doctors and various NGOs continue to provide essential health services despite these challenges. The study indicates a heavy reliance on social media for SRH information and suggests the need for specialized education programs and LGBT-friendly clinics.

Conclusion: The paper discusses strategies to improve and tailor SRH services to meet the needs of Myanmar political migrants. It advocates for additional resources and capacity-building in the SRH sector to enhance service accessibility and effectiveness. This research contributes to developing targeted health interventions, policies, and programs that address the specific SRH needs among this vulnerable population.

Keywords: Myanmar political migrants, sexual and reproductive health, Mae Sot, barriers, facilitators, healthcare access, LGBT-friendly clinics, Civil Disobedience Movement, NGOs.

INTRODUCTION

A military coup attempt in Myanmar in 2021 resulted in significant political turmoil and violence, which led to an increase in political migrants seeking shelter in neighboring countries (1). Located on the border between Thailand and Myanmar, Mae Sot has become an increasingly popular

destination for migrants because of its proximity and established migrant community (2). Myanmar political migrants face distinct difficulties because of their vulnerable legal status and the political oppression they experience, as opposed to other migrants (1). This study focuses on the experiences of Civil Disobedience Movement (CDM) staff,



including doctors, activists, Members of Parliament, political prisoners, and political party members who have fled to Mae Sot due to the threats of arrest, imprisonment, and potential execution. Mae Sot's strategic location and socio-economic landscape make it a prime destination for migrants seeking safety, stability, and new opportunities (3). The ongoing political crisis in Myanmar has led to increased migration, with many seeking refuge and better prospects in border areas like Mae Sot (1). However, political migrants have strained local resources, especially in the health sector where access to sexual and reproductive health (SRH) services is a big issue (1).

The health of economic migrants has been the subject of substantial research. Much less attention has been given to the specific health needs of political migrants. Migrants from Myanmar who are political face unique challenges that are different from those of other migrants. In the past, political migrants were often overlooked or not considered due to their minority status. However, since 2021, the ongoing crisis in Myanmar has led to a significant increase in political migrants (4). This migration has transformed them from a minority group to a growing population of concern (5). There is a critical gap in understanding the particular needs and barriers faced by political migrants, especially with respect to SRH services. Economic migrants typically leave their home countries for better employment opportunities and can often regularize their status in the host country. In contrast, political migrants flee due to persecution, violence, and threats to their lives, which complicates their ability to obtain legal documentation and access to essential services, including SRH services.

This study addresses this gap by examining the barriers and facilitators to Myanmar political migrants' access to SRH services in Mae Sot. As a fundamental component of public health, SRH services address a wide range of topics, including family planning, maternal health, prevention and treatment of sexually transmitted infections (STIs), and access to safe abortion. For political migrants, access to these services is often hindered by multiple factors, including legal, cultural, financial, and language barriers. Myanmar's political context has been unstable for decades, with intermittent periods of

military rule and democratic governance. The 2021 coup by the State Administration Council (SAC) has exacerbated the situation. There is a growing sense of fear and uncertainty as a result. The Myanmar political instability has created a need for basic health care services, including SRH, among political migrants who are often neglected in crises.

The process of accessing SRH services for Myanmar political migrants can be challenging. They have difficulty accessing public healthcare because of legal barriers in Mae Sot. This lack of documentation not only limits their access but also exposes them to the risk of arrest and deportation by the Myanmar Military and Thailand Authorities (6). The situation is further complicated by language and cultural barriers. Many Myanmar political migrants speak different languages and dialects, which makes communication with Thai healthcare providers difficult. Additionally, cultural differences and stigma associated with being a political migrant deter individuals from seeking care (7). Another critical issue is financial constraints, as many migrants have limited income and cannot afford healthcare services (7).

Some community workers help political migrants in accessing SRH services in Mae Sot, especially in response to these challenges. Support systems such as non-governmental organizations (NGOs) and local clinics are vital in providing essential services. For example, the Mae Tao Clinic provides healthcare services to migrants and has been instrumental in addressing their SRH needs. The Civil Disobedience Movement (CDM) and various NGOs offer healthcare and information in an informal network. Understanding these challenges and facilitators is crucial for developing targeted health interventions and policies. This study aims to provide a comprehensive analysis of the barriers and facilitators to Myanmar political migrants' access to SRH services in Mae Sot. As a result of these issues being raised, the study seeks to inform stakeholders and policymakers about the urgent need for tailored SRH services for political migrants. Therefore, the specific objectives of this research are to identify barriers to SRH service access for Myanmar political migrants in Mae Sot, to explore facilitating factors, and to provide recommendations for improving access.



This study emphasizes the importance of adopting a nuanced approach that considers the diverse experiences of different migrant populations. It is possible to improve accessibility to SRH services by addressing barriers and taking advantage of facilitators. This will improve the overall well-being of Myanmar political migrants living in Mae Sot. This research contributes to the broader migrant health discourse and underscores the need for tailored interventions that ensure access to essential health care for all migrants regardless of their status.

Theoretical framework

This study is grounded in two primary theoretical frameworks. These are the Healthcare Accessibility Model and Intersectionality Framework. These frameworks provide a comprehensive foundation for understanding the barriers and facilitators to accessing SRH services for Myanmar political migrants in Mae Sot. The Health Accessibility Model assesses the accessibility of SRH services based on four dimensions. The key factors are Availability, Geographic Accessibility, Financial Accessibility, and Acceptability. This model helps evaluate the multifaceted challenges faced by Myanmar political migrants in accessing healthcare. The Intersectionality Framework analyzes how overlapping identities such as gender, class, race, and legal status collectively shape migrants' experiences and access to SRH services. This framework emphasizes that individuals are marginalized by intersecting social categories, influencing their encounters with injustice and access to healthcare. By integrating these frameworks, the study can holistically address the complex and layered obstacles Myanmar political migrants face in accessing SRH services. This dual approach ensures that both structural and personal factors are considered. The research provides a more nuanced understanding of the problem and potential solutions. Consequently, this comprehensive analysis aims to inform policy and practice and increase healthcare access for this vulnerable population.

METHODOLOGY

This research was a qualitative method study. This study explored barriers and facilitators to accessing SRH services among

Myanmar political migrants in Mae Sot, Thailand. The study involved 31 participants. The sample involved 26 individual in-depth interviews with Myanmar political migrants (including men, women, and LGBT individuals) and five key informant interviews with healthcare professionals and NGO representatives. The participants included individuals between the ages of 18 and 60 with varied educational backgrounds and different durations of stay in Mae Sot. This approach deliberately integrated perspectives from the LGBT community and other groups. This study utilized the purposive sampling method to select participants. It collaborated with political networks and non-governmental organizations working with Myanmar migrants in Mae Sot to recruit participants. This approach aimed to capture various experiences and perspectives relevant to the study objectives.

Participants in this study agreed in writing before the interviews. They understood the study's goals, methods, procedures, risks, and benefits. They could choose to leave the study without a reason. All participants provided written informed consent. The interview guides contained open-ended questions designed to elicit comprehensive responses. The interviews were recorded and transcribed word-by-word. After transcription, the recordings were securely erased. The transcripts underwent anonymization using unique codes. Each interview takes place in a private setting to ensure confidentiality and comfort. The researcher conducted interviews in Burmese to guarantee transparent and effective communication. The interview guides contained open-ended questions to elicit comprehensive responses. Interviews were recorded verbatim and transcribed verbatim after being securely erased. This study anonymized the transcripts with unique codes.

The researcher utilized thematic analysis to identify the primary barriers and facilitators to access SRH services. The analysis process included data familiarization, coding, theme generation, review, and definition. Multiple researchers independently reviewed the data coding and theme development to ensure the quality and reliability of the thematic analysis. The method provided a systematic interpretation of data. On April 11, 2024, the Institutional Review Board of the Institute for Population and Social



Research (IPSR-IRB) at Mahidol University approved (approval number: IPSR-IRB-2024-026) for this research. The researcher also ensured that all data collection and storage procedures followed IPSR-IRB ethical standards.

RESULTS

Barriers to SRH Access

1. Impact of Legal Status on Healthcare Access

Political migrants had a significant problem accessing public healthcare due to their lack of legal documentation. A significant number of participants expressed apprehension regarding potential arrest or deportation when attempting to access medical assistance, which resulted in their reluctance to seek out SRH services. The lack of legal certainty was especially severe for undocumented migrants, who encountered increased dangers and uncertainties.

According to an activist (37-year-old female), *"Upon arriving here, I realized that without proper identification, you are essentially powerless. When I obtained what they call the '10-year card', I tried to research what rights it granted me. However, I could not find any relevant laws, and I have heard that it does not actually provide any tangible benefits..."* This statement highlights the precarious nature of their legal status and the limited protection it gives them.

2. Communication Challenges in Healthcare

Cultural and language barriers pose additional challenges in accessing healthcare services due to differences in culture and language. A significant number of participants needed help in effectively communicating with Thai healthcare providers because of language barriers. The problem was worsened by a shortage of services that were sensitive to different cultures. This resulted in migrants frequently experiencing a sense of being misunderstood and unwelcome. Political migrants are also discouraged from seeking SRH services due to the social stigma attached to being a political migrant, fearing discrimination or negative judgment. As one participant (a 61-year-old female) stated, *"I have never actually been to a Hospital. Moreover, even when people bring their translators from outside, I have heard it does not really work out well."* These issues further

emphasize the importance of adequate communication between migrants and healthcare professionals to ensure that SRH services are accessible to all.

3. Economic Barriers to Healthcare Access

Financial constraints restricted access to SRH services. It is critical to note that a significant number of migrants faced financial constraints and were unable to cover healthcare expenses, including SRH care. Due to excessive costs related to medical services and their precarious economic circumstances, numerous individuals were compelled to forgo crucial healthcare, intensifying their susceptibility. One participant (29-year-old female) said her dire financial situation, *"I cannot do a job that earns me money. For carrying out political duties and..."*, indicating that their income is restricted below what is needed to afford healthcare. Thus, it is paramount that governments provide financial relief to their citizens to alleviate the burden of healthcare costs.

4. Gender-specific Challenges in Accessing SRH Services

Women and LGBT individuals face unique challenges in accessing SRH services. Women encounter barriers to maternal health services, family planning, and safe abortion services due to cultural stigmas and a lack of gender-responsive care. LGBT individuals experience discrimination and a scarcity of LGBT-friendly clinics, further limiting their access to essential SRH services. A participant highlighted the lack of specialized care for LGBT individuals (29-year-old Transman): *"There are no separate medical examinations or consultations for LGBT individuals. Thai-led events are conducted with pride; they are primarily in Thai. Consequently, there appears to be a lack of support and understanding for non-Thai speakers in this context."* Myanmar political migrants are particularly vulnerable since many of them are unaware of Thailand's abortion laws. A midwife (62-year-old Woman) shared her experiences: *"Some women attempt self-induced abortions... They are often reluctant to visit hospitals or clinics, fearing judgment. ... We have had cases where mothers died because their condition was discovered too late."* These accounts underscore the critical lack of information and services available to



women, particularly political migrants. The shortage of accessible, non-judgmental healthcare services and accurate information about reproductive health options has led to dangerous situations, sometimes with fatal consequences. It emphasizes the urgent need to improve access to information and services related to SRH for vulnerable populations, such as women and LGBT people.

Facilitators for SRH Access

1. Community Networks and Support Systems

SRH services have become more accessible through community networks despite various challenges. Informal support networks and initiatives led by senior migrants play a critical role in delivering healthcare information and aid. This helps all migrants navigate the healthcare system and receive essential services.

Non-Governmental Organizations (NGOs) significantly improve access to SRH services. Organizations such as the Mae Tao Clinic provide essential SRH services to migrants. One participant (41-year-old Man) mentioned, *“Whenever we need something, we just head over to Mae Tao Clinic. It is great because you only need to donate there, and the language is not a problem either.”* These NGOs often operate with a deep understanding of the migrants' needs and challenges, offering customized services that are accessible and culturally sensitive. They provide complimentary or discounted healthcare, language translation services, and legal aid.

Doctors from the Myanmar Civil Disobedience Movement (CDM) serve political migrants independently of the established healthcare system. These doctors frequently offer complimentary or affordable services and understand the unique challenges faced by political migrants, earning them the community's trust. One CDM doctor (29-year-old Man) stated, *“I just want to help out. However, since I am not officially allowed to treat patients here, I do what I can. I accompany people to clinics, give advice, that sort of thing. I would love to do more if we could practice legally here.”* Their efforts significantly narrow the gap in healthcare accessibility, particularly for those most vulnerable to legal repercussions.

2. Social Media and Digital Health Interventions

Social media and digital health interventions have become crucial in disseminating SRH information. Many individuals use social media platforms to access information about available services, health education, and support networks. One respondent (31-year-old Woman) described their approach to accessing health information: *“For health-related matters, I usually inquire on the 'Tele Health' Telegram channel. For other information, I tend to search on Facebook.”* This statement highlights the growing reliance on social media platforms to obtain SRH information among the study population. Online consultations and health information websites provide easy and private access to SRH services through digital channels, especially Telegram and Facebook.

Comparative analysis

A comparative analysis revealed distinct challenges and requirements in accessing SRH services for political migrants compared to other migrant populations. The main reasons political migrants flee are fear and violence, as opposed to economic migrants. This has made it challenging for them to acquire proper documentation and access vital services. It is essential to provide focused interventions that are tailored to the needs of political migrants, considering this differentiation. For example, although economic migrants frequently have opportunities to formalize their legal status and utilize public services, political migrants are trapped in an undefined area. They are constantly exposed to the risk of detention and expulsion. The uncertain legal status dramatically affects their behavior in seeking healthcare and their ability to access SRH services. In addition, Myanmar political migrants are more prone to trauma and psychological distress. As a result, their access to SRH is more complex.

The objective is to increase the accessibility of SRH services to political migrants from Myanmar in Mae Sot and enhance their well-being. Overcoming these barriers and using factors that support this goal is essential. The study's findings enhance the discussion on migrant health and emphasize the



importance of comprehensive and focused health policies and programs.

DISCUSSION

This study highlights the necessity for targeted health interventions and policies to address the specific SRH needs of Myanmar political migrants in Mae Sot, Thailand. This research offers valuable insights to stakeholders and policymakers by identifying the barriers and facilitators to accessing SRH services. Political migrants face substantial barriers to accessing SRH services because of legal, cultural, and language obstacles, as well as financial limitations. Many migrants lack the legal protections they need to access public healthcare services and are at risk of being apprehended and expelled. The presence of cultural disparities and language barriers increased the challenges of obtaining healthcare, while economic limitations constrained migrants' capacity to afford healthcare services.

Even with these difficulties, community networks, non-governmental organizations (NGOs), and informal support systems were critical in enabling access to SRH. The Mae Tao Clinic and Myanmar CDM doctors deliver vital healthcare services, while NGOs help through informal networks. The findings emphasize the importance of partnering with non-governmental organizations (NGOs) to enhance SRH service accessibility. The study's findings highlight the necessity of customized interventions that specifically target political migrants. It is suggested that clinics should be opened to the LGBT community so they can feel welcome and supported. The program also involves implementing educational programs tailored to their specific needs. In addition, they use digital health interventions to disseminate SRH information. This report provides recommendations to policymakers and stakeholders for improving the accessibility of SRH services for political migrants.

Moreover, future studies should examine the SRH needs of migrants in depth for political reasons. They should also assess the efficacy of interventions specifically tailored to them. This study adds to the wider discussion on migrants' health and emphasizes the significance of taking a detailed approach that accounts for the varied experiences of various

migrant groups. The study found that overcoming challenges and utilizing factors promote progress. It is possible to improve the availability of SRH services and improve the general welfare of political migrants from Myanmar in Mae Sot. This study illustrates the necessity of comprehensive and efficient health policies and initiatives that guarantee all migrants, irrespective of their legal status, can obtain essential healthcare services.

CONCLUSION

This study reveals significant barriers to SRH service access for Myanmar political migrants in Mae Sot. These barriers include legal, cultural, financial, and language obstacles. However, community networks, NGOs, and informal support systems play crucial roles in facilitating access. The research highlights the need for targeted interventions, culturally sensitive care, and policy reforms to improve SRH service accessibility for this vulnerable population. As a result, these challenges will be addressed, and existing support systems will be leveraged. The overall well-being of Myanmar political migrants can be improved, and they can also receive essential healthcare services regardless of their legal status.

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HIGHLIGHTING THE PREVALENCE OF HIV TESTING IN RELATION AND ITS ASSOCIATED FACTORS AMONG YOUNG WOMEN AGED 15 TO 24 IN THE GAMBIA FROM DEMOGRAPHIC HEALTH SURVEY 2019/2020

Abdou Jarju¹, Vo Thi Hue Man^{1*}

¹College of Public Health Science, Chulalongkorn University, Sabbasastravicaya Building, Phayathai Road, Pathuwan, Bangkok 10330, Thailand

*Corresponding Author: Vo Thi Hue Man, College of Public Health Science, Chulalongkorn University, Sabbasastravicaya Building, Phayathai Road, Bangkok 10330, Thailand, E-mail: vothihue.m@chula.ac.th

ABSTRACT

Introduction: Human immunodeficiency virus (HIV) attacks the immune system and can be diagnosed using a rapid test kit, which is the initial step towards HIV response. Young women aged 15 to 24 years bear the burden of new HIV infections, reported two out of every seven HIV infections globally in 2019, and 55.3% knew their HIV status in Sub-Sahara Africa. In The Gambia, 43.2% of women are diagnosed, and HIV prevalence among young women aged 15–24 is 1.28 %. Thus, this study will enhance the achievement of 95%-95%-95% UNAIDS policy and SDG 3.3, supporting eradicating vertical transmission planned and safe pregnancies.

Objectives: To examine the percentage of HIV testing and determine its association with sociodemographics, knowledge about vertical transmission, and risky sexual behaviors.

Methodology: Secondary data from The Gambia Demographic and Health Survey 2019/2020 was used. The survey was conducted using a stratified sampling of two stages; in the first stage, 281 Enumeration Areas (EAs) were chosen with a probability proportional to having a sampling stratum. In the second stage, the households were systematically sampled, resulting in 7,025 selected households. The participants were household members who had spent the night before the survey were interviewed. The study population was 3,757 young women aged 15 to 24 years who were extracted for the analysis. Sociodemographics, knowledge about vertical transmission, and risky sexual behaviors were predictors of HIV testing. Chi-square and multivariable logistic regression were explored using SPSS version 28, and a statistically significant level was set at $p < 0.05$ and 95% CI.

Results: The prevalence of HIV testing among young women was 71.8%. Nearly three-quarters (70.3%) of respondents who had higher knowledge about vertical transmission opted for HIV testing with statistically significant ($p = 0.002$). After adjusting for confounders (age, marital status, educational level, knowledge of vertical transmission, sex debut, and STIs). However, unmarried (AOR=4.98, 95% CI: 4.16-5.96), having no formal education (AOR= 2.35, 95% CI: 1.75 - 3.15), history of STI (AOR = 2.67, 95% CI = 1.50 - 4.77) were more likely to opt for HIV testing. Interestingly, young women who never had sex were 2.6 times more likely to be tested compared with participants ≥ 18 years (AOR = 2.60, 95% CI = 2.00 - 3.39).

Conclusions: The study findings indicated that young women with lower education levels, unmarried, sexual inactivity, and history of STIs were more likely tested, potentially influenced by general awareness of the HIV burden. Our findings recommend targeted awareness campaigns, improved access to HIV testing through integration, and promotion of HIV self-testing, as it enhances the achievement of UNAIDS' 95% policy.

Keywords: HIV testing, Young women, Determinants, Prevalence, The Gambia

INTRODUCTION

Globally, 39 million people live with HIV, out of which 86% know their HIV status. Generally, women and girls account for 46% of HIV all new HIV infections in 2022, reported

that they are three times more likely to be infected than their counterparts (1, 2). In 2022, AIDS killed one life every minute despite advancements, and around 9.2 million HIV-positive individuals worldwide were not receiving treatment, and approximately 2.1



million individuals received therapy. However, they are not virally suppressed (1). HIV is a pathogen that attacks the immune system. It can be diagnosed with a rapid test kit that yields results in 10 – 30 minutes.

According to UNAIDS, 1.9 million young women and girls aged 15-24 are living with HIV, yet a quarter do not know their status (3-5). HIV testing is an entry point towards HIV prevention, treatment, care, and support services (6). Most new HIV infections in young people are disproportionately found in young women aged 15 – 24 years. In 2019, they represented two out of every seven new HIV infections (7, 8).

As Sub-Saharan Africa (SSA) continues to be the region most affected (69%), Women and girls 55.3% knew their HIV status, accounting for 63% of new HIV infections in 2022 (5, 9, 10). Due to social health determinants, these individuals are susceptible to HIV. It also indicated that their HIV-related health-seeking behavior is superior to that of men as a result of targeted interventions(11).

In addition, The Gambia is characterized as a low HIV epidemic, with 43.2% of reproductive women screened for HIV (9, 10). According to the sentinel surveillance study, the prevalence rate of HIV among nursing mothers is 1.5% (12). Prevention of mother to child of HIV impact study reported that nearly two out of every hundred pregnant women screened for HIV(13). However, according to the national strategy plan 2021 - 2025, the prevalence of HIV among young women aged 15–24 years was 1.28%, of which those aged 20 to 24 years were the most afflicted (14). Their vulnerability was a result of limited access to economic opportunities, cultural norms and values, low awareness of sexual and reproductive health, etc. (7).

Furthermore, identifying HIV determinants will greatly inform HIV responses. Numerous studies have suggested that sociodemographic, economic status, knowledge factors, risky sexual behaviors, sexually transmitted infection, etc, are essential predictors of HIV testing among youth (15-17). Therefore, from the GDHS 2019/2020, the researcher identified the specific HIV determinants that may influence young women's decision to opt for HIV testing. In order to examine the percentage of HIV testing

and determine its association with sociodemographics, knowledge about vertical transmission, and risky sexual behaviors.

However, from reviewing the latest Gambia Demographic Health Survey (GDHS) dataset 2019/2020, the aged 15 to 24 years were chosen to represent y the population of young women. Therefore, our research utilized information from the survey report to identify risk factors that influence young women to opt for HIV testing, examine its percentage and association with independent variables, and assess their knowledge about the prevention of mother-to-child transmission (PMTCT). Knowing your HIV status also enables people to make informed decisions about HIV prevention options (18). Thus, this study will address achieving the 95%-95%-95% policy of UNAIDS and SDG 3.3 towards eradicating vertical transmission and supporting young mothers to have planned and safe pregnancies (19). Research on HIV testing among young women was conducted in The Gambia and beyond. However, no studies were found that specifically identified determinants of HIV testing among young women aged 15 to 24 years; also, limited research explored the determinants and vulnerability towards HIV testing.

METHODOLOGY

Study Design and Data Source

The study used secondary data analysis from the latest nationally representative survey conducted by The Gambia Bureau of Statistics (GBoS) and the Ministry of Health, funded by the United States Agency for International Development. The open-source dataset was accessed following an online request at the World DHS portal by submitting an abstract and official letter to GBoS; this was granted through replied letters from Inner-City Fund (ICF) and GBoS.

The survey was conducted using stratified sampling, which was selected in two stages. Enumeration Areas (EAs) were chosen in the first stage with a probability proportional to their size within each sampling stratum. A total of 281 EAs were selected. The households were systematically sampled in the second stage, in which a household listing operation was performed in all the selected clusters. The resulting lists of households served as the sampling frame from which a fixed number of



25 households were systematically selected per cluster, resulting in a total sample size of 7,025 selected households. Results from this sample were representative at the national, urban, and rural levels (20). Interviews were open to all women aged 15 to 49 who were either long-term residents of the chosen household or guests who spent the night before the survey. Men between the ages of 15 and 59 were also interviewed in half of the chosen households. Additionally, biomarker tests were conducted in the household where men were chosen for interviews(20).

In this research, our unit of analysis was young women aged 15 to 24 years who self-reported HIV testing during the survey. A population of 3,757 participants was extracted from the dataset, which was coded and cleaned 1562 missing cases.

Variables

The dependent variable (ever been tested for HIV) and independent variables (sociodemographic, knowledge about HIV, and sexual risky behaviors/sexual transmission infection) were selected for reviewing various literature.

The dependent variable used in our study is a binary outcome; it is coded as no for 0 and yes for 1. These responses were selected based on the literature reviewed (17, 20-24), etc. HIV testing was self-reported.

The explanatory variables were identified as follows: sociodemographic (age (1=15-19, 2=20-24), marital status (0=unmarried, 1=married), and educational level (0=no education, 1=primary, 2=secondary, 3=tertiary). Prevention of mother-to-child HIV transmission has three critical control points: prevention during pregnancy, delivery, and breastfeeding. The vertical transmission was rated as mentioning less than three points, considered 1= low, while mentioning all the points, rated 2 = high. The Risky Sexual Behavior (RSB) was observed as age at first sex with responses (0 = not hard sex, 1 = <18 years, and 2 = ≥ 18 years). Followed by having multiple sexual partners in the last 12 months (0 = no, 1 = yes). History of STIs in the previous 12 months before the survey was observed (0 = no, 1 = yes).

Statistical Analysis

The categorical variables were analyzed using frequency and percentage, supported by inferential statistics, and observed if numerical data were nonnormally distributed by testing with Shapiro-Wilk or Kolmogorov-Smirnov. Bivariate analysis investigated the association between each predictor variable and the dependent variable (HIV testing). The variable with a significant level at $p < 0.05$.

Multiple Logistic Regression was used to investigate the magnitude and direction of association between the potential predictor among the independent variables and the dependent variable. The variables with a p -value of < 0.20 in simple logistic regression were included to determine further the association with HIV testing for the regression analysis model. The significant level for the analysis was $\alpha=0.05$. The odds ratio (OR) with a 95% confidence interval (95% CI) was used to present the results, with the support of SPSS version 28.

Ethical Consideration

Permission was sought from the following institutions (ICF & GBoS) to access the GDHS 2019/2020 dataset in May 2024. Ethical approval of the research topic was obtained from the Research Ethics Review Committee for Research Involving Human Subjects regulations of the Review Boards of the Ethical Committee.

RESULTS

Sociodemographic Characteristics, Knowledge of PMTCT and RSB/STI

As shown in Table 1, the characteristics of the participants were analyzed among 3757 sexually active young women aged 15 to 24 years with a mean age of 21.9. The age groups were slightly different in percentage, of which more than half (52.9%) of participants were adolescents aged 15 – 19. More than half (56.1%) of respondents were unmarried, and the majority (53.0%) attained secondary education, an indicator determining one awareness of PMTCT stages. Less than three-quarters (66.8%) of the respondents asserted that HIV is preventable from mother to child during pregnancy, delivery, and breastfeeding. Our paper stated that 23.8% had engaged in a sex debut before reaching eighteen years old, but among the young women, only 0.1% had



multiple sexual partners. It is impressive that 71.7% of the participants had no sexual

experience, and only 0.7% reported a history of STI.

Table 1: Frequency Distribution of Sociodemographic Knowledge about PMTCT and Risky Sexual Behaviors (N=3,757)

Variables	Number	Percent
Sociodemographic		
Age of respondents		
15-19	1,989	52.9
20-24	1,768	47.1
Marital Status		
Unmarried	2106	56.1
Married	1651	43.9
Educational Level		
No education	913	24.3
Primary	652	17.4
Secondary	1990	53.0
Tertiary	202	5.4
Knowledge about PMTCT		
HIV transmitted during pregnancy		
Incorrect	563	15.0
Correct	3194	85.0
HIV transmitted during delivery		
Incorrect	828	22.0
Correct	2929	78.0
HIV transmitted by breastfeeding		
Incorrect	489	13.0
Correct	3268	87.0
Overall PMTCT		
Low	1173	31.2
High	2584	68.8
Risky Sexual Behaviours/STI		
Age at first sex		
Not had sex	2693	71.7
<18 years	893	23.8
≥ 18years	171	4.6
Had multiple sexual partners in the last 12 months		
No	3752	99.9
Yes	5	0.1
Had any STI in the last 12 months		
No	3729	99.3
Yes	28	0.7

The association between Ever been tested for HIV and Sociodemographic Knowledge of PMTCT and RSB/STIs

As highlighted in **Table 2**, This section presents an estimate of 71.8% of participants screened for HIV, while more than a quarter (28.2%) of the population did not know their HIV status. Furthermore, HIV testing was more

(88.4%) common among adolescents aged 15 – 19 years than those in the older age group with a highly statistically significant ($\chi^2 = 445.86$, $df = 1$, $p = < 0.001$). Among those who were unmarried, 90.6% opted for the test, highlighting highly statistically significant ($\chi^2 = 839.74$, $df = 1$, $p = < 0.001$). Notwithstanding, HIV testing was also highly statistically



significant ($\chi^2 = 204.69$, $df = 3$, $p = <0.001$) at the education level, registered 81.4% at the secondary level. The overall knowledge about vertical transmission shows a highly statistically significant ($\chi^2 = 9.142$, $df = 1$, $p = 0.002$) with HIV testing with 75.1% at lower knowledge. According to our analysis, the uptake of HIV testing was higher among participants who had no sexual experience

(83.7%). Nearly half (42.7%) of the participants experienced a sexual debut <18 years, and highly statistically significant ($\chi^2 = 666.06$, $df = 2$, $p = <0.001$) reported. Statistically, more than a quarter of young women with a history of STIs underwent HIV screening but showed highly statistically significant ($\chi^2 = 21.93$, $df = 1$, $p = <0.001$) with HIV testing.

Table 2: The association of HIV testing between sociodemographic, Knowledge about PMTCT, and Risky Sexual Behaviours (N=3,757)

Variables	Ever been tested for HIV, N (%)		Chi-Square (χ^2)	P-value
	No 1,059(28.2)	Yes 2,698(71.8)		
Sociodemographic				
Age of respondents (Years)			445.862	<0.001*
15-19	270 (13.6)	1719 (86.4)		
20-24	789 (44.6)	979 (55.4)		
Marital Status			839.737	<0.001*
Unmarried	197 (9.4)	1909 (90.6)		
Married	862 (52.2)	789 (47.8)		
Educational Level			204.688	<0.001*
No education	391 (42.8)	522 (57.2)		
Primary	229 (35.1)	423 (64.9)		
Secondary	371 (18.6)	1619 (81.4)		
Tertiary	68 (33.7)	134 (66.3)		
Knowledge about PMTCT				
HIV transmitted during pregnancy			2.418	0.12**
Incorrect	174 (30.9)	389 (69.1)		
Correct	885 (27.7)	2309 (72.3)		
HIV transmitted during delivery			3.837	0.05**
Incorrect	211 (25.5)	617 (74.5)		
Correct	848 (29.0)	2081 (71.0)		
HIV transmitted by breastfeeding			17.814	<0.001*
Incorrect	177 (27.0)	312 (63.8)		
Correct	882 (27.0)	2386 (73.0)		
Overall PMTCT			9.142	0.002*
Low	292 (24.9)	881 (75.1)		
High	767 (29.7)	1817 (70.3)		
Risky Sexual Behaviours/STI				
Age at first sex			666.058	<0.001*
Not had sex	439 (16.3)	2254 (83.7)		
<18 years	512 (57.3)	381 (42.7)		
≥ 18years	108 (63.2)	63 (36.8)		
Had any STI in the last 12 months			21.932	<0.001*
No	1040 (27.9)	2689 (72.1)		
Yes	19 (67.9)	9 (32.1)		

- Chi-square test, - Significant at P-value < 0.05*



Multivariable logistic regression of Ever being tested for HIV and Sociodemographic Knowledge on PMTCT and RSB/STI

After adjusting for confounders (age, marital status, known on PMTCT and RSB/STI) (16, 21, 25), **Table 3** shows adolescents aged 15 – 19 years are 67% less likely to be screened for HIV compared to the older age of young women (AOR = 0.33, 95% CI = 0.28 – 0.40). However, at the chi-square level, the age of adolescents opted for HIV testing more than the older age with highly statistically significant ($p = <0.001$). However, the unmarried were more likely (AOR=4.98,

95% CI: 4.16-5.96) to test for HIV than those living with their spouse(s). The participants having no formal education (AOR= 2.35, 95% CI: 1.75 - 3.15) had the highest odds of being tested for HIV. Likewise, young women with low knowledge of overall PMTCT were 1.8 times more likely to be tested than those with high-level knowledge of PMTCT. Furthermore, those with a history of STI (AOR = 2.67, 95% CI = 1.50 - 4.77) were more likely to opt for HIV testing. Interestingly, young women who never had sex were 2.6 times more likely to be tested compared to those ≥ 18 years (AOR = 2.60, 95% CI = 2.00 - 3.39).

Table 3: Multivariate analysis of Dependent and Independent Variables (N=3757)

Variables	Model 1		Full and Final Model	
	Unadjusted Odds Ratio	95% CI Lower - Upper	Adjusted Odds Ratio	95% CI Lower - Upper
Sociodemographic				
Age of respondents (Years)				
15-19	5.131	4.377 - 6.015	0.334	0.279 - 0.400
20-24	Ref			
Marital Status				
Unmarried	10.587	8.882 - 12.619	4.976	4.157 - 5.956
Married	Ref			
Educational Level				
No education	0.677	0.492 - 0.933	2.35	1.754 - 3.149
Primary	0.937	0.672 - 1.308	1.894	1.396 - 2.569
Secondary	2.215	1.62 - 3.028	1.926	1.473 - 2.519
Tertiary	Ref.			
Knowledge about PMTCT				
HIV transmission during pregnancy				
Incorrect	0.86	0.71 – 1.04	1.45	1.04 – 2.03
Correct	Ref.			
HIV transmission during delivery				
Incorrect	1.19	1.00 – 1.42	1.91	1.32 – 2.78
Correct	Ref.			
HIV transmitted during breastfeeding				
Incorrect	0.642	0.553 - 0.744	0.379	0.298 - 0.481
Correct	Ref.			
Overall PMTCT				
Low	1.274	1.089 - 1.490	1.803	1.492- 2.178
High	Ref.			
Risky Sexual Behaviours/STI				
Age at first sex				
Not had sex	8.802	6.346 - 12.208	2.601	1.997 - 3.387
<18 years	1.276	0.91 - 1.788	1.102	0.846 - 1.436



Variables	Model 1		Full and Final Model	
	Unadjusted Odds Ratio	95% CI Lower - Upper	Adjusted Odds Ratio	95% CI Lower - Upper
≥ 18years	Ref.			
Had any STI in the last 12 months				
No	5.458	2.462 - 12.103	2.677	1.504 - 4.765
Yes	Ref.			

- Logistic regression, - CI = Confident Interval, Binary regression

DISCUSSION

Knowing one's HIV status is the first step in ensuring the timely initiation of treatment. This intervention will substantially reduce the spread of HIV and related mortalities. Thus, one of the objectives to end the AIDS epidemic by 2030 may not be achievable if young women living with HIV have their status unknown.

The prevalence of HIV testing among sexually active young women is 71.8%, which is closer to the UNAIDS 2025 target; 95% of young women aged 15 – 24 years should know their HIV status (26). The age of participants was associated with testing and was consistent with the research conducted (21, 27, 28). Social behaviors and determinants in Sub-Sahara Africa could influence these results. As age is a replica of human developmental stages, adolescents aged 15-19 years had a lower likelihood of being screened for HIV compared to their counterparts. These aligns with other studies (25, 29), but at the association level, the adolescent opted for testing more than the older age (20-24). Perceived risky sexual behaviors, non-habituation of HIV-related risks, and youth-friendly HIV testing services could influence this result.

Furthermore, the educational level was positively associated with HIV testing. Young women with no education, primary and secondary, have higher odds of HIV screen than those with tertiary education. Non-educated participants were 2.3 times more likely to test for HIV than those educated. These findings could be because of effective community sensitization on sexual and reproductive health related to HIV/AIDS, adequate trust, and adherence to healthcare services in public health facilities, which non-educated and poor people commonly use. Continuous exposure to HIV and STI prevention and transmission information and services, cervical cancer and

STI screening, and fear of not knowing their HIV status may influence the decision of HIV testing among non-educated young women. Also, being educated could serve as a protection factor, which may delay many young women from opting for HIV testing. At the association level, it reported noneducation (57.2%) primary (64.9%) and tertiary education (66.3%) of HIV coverage, highlighting an increased uptake of HIV testing at the secondary educational level (81.4%). Moreover, our study has similar findings (16, 17, 30, 31), which show a higher likelihood of HIV testing among educational levels.

According to UNICEF, PMTCT programs were not sufficiently tailored to address the specific treatment, care, support, and sexual reproductive health needs of young women (32). Based on program intervention and research, it has been identified as the most effective intervention for HIV response among children. An informed knowledge of PMTCT is a prerequisite for informed decisions among young women. Our finding asserted that overall, PMTCT is significantly associated with HIV testing. However, participants who responded to ≤ 2 preventive stages of PMTCT are 80.3% more likely to be tested. Our finding aligns with UNICEF's estimate of PMTCT coverage (80%) in 2020 (32). Finally, this study revealed that a history of STIs is significantly associated with HIV testing. It further asserted that participants who had no history of STIs were 2.8 times more likely to test for HIV compared to those who experienced STIs in the 12 months. This phenomenon could be a result of adequate health-seeking behaviors and regular going for cervical cancer screen and reproductive health counseling among non-infected young women in health facilities. Also, the perceived risk of HIV burden and stigma exposure, poor confidentiality, and attitudes by healthcare professionals toward young women



with positive STIs may delay their decision to opt for HIV screening (21, 23, 33). Our finding is not in line with most of the studies conducted in SSA, for example, in The Gambia and Ghana (21, 34). Notwithstanding, HIV testing is by choice and informed decision through proper HIV counseling among young women. As sex is not the only route of HIV transmission, young women who might be exposed to the virus through the use of injected drugs, sharing sharps and needles, and having comprehensive knowledge of PMTCT may increase the odds of HIV testing. As the saying "You cannot know HIV by looking."

STRENGTHS AND LIMITATIONS

This study reported national representative findings from the late national representative survey in 2019/2020. Our study provides much-needed data for strategic planning and programming to specifically identify determinants and may increase the uptake of HIV testing among young women in The Gambia.

HIV testing was self-reported, an event that participants can recall. Considering age and time, under-reporting past sexual history may have led to recall bias. Sexual behaviors and HIV testing are sensitive issues rarely discussed among young women. Thus, under-reporting of sensitive topics or over-reporting of insensitive topics may have incurred response bias.

CONCLUSION

The study findings indicate that young women with lower education levels, unmarried status, sexual inactivity, and history of STIs were more likely to undergo HIV testing, potentially influenced by general awareness of the HIV burden and social and financial risk protection and women empowerment in reproductive and child health. The participants with a history of STIs should be sensitized on the dangers of STIs in relation to reproductive health and HIV. Also, healthcare service providers should properly conduct HCT during STI clinics to increase confidence in HIV service delivery. Young women are more vulnerable due to social, biological, and behavioral factors, but early and effective implantation tests and treatment policies will enhance long life and well-being among young women living with HIV (18, 35). Our findings recommend targeted awareness campaigns,

improved access to HIV testing through integration with health programs (e.g., family planning, cervical cancer/STIs screening, etc.), and promote HIV self-testing to increase HIV testing coverage among young women aged 15-19 years who had 67% less likely to be tested for HIV. , As HIV testing enhances the prevention of new infections and treatment and determines the attainment of the last two UNAIDS 95% policies in The Gambia and the globe at large

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UX DESIGN FOR A MOBILE APPLICATION IN THAI HEALTHCARE: A DIGITAL SOLUTION FOR ELDERLY CARE

Jaruwan Thongbai¹, Nantika Prinyapol^{1*}, Supakpong Jinarat¹

¹College of Innovative Technology and Engineering, Dhurakij Pundit University, Bangkok 10210, Thailand.

*Corresponding Author: Nantika Prinyapol, College of Innovative Technology and Engineering, Dhurakij Pundit University, Bangkok 10210 Thailand. E-mail: nantika.pri@dpu.ac.th

ABSTRACT

Introduction: Thailand's aging population and declining birth rates challenge healthcare accessibility for elderly individuals with limited family support. Traditional elder care values clash with modern systems, complicating appointments, transportation, and in-hospital procedures. This study aims to develop and evaluate a mobile application to enhance healthcare access and navigation for Thailand's elderly.

Methodology: We conducted surveys and interviews with registered nurses, patient companions, and elderly users at four hospitals to identify pain points in healthcare navigation and appointment management. Insights led to the development of a mobile application using turn-by-turn navigation and user-friendly design principles. The development utilized Kotlin for Android, Firebase for backend support, and Google Map API for navigation. Our iterative UX/UI design process ensured ease of use for individuals with limited technological literacy. Testing showed improvements in appointment scheduling, user satisfaction, and reduced caregiver burden. Key features include appointment scheduling, transportation assistance, in-hospital guidance, and real-time updates.

Results: The UX design prioritized creating an intuitive user journey for elderly users and their caregivers. The application is designed to be user-friendly for elderly individuals who may use smartphones independently or with assistance from family members or caregivers. Feedback loops and iterative testing were integral to enhancing usability and accessibility, ensuring a seamless experience that promotes independence and confidence. Notably, this type of application, which integrates hospital navigation and ease of use, is not yet available in existing hospital-linked applications. The system also adapts to variable patient treatment times depending on their condition.

Conclusion: This mobile application addresses the unique challenges faced by Thailand's aging population, improving healthcare accessibility and reducing caregiver burden. It is pioneering in its integration with hospital processes, a feature not present in existing applications. This study advances digital health solutions tailored for elderly care. Further studies are recommended to assess the customization of individual healthcare systems.

Keywords: Elderly Care, UX Design, Mobile Application, Thai Healthcare, Digital Health Solutions

INTRODUCTION

Thailand is experiencing a demographic shift with a rapidly growing elderly population, expected to rise from 19% in 2021 to 31.44% by 2050 (1). This shift challenges the healthcare system, which is already strained by resource limitations and increasing demands for elderly care. The traditional value of filial piety further complicates the situation, as modern families

struggle to balance caregiving with professional responsibilities.

Elderly individuals in Thailand face barriers in accessing healthcare, including transportation, mobility, and technological literacy issues. Overcrowded state hospitals exacerbate these challenges, leading to long wait times and fragmented healthcare information systems (2, 3). Additionally, in-hospital navigation is difficult for the elderly,



who may have visual, auditory, and physical impairments.

This study proposes a user-friendly mobile application specifically designed for elderly users to address these issues. The app features turn-by-turn navigation for easy movement within hospitals, simplified appointment scheduling, and improved caregiver communication and coordination (4, 5). By focusing on user experience and user interface design (UX/UI) principles, the application aims to provide an intuitive interface that meets the unique needs of elderly users, enhancing their healthcare experience and reducing caregiver burdens (4).

Effective UX/UI design (6) is crucial, ensuring the app is functional and easy to use for elderly individuals who may not be tech-savvy. Features such as large buttons, clear fonts, and simple navigation paths are essential. Real-time turn-by-turn navigation can alleviate stress associated with navigating complex hospital environments, improving the overall healthcare experience for both the elderly and their caregivers.

Globally, definitions of the elderly vary, with the UN defining "older person" as individuals aged 60 and above, while developed countries often consider those aged 65 and above as elderly. In Thailand, the Elderly Act of 2003 defines elderly as anyone aged 60 and above with Thai nationality (7). The UN categorizes aging societies into three stages: 'aging society' (over 10% of the population aged 60+), 'aged society' (over 20%), and 'super-aged society' (over 20% aged 65+).

Addressing the healthcare needs of the elderly in Thailand is essential. Providing close medical attention, timely check-ups, and treatments can alleviate family burdens. The evolving family structure often leads to elderly individuals relying on self-care or spousal support (8). Educating caregivers on health maintenance is crucial, as is providing daytime elderly care services and proactive healthcare measures. Consequently, elderly care will become increasingly important in Thailand.

The primary objective of this study is to develop an integrated mobile application to enhance healthcare accessibility and navigation for the elderly in Thailand, aiming to bridge gaps in healthcare services and improve health equity.

1. Design and develop a User-Friendly Mobile Application: Create an application tailored to the specific needs of elderly users, incorporating features that enhance usability, accessibility, and personalization.

2. Enhance Healthcare Navigation for the Elderly: Improve navigation and user experience in hospital services through a communication app with features like appointment scheduling, in-hospital wayfinding and integrate real-time queue management.

Elderly Transportation Issues

Pattaraphon Thipyasothon et al. (9) conducted a comprehensive study on the transportation issues faced by the elderly in Bangkok, using quantitative and qualitative methods. The research highlighted that health-related activities are the primary reason for elderly travel, with most relying on relatives for transportation. The study suggests developing systems to improve accessibility to health services by considering various factors affecting elderly mobility, thus facilitating easier and more convenient access to healthcare.

Nawarat Waichomphu and Nooriya Latteke (10) explored the expansion of health businesses to support Thailand's aging society. Their research suggests that understanding physical, mental, and social changes in the elderly is crucial for planning and managing healthcare businesses. They proposed guidelines for various health-related businesses, emphasizing the importance of a service-oriented approach to enhance the quality of life for the elderly.

Elderly UX/UI Design

Wichapon Ketchaikoson's (11) study focused on determining the optimal button sizes for mobile applications tailored for the elderly. By testing different button sizes with 30 elderly participants, the study found that a 50-pixel button size was most suitable, taking less than one second to press. This research underscores the importance of UI design in enhancing usability for elderly users, providing critical insights for designing accessible mobile applications.

Natcha Paprom (12) developed an application aimed at preparing individuals for elderly life, focusing on physical changes and



health practices. The application design emphasized usability, featuring serif fonts of 14 points or larger, avoiding pull-down menus, and utilizing vertical and horizontal scrolling. User satisfaction was high, indicating the effectiveness of these design principles in meeting the needs of elderly users.

Real-Time Directions

Relevant research in UX design for mobile applications in Thai healthcare focuses on enhancing elderly care through digital solutions. Modern hospital navigation systems use advanced technologies like indoor positioning and digital mapping to provide real-time directions and improve patient experiences. These systems, offered by companies like Mappedin and Pointr, often include QR code integration for touchless navigation and cloud-based updates for seamless movement within hospital environments (13, 14).

For elderly care, mobile health applications (mHealth) play a crucial role. These apps enable health monitoring, diagnostics, and management via smartphones and wearables, ensuring timely medical interventions and continuous health monitoring (14).

Mobile Health Apps

The current development of applications for elderly transportation to hospitals has significantly increased, encompassing both mobile and web applications. This study focuses on analyzing the usage patterns of similar applications to understand the behaviors of both service users and providers. There are hospital transport services such as:

- *Zeedoctor* (15) A web application providing patient and elderly care services at home and hospitals, including transportation to medical appointments. Users must register, with two types of accounts: service recipients and partners. The service fee is 1,200 THB for eight hours.
- *BMA Doctor* (16) An application offering free hospital transportation services for wheelchair-bound elderly or disabled individuals within Bangkok, requiring advance booking.

The service is exclusive to those with appointments at Bangkok's hospitals.

These studies collectively highlight the necessity of user-centered design in developing healthcare applications for the elderly. Thipyasothon et al. emphasized improving mobility and access to healthcare, Ketchaikoson provided insights on UI design specific to the elderly, Paprom demonstrated effective UX design for health applications, and Waichomphu and Latteke discussed business models catering to an aging population. Together, they underscore the importance of tailored digital solutions in addressing the unique needs of elderly users in healthcare settings.

METHODOLOGY

The development of a mobile navigation application for elderly hospital patients applies key UX/UI principles to meet their specific needs. The interface features large, recognizable buttons, minimalistic layouts, high-contrast text, and scalable fonts for readability (4, 5). The navigation includes straightforward, turn-by-turn directions with clear visual cues (17), touch-friendly elements with ample spacing, and mechanisms for error prevention and recovery (18). Customization options and voice guidance ensure accessibility, enhancing the hospital experience for elderly users.

Data Collection

The initial phase involved a comprehensive survey within hospital premises to understand existing procedures and navigation challenges faced by elderly patients. Observations and interviews with nursing staff revealed the need for a user-friendly application tailored to elderly users, who often require assistance from caregivers. A literature review was conducted to gather relevant data and theoretical frameworks.

Program Development

The application was designed to prioritize simplicity and usability (18). Features included high-contrast text, scalable fonts, intuitive navigation cues, and ample spacing between touch elements to prevent accidental inputs. The development phase included unit testing to ensure functionality. Real user testing



followed, providing valuable feedback for iterative refinements. Customization options for text size and contrast, along with voice guidance, were particularly emphasized to enhance accessibility.

Implementation and Testing

Following development, the application underwent extensive testing with real users. Feedback was collected to refine the design further. Ethical considerations were maintained throughout, ensuring no personal or medical data were collected, thereby preserving privacy and complying with ethical standards. The research focused on understanding the operational workflow and typical contact points within the hospital, such as blood tests before consultations, without interfering with medical treatments.

This study's methodological rigor ensured the development of a reliable application that significantly improves hospital navigation for elderly patients. By focusing on their specific needs, the app enhances independence and ease of use in complex hospital environments. With Thailand's aging population and frequent hospital visits burdening families, this application allows elderly individuals to navigate hospitals independently or with caregiver assistance, reducing reliance on relatives. This solution not only promotes autonomy for elderly patients but also alleviates the caregiving burden on families, ensuring a more efficient and user-friendly healthcare experience.

Insights and Application Design

Preliminary walkthroughs and data collection revealed that elderly patients face navigation and queue management challenges in hospitals due to complex layouts, unclear signage, and inconsistent queue systems. Many rely on relatives for assistance, highlighting the need for an autonomous solution. The mobile application addresses these issues with a turn-by-turn navigation system, simple and intuitive UI, voice commands, and large text. Integration with the hospital's queue management system provides real-time updates, enhancing the user experience. This understanding guides the design and testing phases, ensuring the app meets elderly patients' needs. The next section discusses the conceptual frameworks and UX principles used.

Conceptual Framework

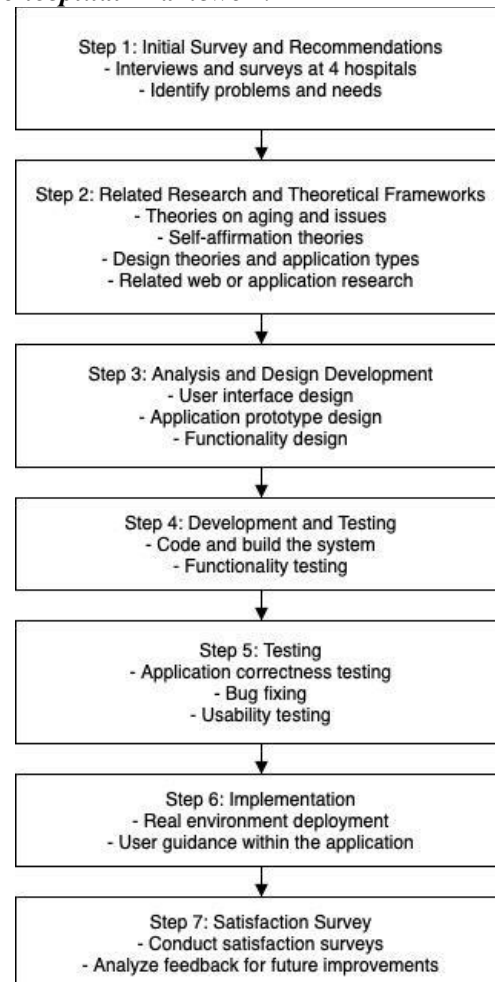


Figure 1: Research Conceptual Framework

The research design, conducted over 12 months, involves seven steps (Figure 1).

1. *Initial Survey and Recommendations* (Months 1-2) Interviews and surveys at four hospitals to identify problems and needs.

2. *Related Research and Theoretical Frameworks* (Months 3-4) Examining aging theories, self-affirmation, design theories, and related applications.

3. *Analysis and Design Development* (Months 5-6) Focus on UX/UI design for simplicity and accessibility.

4. *Development and Testing* (Months 7-8) Coding, building the system, and functionality testing.

5. *Testing* (Month 9) Application correctness, bug fixing, and usability testing.



6. *Implementation* (Month 10)
Deploying the application and providing user guidance.

7. *Satisfaction Survey* (Months 11-12)
Gathering and analyzing user feedback for future improvements.

Initial Survey: Walkthrough and Data Collection

This study begins with a comprehensive exploration of the challenges faced by elderly patients in hospital settings.

The primary aim is to gather firsthand insights through direct observations and initial interviews with hospital staff and patients.

The research team conducted preliminary walkthroughs in four hospitals (Chao Khun Phai Boon Hospital, Makara Kasem Hospital, Taksin Hospital, and Vajira Hospital). Each hospital provided unique insights into the intricacies of patient navigation and care processes for the elderly as shown in Table 1.

Table 1: Walkthrough survey

Hospital	Patients Without Appointments	Patients With Appointments
Chao Khun Phai Boon	Eligibility verification, queue card issuance, medical history taking, medication collection; inconsistent queuing due to prescription complexities	Blood testing before consultation; challenges with navigation and unattended elderly
Makara Kasem	Eligibility verification, medical history taking, vital sign measurement, consultation	Streamlined process; confusion from unclear signage and multiple medication dispensing locations
Taksin	Blood pressure measurement, preliminary medical history taking, eligibility verification, document submission at internal medicine	Similar steps with direct progression to appointment department; complexity in navigating multiple departments
Vajira	Initial screening, blood pressure and weight measurement, registration, new patient history form filling	Automated kiosk registration; challenges with multiple buildings and unclear signage

Key findings reveal that elderly patients struggle with complex hospital layouts, unclear signage, and variable queue management systems. Many rely on memory or staff instructions and depend on relatives for navigation and appointment management, indicating a need for a more autonomous system.

System Analysis and Design

We gathered and analyzed data to plan and develop a system that meets user needs. The data analysis identified required system functions, leading to the creation of application design and visualization. Developers then created wireframes to outline the necessary information for each page.

A Use Case Diagram, as shown in Figure 2, illustrates the interactions between various users (elderly people, caretakers, and

external service providers) and the system's functionalities. The diagram highlights key activities such as appointment scheduling, navigation assistance, queue management, and communication with caregivers, enhancing the hospital experience for elderly patients. The actors are:

1. Elderly People or General Users

- Schedule appointments with caregivers independently, facilitating medical visits without relying on relatives.
- Contact caregivers and view their details.
- Monitor status and follow hospital procedures.
- Check queue status for doctor visits.
- Navigate within hospitals.
- View medication and caregiver appointment history.



- Make emergency calls.
- 2. Caretakers
 - Accept work assignments.
 - View appointment details.
 - Update hospital procedure status.
- Input receipt and medical report information.
- 3. External Service Providers
 - Send SMS OTP for identity verification.

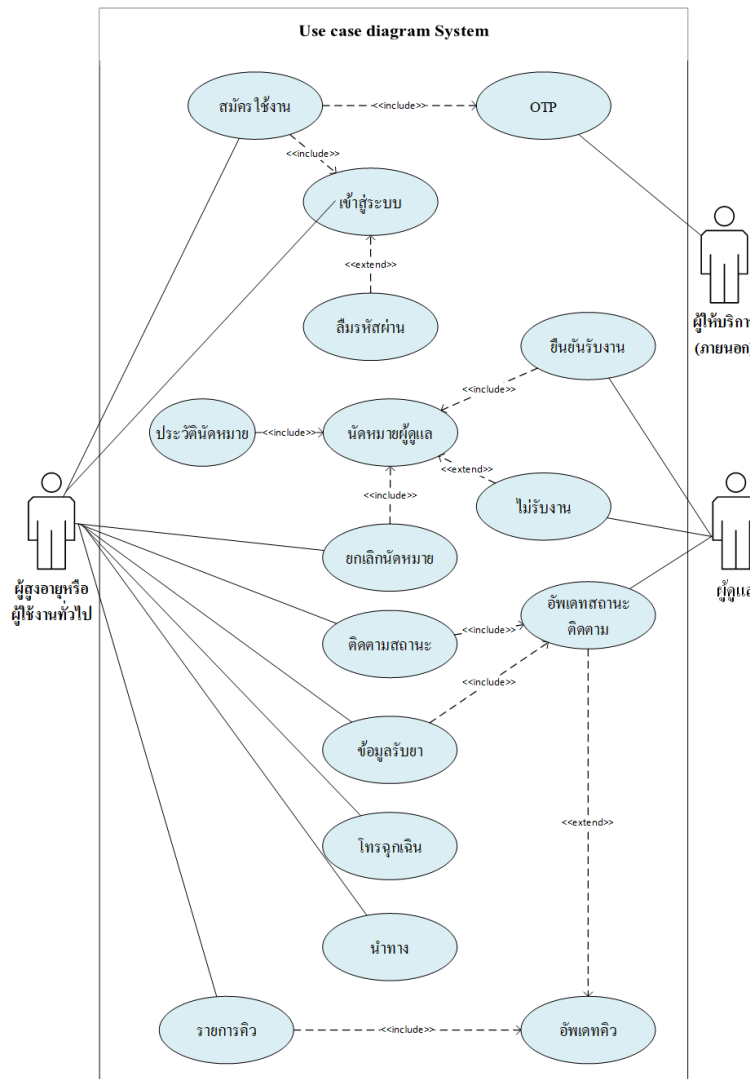


Figure 2: Use Case Diagram of the Mobile Application for Elderly Healthcare Navigation

The development utilized Kotlin for Android, Firebase for backend support, and Google Map API for navigation, ensuring robust functionality and seamless user experience. This combination allows for

efficient real-time data handling, reliable backend services, and accurate, user-friendly navigation, making it highly suitable for elderly healthcare applications.



RESULTS

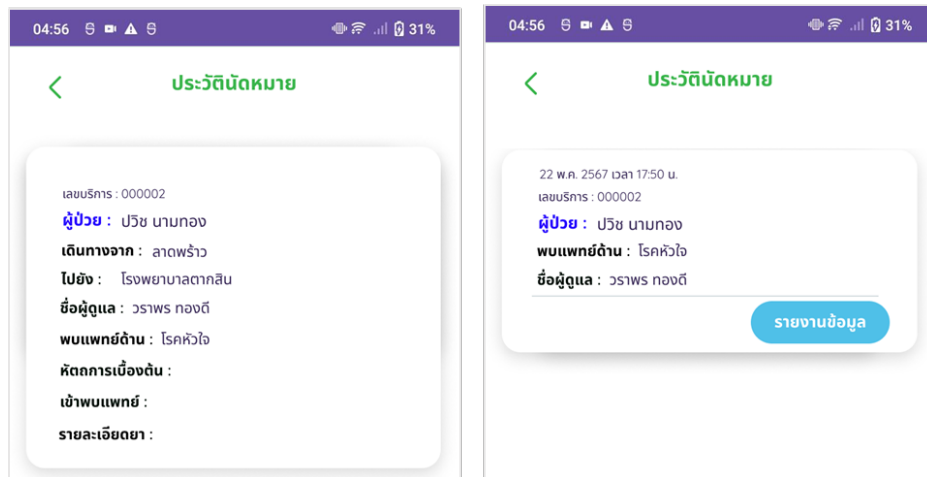


Figure 3: Appointment History Interface

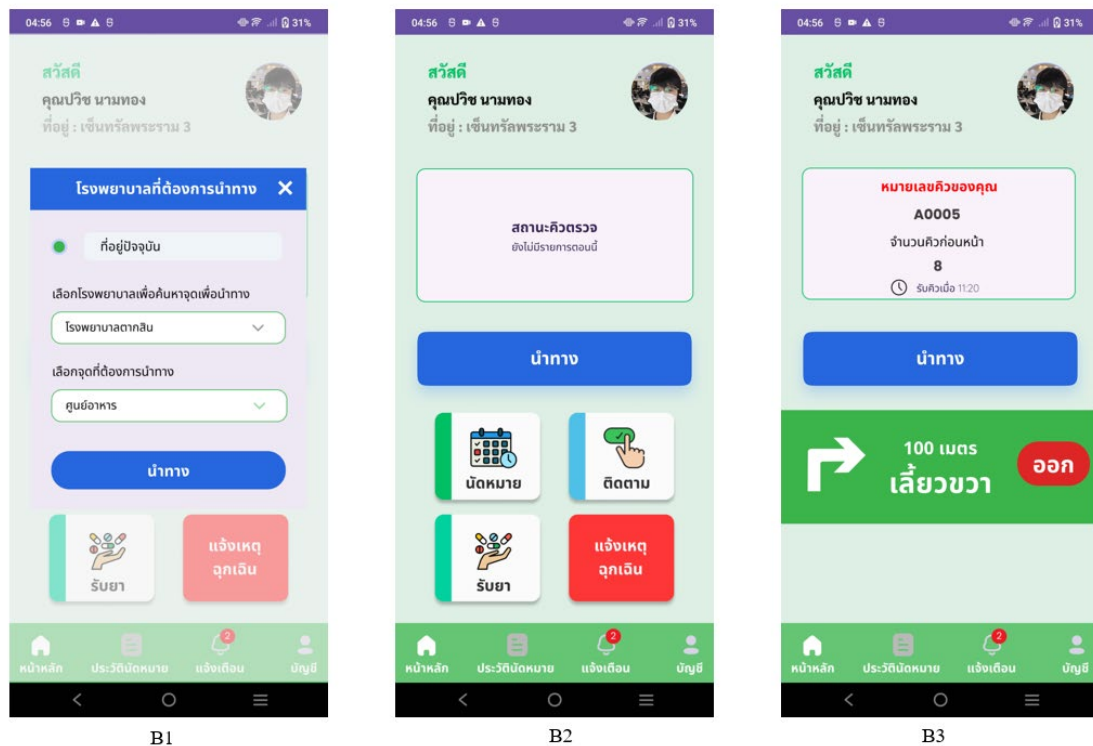


Figure 4: User Interface Screens of the Elderly Healthcare Navigation App

Figure 4 displays three user interface screens from the elderly healthcare navigation application. The screen (B1) for selecting the hospital and navigation point, facilitating wayfinding within the hospital. The main screen (B2) showing appointment scheduling,

status tracking, and emergency reporting options. The navigation screen (B3) providing turn-by-turn directions within the hospital, including queue status and emergency exit options.

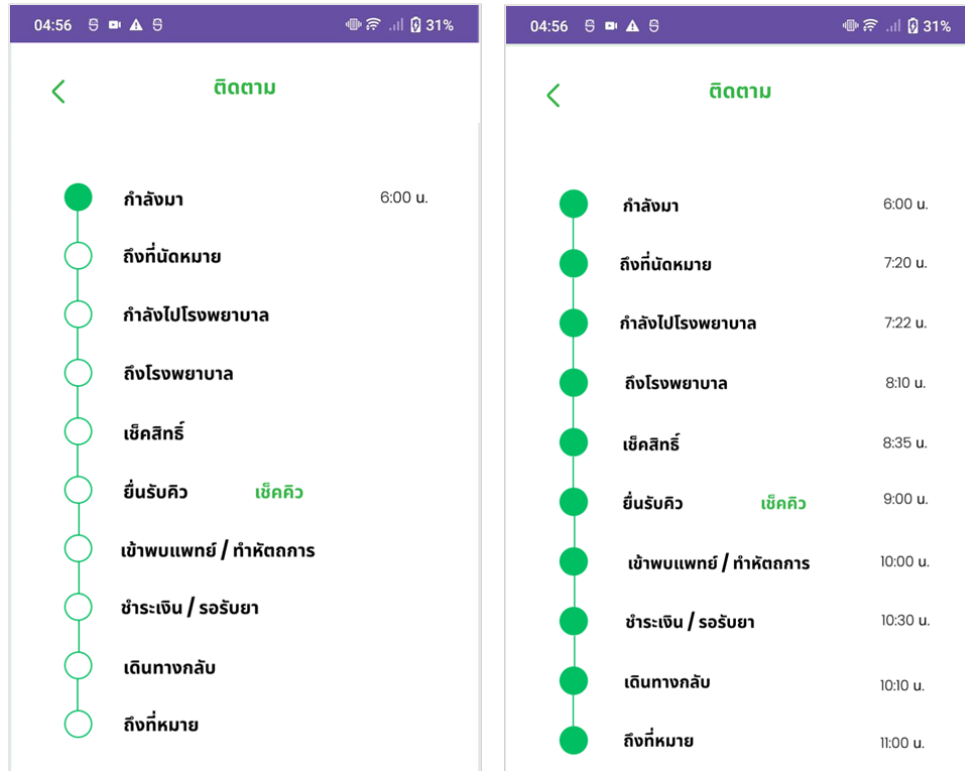


Figure 5: Status Tracking Interface of the Elderly Healthcare Navigation App

Figure 5 showcases the status tracking interface of the mobile application. It provides a timeline of the patient's activities and appointments, with time stamps for each step. This feature enables elderly users to follow their scheduled tasks and hospital visits efficiently, enhancing their overall healthcare experience.

RESULTS

The study identified key challenges in hospital navigation and queue management for elderly patients. User feedback on the mobile application prototype indicated high ease of use and effectiveness, with task completion rates and user satisfaction levels being statistically favorable. Thematic analysis of qualitative feedback highlighted the app's user-friendly design. Satisfaction evaluation, covering aspects like font size, color scheme, symbols, language accuracy, and processing speed, showed high satisfaction levels in both age groups (28-40 years: mean 4.14, SD 0.53; 60-70 years: mean 4.16, SD 0.44). Typically, hospital apps focus on external navigation or basic services, lacking turn-by-turn navigation within hospital premises. Our application uniquely integrates Google Maps API to

enhance in-hospital navigation, further improving elderly healthcare navigation.

CONCLUSION

The development and testing of our mobile application for elderly healthcare navigation have yielded promising results. Rigorous analysis and design produced an intuitive, user-friendly application. Testing with two age groups, 28-40 and 60+, involving 10 participants, indicated high satisfaction levels. Users praised the app's convenience and problem-solving capabilities, showing strong interest in real-world application due to its effective functionality.

Our findings have significant implications for elderly care and hospital navigation. The application addresses critical issues like navigating hospital environments and managing appointments, thereby enhancing the hospital experience for elderly patients. The integration of turn-by-turn navigation within hospital premises, powered by Google Maps API, distinguishes our app from existing solutions that typically offer only external navigation or basic services.

The study's limitations include a small sample size and specific hospital settings, which may affect generalizability. Future studies should include larger and more diverse



samples to validate these results. Despite these limitations, the potential impact on future healthcare technology and elderly care strategies is substantial. Our application meets research objectives by enhancing usability, accessibility, and personalization for elderly users. It significantly improves healthcare navigation with features like appointment scheduling, in-hospital wayfinding, and real-time queue management. This research underscores the importance of user-centered design in developing applications for elderly users, ultimately contributing to better healthcare outcomes and more efficient hospital operations.

RECOMMENDATIONS

Based on the research findings, practical recommendations include automating caregiver acceptance, adding a chat function for user-caregiver communication, and integrating navigation for caregivers. Users should be able to select preferred caregivers, and the app should support iOS for broader accessibility. This solution can help Thai hospitals by improving appointment management and navigation, reducing congestion and wait times. Private hospitals can offer it as a value-added service, while public hospitals can enhance efficiency. Future research should expand to diverse hospital settings, integrate additional health features, and adapt the app for other patient demographics.

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A CROSS-SECTIONAL SURVEY ON WILLINGNESS TO USE PRE-EXPOSURE PROPHYLAXIS (PrEP) AMONG INTERNATIONAL MIGRANT MEN WHO HAVE SEX WITH MEN (MSM) IN THAILAND

Pyae Phyo Kyaw¹, Seo Ah Hong¹, Mathuros Tipayamongkholgul¹, Bang-on Thepthien^{1*}

¹ASEAN Institute for Health Development, Mahidol University, Salaya, Nakhon Pathom 73170, Thailand

*Corresponding Author: Bang-On Thepthien, ASEAN Institute for Health Development, Mahidol University, Salaya, Nakhon Pathom 73170, Thailand, E-mail: bungon.the@mahidol.ac.th

ABSTRACT

Introduction: Both MSM and migrant populations had shown higher susceptibility to HIV infection. However, the intersection of these two groups—migrant MSM—is under-studied. Understanding the willingness to use PrEP among migrant MSM is crucial for expanding PrEP services to marginalized populations, aligning with the United Nations disease-specific target to end AIDS by 2030 under SDG goal 3.3.

Objective: This research explores the percentage of migrant MSM in Thailand who are willing to use PrEP and the factors influencing their willingness.

Methodology: A cross-sectional study was conducted with 296 participants recruited through respondent-driven sampling. The study scrutinized HIV risk behaviors, PrEP awareness and knowledge, stigma and attitudes towards PrEP, PrEP-related self-efficacy, and their influence on the willingness to use PrEP. Data was gathered via a self-administered online questionnaire and analyzed using SPSS version 25.

Results: In this study, 86.5% of the participants identified as men, with the rest identifying as transgender women and other genders. The majority (75%) identified as homosexual. PrEP willingness (defined as “definitely would use PrEP”) was reported by 52% of the sample and was associated with lower education (COR = 2.76; 95% CI = 1.50 - 5.05), Employment status (COR 2.44; 95% CI 1.2-4.96 for the unemployed group and COR 1.83; 95% CI 1-3.31 for the employed group), multiple sex partner (COR = 2.32; 95% CI = 1.43 - 3.76) engaging in chemsex (COR = 1.99; 95% CI = 1.20 - 3.26), substance abuse (COR = 2.49, 95% CI = 1.53 - 4.03), Perceived risk of HIV (COR 1.81; 95% CI 1.13 - 2.9) and positive attitude towards PrEP (COR 1.97; 95% CI 1.24 - 3.14).

Conclusion: We found that the overall willingness to use PrEP was high among migrant MSM living in Thailand, accompanied by good self-efficacy, moderate concern about stigma, and a slightly lower level of positive attitude.

Keywords: PrEP, Migrant MSM, HIV prevention, Thailand, Willingness to use PrEP

INTRODUCTION

Human Immunodeficiency Virus (HIV) continues to pose a persistent challenge, significantly impacting global public health since its identification in the early 1980s. Recent estimates indicate that nearly 39 million individuals worldwide are living with HIV. In 2022 alone, 630,000 people succumbed to HIV-related causes, underscoring the urgent need for comprehensive strategies to address the virus (1).

Individuals from key populations face significantly elevated risks of acquiring HIV

compared to the general population. In 2022, HIV prevalence among adults in the general population (aged 15–49 years) was 11 times higher among gay men and other men who have sex with men (MSM), four times higher among sex workers, seven times higher among people who inject drugs (PWID), and 14 times higher among transgender individuals (TG) worldwide (2).

The United Nations has set a disease-specific target to end AIDS by 2030 under SDG goal 3.3, which includes reducing the number of people newly infected with HIV per 1,000



uninfected population to 0.05 by 2025 and to 0.025 by 2030 (3). The World Health Organization (WHO) developed five prevention pillars to combat HIV, one of which is offering PrEP to population groups at substantial risk and experiencing high levels of HIV incidence (4).

As PrEP has been demonstrated to be safe and effective in numerous studies globally, the WHO first recommended oral PrEP in 2012 for HIV-negative partners within serodiscordant heterosexual couples (5), expanding this recommendation in 2015 to include key populations, including MSM (6). Thailand is one of several sites worldwide where a variety of PrEP clinical trials are underway. It is also a leading country in the Asia Pacific region in HIV prevention and treatment. Thailand's strategy to use key population-led services to combat stigma and discrimination issues in delivering HIV and PrEP programs has proven successful. Key population-led services were supporting 82% of PrEP users in Thailand just three years after the country legalized key provider-led PrEP (7). The number of PrEP users from key population-led programs has nearly doubled since the country moved to provide the services free of charge as part of its universal healthcare. Key population-led programs fill gaps in traditional HIV programming around accessibility, availability, acceptability, and quality, according to the Bangkok-based Institute of HIV Research and Innovation (IHRI). Because services like these are co-created with key populations, projects are located in areas with high need and offer stigma-free, comprehensive services. Using lay providers trained according to national standards, key population-led programs are also more likely to offer comprehensive, gender-sensitive services free of stigma and discrimination that can accompany care in more traditional settings. In 2023, new PrEP policy changes have restricted the capabilities of KP-led services to prescribe or stock PrEP. The updated guidelines now permit only government doctors to prescribe PrEP and government pharmacists to dispense it. Additionally, the National Health Security Office has stopped funding disease prevention and health promotion, including HIV prevention services, for individuals not covered by the UCS. Before these changes, all individuals in Thailand could access free HIV

prevention services at any community-led clinic, regardless of their health insurance status or even if they had no insurance at all. (8)As Thailand is a major destination for migrants, especially from neighboring countries, one major challenge in implementing any policy is to cover the migrant population. Migrant studies have shown that migrants have poor access to health information and health services (9, 10) and have higher vulnerability to a variety of health problems, including HIV infection, compared to their native counterparts (11, 12).

Although Thailand has integrated non-Thai residents, encompassing both general migrants and border populations, into its national strategy to end AIDS (13), programs specifically addressing migrant key populations such as migrant MSM are still scarce. Current policies make it difficult for migrant MSM to access PrEP services, as not all are covered by UCS, and KP-led services can no longer provide them as they did before.

To the best of our knowledge, few studies have been conducted on the intersection of these two marginalized populations, migrant MSM, especially in the Southeast Asian region. Understanding the preexisting situation of PrEP among this population is crucial to developing suitable PrEP policies for them. Thus, the present study aims to explore the willingness to use PrEP among migrant MSM in Thailand and the factors influencing them.

Conceptual Framework

In our study, we investigated the willingness to use Pre-Exposure Prophylaxis (PrEP) among migrant men who have sex with men (MSM) in Thailand. This exploration was structured around three key components:

Information: This component focused on the participants' knowledge and understanding of PrEP. We assessed their level of knowledge about PrEP, including its benefits and usage.

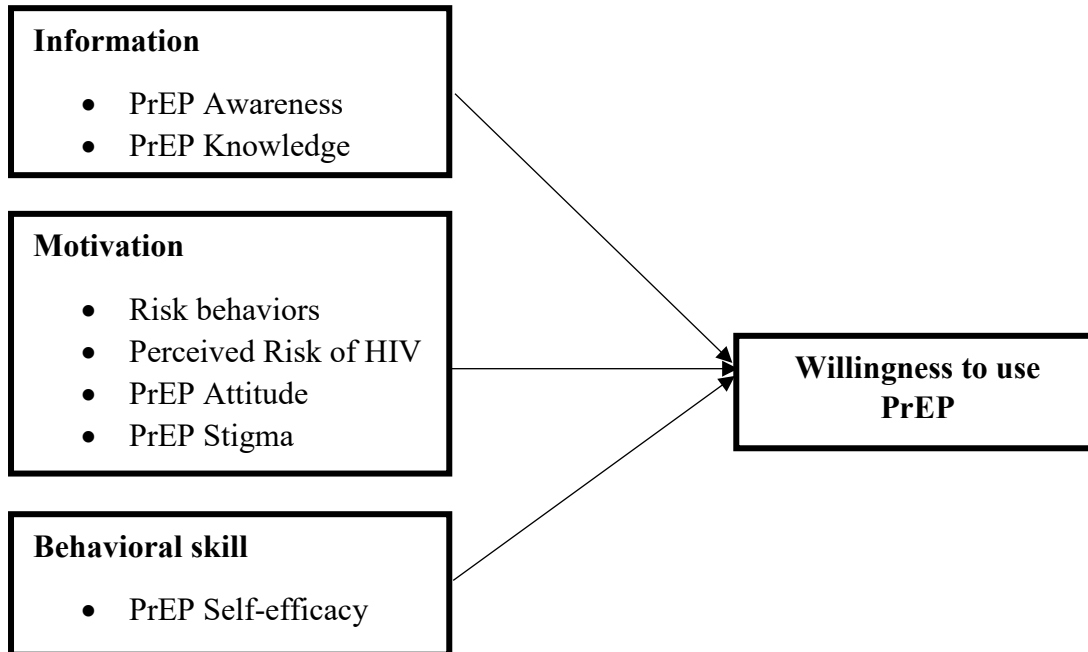
Motivation: Here, we examined the factors that either motivated or discouraged the participants' desire to use PrEP. This included personal and social influences that impacted their decision-making process regarding PrEP usage.

Behavioral Skills: This aspect evaluated the participants' self-efficacy in seeking out and utilizing PrEP services. We looked at their perceived ability to access PrEP, navigate



healthcare systems, and adhere to the prescribed regimen.

Figure 1 Conceptual Framework



METHODOLOGY

Study design

This is a cross-sectional study designed to investigate the willingness to use PrEP as an HIV prevention method and associated factors among migrant MSM who have relocated to Thailand from other countries. An online-based self-administered questionnaire was distributed among MSM migrants residing in Thailand. The data collection period was from May to June 2024.

Sampling and data collection

As the target population is vulnerable, a respondent-driven sampling method was utilized. The survey link and 400 login tokens for single use were provided to the initial seeds, who were then distributed to the other participants. For eligibility, participants have to be at least 18 years of age, of informed consent, biological male, and MSM. HIV-positive patients, cognitively impaired patients, and tourists visiting Thailand were excluded from the study.

The required sample size is calculated using the formula derived by Cochran (1977), assuming P = 0.8 (14):

$$n = \frac{Z^2 P(1 - P)}{e^2}$$

$$n = \frac{1.96^2 * 0.8(1 - 0.8)}{0.05^2}$$

$$n = 246$$

To mitigate incomplete responses, the sample size was increased by 10%, resulting in a minimum of 271 migrant MSM participants. After distributing the online questionnaire, 340 participants responded to the questionnaire. Among them, 44 incomplete responses were excluded, and 296 valid responses were included in the data analysis.

Measurement tools

The self-administered online questionnaire consists of 8 sections. General characteristics were collected, including age, gender identity, sexual orientation, relationship status, education, employment status, average monthly income, residency status, duration of living in Thailand, and Thai language fluency. Risk behaviors related to HIV infection, such as having multiple sex partners, serodiscordant partners, inconsistent condom use, involvement in group sex, commercial sex, Chemex, and substance abuse, were also assessed. Perceived



HIV risk was assessed using two items: "Do you think that you have the chance to get HIV/AIDS?" and "How much are you afraid of getting HIV/AIDS?" and each item was rated on a 5-point Likert scale. Awareness of PrEP was measured with two items: whether the respondent had ever heard of its existence by the name PrEP or as a medication that is taken to prevent HIV. The answer "yes" to either question was regarded as having PrEP awareness. PrEP knowledge was measured using six items of true/false/do not know type. An incorrect answer or do not know the response was regarded as incorrect. PrEP attitudes related to effectiveness, users, safety, and pill burden were measured with four items on a 5-point scale. PrEP stigma and concern about stigma from friends, family, and partners were assessed using five items on a 5-point scale. PrEP self-efficacy related to finding information, affordability, uptake, and adherence was measured with eight items on a 4-point scale.

The outcome variable "willingness to use PrEP" was measured using a 5-item scale by Lim SH et al. (15), which was a shorter version of the 7-item scale developed by Holt et al. (16). 5 items were asked; 1) "I would need to take PrEP," 2) "I would take PrEP even if it were not 100% effective", 3) "I am going to take PrEP as soon as it becomes available," and 4) "I would take pills before or after sex if it would prevent me getting HIV," and 5) "I would take a pill every day if it would prevent me from getting HIV" and the responses were rated on a 5-point scale ranging from 1 = very unwilling to use to 5 = very willing to use. Respondents who got a mean score of ≥ 4 on the 5-item scale were considered willing to use PrEP. We used the same cut-off value as Lim et al. (13)

Data analysis

All statistical analyses were performed using SPSS version 25. Categorical variables

were described using frequency and percentage. Chi-square was used to find an association between socio-demographics, risk behaviors, perceived HIV risk, awareness, knowledge, attitudes, stigma, and self-efficacy related to PrEP between willingness to use among migrant MSM. Variables with p -value ≤ 0.05 in the Chi-square test were used in binary logistic regression analysis to investigate the predictive factors of willingness to use PrEP. All variables with a p -value ≤ 0.05 were regarded as statistically significant.

Ethical Consideration

The Mahidol University Central Institutional Review Board (MUCIRB) approved the study protocol for Human Research. The certificate of ethical approval number is 2024/136.2305.

RESULTS

Demographic characteristics

The demographic characteristics of the participants are summarized in Table 1. Among the 296 respondents, the majority were young MSM (men who have sex with men) under 40 years of age. Regarding gender identity, 86.5% identified as men, 8.8% as transgender women, and 4.7% chose the 'other' category. Approximately three-quarters of the participants identified their sexual orientation as homosexual. Over half of the respondents were employed, and most had achieved a university-level education or higher. In terms of monthly income, 38.5% earned less than 15,000 THB, 32.4% earned between 15,000 and 30,000 THB, and 29.1% earned more than 30,000 THB. Nearly two-thirds of the participants had lived in Thailand for over one year, and 90% reported having legal status to stay in the country. Only a quarter of the respondents were proficient in the Thai language.

**Table 1.** Demographic characteristics of migrant men who have sex with men (MMSM)

Demographic Characteristics	Number (N= 296)	Percent (%)
Age		
18 – 30 years	144	48.6
31 -40 years	120	40.6
>40 years	32	10.8
Gender identity		
Man	256	86.5
Transgender woman	26	8.8
Other	14	4.7
Sexual orientation		
Homosexual	222	75.0
Heterosexual	4	1.4
Bisexual	70	23.6
Relationship status		
Single	166	56.1
In a relationship	130	43.9
Education		
Lower than university-level	62	20.9
University level or higher	234	79.1
Employment		
Unemployed	66	22.3
Self-employed	62	20.9
Employed	168	56.8
Monthly income		
<15000 THB	114	38.5
15000 THB - 30000 THB	96	32.4
> 30000 THB	86	29.1
Duration in Thailand		
< 1 year	106	35.8
> 1years	190	64.2
Residency status		
Documented	268	90.5
Undocumented	28	9.5
Thai language fluency		
No knowledge of Thai language	218	73.6
Can speak Thai	78	26.4

***HIV risk behaviors and Variables related to PrEP***

Risk behaviors, perceived risk of HIV, and PrEP-related variables are depicted in Table 2. Regarding HIV risk behaviors within the past six months, a large majority (88.5%) of respondents reported having sexual intercourse with male partners. Nearly two-thirds (63.5%) had multiple sex partners. More than half (63.5%) believed their partners to be HIV-negative, while 33.8% were unsure, and 2.7% reported HIV-positive partners. Over one-third (37.2%) reported inconsistent condom use. Additionally, 43.9% engaged in sexual activities involving more than two people (group sex). Participation in commercial sex, either selling or buying sex in exchange for money or other profits, was reported by 27%.

Substance use during sex for enhanced pleasure, known as chemsex, was reported by 33.1%, while 39.2% reported overall substance abuse.

In terms of concerns about contracting HIV infection, 58.8% expressed low concern. A significant majority (89.9%) were aware of PrEP (pre-exposure prophylaxis), either by name or as a medication to prevent HIV infection. 61.1% displayed an above-average level of PrEP-related knowledge. A slightly higher percentage of participants (54.7%) expressed a negative attitude towards PrEP. The percentage of participants with high PrEP-related stigma was equal to that of those with low stigma. Finally, 54.7% of participants displayed good self-efficacy in using PrEP.

Table 2 Sexual behavior and background characteristics of migrant men who have sex with men (MMSM)

Variables	Number (N= 296)	Percent (%)
Independent variables		
Sexual intercourse with male partners in the past six months		
Yes	262	88.5
No	34	11.5
Multiple sex partners		
Yes	188	63.5
No	108	36.5
Had serodiscordant partner		
Yes	8	2.7
No	188	63.5
do not know	100	33.8
Inconsistent condom use		
Yes	110	37.2
No	186	62.8
Group sex in the past six months		
Yes	130	43.9
No	166	56.1
Commercial sex		
Yes	80	27.0
No	216	73.0
Chem sex in the past six months		
Yes	98	33.1
No	198	66.9
Substance abuse in the past six months		
Yes	116	39.2



Variables	Number (N= 296)	Percent (%)
No	180	60.8
Perceived risk of HIV		
Low	174	58.8
High	122	41.2
PrEP awareness		
Yes	266	89.9
No	30	10.1
PrEP knowledge		
Low	115	38.9
High	181	61.1
PrEP attitude		
Low	162	54.7
High	134	45.3
PrEP related stigma		
Low	146	49.3
High	150	50.7
PrEP self-efficacy		
Low	136	45.3
High	162	54.7
Dependent variable		
Willingness to use PrEP		
Unwilling	142	48.0
Willing	154	52.0

Overall, 52% of migrant MSM had a mean score of ≥ 4 on the 5-item scale assessing willingness to use PrEP. Binary logistic regression analysis was conducted to identify associations between independent variables and willingness to use PrEP (Table 3).

There is a significant relationship between the level of education and willingness to use PrEP. Migrant MSM with education below the university level were more likely to be willing (COR 2.76; 95% CI 1.5-5.05). Employment status also influenced PrEP willingness. Both unemployed and employed individuals displayed greater willingness compared to the self-employed group (COR 2.44; 95% CI 1.2-

4.96 for the unemployed group and COR 1.83; 95% CI 1-3.31 for the employed group).

Migrant MSM with multiple sex partners were 2.32 times more likely to be willing to use PrEP. Additionally, those engaging in chemsex and substance abuse were more likely to be willing to use PrEP, with crude odds ratios of 1.99 and 2.49, respectively, compared to those without such behaviors.

Perceived risk of HIV also showed a significant association with willingness. High perceived risk was positively associated with willingness to use PrEP (COR 1.81; 95% CI 1.13-2.9). Furthermore, participants with a positive attitude towards PrEP were more likely to be willing (COR 1.97; 95% CI 1.24-3.14).

**Table 3.** Logistic regression analysis of factors associated with willingness to use PrEP

Variables	Unwilling		Willing		COR	95%CI		P-value
	N	Percent	N	Percent		Lower	Upper	
Education								
Lower than University level	18	29.0	44	71.0	2.76	1.50	5.05	0.001
University level or higher	124	53.0	110	47.0	ref			
Employment								
Unemployed	26	39.4	40	60.6	2.44	1.20	4.96	0.014
Employed	78	46.4	90	53.6	1.83	1.00	3.31	0.047
Self-employed	38	61.3	24	38.7	ref			
Multiple sex partners								
Yes	76	40.4	112	59.6	2.32	1.43	3.76	0.001
No	66	61.1	42	38.9	ref			
Commercial sex								
yes	32	40.0	48	60.0	1.56	0.93	2.62	0.096
no	110	50.9	106	49.1	ref			
Chem sex in the past six months								
yes	36	36.7	62	63.3	1.99	1.20	3.26	0.007
no	106	53.5	92	46.5	ref			
Substance abuse in the past six months								
yes	40	34.5	76	65.5	2.49	1.53	4.03	<0.001
no	102	56.7	78	43.3	ref			
Perceived risk of HIV								
Low	94	54.0	80	46.0	ref			
High	48	39.3	74	60.7	1.81	1.13	2.90	0.013
PrEP awareness								
yes	128	48.1	138	51.9	ref			
no	14	46.7	16	53.3	1.06	0.50	2.26	0.880
PrEP knowledge								
Low	62	53.9	53	46.1	ref			
High	80	44.2	101	55.8	1.48	0.92	2.36	0.100
PrEP attitude								
Low	90	55.6	72	44.4	ref			
High	52	38.8	82	61.2	1.97	1.24	3.14	0.004
PrEP related stigma								
Low	62	42.5	84	57.5	1.55	0.98	2.45	0.062
High	80	53.3	70	46.7	ref			
PrEP self-efficacy								
Low	66	49.3	68	50.7	ref			
High	76	46.9	86	53.1	1.10	0.69	1.74	0.690

Statistically significant results ($p < 0.05$) are highlighted in bold.

Abbreviation: COR = crude odd ratio, n = number

DISCUSSION

The findings of this study provide critical insights into the demographic characteristics, HIV risk behaviors, and PrEP-

related variables among young MSM in Thailand. The majority of the participants were highly educated, documented migrant MSM with high income. It could be due to the fact that



the study population was any non-Thai MSM who were living in Thailand, not limited to migrant workers. The data reveals substantial engagement in high-risk behaviors among the participants. A significant majority reported having male sexual partners, with nearly two-thirds having multiple partners. This behavior, coupled with the fact that over one-third reported inconsistent condom use, underscores the heightened risk for HIV transmission within this group. Additionally, participation in group sex, commercial sex, chemsex activities, and substance abuse further elevates this risk.

This study found that 89.9% of the participants were aware of PrEP, a figure higher than the average level of awareness among MSM in low- and middle-income countries (LMIC), which ranged from 0 to 72% (17) and significantly above the global average of 50% (18). Contributing factors to this increased awareness include the basic internet literacy of all participants and the fact that more than two-thirds had a higher level of education.

The overall percentage of migrant MSM who expressed willingness to use PrEP was 52%, slightly lower than the global average of 58.6% (18) but higher than previous studies conducted among MSM in Thailand (19-21). This increase in both awareness and willingness to use PrEP aligns with findings from the systematic review and meta-analysis by (22), which indicated that PrEP awareness increased from 2007 to 2019, and PrEP willingness increased after 2014, following a temporary decline between 2007 and 2014.

Factors Associated with PrEP Willingness

Seven factors were found to have an association with the willingness to use PrEP. Among demographic characteristics, only the level of education and employment status showed significant associations with willingness to use PrEP. Migrant MSM with education below the university level were more likely to be willing to use PrEP, which could reflect a greater perceived vulnerability or a more pragmatic approach to health among those with lower educational attainment. Employment status also played a crucial role, with both unemployed and employed individuals showing greater willingness compared to the self-employed. This may be related to the stability and access to healthcare services that formal employment provides, as

well as the greater perceived vulnerability of the unemployed group. The duration of stay in Thailand and Thai language fluency showed no association with PrEP willingness. This finding is inconsistent with previous studies (11, 23, 24) that identified language as an influencing factor in the utilization of HIV prevention services. It could indicate that participants acquired PrEP awareness and knowledge prior to moving to Thailand or accessed information in languages other than Thai.

The level of PrEP willingness was disproportionately lower than the level of PrEP awareness, which contrasts with previous studies (19, 25-27) where initial awareness was low. However, participants expressed willingness to use it once they were aware of PrEP. This discrepancy may be related to engagement in risk behaviors and self-perceived risk of HIV. Migrant MSM who engaged in risk behaviors expressed a higher level of willingness to use PrEP, which aligns with their heightened awareness of increased HIV risk. These findings are consistent with other studies where MSM expressed willingness to use PrEP if they had high-risk behaviors (28), while those with low self-risk assessment were less willing (15, 29)

The equal distribution of participants with high and low PrEP-related stigma and over half of the respondents demonstrating good self-efficacy in using PrEP did not show a significant association with PrEP willingness. However, having a positive attitude towards PrEP was influential, highlighting the importance of believing in its effectiveness, safety, and the comfort of taking pills daily on PrEP willingness.

CONCLUSION

The majority of migrant MSM participants residing in Thailand had multiple partners and occasionally engaged in other risk behaviors within last 6 months, indicating the need to prioritize them for targeted interventions. The overall willingness to use PrEP was high among them, accompanied by good self-efficacy, moderate concern about stigma, and slightly lower level of positive attitude. These indicators demonstrate a good potential for successful PrEP implementation within this group.



RECOMMENDATIONS

Expanding PrEP interventions to all vulnerable groups is essential to achieving Thailand's target of ending AIDS by 2030. This study explored the willingness to use PrEP, a critical first step in developing effective policies for its implementation. Unlike in other countries, stigma concerns in Thailand are relatively lower, and HIV prevention programs are already familiar with key population-led services and aware of stigma issues. To enhance PrEP implementation, it is crucial to increase awareness of the risk of contracting HIV among migrant MSM and emphasize the effectiveness and safety of PrEP in preventing HIV transmission. Further studies should be conducted to identify and address barriers to PrEP uptake and adherence, ensuring that PrEP services are readily available and accessible to migrant MSM. Continuing to support and expand key population-led services will help ensure stigma-free and comprehensive care. By addressing these areas, Thailand can make significant progress in its goal to end AIDS by 2030.

LIMITATIONS

This study is subject to some limitations. It employs the respondent-driven sampling (RDS) method, which is a type of non-probability sampling. While RDS aims to reach hidden populations, it is susceptible to biases during seed and participant recruitment, potentially affecting the study's generalizability. The research instrument used in this study is a self-administered online survey. This could introduce sample bias toward MSM who can read, write, and use IT devices. Findings based on this sample might not be generalizable to MSM who cannot read, write, or use IT devices. Participants' responses were based on self-reporting, which can be influenced by recall bias or inaccuracies due to memory or social desirability concerns. Participants may provide socially desirable responses, particularly regarding sensitive topics, leading to an overestimation or underestimation of certain variables. Since this study only assessed the willingness to use PrEP, it cannot indicate the actual PrEP uptake. The actual uptake can be different from willingness to use PrEP depending on various factors such as availability and accessibility of PrEP in the region.

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SOCIODEMOGRAPHIC CHARACTERISTICS AND SLEEP QUALITY AMONG URBAN ADULTS IN MANDALAY, MYANMAR

Pan Myat Kyaw Zin¹, Nutta Taneepanichskul^{1*}

¹College of Public Health Sciences, Chulalongkorn University, Sabbasastravicaya Building, Phayathai Road, Bangkok 10330, Thailand

*Corresponding Author: Nutta Taneepanichskul, College of Public Health Sciences, Chulalongkorn University Sabbasastravicaya Building, Phayathai Road, Bangkok 10330, Thailand, E-mail: nutta.t@chula.ac.th

ABSTRACT

Introduction: Sleep quality is crucial for overall human well-being, but sociodemographic characteristics and sleep quality among Mandalay, Myanmar urban residents need to know more. Sleep quality can be affected by cultural, social, psychological, behavioral, pathophysiological, and environmental factors. Understanding the association between sociodemographic characteristics and sleep quality helps to identify at-risk groups and develop targeted interventions to improve overall health and well-being.

Objectives: This study explores the association between sociodemographic characteristics and sleep quality in Mandalay, Myanmar urban adults.

Methodology: A cross-sectional online survey was conducted with 467 participants from Mandalay. A structured questionnaire, including the Pittsburgh Sleep Quality Index (PSQI) to assess sleep quality, was used, along with sociodemographic information such as age, gender, education, night-shift work, monthly income, marital status, number of children, and BMI. PSQI score five was used as a cut-off point to evaluate good or poor sleep quality. Descriptive statistics were performed. Chi-square analyses tested for associations between sociodemographics and sleep quality.

Results: Poor sleep quality is found in 33.4% of the study populations, while the overall median PSQI score is 4. The average age of the study population was 29. The proportion of males and females is 35.5% and 64.5%, respectively. Among the sociodemographic variables, only night-shift work is associated with sleep quality (p-value = 0.009).

Conclusion: This study highlights the substantial impact of nightshift work on sleep quality among urban populations in Mandalay, Myanmar. Sleep education programs and workplace interventions could improve night shift workers' sleep health and overall well-being in urban settings.

Keywords: Sleep Quality, The Pittsburgh sleep quality index (PSQI): Mandalay, Myanmar

INTRODUCTION

Sleep is essential for our long-term health and well-being. It is an integral part of overall health and a physiological and psychological well-functioning source. It is also critical for rest, restoring body functions, and improving cognitive functions. It also influences hormone release, protein synthesis, and autonomic nervous system modulation (1). Sleep patterns are influenced by several factors such as biological factors: age, gender, and hormonal changes; environmental factors: impact of light, noise, temperature, and sleeping environment; lifestyle factors: diet, exercise, screen time, stress, and medical conditions. Healthy sleep has several features,

including enough duration, high quality, suitable timing, and the absence of sleep problems (2).

Up to 45% of the world's population have sleep difficulties that affect health and quality of life, and 35% of individuals believe that they do not get enough sleep, which has implications for both physical and mental health (3). The economic burden of poor sleep has been estimated to be \$107 billion. However, public health outcomes of sleep are often unrecognized by the society (4). The CDC has advocated five surveillance systems to monitor sleep-related factors and symptoms among adults, youth, and children to raise public awareness of sleep's impact on public health



and safety. In 2015, the National Sleep Foundation in the United States announced updated sleep duration guidelines based on nine age categories, recommending 7-9 hours of sleep for young adults and adults and 7-8 hours for older adults (5).

There are only a few literature regarding sleep quality in Myanmar. Health consequences related to sleep are often disregarded in Myanmar. The PHQ-9 survey, which included 929 participants from all states and regions, indicated that a significant portion of the population experienced moderate to severe depression, which correlates with sleep disturbances (6). Research done in 2017 involving Myanmar migrant workers in Malaysia reported that 62.5% of the study population had a Global PSQI score >5 , and shift workers were 3.393 times more likely to have poor sleep quality than non-shift workers. The study also found that lower BMI, upper skill level jobs, being a shift worker, working 6-7 days per week, working >8 hours per day, and spending more than 30 minutes for commute were associated with poor sleep quality (7). Myanmar migrant workers have a higher prevalence compared to studies done among nurses in Malaysia, which is 57.8% (8). Another study was done among type 2 DM patients in a private hospital in Yangon, Myanmar, also reported that approximately 48.4% of patients had poor sleep quality and the three most frequent complaints: prolonged sleep latency (80.7%), reduced habitual sleep efficiency (68.6%) and daytime dysfunction (61.4%) (9).

Some literature reported that sociodemographic factors can be associated with sleep quality. People with lower socioeconomic status reported less sleep duration and lower sleep quality (10). Therefore, evaluating socioeconomic disparities in sleep is important in highlighting inequality in important health outcomes, understanding how habitual sleep is influenced, and targeting high-risk groups for future interventions. Sekine and colleagues reported that after adjusting for differences in sleep, disparities in physical and mental health between people with high and low employment grades were reduced by 20-40% (11). There is a direct relationship between age and

deterioration in the quality of sleep (12). Liu and colleagues provided age-based prevalence of insufficient sleep (≤ 6 hr) in which 32.2% for age 18-24, 37.9% for 25-34, 38.3% for 35-44, 37.3% for 45-64, and 26.3% for those 65 or older (13).

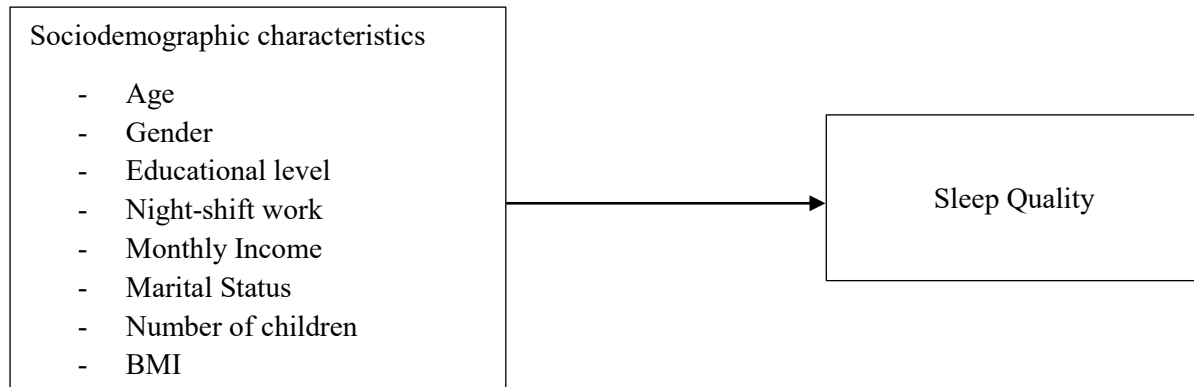
Regarding gender differences in sleep quality, young adult women have better sleep quality, characterized by shorter sleep onset latency and higher sleep efficiency, in contrast with men of the same age group (14, 15). However, women of all adult age groups report more sleep problems (inadequate sleep and insomnia) than male despite having better sleep quality, which suggests that women are more susceptible to symptoms due to inadequate sleep (16). In a survey using a sample from the 2006 BRFSS system, a lower education level is associated with the highest sleep complaints, while sleep complaints reported decreased with higher levels of educational attainment (17). Individuals belonging to the lower socioeconomic class are more prone to experiencing inadequate sleep because of environmental stressors. Unsatisfactory sleep quality correlates significantly with unemployment and low income (17, 18). Unmarried individuals may have better sleep quality than married couples due to greater flexibility in managing sleep schedules (19). A bidirectional relationship exists between BMI and sleep quality. Sleep deprivation induces an imbalance in bodily hormones, which promotes obesity and overeating. Higher BMI is also related to shorter sleep duration (20).

Numerous studies related to sleep quality have been conducted and have been covered extensively in other countries. This is the first research that evaluated the sleep quality in Mandalay. The information on socioeconomic status and sleep quality still needs to be clarified. As a result, this study aims to explore the relationship between sociodemographic characteristics and sleep quality in urban adults in Mandalay, Myanmar. This study aims to evaluate the percentage of poor sleep quality in urban adults in Mandalay, Myanmar. This study aims to assess the association between sociodemographic characteristics and sleep quality in Mandalay, Myanmar urban adults.

**Conceptual framework**

Independent variables

Dependent variable

**METHODOLOGY****Study design**

A cross-sectional survey was conducted, and a self-reported questionnaire was distributed through social media.

Sampling technique

The participants were recruited using a semi-snowball sampling technique.

Sample size

The total urban adult population in the study area was 684852 people. The sample size using the Yamane formula was 400 people (21). After adding the 10% error, the total sample size was 440. However, after data collection, 485 people participated in the survey. After inclusion and exclusion, 467 participants were eligible for data analysis.

$$n = \frac{N}{1 + N(e^2)}$$

$$n = \frac{684852}{1 + 684852(0.05)^2}$$

n = sample size

N = population size

e = margin error

Study area and population

Participants were recruited from seven townships of Mandalay City, the economic center of upper Myanmar. The urban population density is 100% in five townships and 34% and 5% in two townships, respectively. The targeted population was adults aged 18 years or above who had resided in Mandalay for more than six months.

Inclusion criteria

- People 18 or older have lived in Mandalay for over six months.
- People who can access online questionnaires.

Exclusion criteria

- If there is any physical disorder (musculoskeletal disorders, multiple sclerosis, spinal cord injury, and amputations) and psychological disorder (major depressive disorder, generalized anxiety disorder, post-traumatic stress disorder, bipolar affective disorder, schizophrenia, alcohol abuse), we will exclude it. Physical disorder is associated with poor sleep quality (22, 23). Psychological disorders affect sleep quality, including difficulty staying asleep, falling asleep, daytime sleepiness, and hypersomnia (24).
- If the respondent has already been diagnosed with a sleep disorder or disease that influences sleep quality, e.g., Obstructive sleep apnea (OSA).

Data collection

Data was collected using self-administered Google form online questionnaires developed in English and translated into Myanmar. The questionnaire was delivered through social media apps such as Facebook, Viber, and X, which are widely used in Myanmar. Participants were given informed consent before answering the questionnaire. To avoid the duplication of the data, the participants were asked for their mobile numbers or email addresses. If there



was any missing information in the response, it was regarded as missing data and needed to be included in the study. The data collection was conducted from 1st June to 30th June 2024. The collected data was analyzed by using SPSS software.

Measurement tool

A structured questionnaire, including the Pittsburgh Sleep Quality Index (PSQI), was used to assess sleep quality and sociodemographic information such as age, gender, education, night-shift work, monthly income, marital status, number of children, and BMI. The questionnaires used in this research project were asked for permission from the original author to be used or translated. PSQI is a validated tool widely used in sleep research, which consisted of 19-self-reported items comprised of seven components: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, daytime dysfunction over the last month (25). The answers are scored on a 0-3 scale. The total score ranges from 0-21, the sum of the scores for all seven components. A global score of PSQI was used to evaluate good or poor sleep with a cutoff score of 5. If the score is equal to or less than 5, it indicates good sleep quality, and scoring more than 5 indicates poor sleep quality. Descriptive statistic was performed. Chi-square analyses tested for associations between sociodemographics and sleep quality. This study was approved by The Research Ethics Review Committee for Research Involving Human Research Participants, Group I, Chulalongkorn University (COA No. 139/67).

Sleep Quality Questionnaire

The following questions are related to your usual sleep habits during the past month only. Your answer should indicate the most accurate reply for most days and months in the past month.

1. When do you usually go to bed?
2. How long (in minutes) has it taken to fall asleep each night?
3. When do you usually get up in the morning?
4. How many hours of actual sleep do you get at night? (This may be different than the number of hours you spend in bed)

5. During the past month, how often have you had trouble sleeping because you...
 - a) Cannot get to sleep within 30 minutes
 - b) Wake up in the middle of the night or early morning
 - c) Have to get up to use the bathroom
 - d) Cannot breathe comfortably
 - e) Cough or snore loudly
 - f) Feel too cold
 - g) Feel too hot
 - h) Have bad dreams
 - i) Have pain
 - j) Other reason(s), please describe, including how often you had trouble sleeping because of this reason (s):
6. During the past month, how often have you taken medicine (prescribed or over the counter) to help you sleep?
7. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?
8. During the past month, how much of a problem has it been for you to keep up enthusiasm to get things done?
9. During the past month, how would you rate your sleep quality overall?

Component 1 Subjective sleep quality

Examine question #9, and assign scores as follows:

Response	Component 1 score
“Very good”	0
“Fairly good”	1
“Fairly bad”	2
“Very bad”	3

Component 1 score:

Component 2 Sleep Latency

1. Examine question #2, and assign scores as follows:

Response	Score
≤15 minutes	0
16-30 minutes	1
31-60 minutes	2
> 60 minutes	3

Question #2 score:

2. Examine question #5a, and assign scores as follows:

Response	Score
Not during the past month	0
Less than once a week	1
Once or twice a week	2
Three or more times a week	3



Question #5a score:

1. Add #2 score and #5a score

Sum of #2 and #5a:

2. Assign component 2 score as follows:

Sum of #2 and #5a	Component 2 score
0	0
1-2	1
3-4	2
5-6	3

Component 2 score:

Component 3 Sleep Duration

Examine question #4, and assign scores as follows:

Response	Component 3 score
> 7 hours	0
6-7 hours	1
5-6 hours	2
< 5 hours	3

Component 3 score:

Component 4 Habitual Sleep Efficiency

1. Write the number of hours slept (#4) here:
2. Calculate the number of hours spent in bed:

Getting up time (#3):

Bedtime (#1):

A number of hours spent in bed:

1. Calculate habitual sleep efficiency as follows:

(Number of hours slept/Number of hours spent in bed) x 100 = Habitual sleep efficiency (%)

2. Assign component 4 score as follows:

Habitual sleep efficiency %	Component 4 score
>85%	0
75-84%	1
65-74%	2
<65%	3

Component 4 score:

Component 5 Sleep Disturbances

1. Examine questions #5b-5j, and assign scores for each question as follows:

Response	Score
Not during the past month	0
Less than once a week	1
Once or twice a week	2
Three or more times a week	3

1. Add the scores for questions #5b-5j:

2. Assign component 5 score as follows:

Sum of 5b-5j	Component 5 score
0	0
1-9	1
10-18	2
19-27	3

Component 5 score:

Component 6 Use of sleep medication

Examine question #6 and assign score as follows:

Response	Component 6 Score
Not during the past month	0
Less than once a week	1
Once or twice a week	2
Three or more times a week	3

Component 6 score:

Component 7 Daytime dysfunction

1. Examine question #7, and assign scores as follows:

Response	Score
Never	0
Once or twice	1
Once or twice each week	2
Three or more times each week	3

Question #7 score:

2. Examine question #8, and assign scores as follows:

Response	Score
No problem at all	0
Only a very slight problem	1
Somewhat of a problem	2
A very big problem	3

Question #8 score:

1. Add the scores for question #7 and #8:

2. Assign component 7 score as follows:

Sum of #7 and #8	Component 7 Score
0	0
1-2	1
3-4	2
5-6	3

Component 7 score:

Global PSQI Score

Add the seven component scores together:

≤ 5	Good Sleep Quality
>5	Poor Sleep Quality



RESULTS

Table 1 shows the sociodemographic profile of the participants. The study includes 467 participants. The majority of participants (64.5%) were in the age group 26-64 years (median age was 29 years). The proportion of males and females was 35.5% and 64.5%, respectively. For educational level, 49.5% of participants reported high school and lower, whereas 50.5% reported bachelor's degree and higher. Only a few participants (22.9%) responded as night-shift workers, while most participants (77.1%) did not. Most participants

(60%) reported income ≤ 300000 kyats whereas 40% reported income > 300000 kyats per month. Regarding marital status, 66.4% of participants reported being single, followed by 31.3% being married and only 2.4% being separated/widowed/divorced. The majority of participants, 73.9%, reported having no children, followed by one child (11.3%), two children (7.3%), and \geq three children (7.5%), respectively. For BMI, $< 18.5 \text{ kg/m}^2$ underweight (9%), $18.5\text{-}22.9 \text{ kg/m}^2$ normal (56.5%), $23\text{-}24.9 \text{ kg/m}^2$ overweight (14.1%), $\geq 25 \text{ kg/m}^2$ obese (20.3%).

Table 1 Sociodemographic characteristics (N = 467)

Characteristics	Variables	N	%
Age	18-25 years	148	31.7
	26-64 years	301	64.5
	≥ 65 years	18	3.9
Gender	Male	166	35.5
	Female	301	64.5
Educational level	High school and lower	231	49.5
	Bachelor's degree and higher	236	50.5
Night-shift worker	Yes	107	22.9
	No	360	77.1
Monthly income	≤ 300000 Kyats	280	60.0
	> 300000 Kyats	187	40.0
Marital status	Single	310	66.4
	Married	146	31.3
	Separated/Widowed/Divorced	11	2.4
Number of children	No Child	345	73.9
	1 Child	53	11.3
	2 Children	34	7.3
	≥ 3 Children	35	7.5
BMI (kg/m^2)	< 18.5 Underweight	42	9.0
	$18.5\text{-}22.9$ Normal	264	56.5
	$23\text{-}24.9$ Overweight	66	14.1
	≥ 25 Obese	95	20.3

Sleep Quality

Table 2 depicts descriptive findings of components of sleep quality. The median PSQI score is 4. The percentage of good sleep quality (PSQI score ≤ 5) is 66.6%, and poor sleep quality (PSQI score > 5) is 33.4%. 60% of the participants reported "fairly good" subjective

sleep quality, whereas 31% reported "very good" sleep quality. Most participants (44.8%) sleep > 7 hours daily. Most participants (69%) had habitual sleep efficiency $> 85\%$. Most of the participants (89.5%) reported that they do not use sleep medications.

**Table 2** Descriptive findings of components of sleep quality

Component	Response	Score	N	%
1. Subjective sleep quality	Very good	0	145	31.0
	Fairly good	1	280	60.0
	Fairly bad	2	36	7.7
	Very bad	3	6	1.3
2. Sleep Latency	0 (Sum scores)	0	151	32.3
	1-2	1	223	47.8
	3-4	2	81	17.3
	5-6	3	12	2.6
3. Sleep Duration	>7 hours	0	209	44.8
	6-7 hours	1	207	44.4
	5-6 hours	2	35	7.5
	<5 hours	3	15	3.2
4. Habitual Sleep Efficiency	>85%	0	322	69
	75-84%	1	72	15.4
	65-74%	2	41	8.8
	<65%	3	32	6.9
5. Sleep Disturbances	0 (Sum scores)	0	16	3.4
	1-9	1	358	76.7
	10-18	2	91	19.5
	19-27	3	2	0.4
6. Use of sleep medication	Not during the past month	0	418	89.5
	Less than once a week	1	37	7.9
	Once or twice a week	2	11	2.4
	Three or more times a week	3	1	0.2
7. Daytime dysfunction	0 (Sum scores)	0	234	50.1
	1-2	1	191	40.9
	3-4	2	37	7.9
	5-6	3	5	1.1

Table 3 shows the association between sociodemographic characteristics and sleep quality. The result revealed that the sociodemographic factor that affected sleep quality with statistical significance was night

shift workers at a significant level of 0.05 (Chi-square test = 6.906, p-value = 0.009). Poor sleep quality was found in 43.9% of night shift workers.

Table 3 Association between sociodemographic characteristics and sleep quality

Variables	Sleep Quality				X ²	P-value
	Good Sleep Quality (N = 311)		Poor Sleep Quality (N = 156)			
	N	%	N	%		
Age					0.615	0.735
18-25 years	101	68.2	47	31.8		
26-64 years	197	65.4	104	34.6		
≥65 years	13	72.2	5	27.8		
Gender					3.001	0.083
Male	119	71.7	47	28.3		
Female	192	63.8	109	36.2		



Variables	Sleep Quality				X ²	P-value
	Good Sleep Quality (N = 311)		Poor Sleep Quality (N = 156)			
	N	%	N	%		
Educational Level					1.027	0.311
High school and lower	159	68.8	72	31.2		
Bachelor's degree and higher	152	64.4	84	35.6		
Night-shift worker					6.906	0.009*
Yes	60	56.1	47	43.9		
No	251	69.7	109	30.3		
Monthly income					0.500	0.479
≤300000 Kyats	190	67.9	90	32.1		
>300000 Kyats	121	64.7	66	35.3		
Marital status					0.170	0.918
Single	205	66.1	105	33.9		
Married	99	67.8	47	32.2		
Separated/Widowed/Divorced	7	63.6	4	36.4		
Number of children					1.661	0.646
No Child	228	66.1	117	33.9		
1 Child	33	62.3	20	37.7		
2 Children	24	70.6	10	29.4		
≥3 Children	26	74.3	9	25.7		
BMI (kg/m ²)					6.503	0.090
<18.5 Underweight	22	52.4	20	47.6		
18.5-22.9 Normal	174	65.9	90	34.1		
23-24.9 Overweight	50	75.8	16	24.2		
≥25 Obese	65	68.4	30	31.6		

* p-value significant at <0.05

p values were generated using the Chi-square test

DISCUSSION

There was a total of 467 participants in this study. Two-thirds of the participants were in the age group 26-64 years. The median age was 29 years. The majority are female participants with a bachelor's degree and higher educational status, monthly income of ≤300000 Kyats, and normal weight BMI of 18.5-22.9kg/m². One-third of the participants are night-shift workers. The majority of participants were single and had no children.

In our study, 33.4% of participants had poor sleep quality. Two-thirds of the participants answered "fairly good" subjective sleep quality, while one-third answered that they had "very good" sleep quality. This may be related to higher educational status despite low

income. The finding is similar to a study by Grander and his colleagues, where high educational status has fewer sleep complaints (17). Most participants sleep >7 hours daily, aligning with the National Sleep Foundation recommendation (5). The majority had habitual sleep efficiency >85%, which is higher than the study done on T2DM patients in Yangon (9). Most participants reported that they do not use sleep medications, which may be related to their perception of "fairly good" subjective sleep quality. In the present study, the median PSQI score was 4 and 33.4% poor sleep quality (PSQI >5), which is lower than the study done in DM patients in Yangon, Myanmar, where 48.4% of T2DM patients had poor sleep quality, and the PSQI score was 5.97± 3.45 (9). The



higher prevalence of poor sleep quality in DM patients than in the general adult population could be due to complications from the disease, which negatively impact poor sleep quality (26). The participants in this study have better sleep quality compared to Chinese adults (mean PSQI = 6.2 ± 3.9) (27) and Egyptian students, in which 84.8% had poor sleep quality (28). The variations between different results from different studies may be related to different socioeconomic and cultural factors between populations.

This study aimed to examine the association between sociodemographic characteristics and sleep quality in urban adults in Mandalay, Myanmar. The chi-square test was used for data analysis. Among the sociodemographic characteristics, only night-shift work was significantly associated with sleep quality (p -value = 0.009). The result is consistent with a study done on Myanmar migrant workers in Malaysia in which night-shift workers have 3 times poorer sleep quality than those who are not night-shift workers (7). This can be explained by circadian rhythm disruption due to irregular working hours, which results in sleep deprivation and daytime dysfunction in night-shift workers (29). Our study did not find an association between age, gender, educational level, monthly income, marital status, number of children, BMI, and sleep quality.

Contrary to our results, numerous studies reported that old age is associated with increased sleep problems (30) and shorter sleep duration (31). However, when physical and mental health conditions are considered, no association was found between physical and mental health (32). While this study did not consider health conditions, this could explain the reason. Similar to our results, income (33) and education (34) are not associated with sleep quality. Regardless of marital status, women have more sleep problems, and the sex gap is largest among divorced and separated, which may be related to the stress due to single parenthood, loss of economic support, and social stigma (35), but this is inconsistent with our study because gender was not significantly related to sleep quality. Several factors explain the lack of associations in our study, including cultural and social dynamics, community and lifestyle differences, and environmental factors that may play a significant role in shaping sleep

patterns and habits. Our study did not measure potential confounding factors, such as occupational stress, health conditions, work patterns, and dietary habits, that could influence sleep quality.

CONCLUSION

In conclusion, the median sleep quality score was 4. Hence, many participants in this study have good sleep quality. This study highlights the substantial impact of night shift work on sleep quality among urban populations in Mandalay, Myanmar. Addressing the challenges requires a multifaceted approach, such as optimizing work schedules, providing sleep education programs, encouraging sleep hygiene practices, and offering counseling services and medical services to address any psychological issues that may affect sleep quality. Study findings should be interpreted considering several limitations.

LIMITATIONS

First, the cross-sectional study design limits the causal relationship between sociodemographic characteristics and sleep quality. Second, participants were recruited with an online-based semi-snowballing technique, so the results may be influenced by selection bias and may not be generalizable to the broader population. Third, self-report questionnaires to measure sleep hygiene behaviors and sleep quality may introduce potential reporter bias. In addition, this study does not provide objective measures of sleep hygiene practices and sleep quality to support self-report measures.

RECOMMENDATIONS

The government should raise public awareness of sleep health by launching public health campaigns and distributing sleep hygiene pamphlets via various media channels (social media, TV, and radio). Sleep education should be integrated into school curriculums to teach children and adolescents the importance of sleep from an early age.

The government should set guidelines for work hours and shift schedules, such as (morning, evening, and night) for better sleep adjustment, limiting the number of consecutive night shifts to reduce sleep debt accumulation, particularly in industries with high rates of night-shift workers. Moreover, making sleep a



priority to avoid sleep debt, taking a nap before the night shift to boost the overall sleep quality, avoiding light exposure near the end of the shift, using blue light-blocking glasses to help sleep during the day, and going to bed directly after arriving at home are recommended (36). The government should allocate funds for sleep health research and collect data on sleep patterns and sleep-related health issues to inform policies and programs. Future longitudinal research with objective sleep measures such as actigraphy or polysomnography is needed to understand sleep quality better.

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THE ASSOCIATION BETWEEN COUPLE DECISION MAKING AND MENTAL HEALTH HELP SEEKING INTENTION

Malika Adila Fitra¹, Montakarn Chuemchit^{1*}

¹College of Public Health Sciences, Chulalongkorn University, Sabbasastravicaya Building, Payathai Road, Bangkok 10330, Thailand

*Corresponding Author: Montakarn Chuemchit, College of Public Health Sciences, Chulalongkorn University, Sabbasastravicata Building, Payathai Road, Bangkok 10330, Thailand, Email: montakarn.ch@chula.ac.th

ABSTRACT

Introduction: The postpartum period is a critical time for new mothers as they experience drastic physical and mental changes. During this period, mothers are also vulnerable to physical and mental health issues such as postpartum blues and postpartum depression. Early professional help can reduce the burden of mental health problems. An intention to perform help-seeking can be influenced by several factors, including close family members' involvement. In the context of new mothers, the husband's role is essential in decision-making.

Objectives: This study aims to examine the correlation between collaborative decision-making by couples and the intention of mothers to seek mental health help during the postpartum period in Jakarta, Indonesia.

Methodology: This research is a quantitative cross-sectional study focused on mothers in the postpartum period aged 18-49 years in Jakarta, Indonesia, who just gave birth from the first day up to six weeks. It targeted mothers that are not diagnosed with baby blues or postpartum blues, aiming to investigate their intentions before seeking professional mental health assistance. After passing ethics approval, data were collected using convenience sampling from online childbirth and breastfeeding forums on Facebook and Instagram, with participants completing a self-administered online questionnaire. Quantitative analysis, including descriptive statistics and Spearman's correlation, was conducted using IBM SPSS 29.

Results: The study included a total of 395 postpartum mothers in Jakarta. Most participants were aged between 21 and 35 (88.1%), with the majority holding a bachelor's degree (49.9%). The average monthly income of most participants was below the minimum wage in Jakarta (59.5%), which is Rp5,067,381. Among the participants, 60% scored below the median cutoff for collaborative couple decision-making (Median = 17; IQR = 2), and 51.1% scored below the median cutoff for mental health help-seeking intention (Median = 9; IQR = 9). Spearman's correlation analysis revealed a significant positive correlation between collaborative couple decision-making and mental health help-seeking intention (p-value = 0.01, one-tailed).

Conclusion: This study indicates that postpartum mothers in Jakarta have a relatively low intention to seek mental health help. Couple collaborative decision-making shows a significant correlation with mothers' intention to seek professional help for mental health issues. These findings may guide policymakers or stakeholders in developing support programs that involve partners in their implementation.

Keywords: Postpartum Mothers, Mental Health, Help Seeking, Decision Making.

INTRODUCTION

The postpartum period is critical for women and the family members, including the infant and partner. It involves managing numerous responsibilities, including baby care and household chores, while dealing with bodily changes (1). Following childbirth, mothers face risks such as infections, high

blood pressure, postpartum hemorrhage, headaches, blurred vision, loss of consciousness, and psychological disturbance, including postpartum depression (2). Postpartum depression disrupts mothers' daily lives and affects infants by reducing physical and emotional interactions, impacting mother-infant attachment. It also hinders the child's



cognitive and psychomotor development and may cause physical and behavioral disturbances (3).

The World Health Organization recommends providing a positive postpartum experience in 2022 to enhance the short—and long-term health of mothers and children (4). Early mental health intervention is crucial to reducing the burden and costs of mental illness and to prevent future recurrence, improving overall quality of life (5). Despite the importance of psychological support, many individuals still do not seek help even when they recognize the need.

In Indonesia, Basic Health Research 2018 (6) found that 11.4% of mothers experienced postpartum disorders, including bleeding, abnormal discharge, swelling, headaches, seizures, swollen breasts, and baby blues. Postpartum depression affects 2.32% of mothers nationally, with rates between 18.37% and 26.15% in the first three months after birth (7,8). Psychological support is one of the helpful interventions in the early stage of the disorder (9), yet according to Basic Health Research (6), 50.1% of affected mothers did not seek help.

A person's health behavior is influenced by sociodemographics, personality, beliefs, emotions, health perceptions, and social relationships (10,11). For mothers, the relationship with their husbands is crucial. Daily decision-making dynamics affect health behavior choices; for instance, a husband's belief in breastfeeding influences a mother's decision to breastfeed (12). Research in Indonesia found that joint decision-making in households is linked to LAMP contraceptive use (13).

Decision-making is a complex critical thinking activity. In practice, gender plays an important role, as men and women have different values in thinking and making decisions, which leads to different outcomes (14). When decisions are made collaboratively, different thinking methods bring more resources and considerations (15,16). In Indonesia, within the context of households, patriarchal culture is deeply ingrained among various ethnic groups. This patriarchal culture produces important household decisions predominantly influenced by the husband rather than the wife (17). However, research linking this factor to mental health help-seeking is still

limited, especially among postpartum mothers in Indonesia.

This study examines the correlation between couple decision-making and help-seeking intentions among mothers in the postpartum period in Jakarta. Despite Jakarta having comprehensive health services, including mental health care, the rate of help-seeking remains low. Based on the literature review, we hypothesize there is a significant correlation between couple decision-making and mental health help-seeking intention among mothers in the postpartum period in Jakarta.

METHODOLOGY

This quantitative study utilized a cross-sectional study design, measuring outcomes and exposures in participants simultaneously. Data was collected in Daerah Khusus Ibukota (DKI) Jakarta Province, the capital city and the center of government and business in Indonesia. The choice of Jakarta was based on data from the Central Bureau of Statistics in 2022, which showed that 85.46% of residents preferred to treat health problems themselves rather than using professional health facilities despite having the most developed health services in the country (18). The population included women who had recently given birth (up to 42 days postpartum), were living with a partner, aged 18-49, and had never accessed mental health professional services. Women with acute or chronic conditions that hindered completing the questionnaire were excluded.

The study used non-probability sampling, specifically convenience sampling, where participants were selected based on accessibility and willingness. Data collection began with the researchers joining Facebook forums for pregnant, breastfeeding, and new mothers, each with over 90,000 members. Aside from sharing online questionnaires using Google Forms in public posts, personal approaches to encourage participation are also made. Additionally, questionnaires were distributed on Instagram and X/Twitter, targeting users in postpartum or breastfeeding communities who met the study criteria.

The study used the Collaboration Decision-Making Scale by Koval & Hansen to assess couple decision-making, which measures collaborative problem-solving in relationships (19). The original Collaboration



Decision Making Scale Cronbach Alpha score ranged between 0.62-0.72, showing good reliability. The scale consists of 4 items, with response options 1-5. The response are: 1 = "Strongly Disagree," 2 = "Disagree," 3 = "Neutral," 4 = "Agree," and 5 = "Strongly Agree." A higher total score indicates a better individual's perception of collaboration toward decision-making. The instrument was translated into Indonesian by the language and psychology expert. The overall Cronbach Alpha score obtained is 0.915, ranging between 0.918 and 0.949 for each item during pilot research.

Postpartum help-seeking behavior was measured using the Mental Health Intention Scale (MHSIS-3) by Hammer & Spiker Indonesian version, translated by Widyatmiko & Surjaningrum (20,21). This instrument consists of 3 items, with the answers ranging from 1 to 6 Likert scale to rate their intention toward help-seeking, 1= "Strongly Dissagree", 2 = "Disagree", 3 = "Somewhat Disagree", 4 = "Somewhat Agree", 5 = "Agree", and 6 = "Strongly Agree". The original MHSIS-3 has good reliability (>0.70) with overall Cronbach Alpha $\alpha = 0.92$ and an accuracy rate of 70% for predicting help-seeking behavior in adults [20]. The higher the total score, the higher one's intention toward mental health help seeking intention. The overall Cronbach's Alpha score on pilot research was 0.901; each item ranged between 0.797 – 0.888. This result indicates a good reliability on MHSIS-3.

This research has passed ethical approval from Universitas Muhammadiyah Jakarta, with serial number No.10.111.B/KEPK-FKMUMJ/V/2024.

RESULTS

A total of 411 mothers in the postpartum period completed the online questionnaire. After screening, 395 participants met the eligibility criteria and did not withdraw. The sociodemographic characteristic is shown in Table 1. Participants' ages ranged from 19 to 45 years (Median = 26; IQR = 6). To see the age characteristics, age was divided into maternal age categories: under 20 years as adolescent, 21-35 years as maternal age, and over 35 years as advanced maternal age, with the majority of age coming from the 21-35 age group (88.1%). This categorization reflects higher birth risks associated with adolescent and advanced maternal ages compared to the middle age group.

Most participants had higher education (Bachelor's Degree), making up 49.9% (n = 197). The minimum wage in Jakarta (Rp. IDR 5,067,381) was used as a cutoff point to see participants' financial characteristics. The monthly income of participants was categorized into below and above the minimum wage of for Jakarta, with 59.5% (n = 235) earning below this threshold (Median = 5,000,000; IQR = 1,650,000)

Table 1. Sociodemographic Characteristics (N=395)

Variable	Number	Percent (%)
Age		
<21	13	3.3
21-35	348	88.1
>35	34	8.6
Education		
No Education	1	0.3
Elementary School	1	0.3
Junior High School	1	0.3
Senior High School	110	27.8
Diploma	80	20.3
Bachelor's Degree	197	49.9
Master's Degree	3	0.8
Doctoral Degree	2	0.5
Financial Condition (Monthly Income)		
Below Minimum	235	59.5
Above Minimum	160	40.5



Table 2 summarizes the descriptive analysis processed using SPSS. A median cutoff was used because the normality testing result with Kolmogorov Smirnov showed that the data is not normally distributed ($p > 0.05$).

Table 2. Overview of Couple Decision Making and Mental Health Help Seeking Intention

Variable	Median	IQR
Couple Decision Making	17	2
Mental Health Help Seeking Intention	9	9

IQR, Interquartile Rank

The Couple decision-making variable has a median of 17, with a minimum score of 7 and a maximum of 20. Based on the median as a cutoff point, 60% of participants have low collaboration in decision-making with their partner ($n = 237$). The dependent variable, Mental Health Help-Seeking Intention, has a median of 9, with a minimum score of 3 and a maximum of 18. Based on the mean cutoff point, 51.1% of participants have low mental health help-seeking intention ($n = 202$).

Table 3. Correlation Analysis Result

Variable	Spearman Correlation Coefficient	P Value
Age	0.012	0.806
Financial (Monthly Income)	0.036	0.473
Couple Decision Making	0.180**	<0.001

**Correlation is significant at the 0.01 level

Spearman's rank correlation was used to see the correlation between age, financial condition, couple decision-making, and mental health help-seeking intention, with the result presented in Table 3. This method was used to consider non-normally distributed data. The correlation between age and mental health help-seeking intention is insignificant $r_s(393) = .012$, $p=0.806$. Similar to age, financial condition also shows no significant correlation with mental health help-seeking intention, $r_s(393) = .036$, $p= 0.473$. However, couple decision-making shows a significant positive

relationship with mental health help-seeking intention, $r_s(393) = 0.180$, $p= <0.001$. This shows that the higher the mother perceived collaborative decision-making with their husband, the higher the intention to seek mental health-related help from professionals. Despite being statistically significant, the strength of this relationship is relatively weak.

Kruskal-Wallis analysis was done for the categorical independent variable Education background. The result shows a significant difference in mental health help-seeking intention across eight different education levels, $\chi^2(7, N= 395) = 39.390$, $p= <.001$. Mothers with higher education, such as a master's degree and bachelor's degree, show a higher mental health help-seeking decision.

DISCUSSION

The findings indicate that age does not significantly predict mental health help-seeking intentions, aligning with Segal et al., who found no difference between younger and older adults' willingness to seek professional psychological help (18). Similarly, the financial condition does not significantly correlate to seeking mental health help. Eisenberg et al. findings support this, noting that while current financial circumstances are not a decisive factor in help-seeking behavior, growing up in a poorer household does have an impact, suggesting a more complex relationship between financial factors and help-seeking (23).

The result found that education level significantly correlated to seeking mental health help, with higher education correlating with more excellent help-seeking intentions. Mothers with higher education levels are more likely to seek mental health assistance, consistent with findings of previous findings (24,25). Education broadens individuals' knowledge, impacting their awareness of health issues and perception of healthcare services, affecting their decision to seek medical assistance (26).

Research indicates that couple decision-making has a significant positive relationship with mental health help-seeking intentions. This suggests that individuals who engage more in collaborative decision-making with their partners are more likely to intend to seek mental health help, consistent with previous research outcomes in health behavior. In health-related contexts, couple decision-



making influences health behavior outcomes. For example, joint decision-making among couples is positively associated with the use of modern contraceptives among young married women in Bangladesh, emphasizing the role of mutual involvement in decision-making in family planning (27). Similarly, Mahendra et al. found that households practicing collective decision-making, especially those involving the mother or female member, showed a notable correlation with the use of Long-Acting and Permanent Methods (LAPM) of contraception (13). These findings highlight the importance of gender dynamics and household communication in shaping health-related behaviors.

Collaborative decision-making demonstrates that both parties in a relationship interact and jointly participate in making important life decisions. When decisions are made, each individual's resources, such as knowledge and information, are more significant. Involving others in decision-making is beneficial for gathering information and is associated with greater well-being and better-coping strategies over time (15,16).

Although the correlation between collaborative decision-making and the intention to seek mental health help in this study was statistically significant, the strength of the correlation is meager. This indicates that other factors may have a more substantial impact on the intention to seek psychological help. The study also shows that both perceptions of collaborative decision-making and mental health help seeking intention are low. Based on these findings, it can be concluded that the intention to seek psychological help among mothers in the postpartum period in Jakarta is still low, and mental health needs have not yet become a top priority, especially when it comes to making decisions collaboratively with a partner.

While this research highlights the importance of collaborative decision-making, it is important to note several limitations. First, the study only examines perceived collaborative decision-making from the mother's perspective and does not cover the entire decision-making process. Researchers also know that the social media data collection method caused selection bias, as the sample may not accurately reflect the broader population of postpartum mothers.

Additionally, the research does not delve deeper into clinically diagnosed postpartum depression or postpartum blues, which could provide more comprehensive insights into the mental health outcomes associated with collaborative decision-making.

CONCLUSIONS

This research highlights the significant positive relationship between couple decision-making and mental health help-seeking intentions, indicating that individuals who engage more in collaborative decision-making with their partners are more likely to seek mental health help. This is consistent with previous findings, such as the increased use of modern contraceptives among young married women in Bangladesh and the correlation between collective decision-making and the use of Long-Acting and Permanent Methods (LAPM) of contraception. Collaborative decision-making facilitates sharing knowledge and information, contributing to greater well-being and improved coping strategies.

Future research should explore the entire decision-making process within couples and delve deeper into clinically diagnosed postpartum depression and postpartum blues to provide a more comprehensive understanding of mental health outcomes. At the operational level, healthcare providers should encourage and facilitate collaborative decision-making among couples, particularly in health-related contexts, and consider gender dynamics to promote equitable family planning practices. Policy and program makers can also create educational campaigns to address the influence of patriarchal norms, encouraging husbands to support their wives in seeking mental health care. Longitudinal studies are also recommended to understand the long-term effects of collaborative decision-making on mental health and other health-related behaviors.

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THE WILLINGNESS TO PAY FOR HUMAN PAPILLOMAVIRUS (HPV) VACCINE AMONG PARENTS OF DAUGHTERS AGED BETWEEN 10 TO 15 YEARS OLD IN VIENTIANE CAPITAL, LAO PDR

Phimmanivanh Menorath¹, Cheerawit Rattanapan^{1*}, Orapin Laosee¹, Thunwadee Suksaroj¹

¹ASEAN Institute for Health Development, Mahidol University, Salaya, Phutthamonthon, Nakhonpathom, 73710, Thailand

*Corresponding Author: Cheerawit Rattanapan, ASEAN Institute for Health Development, Mahidol University, Salaya, Phutthamonthon, Nakhonpathom, 73710, Thailand, E-mail: cheerawit.rat@mahidol.edu

ASBTRACT

Introduction: Cervical cancer in Laos is the fourth leading cause of cancer deaths among women. More than 371 women are diagnosed, and 191 die from this cancer each year. HPV vaccines can protect against cervical cancer infection by up to 90%. Recently, the HPV vaccine has been free for Lao girls aged between 10 and 15 years old by GAVI support until the end of 2025. The limited budgets of the Lao government directly reflect the sustainability of HPV vaccination. However, the contribution of the Lao population to their health care with willingness to pay (WTP) for HPV vaccine among parents of daughters aged 10 to 15 years old in Vientiane capital, Lao PDR, remains a concern.

Objectives: This study aims to identify WTP and factors associated with WTP for the HPV vaccine among parents of daughters aged 10 to 15 in Vientiane, the capital of Lao PDR.

Methodology: This quantitative cross-sectional study of WTP for HPV vaccine among parents of daughters aged 10 to 15 in Vientiane capital, Lao PDR. A simple random technique was applied to select the study area sample, including 422 respondents through face-to-face interviews with a structured questionnaire. A continuous evaluation method was applied for WTP measurement, and the WTP is the maximum with the total cost of the vaccine. The SPSS was applied for data analysis, including descriptive and inferential statistics, which were used to describe each variable and identify factors associated with WTP according to hypothetical WTP.

Results: A total of 422 respondents completed the survey. 85.8% of respondents were WTP for the HPV vaccine with amounts between 0-6,000,000 LAK for 2 doses, and only 14.2% were not WTP for these. The results illustrated that gender (OR: 2.848, 95% CI: 1.262-6.429), number of daughters (OR: 5.338, CI: 1.540-18.504), income (OR: 4.231, CI: 2.111-8.482), attitudes (OR: 10.38, CI: 4.58-23.54), knowledge on cervical cancer (AOR: 2.828, CI: 1.401-5.710), knowledge on HPV vaccine (AOR: 3.096, CI: 1.492-6.425) and barrier (AOR: 2.346, CI: 1.113-4.943) were significantly associated with WTP for HPV vaccine ($p < 0.05$).

Conclusion: More than three-fourths of the sample indicated that they were willing to pay any amount out of their pockets to get the HPV vaccine for their daughter. Thus, the contribution of Lao populations in paying for their health care services is one way to increase the government's stability and financial liquidity by appropriately developing the contributed payment mechanism for health.

Keywords: Willingness to pay/ Cervical cancer/ HPV vaccine/ Daughter aged 10 to 15 years old/ Lao PDR

INTRODUCTION

Recently, many people have been severely facing cancer; especially, cervical cancer is the main cause of female death with cancer worldwide (1, 2). In 2020, the number of women who were diagnosed with cervical cancer was more than 604,000, and approximately 342,000 worldwide (3, 4). Most

new cases and deaths of cervical cancer have occurred in low- and middle-income countries (LMICs) due to inadequate access to cervical cancer prevention, screening, and treatment (5).

Lao People's Democratic Republic (PDR) was also classified into low- and middle-income countries. The severity of cervical cancer in Lao PDR is the fourth most common



cause of female cancer deaths in 2020(6, 7). More than 191 Lao women died of cervical cancer, and diagnosed with this cancer was 371 women in 2020 (6). Moreover, cervical cancer has been estimated, without any intervention, that the number of Lao women will die from this cancer around 21,975 and 52,280 in the years 2070 and 2120, respectively (8).

The introduction of HPV vaccines into the national immunization program is a crucial first step to be able to achieve high coverage of vaccines against cervical cancer. Since 2009, the World Health Organization (WHO) has recommended the inclusion of HPV vaccination into National Immunization Programs (NIP) in countries where cervical cancer is a public health priority and where cost-effective and sustainable implementation of the vaccine is feasible (9). HPV vaccine was included in the NIP of Lao PDR in 2020, and HPV vaccines are recently free for Lao girls aged between 10 to 15 years old by GAVI support until the end of 2025 (10, 11).

The government of Lao PDR is facing many challenges incredibly the limited budget is a direct reflection of addressing the disease burden, such as the HPV vaccine, which requires a high budget that the Lao government must segment and allocate for sustainable implementations in the next (12). The Lao government budget is limited to spending on health, and the domestic government health expenditure was only 4.6% of the total general government expenditure in 2020 (10).

Changing financial circumstances and changing aid funding to full self-financing require a much higher level of domestic funding by 2025 (10). The government has developed a health financing strategy from time to time, including a health sector reform strategy to allocate sufficient budgets for the health sector and ensure financial sustainability towards Universal Health Coverage (UHC). Integrating NIP into the line of the health system is one way to make budget allocation more efficient and integrate vaccination activities into the Health Insurance (HI) scheme (12, 13).

Furthermore, the contribution of Lao populations in paying for their health care services is one way to increase stability and financial liquidity for the government. However, such a contribution must prevent the population from falling into poverty. Nevertheless, the HPV vaccine will not receive

external financial support soon. This study targets girls aged 10 to 15 years to ensure continued uptake of the HPV vaccine in line with the government guidelines to reduce the rate of incidents and death related to cervical cancer. However, the vaccines must be paid for, which may require purchasing or paying for the vaccine out-of-pocket. Willingness to pay (WTP) for the HPV vaccine is the value that individuals place on the vaccine. Thus, WTP for HPV vaccine among parents of daughters aged 10 to 15 years old in Vientiane capital, Lao PDR, remains a concern.

METHODOLOGY

Study design

This study was conducted as a quantitative cross-sectional study in Vientiane Capital, Lao PDR. It was based on a community-based purposive sample in the Chanthabouly district. The sample size was estimated using Daniel's formula, and a 10% non-response rate was included.

Study population

Parents with at least one daughter aged between 10 to 15 years old were the criteria of this study, and they can decide whether to vaccinate their daughter. Meanwhile, parents of daughters aged 10-15 years old who have received the HPV vaccine were excluded from the criteria. The sample of villages in Chanthabouly district was chosen by using sample random sampling by drawing technique for 6 villages consisting of Houayhong, Phontongchommani, Phontongsavat, Nongthanua, Phonsavang, and Dandong. It included 422 respondents through face-to-face interviews with a structured questionnaire.

Research instrument

The questionnaire was developed based on literature reviews and modified by qualified specialists from AIHD. It was categorized into five sections: 1. Socio-demographic characteristics; 2. Motivation; 3. Ability; 4. Occupation; and 5. Willingness to pay for HPV vaccine.

The conceptual framework was designed based on Motivation-Ability-Opportunity (MOA) theory. Applying AOM theory in this study is essential because it explains individuals' behavior, performance, and decisions regarding WTP. There were three



components in MOA theory: 1. Motivation directly influences behavior on willingness and conscious decision-making; 2. Ability refers to psychological and physical ability, including having the necessary knowledge and skills, and 3. Opportunity refers to an uncontrollable aspect for a person who is an issue or barrier-related individual.

Data analysis

The descriptive analysis was applied to identify the frequency and percentage of all variables. The contingent Valuation Method was applied for WTP measurement with an open-ended question technique; the WTP is the maximum with the whole vaccine cost. Chi-square tests were used to identify the association and measure the strength of the relationships between the outcome and each independent variable. All variables with p-value < 0.25 in the bivariate logistic regression analysis were included in a multivariate logistic regression model. A p-value < 0.05 and an adjusted odds ratio (AOR) with a 95% confidence interval were used to identify the predictors of the outcome according to

hypothetical WTP. Data analysis was applied using SPSS software version 18.

Ethical consideration

The research proposal for this study received ethical approval from the ethical committee of the Mahidol University Social Science Independent Review Board (MU-SSIRB).

RESULTS

The majority of respondents (69.4%) were female, and the median age was 43 years old, with all aged between 31 and 58 years (Table 1). Almost 94.1% of respondents had only one daughter aged 10 to 15 years, and over half (51.2%) had a household monthly income between 2,600,00 and 5,000,000 LAK. The results of this study illustrated that 85.8% of respondents were willing to pay for HPV vaccine for their daughter with an amount of WTP for HPV vaccine between 0-6,000,000 LAK for 2 doses, and only 14.2% of them were not WTP for the vaccine (Table 3). Financial constraints are inadequate to pay for the HPV vaccine, which is the main reason respondents were unwilling to pay for the vaccine.

Table 1. Description of Socio-demographic characteristics of respondents (N=422)

Variables	Number	Percent (%)
Age group (year)		
≤ 42	199	47.2
> 42	223	52.8
Median=43, QD=4.0, Min=31, Max=58		
Gender		
Father	129	30.6
Mother	293	69.4
Education		
Primary school	24	5.7
Lower secondary school	56	13.3
Upper secondary school	102	24.2
Technical/vocational education	104	24.6
Bachelor's degree	113	26.8
Master degree	23	5.5
Occupation		
Civil servant	92	21.8
Private employee	65	15.4
Business owner	107	25.4
Self-employed	29	6.9
Labor	40	9.5
Housewife	89	21.1



Variables	Number	Percent (%)
Family size		
<= 4	252	59.7
> 4	170	40.3
Median=4, QD=0.50, Min=2, Max=13		
Number of daughters		
1	397	94.1
2	24	5.7
3	1	0.2
Household Income		
≤ 1 million LAK	2	0.5
1.1 to 2.5 million LAK	97	23.0
2.6 to 5 million LAK	216	51.2
> 5 million LAK	107	25.4

Table 2. Description of Motivation-Ability-Opportunity responses of respondents

Variables	Frequency	Percent (%)
<i>Motivation domains</i>		
Level of perceived susceptibility to getting cervical cancer		
Low perception	220	52.1
High perception	202	47.9
level of perceived severity for cervical cancer		
Low perception	161	38.2
High perception	261	61.8
perception level on cues to get the HPV vaccine		
Low perception	213	50.5
High perception	209	49.5
Level of attitudes toward HPV vaccine		
Negative attitude	193	45.7
Positive attitude	229	54.3
<i>Ability domains</i>		
Level of Knowledge on cervical cancer		
Inadequate knowledge	194	46.0
Adequate knowledge	228	54.0
Level of Knowledge on HPV vaccine		
Inadequate knowledge	93	22.0
Adequate knowledge	329	78.0
Level of self-efficacy		
Low self-efficacy	209	49.5
High self-efficacy	213	50.5
<i>Opportunity domain</i>		
Level of barriers to HPV vaccination		
Low perception	207	49.1
High perception	215	50.9

Table 3. Description of willingness to pay and unwillingness to pay of respondents

Variables	Number	Percent (%)
WTP and not WTP		
WTP for HPV vaccine (2doses)		
Yes	362	85.8
No	60	14.2



Variables	Number	Percent (%)
Maximum amount of Willingness to pay for HPV vaccine		
≤500,000 LAK	257	60.9
>500,000 LAK	165	39.1
Median=500,000, QD=1,143,000, Min=0, Max=6,000,000		
Not willing to pay for Human Papillomavirus vaccine (full package)		
– HPV vaccine should be the response of the government free of charge	40	42.6
– HPV vaccine should be covered in the Health Insurance scheme	11	11.7
– Financial constraints are inadequate to pay for the HPV vaccine	43	45.7

The results of the multiple logistic regression in the final model (Table 4) showed that seven independent variables were significant predictors association with WTP for HPV vaccine consists of gender (OR: 2.848, 95% CI: 1.262-6.429), number of daughters

(OR: 5.338, CI: 1.540-18.504), income (OR: 4.231, CI: 2.111-8.482), attitudes (OR: 10.38, CI: 4.58-23.54), knowledge on cervical cancer (AOR: 2.828, CI: 1.401-5.710), knowledge on HPV vaccine (AOR: 3.096, CI: 1.492-6.425) and barrier (AOR: 2.346, CI: 1.113-4.943).

Table 4. Factors associated with WTP for HPV vaccine by multiple logistic method

Factors	AOR	Full model 95% CI		P-value	AOR	Final model 95% CI		P-value
		Lower	Upper			Lower	Upper	
Gender								
Father	2.822	1.242	6.413	0.013	2.848	1.262	6.429	0.012
Mother	1.00				1.00			
Education								
Upper high school or less	1.00							
Higher than upper high school	1.242	0.571	2.702	0.584		NA		
Occupation								
Civil servant/Private employee/ Business owner	1.154	.541	2.464	0.711		NA		
Self-employed/ Labor/ Housewife	1.00							
Number of daughters								
=1	5.151	1.476	17.97	0.010	5.338	1.540	18.50	0.008
>1	1.00				1.00			
Household's monthly income								
≤2.5 million LAK	1.00				1.00			
>2.5 million LAK	3.858	1.857	8.017	<0.001	4.231	2.111	8.482	<0.001
Level of attitudes toward HPV vaccine								
Negative attitude	1.00				1.00			
Positive attitude	10.55	4.64	23.99	<0.001	10.38	4.58	23.54	<0.001



Factors	AOR	Full model 95% CI		P-value	AOR	Final model 95% CI		P-value
		Lower	Upper			Lower	Upper	
Level of knowledge on cervical cancer								
Inadequate knowledge	1.00				1.00			
Adequate knowledge	2.785	1.375	5.639	0.004	2.828	1.401	5.710	0.004
Level of knowledge on HPV vaccine								
Inadequate knowledge	1.00				1.00			
Adequate knowledge	2.930	1.393	6.163	0.005	3.096	1.492	6.425	0.002
Level of barrier to HPV vaccination								
Low perception	2.209	1.030	4.737	0.042	2.346	1.113	4.943	0.025
High perception	1.00				1.00			

DISCUSSION

This study aimed to identify the willingness to pay and determine the predictors of willingness to pay for HPV vaccine among parents of daughters aged 10 to 15. The results show that 85.5% of parents were willing to pay their daughters for the HPV vaccine, and the average amount of WTP was approximately 1,250,000 LAK (US\$65.78). In Nigeria, 91.6% of mothers had positive WTP for the HPV vaccine; the average WTP was US\$11.68 (14). In Vietnam, knowledge, attitude, and practice on and willingness to pay were assessed, and 86.6% of respondents, with the average out-of-pocket for HPV vaccine was US\$49.3 per dose (15). These findings suggest a high percentage of willingness to pay for the HPV vaccine, and there are differences regarding the amount of WTP for the HPV vaccine.

Socio-demographic characteristics factors in this study found that fathers were WTP predictors of their daughters for the HPV vaccine compared to mothers. Such findings in a study in Ghana mentioned that fathers were important in financial decision-making (16), and quantitative studies suggested that males were usually willing to pay more than their female counterparts (17, 18). The number of daughters in the family positively predicted WTP for the HPV vaccine. A similar finding in China reported that one-child families were interested in a higher willingness to pay their child for the vaccination (19). In contrast, if parents have to pay and make the decision about vaccinations for their children together with having a larger family size, the budgetary restrictions may be significant.

The study found that almost 92.6% of parents willing to pay for the vaccination had a household monthly income of more than 2.5 million LAK. This result is consistent with similar research findings reported that higher income was significantly associated with WTP for the HPV vaccination, respectively (20-22). The individual having more income may have additional money to be allocated to promote their family's health.

However, age, education, occupation, and family size were non-significant predictors of association with WTP for the vaccination in this study. In line with previous studies, it was found that age, family size, and occupation were not significantly affected by WTP for the vaccination (19, 23). On the contrary, a previous study in Vietnam revealed that parents' higher education levels contribute to determining their willingness to pay their children for the HPV vaccine (15).

In terms of attitudes on HPV vaccination, WTP for the vaccination was reported for parents who had positive attitudes. A similar finding revealed that positive attitudes were higher willingness to HPV vaccination for their daughter (24). This highlights the importance of feelings and beliefs about HPV vaccination. Positive attitudes further increase confidence in vaccines' effectiveness, safety, and advantages.

Parental knowledge of cervical cancer and the HPV vaccine was a predictor of WTP in their daughter for the HPV vaccine. Previous studies reported that good knowledge was significantly associated with WTP to prevent cervical cancer (20, 23, 25). A possible



explanation for this could be increased information and awareness about cervical cancer and HPV vaccines. The study findings highlight the importance of addressing these factors to increase vaccination rates and reduce the burden of HPV-related disease.

The barrier of HPV vaccination was a predictor associated with WTP for the vaccine. Barriers to HPV vaccination among parents highlight concerns about vaccination uptake as well as cultural stigma associated with a vaccine for a sexually transmitted disease (26).

CONCLUSION

The study highlights the significant influence factors on socio-demographics, perception, attitude, and knowledge of cervical cancer and HPV vaccine to the willingness to pay for the HPV vaccine. The importance of achieving higher coverage rates among parents of daughters aged 10 to 15 years old should provide knowledge and understanding, fostering positive attitudes suitable and correctly together with addressing the financial barriers. The price of the HPV vaccine is relatively high, so we should consider price sensitivity when accessing the vaccination. According to a willingness to pay, the contribution of Lao populations in paying for their health care services is one way to increase stability and increase financial liquidity for the government by appropriately developing the contributed payment mechanism on health.

LIMITATIONS AND RECOMMENDATIONS

This study's limitations may include only participants living in the capital city. This study may not fully represent the willingness to pay in rural areas because the information on socio-demographic characteristics, knowledge, attitude, perception, information of disease, and accessibility of the HPV vaccine may be a barrier in rural areas of Lao PDR. This study is concerned with only quadrivalent (4-valent) HPV vaccine and may not represent willingness to pay for all types of HPV vaccine. The recommendation of research is to compare willingness to pay for different types of HPV vaccines.

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ASSOCIATION BETWEEN PERCEPTION OF ACADEMIC STRESS AND FAMILY RELATIONSHIP TOWARD MENTAL WELL-BEING AMONG PHARMACY STUDENTS AT CHULALONGKORN UNIVERSITY IN THAILAND: A CROSS-SECTIONAL STUDY

Chompunoot Prasongpol¹, Pramon Viwattanakulvanid^{1*}

¹College of Public Health Sciences, Chulalongkorn University, Sabbasatavicaya Building, Phayathai Road Bangkok 10330, Thailand

*Corresponding Author: Pramon Viwattanakulvanid, College of Public Health Sciences, Chulalongkorn University Sabbasatavicaya Building, Phayathai Road, Bangkok 10330, Thailand, Email: Pramon.V@chula.ac.th

ABSTRACT

Introduction: University students' mental health and well-being, especially those in healthcare, are increasingly important due to their influence on health and societal issues. Pharmacy students who face high expectations and life changes experience significant stress, impacting their mental health and academic performance. Understanding the factors affecting their stress and mental well-being is crucial. This study investigated the relationship between general characteristics, academic stress, family relationships, and mental well-being among pharmacy students at Chulalongkorn University in Thailand.

Methodology: The cross-sectional study, conducted in May 2024, used an online self-administered questionnaire to gather data on general characteristics, academic stress (PAS), family relationships (FACI8), and mental well-being (SWEMWBS). Descriptive statistics, simple logistic regression, and multiple logistic regression were used for analysis.

Results: This study involved 289 pharmacy students; 199 were predominantly female (68.9%), aged 18–26, with an age range of 18–26 and a mean age of 21.87 (S.D. 1.8). Fifth-year students comprised the highest response group (23.9%). About 54.7% reported good mental health, and 45.3% reported poor mental health. Over half had a low perception of academic stress (55%), and 66.4% reported imbalanced family relationships. Multiple logistic regression revealed significant associations between the perception of academic stress (AOR: 2.87, 95% CI: 1.68–4.90, $p < 0.001$), family relationships (AOR: 2.02, 95% CI: 1.15–3.57, $p = 0.015$), and mental well-being.

Conclusion: The study demonstrated that the perception of academic stress and family relationships is significantly associated with mental well-being among pharmacy students. Despite more than half of the students reporting good mental well-being, mental health awareness activities and improved academic support remain important to enhance their well-being further and reduce stress.

Keywords: Family Relationship, Mental Well-being, Pharmacy students, Perception of Academic Stress

INTRODUCTION

At present, mental health and well-being issues among university students are globally significant topics of interest as it is a growing health and societal problem. During a critical transitional phase, university students often experience significant academic-related stress due to an imbalance between personal demands and external pressures from family, friends, and the academic environment (1). Key stressors include academic pressure, heavy workloads, increased responsibilities, time management challenges, changes in daily

routines, peer conflicts, comparisons, and uncertainty about post-graduation plans (2). Especially in healthcare, students have been reported to have increased stress levels due to the nature of the educational process and the pressure of high expectations from their teachers, parents, peers, and society. However, pharmacy students demonstrate a comparatively higher prevalence of stress than students of other health professions, which negatively affects their mental health, resulting in the occurrence of stress-related mental disorders and poor academic performance (3).



Thus, it is important to understand how various factors are related to reduce stress and improve mental well-being.

The majority source of stress related to mental health problems among students is academic stress. The study supported the impact of academic stress causing negative sequences in university students, including poor academic performance and learning outcomes (4, 5) and withdrawal from school (6). Furthermore, long-term stress suffers strongly from both physical and psychological consequences. The negative effects of physical health abnormalities, such as fatigue, loss of appetite, headaches, and gastrointestinal issues. Followed by mental health and well-being problems (5).

Another important predictor for mental health and well-being is relationship issues. One is family relationships, the first units that shape individual characteristics, promoting healthy personalities, encouraging social abilities, and fostering societal adjustment (7). Accordingly, the bond between family members, especially between parents and adolescents, encompasses norms and values that directly impact the health and well-being of family members (8).

Hence, early awareness and accessible guidance on managing academic stress are crucial, as high levels of academic stress are positively associated with poor mental well-being. Researchers are increasingly interested in understanding the impacts of academic stress on mental health to address mental health problems and related risk factors among students (1, 9)

The research investigates the relationship between the perception of academic stress, family relationships, and mental well-being levels among Chulalongkorn University pharmacy students.

METHODOLOGY

Study Design, Study Area, and Population

The cross-sectional study was conducted in May 2024 among the first- to sixth-year undergraduate pharmacy students at Chulalongkorn University in Thailand, using an online, self-administered questionnaire.

Sample Size Estimation and Sampling Technique

Daniel Wayne's method (1995) (10) was used to estimate the finite population proportion. The expected proportion is 0.5, referring to the proportion of students with good mental well-being (11). Consequently, the calculated sample size was 279 participants, with an add-up by drop-out rate of 5–10%. The sampling methods used in this study are non-probability quota sampling and convenience sampling methods.

Inclusion and Exclusion Criteria

This study includes full-time undergraduate students aged 18 and over at the Faculty of Pharmaceutical Sciences willing to participate. Students receiving mental health treatment, unable to complete online questionnaires, or unwilling to participate are excluded.

Measurement Tools

The questionnaire consisted of four parts: questions on general characteristics, perception of academic stress (PAS), family relationships, and mental well-being level. Firstly, the general characteristics section included questions on gender, age, year of study, current cumulative GPA, living arrangement while studying, family background (siblings, parent's marital status, parents' education level), household income, and underlying disease. Following that, the perception of academic stress (PAS) scale had 18 questions adapted from the validated questionnaire by Bedewy and Gabriel (2015) (12). Using a 5-point Likert scale, participants rated their perception of academic stress regarding their thoughts or feelings toward the classes they were currently taking. They indicated how much they agreed with each statement. A higher score indicates lower academic stress. Then, the family relationship part, adapted from the Thai version of the Family Attachment and Changeability Index 8 (FACI8) questionnaire, assessed how well family bonding, flexibility, and communication were among family members. The questionnaire includes 16 items on a 3-point Likert scale (13, 14). Finally, the seven items of the Short Warwick-Edinburgh Mental Well-being Scale (SWEMWBS) were adapted and translated into Thai by Natthaphansan



Sriwichai (15). Meanwhile, I scored the level of feeling through the seven statements over the last two weeks to investigate the mental well-being levels. The higher scores refer to a higher level of mental well-being level.

In addition, the perception of academic stress questionnaire was translated into Thai with a back-translation method and revalidated through the Item-Objective Congruence (IOC) index with an acceptable IOC score value ranging from 0.67 to 1.0 (greater than 0.5) by three experts (16). As for the reliability test, we conducted the pilot test on university students with similar characteristics. The Cronbach's alpha from SPSS analysis displays the details, demonstrating a high level of internal consistency (the acceptable value ≥ 0.7) (17). The questionnaire items show a range of Cronbach's alpha values of 0.784 to 0.882.

Data Collection Process and Ethical Considerations

Chulalongkorn University's Research Ethics Review Committee approved this study on May 9, 2024 (COA No. 102/67). After obtaining approval from the Chulalongkorn University Ethical Committee and permission from the Faculty of Pharmaceutical Science, the data collection process was initiated using an online, self-administered questionnaire distributed through Google Forms.

Data Analysis

The data were analyzed using SPSS version 29.0 software. Descriptive statistics

were analyzed, and for inferential analysis, simple logistic regression (p -value <0.20) and multiple logistic regression (p -value <0.05) were employed to analyze the data and identify factors associated with mental well-being levels.

RESULTS

General Characteristics

Table 1 depicts descriptive data on the general characteristics of pharmacy students at Chulalongkorn University. Two hundred eighty-nine pharmacy students participated in this study; 199 were predominantly female (68.9%), with a mean age of 21.87 (S.D. 1.8). The highest responses came from fifth-year students 69 (23.9%), fourth-year students 62 (21.5%), and sixth-year students 49 (17.0%), respectively. In addition, more than half of the students had a current cumulative GPA of more than 3.00, showing 226 (72.8%).

Among the students, 55.7% lived with their parents, 22.1% lived alone, 14.2% with friends, and 8.0% with relatives. Most students (74.4%) had siblings. The majority (76.8%) had living-together parents, while 10.4% had divorced parents, 7.3% had separated parents, and 5.5% had widowed parents. Over half of the fathers (57.1%) and mothers (58.8%) had a bachelor's degree or equivalent. Regarding family income, 37.0% earned more than 100,000 baht per month, 36.3% between 50,000 and 100,000 baht, and 26.6% less than 50,000 baht. Additionally, 91% of students did not have any underlying diseases.

Table 1 General Characteristics of Pharmacy Students at Chulalongkorn University (n= 289)
General Characteristics Frequency (N= 289)

General Characteristics	Number (N= 289)	Percent (%)
Gender		
Male	77	26.6
Female	199	68.9
Others	13	4.5
Age (years)		
<22	106	36.7
≥ 22	183	63.3
<i>Mean\pmSD, 21.87\pm 1.8, Min=18 Max =26</i>		



General Characteristics	Number (N= 289)	Percent (%)
Year of Study		
Year 1	38	13.1
Year 2	36	12.5
Year 3	35	12.1
Year 4	62	21.5
Year 5	69	23.9
Year 6	49	17.0
GPA		
≤ 3.00	63	21.8
>3.00	226	78.2
Living Arrangement		
Stay alone	64	22.1
Stay with Parents	161	55.7
Stay with Friends	41	14.2
Stay with Relatives	23	8.0
Have Sibling		
No	74	25.6
Yes	215	74.4
Parent's current Marital Status		
Living together	222	76.8
Separated	21	7.3
Divorced	30	10.4
Widowed	16	5.5
Father Education Level		
Below bachelor's degrees	55	19.0
Bachelor's Degrees	165	57.1
Postgraduate	69	23.9
Mother Education Level		
Below bachelor's degrees	65	22.5
Bachelor's Degrees	170	58.8
Postgraduate	54	18.7
Average Family Income (Thai Baht per month)		
Less than 50,000 baht	77	26.6
50,000-100,000 baht	105	36.3
More than 100,000 baht	107	37.0
Have Underlying Disease		
No	263	91.0
Yes	26	9.0

Perception of Academic Stress Level

Table 2 classifies the perception of academic stress levels among the 289 study participants as follows: The levels were divided into two groups based on their mean scores: low (score≤55) for academic stress and high

(score>55). The low PAS level/high academic stress group had 159 (55% of the total), and the high PAS level/low academic stress group had 130 (45%).

**Table 2** Perception of Academic Stress Level in Pharmacy Students at Chulalongkorn University (n=289)

Perception of Academic (PAS)	Number (%)
Low PAS Level /High Academic Stress* (score≤55)	159 (55.0)
High PAS Level /Low Academic Stress* (score>55)	130 (45.0)

Mean±SD, 55±9.1
Minimum score= 27, Maximum score= 79

*a higher level of perception of academic stress level indicates lower academic stress

Family Relationship Type

The Thai version of the Family Attachment and Changeability Index 8 (FACI8) questionnaire consists of 8 attachments and eight changeability questions. The summing score of the attachment and changeability scale divided into two categories provided the Family Relationship (FR) score. Then, the family level was categorized using the Family Relationship (FR) score. The imbalanced family type refers to 3 types of family level using the family relationship (FR) score, including the extreme level (FR score 1.0–3.5), the moderate level (FR score 4.0–4.5), and the midrange levels (FR score 5.0–5.5). Meanwhile, the balanced family type (FR score

6.0) encompasses families at a balanced level. To clarify, the imbalanced family comprises extreme, moderate, and midrange family levels, which refer to poor, moderate, and optimal family bonding, respectively, and the family's attachment and adaptability range from poor to good. While a balanced family encompasses both good family bonding, good attachment, and changeability (13, 14)

The following table displays the descriptive findings for each family type. Table 3 shows that 192 out of 289 students rated their family as imbalanced (66.4%). While 33.6% reported that their family type was balanced.

Table 3 The categories of Family Type of Pharmacy students at Chulalongkorn University (n=289)

Family Type**	Number (%)
Imbalanced family (Extreme Level/Moderate Level/Midrange Level)	192 (66.4)
Balanced family (Balance Level)	97 (33.6)

** The categorization of the family type comes from grouping the family level based on the standard range of the Thai version of FACI8 (13, 14)

Mental Well-being Level

The mental well-being part used SWEMWBS to assess students' mental well-being levels.

Table 4 shows that 54.7% of students had a high level of mental well-being, and 45.3% had poor mental well-being.

Table 4 The mental well-being level of Pharmacy students at Chulalongkorn University (n=289)

Mental well-being	Number (%)
Poor Level (Score<25)	131 (45.3%)
Good Level (Score≥25)	158 (54.7%)

Median (IQR), 25(22-28)
Minimum score= 7, Maximum score=35

*A higher score indicates a higher level of mental well-being

Inferential Findings

The factors associated with the mental well-being level of pharmacy students at

Chulalongkorn University (n = 289) were examined. The first analysis step uses simple logistic regression, considering a p-value < 0.2



to increase the likelihood of including independent variables in the multivariate model (18).

Table 5 presents the six independent variables in the binary logistic regression model, which include the year of study, living arrangement, family average income, parents' marital status, perception of academic stress (PAS) level, and family relationship. As a result, the binary logistic regression, considering a significance level of 0.05, demonstrated that perception of academic stress

(PAS) level and family relationship were significant predictors of mental well-being. Specifically, the students with a high perception of academic stress (low academic stress) were 2.87 times more likely to have good mental well-being than students with a low perception of academic stress (high academic stress) (AOR: 2.87, 95% CI: 1.68–4.90, $p < 0.001$). Meanwhile, students who report their family relationship as balanced are 2.02 times more likely to have good mental well-being than those who reported an imbalanced family type (AOR: 2.02, 95% CI: 1.15–3.57, $p = 0.015$).

Table 5 Associated factors of good mental Well-being Level of Pharmacy Students at Chulalongkorn University (N= 289)

Variable	Mental well-being		COR ^a (95% CI)	AOR ^b (95% CI)	P-value ^c
	Poor Level N(%)	Good Level N(%)			
Gender					
Male ^{Ref}	31 (40.3)	46 (40.3)	1	-	-
Female	93 (46.7)	106(53.3)	0.77	-	-
Others	7 (53.8)	6 (46.2)	(0.45-1.31) 0.58 (0.18-1.88)	-	-
Age (years old)					
<22 ^{Ref}	52 (49.1)	54 (50.9)	1	-	-
≥22	79 (43.2)	104 (56.8)	1.27 (0.78-2.05)	-	-
Year of Study					
Year 1 ^{Ref}	15 (39.5)	23 (60.5)	1	1	0.26
Year 2	18 (50.0)	18 (50.0)	0.65 (0.26-1.64)	0.63 (0.28-2.18)	0.64 0.19
Year 3	21 (60.0)	14(40.0)	0.44 (0.17-1.11)	0.49 (0.17-1.14)	0.52 0.38
Year 4	31 (50.0)	31 (50.0)	0.65 (0.29-1.48)	0.74 (0.30-1.83)	0.74
Year 5	23 (33.3)	46 (66.7)	1.3 (0.57-2.96)	1.51 (0.60-3.76)	
Year 6	23 (46.9)	26 (53.1)	0.74 (0.31-1.74)	0.86 (0.34-2.17)	
GPAX					
≤3.00 ^{Ref}	29 (46.0)	34 (54.0)	1	-	-



Variable	Mental well-being		COR ^a (95% CI)	AOR ^b (95% CI)	P-value ^c
	Poor Level N(%)	Good Level N(%)			
>3.00	102 (45.1)	124 (54.9)	1.04 (0.43-0.59)	-	-
Living Arrangements					
Stay alone ^{Ref}	36 (56.3)	28 (43.8)	1	1	0.77
Stay with Parents	66 (41.0)	95 (59.0)	1.85 (1.03-3.32)	1.32 (0.68-2.57)	0.42 0.36
Stay with Friends	17 (41.5)	24 (58.5)	1.82 (0.82-4.01)	1.51 (0.62-3.66)	0.93
Stay with Relatives	12 (52.2)	11 (47.8)	1.18 (0.45-3.07)	1.05 (0.36-3.06)	
Have sibling					
No ^{Ref}	33 (44.6)	41 (55.4)	1	-	-
Yes	98 (45.6)	117 (54.4)	0.96 (0.57-1.63)	-	-
Parents Marital Status					
Living together	97 (43.7)	125(56.3)	1	1	0.4
Separated	7 (33.3)	14 (66.7)	1.55 (0.60-3.99)	1.21 (0.43-3.40)	0.71
Divorced	17 (56.7)	13 (43.3)	0.59 (0.28-1.28)	0.56 (0.22-1.39)	0.21
Widowed	10 (62.5)	6 (37.5)	0.47 (0.16-1.33)	0.51 (0.16-1.64)	0.26
Father Education Level					
Below bachelor's degrees ^{Ref}	25 (45.5)	30 (54.5)	1	-	-
Bachelor's degrees	76 (46.1)	89 (53.9)	0.98 (0.52-1.80)	-	-
Postgraduate	30 (43.5)	39 (56.5)	1.08 (0.53-2.21)	-	-
Mother Education Level					
Below bachelor's degrees ^{Ref}	33 (50.8)	32 (49.2)	1	-	-
Bachelor's degrees	76 (44.7)	94 (55.3)	1.28 (0.72-2.26)	-	-
Postgraduate	22 (40.7)	32 (59.3)	1.5 (0.72-3.11)	-	-
Average Family Income (THB per month)					
<50,000 ^{Ref}	38 (49.4)	39 (42.1)	1	1	0.61
50,000-100,000	51 (48.6)	54 (51.4)	1.03 (0.57-1.86)	1.07 (0.56-2.05)	0.85



Variable	Mental well-being		COR ^a (95% CI)	AOR ^b (95% CI)	P-value ^c
	Poor Level N(%)	Good Level N(%)			
>100,000	42 (39.3)	65 (60.7)	1.51 (0.83-2.73)	1.38 (0.69-2.79)	0.36
Have Underlying Disease					
No ^{Ref}	121 (46.0)	142 (54.0)	1 0.69	- -	- -
Yes	10 (38.5)	16 (61.5)	(0.31-1.54)		
Perception of Academic Stress (PAS) Level					
Low PAS	94 (59.1)	65 (40.9)	1	1	-
(High academic stress) ^{Ref}					
High PAS	37 (28.5)	93 (71.5)	3.64 (2.22-5.96)	2.87 (1.68-4.90)	<0.001*
(Low academic stress)					
Family Relationship Type					
Imbalanced Family ^{Ref}	101(52.6)	91 (47.4)	1	1	-
Balanced Family	30 (30.9)	67 (69.1)	2.48 (1.48-4.15)	2.02 (1.15-3.57)	0.015*

^a COR (crude odds ratio) from simple logistic regression

^{b,c} AOR (adjusted odds ratio) and p-value from multiple logistic regression including significant variables from bivariate analysis

* Significance level p-value <0.05

Binary Logistic Regression shows Model chi-square = 46.94 (df = 15, p-value < 0.001); Nagelkerke R Square = 0.200; Hosmer and Lemeshow test chi-square = 1.963 (df=8, p = 0.982); Hit rate = 67.5%

DISCUSSION

Current research demonstrates that the mental well-being assessment persisted, indicating that more than half of the participants had good mental well-being. Meanwhile, the overall proportion of students with a low perception of their academic stress score is greater than half, suggesting a higher stress level. Following that, most students described their family type as imbalanced, with moderate family bonding, good attachment, and changeability.

The study found that binary logistic regression analysis identified perceptions of academic stress and family relationships as significant predictors of mental well-being among Chulalongkorn University pharmacy students. Students with higher perception scores, indicating lower academic stress, had better mental well-being. This finding aligns with previous research on U.S. college students, which also showed a positive correlation

between perceptions of academic stress and mental well-being. Students with lower perception scores, indicating higher academic stress, had worse mental well-being. The study results aligned with a previous study that identified four academic stressors—pressure to perform, perceptions of workload and examinations, self-perceptions, and time constraints—particularly associated with mental well-being(19). The other previous studies, which had similar findings and examined different components of stress and mental health indicators on different scales or methods, also supported our research result. The higher stress level is negatively associated with students' mental health(20). The assessment of academic stress perception reflects students' stress level towards their academic situation. However, the study found that factors like self-perception, variations in university environments, teaching systems, and corporate culture can influence this perception.



Another factor significantly associated with mental well-being is family relationships. The bond between parents and adolescents forms family units, which are directly linked to the mental health and well-being of family members (8, 21). The former study indicated that a good family environment, starting from nurturing (22), including love among family members, open communication with each other, parental support, and understanding, can be a predictor of good family functioning and has been related to effectively physical and psychological health, quality of life, individual productive, and well-being (8, 23).

LIMITATIONS

The cross-sectional design allows for simultaneous data collection from many participants but cannot determine causality or long-term behavioral changes. As a result, qualitative research may be an appropriate approach because it could provide more in-depth data. Consequently, the study's use of convenient sampling exposes it to selection bias and limits its ability to achieve generalization. Moreover, the reliance on self-reported data introduces potential bias and efficient online questionnaires often need higher response rates, particularly due to the timing of exams and school breaks. Finally, the study's focus on pharmacy students at Chulalongkorn University limits the generalizability of the findings to a broader population. Despite these limitations, the study offers a valuable preliminary step for future research in mental health among pharmacy students at Chulalongkorn University.

CONCLUSION

The study results revealed that a higher proportion of students reported good mental health compared to those with poor mental health. The study demonstrated that perceptions of academic stress and family relationships had significant associations with mental well-being among pharmacy students. While general characteristics were not significantly predictive of mental well-being, the study supports the notion that various individual and external factors can influence mental well-being. As we know, the individual's mental well-being and the absence of mental illness reflect a sense of balance in emotion, thoughts, social relationships, and personal interests.

RECOMMENDATION

Future studies should explore a wider range of factors influencing mental health and well-being, using qualitative methods for deeper insights. Additionally, employing probability sampling will ensure broader generalizability, and expanding the study beyond Chulalongkorn University will provide a more representative student population. Since pharmacy students will become frontline healthcare practitioners, understanding their mental health is crucial for planning effective student support services. Despite a majority reporting good mental well-being, there is a need for enhanced mental health awareness and academic support to improve their well-being further and reduce stress. To address this, increasing mental health resources and awareness activities is essential. Enhance educational support through integrated learning management programs. We should offer short mental health and well-being courses, enabling students to share their experiences with mental health specialists. These measures will help improve students' mental health and well-being, ultimately preparing them for future healthcare roles.

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STIGMATIZATION OF SEXUAL ORIENTATION, GENDER IDENTITY, GENDER EXPRESSION, AND SEX CHARACTERISTICS (SOGIESC) AMONG MYANMAR TRANSGENDER WOMEN IN SAMUT SAKHON PROVINCE, THAILAND: IMPACTS ON ACCESS TO SEXUAL HEALTH SERVICES

Min Khant Nyunt¹, Kanchana Tangchonlatip^{1*}, Dusita Phuengsamran¹

¹*Institute for Population and Social Research, Mahidol University, Salaya, Phutthamonthon, Nakhon Pathom 73170, Thailand*

**Corresponding Author: Kanchana Tangchonlatip, Institute for Population and Social Research, Mahidol University, Salaya, Phuttamonthon, Nakhon Pathom 73170, Thailand, Email: kanchana.tag@mahidol.ac.th*

ABSTRACT

Introduction: Transgender women in Myanmar face significant stigmatization due to deeply rooted gender norms, civil laws, and Buddhist beliefs, which impede their access to sexual and reproductive health services. Migrant transgender women from Myanmar in Samut Sakhon may encounter similar stigmatized experiences in their Myanmar society. Previous studies show that migrant transgender women experience vulnerability and marginalization due to the intersectional challenges of being migrants and transgender women.

Objectives: To understand the stigmatization among transgender women from Myanmar in Samut Sakhon Province and how these experiences impact access to sexual health services.

Methodology: The qualitative study was conducted through 10 in-depth interviews with nine in-person and one online video meeting with Myanmar transgender women aged 18 years and older living in Samut Sakhon for at least six months. The purposive sampling method was employed to reach transgender women representing various gender expressions: four openly expressed, four partially expressed, and two never expressed. The snowball sampling method was then utilized in the study to recruit eligible participants, and thematic analysis was used.

Results: Every Myanmar transgender woman experiences childhood trauma due to stigmatized experiences. This often includes physical and mental abuse by family members, leading to an anticipated stigma characterized by a fear of discrimination. It further contributes to delays in seeking gender-affirming care and STI testing. Never-expressed transgender women tend to have more internalized stigma, such as negative beliefs or fear of shame, to visit clinics for sexual health services than those who have partially or openly expressed their identity. Although partially and openly expressed women face similar stigmatization based on sexual orientation, gender identity, gender expression, and sex characteristics (SOGIESC), such as verbal and mental abuse, openly transgender women can cope better with their experiences due to their higher self-esteem and the presence of support network.

Conclusion: This study addresses the research gap in understanding the stigmatized experiences of SOGIESC among Myanmar transgender women and its impacts on access to sexual health services. It highlights the need for empowerment programs such as SOGIESC awareness raising to reduce self-stigmatization and psychosocial support to improve access to sexual health services for Myanmar transgender women.

Keywords: Transgender women, stigmatization, sexual orientation, gender identity, gender expression, sex characteristics, sexual health services.

INTRODUCTION

Stigma toward sexually diverse individuals involves labeling, stereotyping, separation, status loss, and discrimination. Especially transgender women often experience stigmatization based on gender

norms, societal expectations, and values, perpetuating stereotypes and restricting rights and behaviors according to sex at birth (1). This causes acceptance of masculinity for men and femininity for women, marginalizing those who do not conform, notably lesbian, gay, bisexual,



transgender, queer, intersex, and asexual (LGBTQIA+) individuals.

Stigma against transgender women often originates from cultural and religious. For example, the patriarchal society in Myanmar devalues transgender women, viewing them as mentally impaired or sinners due to bad karma in their past lives, and this leads to internalized stigma. Such as shame or negative thoughts about their sexuality and discrimination. Similarly, stigma towards LGBTQIA+ still exists in some countries, enforced by cultural norms and laws. For instance, laws in countries like Malaysia and India criminalize transgender identity, worsening stigma (2). Moreover, Myanmar's colonial-era laws still criminalize homosexuality, leading to arrests and abuse of transgender women (3, 4). Despite UN efforts to enact anti-discrimination laws in many countries, including Myanmar, most of the countries still prohibit same-sex marriage (5).

Transgender women are at a high risk of sexually transmitted infections (STIs) and human immunodeficiency virus (HIV) infection due to prevalent unprotected sex and high STI diagnoses (6). They are disproportionately affected by HIV, with a prevalence rate 14 times higher than other adults (7). In Southeast Asia, HIV prevalence among transgender women is rising, as seen in Jakarta (34.0% in 2015) and Phnom Penh (14.0% in 2019). Despite some progress in Thailand, stigma and discrimination still hinder effective HIV prevention and treatment for transgender women (8).

Globally, transgender women face numerous barriers to HIV prevention and treatment, including criminalization, stigma, discrimination, and violence. These structural factors increase risky behaviors, such as condomless sex and unsafe needle use (7). One piece of evidence showed that stigma significantly impacts access to healthcare, with 72.0% of transgender people reporting stigma and 14.4% avoiding healthcare due to discrimination. Mainly, migrant transgender women experience even greater stigma and discrimination due to the intersectionality challenges of being migrants and transgender (9).

The goal of ending AIDS by 2030 requires 90% of people with HIV to know their

status (10). Therefore, early HIV testing, treatment, and prevention are crucial (11). However, stigma remains a significant barrier among LGBTQIA+ communities globally (2). Thus, understanding stigmatization towards migrant transgender women is essential for inclusive sexual health services (12). Previous studies on HIV and STIs among migrant transgender women focus on Western contexts (9, 13, 14). There is a lack of understanding about Myanmar migrant transgender women in Burmese society in Thailand, particularly in Samut Sakhon.

One study mentioned that transgender women are more likely to engage in condomless sex and avoid STI and HIV testing when they have feelings of shame or negative thoughts about their SOGIESC (internalized stigma) (15). One study in Senegal presented that sexual behavior stigma could make them unable to disclose their gender identity and sexual behaviors due to anticipated stigma characterized by fear of discrimination and negative treatment, which could delay seeking HIV services among gay and transgender women (16). Therefore, a conceptual framework was applied in this study to understand how the stigmatization of transgender women in accessing sexual health services at different levels based on the hypothesis of Bronfenbrenner's socio-ecological model (Bronfenbrenner, 1977). According to one recent study, migrant Myanmar transgender women in Samut Sakhon also experienced workplace discrimination and verbal abuse according to a recent study (17). Therefore, gender and cultural norms in Burmese society in Samut Sakhon persist. This study aims to understand the stigmatization of (SOGIESC) of Myanmar transgender women living in Samut Sakhon Province and to explore its impact on sexual health service utilization using a socio-ecological model to understand the different levels of stigmatization among the Burmese community (18). This approach provided insights into the individual, interpersonal, and communal impacts of stigma, helping to achieve equitable sexual health services for migrant transgender women by addressing current gaps in Samut Sakhon, Thailand.

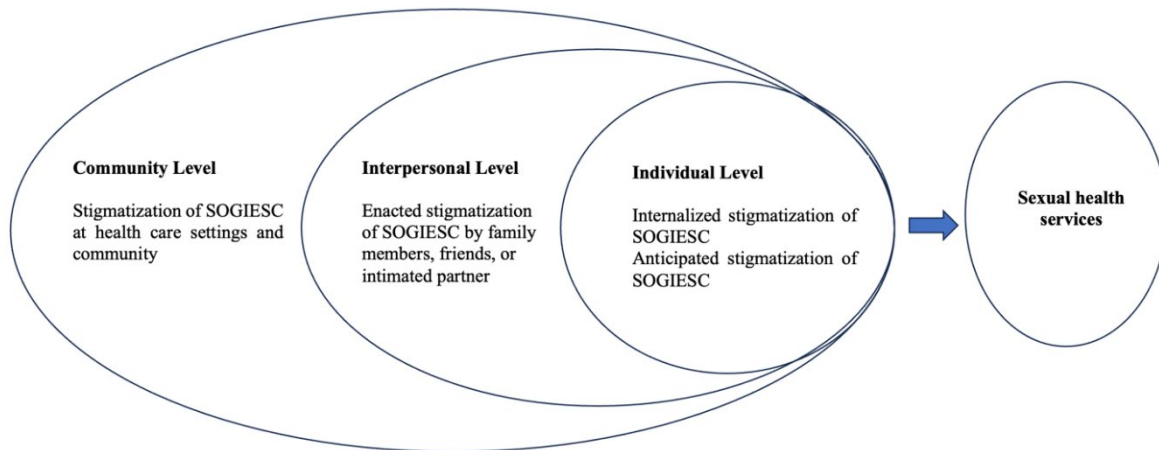


Figure 1 Conceptual Framework of this study (adapted from Bronfenbrenner Theory)

METHODOLOGY

According to Creswell & Creswell (2018), the number of participants in phenomenological research has rough estimates of between 8 and 10 participants (19). Therefore, the qualitative study was conducted with ten in-depth interviews with Myanmar transgender women over 18 years old who had resided in Samut Sakhon for more than six months. The sampling method involved

purposive sampling, selecting participants with different gender expressions, and snowball sampling to refer potential participants. Samut Sakhon was chosen as a study setting due to its significant population of migrant workers, including those from Myanmar, and its proximity to Bangkok, which facilitates access to healthcare services and support organizations.

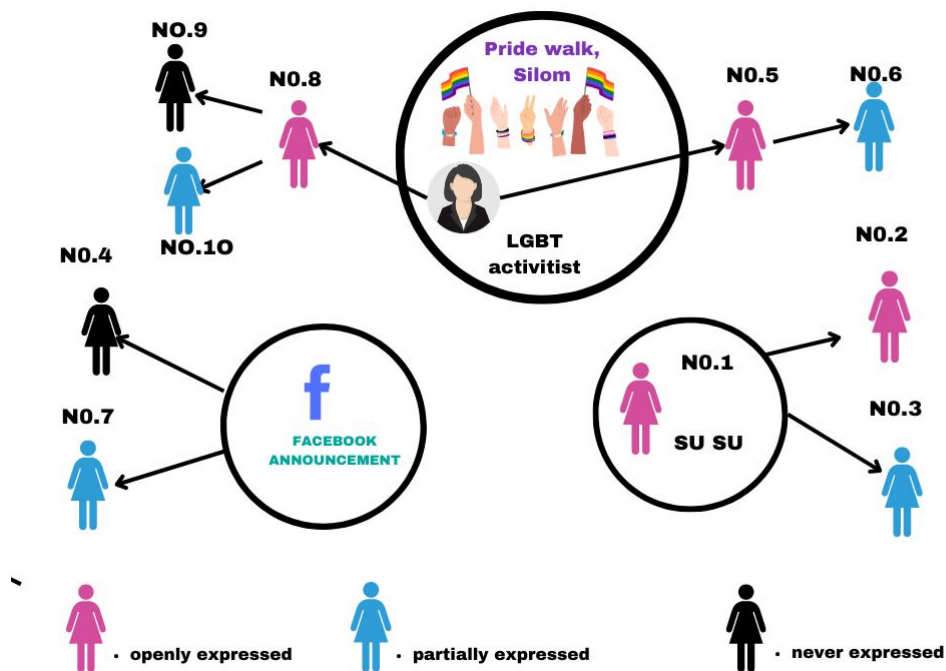


Figure-2 Recruitment procedures for this study.



After getting approval from the ethical board of IPSR, data collection was started on May 10 and finished on June 11. Initially, recruitment was conducted through a Facebook announcement. However, only one participant could be recruited from Facebook, and the plan was changed to include alternative strategies. Through consecutive referrals from the LGBT activist from Silom Pride Walk, five participants residing in Samut Sakhon were interviewed. Ethical considerations included obtaining written informed consent, maintaining participant anonymity through coded identifiers, and conducting interviews in a private and safe environment. The audio recordings were transcribed into written text to capture the participants' voices and nuances for subsequent analysis. After finishing the transcription, interview transcripts and field notes were analyzed using thematic analysis techniques to identify patterns, themes, and variations presented in the participants' narratives. Microsoft Excel was employed to analyze different themes based on the conceptual framework. The researcher identified the four themes and two co-investigators, as shown in the following.

- 1) Stigmatization experiences in Myanmar

- 2) Stigmatization experiences in Samut Sakhon, Thailand
- 3) Sexual health services utilization
- 4) Intersection of stigmatization, coping strategies, and support system

RESULTS

Participants consisted of 4 openly expressed, four partially expressed, and two never expressed transgender women. In this study, openly expressed transgender women refers to individuals who can express their gender identity openly as always. Partially expressed one means a transgender woman who cannot always express her gender identity everywhere. A never-expressed transgender woman indicates one who cannot express her gender identity. Most of the participants reside in Mahachai. They work in various sectors, such as seafood factories, fishery factories, beauty salons, etc. Never expressed that transgender women are younger than other types, and they reside in Samut Sakhon within one year. Openly expressed transgender women are older than other participants, and two transgender women (ID-1 and ID-8) are married.

**Table 1** Demographic characteristics of participants

Code ID	Mode of Interview	Age	Type of Expression	Occupation	Address	Education	Duration in Samut Sakhon	Legal Status	Single/ Married/ Partners
4	In	19	Never	Seafood Factory	Mahachai Thai Union,	High school	One year	Documented	Single
9	In Person	21	Never	Dtac Company, sales promoter	Mahachai	High school	One year	Documented	Single
7	In Person	22	Partial	furniture shop	Om Noi	High school	Two years	Documented	Multiple partners
6	In Person	31	Partial	Own business (Myanmar food)	Om Noi	Middle school	Five years	Documented	Cohabitation partner
3	Online	33	Partial	Seafood Factory	Mahachai	Middle school	12 years	Documented	Single
10	In Person	33	partial	Burmese food seller, agent for work permit staff in a beauty salon	Mahachai	Primary school	Five years	Documented	widowed
2	In Person	34	Open		Mahachai	Middle school	Two years	Documented	Have dating partner
5	In Person	34	Open	Snack factory	Khok Khan Krathum	Middle school	Two years	Documented	single
8	In Person	34	Open	Fishery	Beam	High school	15 years	Documented	Married
1	In Person	40	Open	Owner of beauty salons.	Mahachai	High school	Ten years	Documented	Married



According to the thematic analysis, four themes were defined to discuss in this study in the following session.

1. Stigmatized experiences in Myanmar

In this study, almost all participants had already experienced stigmatization in their childhood before they moved to Thailand, which led to childhood trauma and internalized stigma. Significantly, some experienced physical abuse when they are trying to open their gender identity and expression in front of their families.

1.1 Internalized stigma due to experience in childhood

"When I finally came out, I was no longer welcome in my home. It felt like losing everything at once." My father beat me, and I was admitted to the hospital due to bruises on both my legs. My life was like living in a small box; I felt tight and did not have freedom"(ID6-31 years old- partially expressed).

2. Stigmatized experiences in Samut Sakhon Province

All participants migrated to Thailand to escape from their hostile environment. Nevertheless, it was found that openly and partially expressed transgender women were more experiencing stigmatization at the workplace and in public than never-expressed transgender women.

2.1 From visibility to concealment due to stigma

It is of interest to find that one transgender woman had transformed into a partially expressed type from an open type in Myanmar due to societal pressure from frequent discrimination in her workplace since she is living in a homophobic environment.

"At my workplace, LGBT workers are few. All workers harbor negative attitudes towards us. They are toxic people. When they see me dressed as a female, they mockingly refer to my masculinity in public by calling my real name. Finally, I decided not to wear like a female neither in the workplace nor public"(ID3-33 years_ partially expressed).

2.2 Still hiding their gender identity due to fear of discrimination

One partially expressed transgender woman also shares her experiences, of living in a homophobic environment. She has to stay with five male friends in a small, congested room provided by her employer. In the workplace, she cannot express herself like a woman and pretend to behave like a real man in front of her friends. She usually opened up about her gender identity, dressing like a female when she went to Silom with her partially expressed transgender friends. Even though she moved to Thailand, she is still suffering from internalized stigma due to the homophobic environment.

" My life is like a hermit crab, hiding in a shell to protect itself from the environment that is always found on the beach of my village. Now, I am away from family, but I am still pretending to act the different one who I do not want to be. It is so hurt."(ID-7-22 years old partially expressed).

Transgender women who have never expressed their gender identity are typically around 20 years old and still adapting to their new environment. One never-expressed transgender woman (ID-4) is living with his brother and still experiences internalized stigma, such as shame. (ID-9) On the other hand, another never-expressed transgender woman (ID-9) lives with her work colleagues and has supportive LGBT friends, so she does not experience internalized stigma. However, she has fears of discrimination in the workplace.

"Every day, living with my brother makes me challenging. I felt tight and sad due to hardship to express my gender identity."(ID-4-19 years old-Never expressed).

" Yeah, I have good friends but I never tried dressing as a woman yet. Because I am living and working among Burmese people. I felt someone could discriminate against me."(ID-9-21 years old- Never expressed).

**Table 2** Intersection of coping strategies, support systems, and stigma on health-seeking behaviors and access to sexual health services

Code ID	Age	Type of Expression	Occupation	Coping Strategies	Internalized Stigma	Anticipated Stigma	Present of support system	Impact on health-seeking behaviors	Access to sexual health services
4	19	Never	Seafood factory	Pretending masculinity, self-force hiding gender identity, Drinking alcohol	Yes (+) isolate with LGBT	Yes, fear of shame, hiding her gender identity	No	Risky sexual behavior, no support groups	No Yes, HIV STI testing at World Vision
9	20	Never	Dtac sale promoter	Self-acceptance, self-love	No,	Yes, but she can cope Yes, since she lived with homophobic friends	LGBT group	Healthy sexual behavior, daring to go to the clinic	No Regular testing (Samut Sakhon hospital)
7	22	Partial	Furniture shop	Avoid toxic people, neglect, and experiences	Yes	Yes, but she can cope Yes, fear of shame; thus, she hides her gender expression	No	Did not go to the clinic due to lack of support	No Regular testing (Samut Sakhon hospital)
6	31	Partial	Own Business, Myanmar food	Coping with self-esteem and love	No	Yes, but she can cope Yes, fear of shame; thus, she hides her gender expression	Yes	Safe sex with boyfriend	No Regular testing (Samut Sakhon hospital)
3	33	Partial	Seafood factory	Trying to hide herself, self-hate	Yes	Yes, but she can cope	No	Never tested for HIV and STI	No access
10	33	partial	Burmese food seller, agent for work permit	Try to hide his identity, but self-love and self-acceptance	No	Yes, but she can cope	Yes	Tested, regularly Received condom and lubricant from NGO Staff	At Rak Thai clinic HIV tested at World Vision
2	34	Open	Beauty Saloon staff	Cope with self-esteem	No	Yes, but she can cope	Yes	She tested at the clinic three months ago	Rak Thai Regular HIV STI testing at Rak Thai
5	34	Open	Snack factory	Self-esteem	No	No	Yes	Safe sex with his husband, regular testing	Rak Thai Regular HIV STI testing at Rak Thai
8	34	Open	Fishery factory	Self-esteem	No	No	Yes, but she tested at Bangkok Hospital	She dares to go to the clinic and safer practices with her husband	Access to gender-affirming surgeries, hormonal treatment
1	40	Open	Beauty salon owner,	Self-esteem	No	No	Yes, but she tested at Bangkok Hospital	She dares to go to the clinic and safer practices with her husband	Access to gender-affirming surgeries, hormonal treatment



3. Sexual Health Service Utilization

3.1 Fear of shame acts as a barrier

In this study, most participants easily access sexual health services at NGO clinics (Rak Thai & World Vision) and Samut Sakhon Public Hospital. However, 3 participants avoid the clinic to test for HIV and STI due to fear of discrimination and shame. These participants experience high levels of internalized and anticipated stigma, leading them to hide their gender identity. As a result, the stigmatized experiences discourage them from seeking health services and drive them to engage in risky sexual behaviors.

“ I have never visited the clinic or hospital in Samut Sakhorn. I did not want someone to know about my sexual behavior. I just let and request my dating partner to bring a condom when he comes to my room because I dare not go to buy a condom at 7/11” (ID-4-19 years old- never expressed).

4. Intersection of Stigmatization, Coping Strategies and Support System

This study revealed that coping strategies and support systems intersect to respond to the individual's stigmatization, serving as a buffer for health-seeking behaviors. Moreover, the presence of support groups significantly influences the health outcomes of transgender individuals. For instance, openly and partially expressed transgender women were more likely to experience stigmatization in their community than never-expressed participants. However, most participants have better coping skills to respond to stigma and it enhances access to sexual health services with supportive friends.

A partially-expressed transgender woman (ID-10) also shared her good experiences, having benefited from her friends who provided emotional and practical support, and she engaged in regular health-seeking behaviors, including routine HIV/STI testing and utilizing sexual health services regularly.

“After breaking up with my wife, I usually had sex with some male partners one time a week but I did not dare to clinic for HIV testing. When I have LGBT friends, they encourage me to love myself by going along with them to Rak Thai regularly”.(ID-10-33 years old-Partially expressed).

Conversely, some participants (ID-3,4,&7) resort to negative coping strategies,

such as hiding their identity, self-hating, or using alcohol to cope with stigma. These ineffective coping mechanisms and lack of support systems lead to the avoidance of health services and increased engagement in risky behaviors, thereby limiting their access to sexual health services due to fear of discrimination and internalized stigma (self-blame).

“Every time I have sex with a male, I always regret it, and I blame myself. At that time, I drunk to forget my feelings. I have never visited the clinic or hospital in Samut Sakhorn. I do not want someone to know about my sexual behavior.”(ID-4-19 years old never expressed).

DISCUSSION

Most of the participants had already experienced stigma since their childhood before they moved to Samut Sakhon. Almost all participants are still experiencing stigma differently in the Burmese society of Samut Sakhon. Some never-expressed and partially expressed participants had internalized stigma and anticipated stigma (fear of discrimination), which led to the hiding of gender identity and expression. Although most openly and partially expressed transgender women experienced enacted stigma by their work colleagues or some community, they can cope with those struggles with their high resilience and the presence of supportive friends. According to the conceptual framework, this study also revealed that internalized and anticipated stigma at the individual level was a barrier to accessing sexual health services due to compound challenges of stigma and discrimination. Moreover, it also highlighted that social support and peer groups at the internal personal level serve as a buffer between the stigmatization experiences and access to sexual health services. Some transgender women without any peer networks are more likely to experience stigma and discrimination, and those challenges can make a barrier to seeking sexual health services, resulting in delays in seeking care and avoidance of healthcare settings.

CONCLUSIONS

This study aimed to investigate the experiences of stigmatization of SOGIESC and the impacts on sexual health services among Myanmar transgender women in Samut Sakhon



province, a group overlooked in sexual health services in previous studies. However, this study had limitations, including a small sample size and a focus on participants from a single geographic area, which may limit the generalizability of the findings. Future research should explore the impact of social support between the stigma and sexual health services accessibility in diverse geographic regions and with larger, more varied populations to validate these findings and explore additional factors. Ultimately, this study highlights the urgent need for psychosocial support for transgender women to enhance access to sexual health services and SOGIESC awareness to reduce self-stigmatization and anticipated stigma for all types of Myanmar transgender women, regardless of gender identity and migrant status. Doing so can make significant strides towards achieving the SDGs and ensuring a more inclusive and equitable for all.

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ASSOCIATION BETWEEN SOCIODEMOGRAPHIC FACTORS AND KNOWLEDGE RELATED TO HUMAN PAPILLOMA VIRUS INFECTION AND VACCINE AMONG YOUNG ADULT WOMEN IN MANDALAY CITY, MYANMAR: A CROSS-SECTIONAL STUDY

Kyi Thu¹, Pramon Viwattanakulvanid^{1*}

¹College of Public Health Sciences, Chulalongkorn University, Sabbastravicaya Building, Phayathai Road, Bangkok 10330, Thailand

*Corresponding Author: Pramon Viwattanakulvanid, College of Public Health Sciences, Chulalongkorn University, Sabbastravicaya Building, Phayathai Road, Bangkok 10330, Thailand, Email: Pramon.V@chula.ac.th

ABSTRACT

Introduction: Human Papillomavirus (HPV), the most common sexually transmitted viral infection, is a universal public health concern. Understanding the sociodemographic determinants of HPV-related knowledge is crucial for vaccination.

Objectives: This study aimed to 1) determine the association between sociodemographic factors and the knowledge of HPV infection and vaccination among young adult women in Mandalay City, Myanmar, and 2) identify the top three incorrect answers for knowledge related to HPV infection and vaccine.

Methodology: A cross-section online survey was conducted in May 2024 on young adult women in Mandalay City using quota and convenience sampling methods. The questionnaires covered sociodemographic characteristics such as age, race, religion, marital status, educational status, occupational status, income level, and knowledge of HPV infection and vaccine. All items in questionnaires were tested for content validity with Item Objective Congruence (IOC) and reliability with Kuder-Richardson 20 (>0.7). Binary logistic regression was utilized to identify the association between sociodemographic factors and knowledge related to HPV infection and vaccines. A significant p-value was set at 0.05.

Results: 462 young adult women aged 18 to 35 participated in the survey. The top three most incorrect answers for knowledge related to HPV infection and vaccines are 1) HPV infection always leads to health problems (371, 80.3%), 2) HPV infection is a bacterial infection (327, 70.6%) and 3) HPV can cause HIV (325, 70.3%) respectively. Among the participants, 227 (49.1%) displayed a poor level of knowledge, while 235 (50.9%) demonstrated a good level of knowledge. Binary logistic regression indicated that advanced education level (AOR=1.57; 95% of CI 1.01, 2.41; p=0.041), employment (company and government employees) (AOR=2.37; 95% CI 1.38, 4.06; p=0.002) and own business (AOR=2.04; 95% of CI 1.08, 2.83; p=0.026) were associated with knowledge related to HPV infection and vaccine.

Conclusion: Advanced education level, employment, and business ownership were associated with good knowledge of HPV infection and vaccines. HPV-related knowledge is crucial for public health intervention in Myanmar. Our study suggests that the government should target health awareness and HPV vaccination campaigns specifically toward populations with basic educational levels, younger age, and unemployment.

Keywords: Sociodemographic factors, Knowledge, Human Papilloma Virus, Vaccine, Young adult women, Myanmar

INTRODUCTION

Cancer is one of the world's most significant public health problems for both women and men. Among various types of cancer, cervical cancer is the fourth most

common type of cancer throughout the world among women, with the occurrence of anticipated 342,000 fatalities and 604,000 new cases in 2020. Cervical cancer accounted for 47.58% and 58.84% of gynecological cancer



admissions at the Central Women's Hospital of Mandalay and Yangon. According to the data from GLOBOCAN, cervical cancer is the most common and preminent cause of death in women; the age-standard incidence rate is 22.6 per 100,000 and 14.5 per 100,000 mortality rates(1).

The leading cause of cervical cancer is the oncogenic Human Papillomavirus infection. Based on their association with HPV-related cancer, HPV infection can be grouped into high-risk and low-risk types. Among the various subtypes of HPV infection, HPV 16 and 18 are responsible for 70% of cervical cancer cases worldwide (2, 3). Human Papillomavirus (HPV) infection can lead to various cancers, including cervical cancer, as well as cancers of the oropharynx, penis, vagina, and vulva. Other HPV-related diseases are respiratory, laryngeal papillomatosis, and warts, including the anogenital, nasal, oral, and laryngeal (4).

Early sexual intercourse, multiple sexual partners, weak immune system, and long-term use of oral contraceptive pills are the main risk factors for getting HPV infection (5). Fortunately, cervical cancer is a preventable disease. There are three pillars for preventive methods for cervical cancer, which include primary, secondary, and tertiary. Taking the vaccine (primary prevention) is the most successful strategy to prevent HPV infection and its related diseases (6). According to the data from WHO, there are six HPV vaccines accessible worldwide, and all are protected from high-risk HPV 16 and 18. Although HPV vaccines have shown a considerable impact, which has 95% efficacy in prevention, on reducing the prevalence of cervical cancer, the vaccination rates have generally been low in Asian regions (7).

Myanmar included the HPV vaccination in its national immunization program in 2020 to achieve the cervical cancer elimination target by 2030, and the primary target cohort age is 9-13 years old girls (8). However, a military coup happened in 2021, and all immunization programs were stopped temporarily. Consequently, we need to find out about vaccination coverage in Myanmar. Knowledge regarding HPV infection and the vaccine is crucial for the uptake of HPV vaccination. Only one study was conducted in Myanmar, which was performed in four townships randomly selected in Yangon,

demonstrating a lack of knowledge and health education about the risk factors, causes, symptoms, complications, and vaccine availability and efficacy (9).

Hence, this study aimed to identify the association between sociodemographic factors and the knowledge of HPV infection and vaccination among young adult women in Mandalay and to identify the top three incorrect answers for knowledge related to HPV infection and vaccine. Such data would be helpful to the development of appropriate HPV vaccination strategies and awareness campaigns of three prevention pillars. It also helps reduce morbidity and mortality of HPV-related diseases consequently.

METHODOLOGY

Study design

An online cross-sectional was conducted in Mandalay, Myanmar, from April to May 2024.

Study population and sample size

Mandalay, the second largest city in Myanmar, has a vast urban population. There are seven townships under the Mandalay Civil Development Committee (10). Young women who were aged between 18 and 35 years, lived in Mandalay City for at least six months, could assess the Google Form survey, and were willing to participate were included

The sample size calculated was 384 using the finite proportion formula with a 99% confidence interval, an estimated proportion of 0.2, and a margin of error of 0.04 (11). The sample size was 423 after 10% was added to anticipate the missing data. The researcher used a non-probability sampling method. The sample size for each township was derived by using quota sampling to proportionately represent the overall study population. The measurement tools were distributed through social media such as Facebook, Instagram, and Viber.

Measurement tool

The questionnaires used the standard Carolina HPV Immunization Attitude and Belief Scale (CHIAS) (12). Before collecting data, a pilot test was conducted on 39 participants (10% of the total sample size) in Yangon, which has characteristics similar to those of Mandalay City. Kuder-Richardson



formula 20 was used to test the reliability of knowledge questions. The result was 0.84 and showed high reliability in knowledge (13). Content validity was also checked with experts.

The questionnaire consisted of two parts, which covered the socio-demographic characteristics and knowledge related to HPV infection and vaccine, in three sub-sections. Knowledge-related questionnaires comprised 34 items; the correct response was scored 1, and the wrong answer and don't know were scored 0. Knowledge level was divided into good and poor levels. The median cutoff point {18} was used to categorize the knowledge level due to the non-normal distribution of knowledge data.

Statistical Analysis

Data entry and analysis were done by SPSS ver.22. Descriptive statistics such as frequency, percentage, mean, and standard deviation were calculated. A descriptive analysis was done to find out the top three incorrect answers of knowledge related to HPV infection and vaccine. Multivariable binary logistic regression was performed to identify the association factors such as age, race, religion, marital status, educational status, occupation, and income level on the knowledge level of HPV infection and vaccine. P-value, adjusted odd ratio, and 95% confidence interval were calculated. The level of significance was set at <0.05.

Ethical consideration

The study protocol (N0-103/67) received ethical approval from the Research Ethics Review Committee for Research Involving Human Research Participants, Group 1, Chulalongkorn University.

RESULTS

Table 1 describes the respondents' knowledge related to HPV infection and vaccines. Out of 34 questions, the three most incorrect answers were 1) HPV infection always leads to health problems (Q22, 80.3%), 2) HPV is a bacterial infection (Q3, 70.6%), and 3) HPV can cause HIV/AIDS (Q18, 70.3%). In

contrast, the three most correct answers were 1) the vaccine requires at least two doses (Q24, 82.5%), 2) it offers protection against most cervical cancers (Q28, 81.0%), and using condoms reduces the risk of getting HPV infection (Q11, 78.4%).

Table 2 shows the proportion of knowledge level and knowledge scores categorized into "good" and "poor" levels by median cutoff point (median=18). Out of the total participants, 227 individuals (49.1%) had a poor level of knowledge, while 235 individuals (50.9%) had a good level of knowledge.

Table 3 presents the participants' sociodemographic characteristics alongside the total knowledge score for each group of these characteristics. The average total knowledge score of the participant was 17.87±6.11. More than half of the participants were adults (56.3%). Most respondents were Burmese (87.9%), and Buddhism (91.8%) was the predominant religion. Approximately two-thirds of the participants were single (66.7%), and over half were employed (54.8%). The majority of participants had a monthly income exceeding 330,000 kyats.

The adult age group had a higher level of knowledge than the young group. Married participants had a good level of knowledge, with the highest score among different marital statuses, averaging 18.99. Similarly, those with advanced degrees and employed individuals had a good level of knowledge in their respective categories, with average scores of 20.38 and 18.87, respectively. Participants with a monthly income exceeding 330,000 kyats had a better level of knowledge than the others, with an average of 19.69.

Multivariable binary logistic regression analysis was performed to determine socio-demographic factors' association with the knowledge level of HPV infection and vaccine. The results showed that advanced education, employment, and business ownership were statistically significantly associated with good knowledge related to HPV infection and vaccines, as shown in Table 4.

**Table 1** Frequencies and distribution of knowledge score (correct and incorrect answer) related to HPV infection and vaccine (N=462)

Statement	Number (%)	
	Incorrect answer	Correct answer
Aetiology of HPV infection		
1. HPV infection is very rare.	224 (48.5)	238 (51.5)
2. HPV can be cured with antibiotics.	310 (67.1)	152 (32.9)
3. HPV is a bacterial infection.**	326 (70.6)	136 (29.4)
4. HPV has always visible signs or symptoms.	240 (51.9)	222 (48.1)
5. There are many types of HPV.	183 (39.6)	279 (60.4)
6. A person could have HPV for many years without knowing it.	172 (37.2)	290 (62.8)
7. Men cannot get HPV.	185 (40)	277 (60)
8. Most sexually active people will get at some point in their lives.	114 (24.7)	348 (75.3)
9. Having many sexual partners increases the risk of getting HPV.	106 (22.9)	356 (77.1)
10. Having sex at an early age increases the risk of getting HPV.	196 (42.4)	266 (57.6)
11. Using condoms reduces the risk of getting HPV.*	100 (21.6)	362 (78.4)
12. HPV can be passed on by genital skin-to-skin contact.	123 (26.6)	339 (73.4)
13. HPV can be passed on during sexual intercourse.	135 (29.2)	327 (70.8)
14. HPV can be transmitted through oral sex.	244 (52.8)	218 (47.2)
15. HPV can be transmitted through anal sex.	207 (44.8)	255 (55.2)
16. A person with no symptoms cannot transmit HPV infection.	288 (62.3)	174 (37.7)
Consequences and complications of HPV infection		
17. HPV can cause cervical cancer.	122 (26.4)	340 (73.6)
18. HPV can cause HIV/AIDS**	325 (70.3)	137 (29.7)
19. HPV can cause genital warts.	184 (39.8)	278 (60.2)
20. HPV can cause anal cancer.	266 (57.6)	196 (42.4)
21. HPV can cause cancer of the penis.	257 (55.6)	205 (44.4)
22. HPV infection always leads to health problems.**	371 (80.3)	91 (19.7)
23. HPV can cause oral cancer.	318 (68.8)	144 (31.2)
Doses, purposes, and availability of HPV Vaccine		
24. The HPV vaccine requires at least two doses.*	81 (17.5)	381 (82.5)
25. The HPV vaccine offers protection against all sexually transmitted infections.	240 (51.9)	222 (48.1)
26. The HPV vaccines are most effective if given to people who have never had sex.	223 (48.3)	239 (51.7)
27. Someone who has had the HPV vaccine cannot develop cervical cancer.	302 (65.4)	160 (34.6)
28. The HPV vaccine offers protection against most cervical cancers.*	88 (19.0)	374 (81.0)
29. The HPV vaccine offers protection against genital warts.	238 (51.5)	224 (48.5)
30. Girls who have had the HPV vaccine do not need a Pap smear test when they are older.	300 (64.9)	162 (35.1)
31. The HPV vaccine protects you from every type of HPV.	291 (63.0)	171 (37.0)
32. You can cure HPV by getting the HPV vaccine.	286 (61.9)	172 (37.2)
33. The HPV vaccine is approved and recommended by WHO for females aged 9-45 years.	132 (28.6)	330 (71.4)
34. WHO approves the HPV vaccine for males aged 9-26.	272 (58.9)	190 (41.1)

*Most correct answer

**Most incorrect answer

**Table 2** Frequencies of Knowledge Level

Knowledge level (N=462)	Number (%)
Poor level	227 (49.1)
Good level	235 (51.9)
Median (interquartile range)	18 (9)
Minimum, maximum	2, 33

Table 3 Socio-demographic characteristics of participants and knowledge related to HPV infection and vaccine (N=462)

Variable	Number (%)	Total knowledge score
<i>Age group (years)</i>		
18-26 years old	202 (43.7)	17.24±6.01
27-35 years old	260 (56.3)	18.35±6.16
<i>Race</i>		
Burmese	406 (87.9)	17.94±6.15
Shan	27 (5.8)	17.30±5.49
Kachin	15 (3.2)	15.13±5.71
Rakhine	7 (1.5)	17.29±7.41
others	7(1.5)	22.14±4.01
<i>Religion</i>		
Buddhism	424 (91.8)	18.07±6.06
Christian	24(5.2)	16±7.16
Muslim	10(2.2)	17.30±6.12
Hindu	4(0.9)	15.50±3.41
<i>Marital Status</i>		
Single	308(66.7)	17.54±6.01
Married	138(29.9)	18.99±6.25
Separated/Divorced	10(2.2)	14.10±5.10
Widowed	6(1.3)	15.17±5.77
<i>Educational Status</i>		
Primary school	28(6.1)	16±5.57
Secondary school	41(8.9)	15.54±5.36
High school	109(23.6)	16.05±4.92
College/University	210(45.5)	18.63±6.29
Other advanced degrees	74(16.0)	20.38±6.50
<i>Occupational Status</i>		
Unemployed	99(21.4)	15.13±5.60
Employed	253(54.8)	18.87±5.76
Own business	104(22.5)	18.26±6.68
Others	6(1.3)	14.17±4.62
<i>Monthly income</i>		
0-174,000	172(37.2)	16.28±5.41
174,000-330,000	114(24.7)	17.45±5.41
>330,000	176(38.1)	19.69±6.72

Current rate: 1 USD = 4150 Kyats (MMR), May 2024

**Table 4** Association between socio-demographic factors and knowledge of HPV infection and Vaccination level

Variables	B	SE	Adjusted OR (AOR)	95% CI		P-value
				Lower	Upper	
<i>Age</i> (young ^{ref})	-0.157	0.243	0.855	0.531	1.375	0.517
<i>Religion</i> (Buddhists ^{ref})						
Christian	-0.474	0.510	0.622	0.229	1.691	0.351
Islam	0.640	0.776	1.897	0.415	8.678	0.409
Hindu	-0.425	1.355	0.654	0.046	9.301	0.754
<i>Race</i> (Burmese ^{ref})						
Shan	0.471	0.462	1.602	0.647	3.964	0.308
Kachin	-0.397	0.682	0.672	0.176	2.561	0.561
Rakhine	0.043	0.927	1.044	0.170	0.6421	0.963
Others	21.062	14770.89	14027	0.000	-	0.999
<i>Marital status</i> (Single ^{ref})						
Married	0.527	0.252	1.693	0.032	2.778	0.093
Separated/divorced	-1.589	0.896	0.204	0.035	1.180	0.076
Widow	-0.059	0.971	0.942	0.140	6.320	0.951
<i>Occupational status</i> (Unemployed ^{ref})						
Employed						
Own business	1.070	0.292	2.371	1.381	4.064	0.002*
Others	0.931	0.336	2.045	1.382	4.063	0.026*
	-0.832	1.130	0.435	0.048	3.988	0.462
<i>Educational status</i> (primary ^{ref})						
Secondary						
High school	-0.787	0.555	0.455	0.154	1.351	0.156
College/university	-0.420	0.466	0.657	0.264	1.639	0.368
Advanced degree	0.207	0.463	1.230	0.497	3.046	0.654
	0.82	0.533	1.574	1.014	2.412	0.041*
<i>Income level</i> (Low ^{ref})						
Medium	-0.357	0.282	0.700	0.402	1.216	0.205
High	-0.033	0.284	0.968	0.554	1.690	0.908

Model chi-square = 62.323 ($df = 14$, p -value < 0.001); Nagelkerke R Square = 0.216; Hosmer and Lemeshow test chi-square = 10.704 ($df = 8$, p -value = 0.219)

* Significance level $p < 0.05$



DISCUSSION

The findings reveal significant variations in knowledge levels across different demographic groups.

Advanced-level participants are significantly more likely to have a good level of knowledge. This coincides with the previous study conducted in Thailand (14). This indicates that the availability of information is somewhat restricted to those with primary education and college levels, highlighting the need to increase awareness among all students at the basic education level. Employed and owned business participants are significantly associated with having a good level of knowledge. These findings align with the previous studies conducted in mainland China (15, 16). Work environments may provide opportunities for health education through workplace programs, social interactions, and better access to healthcare services, contributing to higher knowledge levels.

In Myanmar, few studies investigated the knowledge level of HPV infection and vaccine. The previous research study, which was performed on Urban women in Mandalay, demonstrated that there was a lack of knowledge and health education about the risk factors of cervical cancer and early warning symptoms in low socio-economic levels (17).

Overall, the three most incorrect answers were 1) HPV infection always leads to health problems (Q22, 80.3%), 2) HPV is a bacterial infection (Q3, 70.6%), and 3) HPV can cause HIV/AIDS (Q18, 70.3%). The most incorrect responses to knowledge-related questions within each subsection were discussed accordingly.

Etiology of HPV infection: The statement "HPV is a bacterial infection" had the highest rate of incorrect responses at 70.6%, followed by "HPV can be cured with antibiotics" at 67.1%. Additionally, "A person with no symptoms cannot transmit HPV infection" was the third most incorrect, with 62.3% of participants answering incorrectly. The high levels of misinformation could result in unfavorable attitudes towards the HPV vaccine.

Consequences and complications of HPV infection: Almost four-fifths of participants misbelieved that HPV infection will always lead to health problems. Interestingly, more

than two-thirds of participants (70.3%) misunderstand that HPV can cause HIV. The findings indicate the need for health campaigns aimed at correcting these misconceptions and improving public understanding of HPV and its associated health risks.

Doses, purposes, and availability of HPV vaccine: Over 65.4% of participants mistakenly believed they could not develop cervical cancer, and similarly, 64.9% were unaware that they would still need Pap smears after receiving the vaccine. It is essential to educate all women about continuing to undergo Pap smear tests based on their circumstances, even if they have received the vaccine. On the other hand, 71.4% of participants correctly identified the recommended age for women to receive the vaccine, and 82.5% accurately understood the required number of vaccine doses.

CONCLUSIONS

This study revealed significant disparities in knowledge levels about HPV infection and vaccination across various demographic groups. Basic education levels are significantly less knowledgeable than advanced levels, highlighting the need for broader educational initiatives targeting all educational levels.

In addition, the study identified the misconceptions about HPV infections and vaccines. These misunderstandings underscore the need for targeted health campaigns to correct misinformation and improve public understanding of HPV and vaccination. Addressing these gaps in knowledge is crucial for promoting informed decision-making and enhancing the effectiveness of HPV prevention efforts in the community.

LIMITATIONS

This study was conducted in Mandalay and may only be generalized to women from some countries. It used a non-probability quota convenience sampling method, which might limit the representation of the study population. Our study design cannot assess the causality of associations between socio-demographic factors and knowledge related to HPV infection and Vaccine. Furthermore, participants who could not become more involved with social media and IT devices may have had limited access to the online survey.



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FACTORS INFLUENCING WOMEN'S AUTONOMY IN SEXUAL RIGHTS AND REPRODUCTIVE HEALTH DECISION-MAKING IN MYANMAR

Thiha Lwin¹, Truc Ngoc Hoang Dang^{1*}, Dusita Phuengsamran¹

¹*Institute for Population and Social Research, Mahidol University, Salaya, Phuttamonthon, Nakhon Pathom 73170, Thailand*

**Corresponding author: Truc Ngoc Hoang Dang, Institute for Population and Social Research, Mahidol University, Salaya, Phuttamonthon, Nakhon Pathom 73170, Thailand, E-mail: truc.ngo@mahidol.edu*

ABSTRACT

Introduction: Evidence shows that autonomous women can make their own contraceptive choices and refuse sex from their husbands. There is a research gap regarding the factors influencing women's autonomy in sexual rights and reproductive health decision-making in Myanmar.

Objective: This study investigates the factors influencing women's autonomy in sexual and reproductive health rights (sexual rights and self-determination in contraceptive use) among reproductive-aged women in Myanmar.

Methodology: The study utilizes data from the Myanmar Demographic and Health Survey (2015-16), including 3,815 currently married women aged 15-49 who lived with their husbands or partners and used contraceptive methods. Due to the uneven distribution of these rights within the sample, separate binary logistic regression analyses were conducted to examine women's autonomy in sexual rights and contraceptive use.

Results: Women's and their husbands' education significantly impacted women's ability to refuse sex. Employed women were more likely to have autonomy in refusing sex compared to unemployed women, and rural women were less likely to refuse sex compared to urban women. In terms of reproductive health decision-making, age gaps between spouses decreased women's decision-making power in contraceptive use, while having five or more children increased it. Wealthier women are less likely to decide on contraceptive use compared to poorer women. The husbands' occupation also influenced women's self-determination in contraceptive use.

Conclusion: The study underscores the importance of women's education, occupation, and husbands' education in enhancing women's autonomy. The Myanmar government should encourage women to pursue education and provide career opportunities. Policymakers should promote gender equality programs, especially in rural areas, and integrate comprehensive sexual and reproductive education into the school curriculum to raise awareness for everyone.

Keywords: women's autonomy, sexual rights, reproductive autonomy, self-determinants in contraceptive use, Myanmar.

INTRODUCTION

In Myanmar, gender impacts social roles, norms, family responsibilities, and power imbalance within family members (1). The Global Gender Gap Report 2023 ranks Myanmar 123rd out of 146 countries regarding gender equality (2). Myanmar women encounter difficulties in deciding their sexual autonomy on their bodies, health, and also access to family planning services (3, 4). Patriarchal norms and social structures continue to hinder women's fully exercising their SRHR, including the right to access contraceptives in Myanmar (5).

In society, wives are expected to be sexually available for their husbands when desired, and husbands are considered lawful owners who can control sexual relationships within marriage (6). Additionally, in particular ethnic areas, despite the availability of contraceptives, husbands and male community leaders often discourage women from using contraception to limit births due to concerns about the declining numbers of the population. This demonstrates women's challenges in making decisions for themselves, even when services are accessible in Myanmar (5).



Furthermore, there is still a gap in research on factors influencing women's autonomy in sexual rights and reproductive health decision-making among Myanmar women. Women's autonomy is a fundamental human right, a crucial indicator of women's empowerment and freedom to make societal decisions (7). Therefore, it is crucial for all women to have the freedom to make decisions about their fertility and sexual preferences without coercion or violence to achieve optimal health and happiness (8). Advancing women's autonomy and gender equality is crucial for progress in Myanmar. (9).

This study aims to investigate what factors are influencing Myanmar women's autonomy in sexual and reproductive health rights in terms of sexual rights and reproductive health decision-making. Women's autonomy in this study encompasses their ability to make decisions about their contraceptive use and their freedom to decide to refuse sex from their husbands or partners.

METHODOLOGY

The study used data from the Myanmar Demographic and Health Survey (MDHS) 2015-2016, the latest national data on Myanmar's reproductive health and population indicators. The MDHS survey included 12,500 households, with 13,454 women and 5,218 men aged 15-49 eligible for interviews. The response rates were 96% for women and 91% for men (9). The study focused on a sample population of 3,815 currently married women aged 15-49 who answered questions about contraceptive use and refusal of sex from their husbands/partners.

Measurements

The selection of variables for this study is based on the literature review and Women's Empowerment Theory. Kabear (1999) proposes a women's empowerment theory that emphasizes women's capacity to make decisions for their well-being, including three dimensions of empowerment: resources, agency, and achievements. "Access to resources" can be measured by women's involvement in decision-making concerning household expenditure and human and social resources, enhancing their ability to choose. "Agency" is commonly measured by decision-making agency. "Achievement" involves

measuring empowerment through the ability to access information, make decisions, and act in their interests to achieve desired outcomes (11).

Dependent Variable

Regarding women's autonomy in sexual rights (the ability of women to refuse sex from their husbands), this variable was developed from the question "Can respondents refuse sex?" by their sexual rights, with responses categorized as yes or no.

Regarding women's autonomy in reproductive health decision-making (self-determination in contraceptive use), this variable was measured by whether women can make their decision-making in contraceptive use and indicated as yes or no.

Independent Variables

In this study, the independent variable includes the socio-demographic characteristics of women. The age difference between the wife and husband was calculated by subtracting the woman's age from the husband's. It was categorized as the wife's age similar to the husband's age, the wife being five years older than the husband and the wife being five years younger. The place of residence was categorized as urban or rural. The number of living children was divided into four groups: no children, one to two children, three to four children, and five children and above. The household wealth index was measured as poorest, poorer, middle, more prosperous, and richest. The variable of media exposure to family planning messages was classified as yes or no. Women's and husbands' education was classified as no education, primary, secondary, and higher education. Women's and husband's occupations were categorized as not working, professional/technical/managerial/clerical, sales/services, agricultural, skilled manual, and unskilled manual.

Data Analysis

This study used the STATA Program version 17 and a specific command to calculate the sample weight for statistical analysis. The frequency distribution was described to show the sample distribution for all the variables. This study applied the binary logistic regression method to investigate the factors influencing sexual rights (the ability to refuse sex from husband/partner) and reproductive health



decision-making in contraceptive use. The odds ratios (ORs) were estimated to assess the strength of the associations, and the 95% confidence intervals (CIs) were used for significance testing.

Ethical Consideration

The dataset was granted upon registration and request approval from the DHS program. The Institutional Review Board (IRB) at the Institute for Population and Social Research reviewed and approved the study.

RESULTS

Table 1 presents descriptive statistics of the social demographic variables explored among married women in Myanmar. In examining the age dynamics within couples, more than half of the women were similar age to their husbands, the other 23.6% of women were younger than their husbands, and only 3.2% were older than their husbands. Most women were 18 years or older at the time of their first marriage (73.42%), and only 26.58% were younger than 18 when they first got married. More than half of the women lived in rural areas (69.7%), whereas 30.3% resided in urban areas. The majority of individuals were in the “richer” category of the wealthy index (21.4%), closely followed by the “Richest” quintile at 20.4%. The “middle” category

(19.7%), while the “Poorest” and “Poorer” categories represented 19.0% and 19.5%, respectively. Approximately half of the women had one to two children (56.3%), about one-third had three to four children (30.2%), only 7.5% had five or more children, and the other 6.1% had no children. More than half of the women had no exposure to media (66.2%), and 33.8% had exposure.

The majority of the respondents had either primary (45.7%) of respondents had primary or secondary (34.3%), while about 9.3% reported higher education, and only 10.7% had no education. The distribution of education for the husbands was almost the same as that of the women respondents. The majority of women were unemployed (30.6%). In comparison, 19.2% were employed in sales and services, 24.3% worked as unskilled manual workers, the other 14.1% were agricultural workers, and only 6.3% of respondents worked as professional, technical, managerial, or clerical positions and skilled manual workers (5.5%). The majority of respondent’s husbands were employed in either unskilled manual work (35.9%) or agricultural (24%) and skilled manual work (21.7%). Only 8.5% worked in sales and services occupations, the other 9.6% in professional roles, and only 0.3% reported not working.

Table 1: Descriptive Statistics of currently married women aged 15-49 socio-demographic characteristics. (N = 3,815)

Characteristic	Number (%)
Age difference between husband and wife	
Wife's age is similar to the husband's age	2,793 (73.2)
Wife's age is five years older than the husband's age	902 (23.6)
Husband's aged five years older than wife's age	120 (3.2)
Women’s Age at First Marriage	
Younger than 18 years	1,014 (26.6)
18 years or older	2,801 (73.4)
Place of residence	
Urban	1,155 (30.3)
Rural	2,660 (69.7)
Wealthy Index	
Poorest	724 (19.0)
Poorer	745 (19.5)
Middle	753 (19.7)
Richer	815 (21.4)
Richest	778 (20.4)



Characteristic	Number (%)
Number of living children	
no children	233 (6.1)
have one to two children	2,146 (56.2)
have three to four children	1,151 (30.2)
have five children and above	285 (7.5)
Media exposure to family Planning message	
No Media Exposure	2,526 (66.2)
Media Exposure	1,289 (33.8)
Women's Education	
No education	408 (10.7)
Primary	1,743 (45.7)
Secondary	1,309 (34.3)
Higher	355 (9.3)
Husband's Education	
No education	469 (12.3)
Primary	1,487 (39.0)
Secondary	1,585 (41.5)
Higher	274 (7.2)
Women's Occupation	
Unemployment	1,168 (30.6)
Professional/technical/managerial/clerical	242 (6.3)
Sales/services	732 (19.2)
Agricultural	537 (14.1)
Skilled manual	210 (5.5)
Unskilled manual	926 (24.3)
Husband's Occupation	
Unemployment	12 (0.3)
Professional/technical/managerial/clerical	365 (9.6)
Sales/services	324 (8.5)
Agricultural	916 (24.0)
Skilled manual	827 (21.7)
Unskilled manual	1,371 (35.9)

Table 2 presents descriptive statistics of the dependent variable, which focuses on women's autonomy. Regarding sexual rights, the majority of women (83.1%) indicated that they could refuse sex, while 16.9% indicated

they could not. Regarding self-determination in contraceptive use autonomy, 97.6% of women reported having autonomy in contraceptive use decisions, whereas only 2.4% had no autonomy in these decisions.

Table 2: Descriptive Statistics of Women's Autonomy in Sexual Rights and Reproductive Health Decision-making in Contraceptive Use Characteristic (N = 3,8151)

Characteristic	Number (%)
Sexual Rights (Refuse sex from husbands)	
Cannot refuse sex	643 (16.9)
Can refuse sex	3,172 (83.1)
Reproductive Health Decision-Making (Self-determination in Contraceptive Use)	
No Autonomy in Contraceptive Decision	93 (2.4)
Autonomy in contraceptive decision	3,722 (97.6)



Table 3 presents the binary logistic regression results of the association between socio-demographic characteristics and dependent variables of women's autonomy, with all variables significant at p-value <0.05.

Regarding women's autonomy in sexual rights (refusing sex from husbands), rural women were 0.35 times less likely to have autonomy compared to urban women. Professionally employed women were 3.42 times more likely to have autonomy than unemployed women. Women with primary education had a 1.83 times higher likelihood of autonomy in refusing sex; secondary education had a 1.87 times higher likelihood. Moreover, higher education had a 2.30 times higher likelihood than uneducated women. Husbands' education also influenced women's autonomy; women whose husbands had primary education were 1.55 times more likely to have autonomy, and those with secondary education were 2.15 times more likely to have women's autonomy in

refusing sex compared to women whose husbands were uneducated.

Regarding women's autonomy in decision-making in contraceptive use, women with older husbands were 0.49 times less likely to have autonomy, and women older than their husbands were 0.68 times less likely compared to those with similarly aged husbands. Husband's occupation also significantly influenced women's autonomy. Women whose husbands were employed in sales/services were 0.18 times less likely to have autonomy; skilled manual jobs were 0.69 times less likely, and agricultural jobs were 0.66 times less likely, compared to unemployed husbands. Women with five or more children were significantly more likely to have autonomy in contraceptive decision-making compared to those with no children. Wealth also played a role; women in the richest category were significantly 0.71 times less likely to have autonomy compared to the poorest category.

Table 3: Associations between Women's Autonomy in Sexual Rights and Reproductive Health Decision-making and the Socio-demographic Characteristics of Currently Married Women Aged 15-49 (N=3,815)

Characteristic	Women's Autonomy in Sexual Rights (Refuse Sex from husband/partner)	Women's Autonomy in Reproductive Health Decision-making (Self- determination in contraceptive use)
	Adjusted OR (95% CI)	
Age difference between husband and wife		
Wife's age is similar to the husband's age	1.00	1.00
Wife's age is five years older than the husband's age	0.92(0.73, 1.16)	0.51(0.29, 0.92) *
Husband's aged five years older than wife's age	1.07(0.60, 1.92)	0.32 (0.11, 0.89) *
Women's Age at First Marriage		
younger than 18 years	1.00	1.00
18 years or older	1.01(0.81,1.27)	0.67(0.33, 1.38)
Place of residence		
urban	1.00	1.00
rural	0.65(0.48, 0.88) **	0.74(0.40, 1.37)
Wealthy Index		
poorest	1.00	1.00
poorer	1.05(0.78, 1.42)	1.08(0.43, 2.74)
middle	1.26(0.90, 1.74)	1.19(0.49, 2.85)
richer	0.92(0.66, 1.28)	0.69(0.29, 1.66)
richest	0.80(0.53, 1.20)	0.29(0.12, 0.68) **



Characteristic	Women's Autonomy in Sexual Rights (Refuse Sex from husband/partner)	Women's Autonomy in Reproductive Health Decision-making (Self- determination in contraceptive use)
Adjusted OR (95% CI)		
No of living children		
no children	1.00	1.00
Have one to two children.	1.07(0.70, 1.64)	1.74(0.72, 4.20)
have three to four children	0.91(0.58,1.43)	1.78(0.70, 4.53)
have five children and above	0.66(0.38, 1.13)	5.29(1.17, 23.99) *
Media exposure to family Planning message		
No Media Exposure	1.00	1.00
Media Exposure	1.03(0.82,1.29)	1.25(0.68 ,2.29)
Women's Education		
No education	1.00	1.00
Primary	1.83(1.35, 2.48) ***	0.86(0.35, 2.13)
Secondary	1.87(1.31, 2.68) **	1.08(0.40, 2.93)
Higher	2.30(1.27, 4.16) **	2.43(0. 40, 14.65)
Husband's Education		
No education	1.00	1.00
Primary	1.55(1.16, 2.08) **	2.04(0.97, 4.29)
Secondary	2.15(1.54, 2.10) ***	1.99(0.92, 4.31)
Higher	1.44(0.81, 2.57)	1.63(0.43, 6.21)
Women's Occupation		
no working	1.00	1.00
professional/technical/managerial/clerical	3.42(1.66, 7.08) **	2.56(0.34, 19.47)
sales/services	1.18(0.87,1.62)	1.26(0.66, 2.40)
agricultural	1.20 (0.84,1.72)	1.19(0.44, 3.23)
skilled manual	0.84(0.55, 1.29)	0.65(0.24, 1.81)
unskilled manual	0.99(0 .75, 1.30)	0.83(0.37, 1.84)
Husband's Occupation		
no working	1.00	1.00
professional/technical/managerial/clerical	0.40(0.05, 3.49)	0.54(0.13, 2.29)
sales/services	0.32(0 .04, 2.74)	0.18(0.07, 0.45) ***
agricultural	0.45(0.05, 3.86)	0.34(0.13, 0 .92) *
skilled manual	0.32(0.04, 2.73)	0.31(0.14 ,0.70) **
unskilled manual	0.38(0 .04, 3.25)	1 (omitted)
Pseudo R2	0.047	0.084

Notes: p-value <0.05*, <0.01**, < 0.001***; OR = Odds Ratio, AOR = Adjusted Odds Ratio,
CI = Confidence Interval



DISCUSSION

Regarding sexual rights, the study highlights the significant role of women's education in enhancing their autonomy. Women with primary, secondary, and higher education were significantly more likely to have autonomy than uneducated women, consistent with previous research (8, 12, 13). This could be attributed to highly educated women being more likely to be aware of their rights and health and possess greater self-confidence than those with little or no education (12). Also, husbands' education became a crucial factor in women's autonomy. Women with primary and secondary educated husbands were more likely to have the autonomy to refuse sex regarding their sexual rights compared to those whose husbands were uneducated. This finding aligns with other studies in Asia (13, 14). This suggests that educated husbands respect their wives' autonomy and understand the importance of mutual consent in sexual relations.

Women's economic status also impacts their sexual rights. This study found that women employed in professional positions were more likely to have the autonomy to refuse sex from their husbands or partners, consistent with previous research (14, 15). Employment may give women greater financial independence and self-confidence, enhancing their ability to assert their sexual rights (8, 12). The study revealed that rural residence women were less likely to refuse sex compared to those residing in urban areas. This finding is consistent with previous studies conducted in Bangladesh and Indonesia, suggesting it could be linked to the more decisive influence of social and cultural norms reinforcing women's lower status in rural areas (1, 14).

Regarding women's autonomy in contraceptive use, women with older husbands were significantly less likely to have autonomy in contraceptive use decision-making, supporting findings from Bangladesh, which highlighted that a couple of age gaps affected women's self-determination in contraceptive use (1). Women with five or more children were more likely to autonomously decide on contraceptive use compared to those with no children. This finding is consistent with previous studies (1, 16, 17). The research conducted in Myanmar highlighted that women were more likely to use contraceptive methods

once they had achieved their intended family size (17). This suggests that as women had more children, they may become more involved in contraceptive use and feel more empowered in family planning decisions (1).

Interestingly, poorer women exhibited more autonomy in contraceptive decisions than those in the wealthiest category in this study, consistent with previous studies in Bangladesh and Ghana (18, 19). Conversely, other studies found that women in the wealthiest quintiles have more autonomy in contraceptive decision-making (8, 20). This study's finding suggests that among poorer women who wish to avoid pregnancy, increased sexual empowerment is associated with a higher likelihood of contraceptive use (18).

This study found that women whose husbands worked in sales/services, skilled manual, and agricultural jobs were less likely to have autonomy. This finding aligns with a study conducted in Nigeria (21). This suggests that occupation reflects independence, control, and social networks, which could influence health outcomes by providing opportunities such as better access to healthcare services, education, and housing for those with higher social status (22).

LIMITATIONS

This study has limitations due to the use of secondary data from the MDHS. It contains limited items to measure women's autonomy in sexual and reproductive health rights. Moreover, there are variable limitations related to women's access to resources such as family planning services, health facilities, and communication with healthcare providers to attain women's autonomy for their sexual and reproductive well-being. Additionally, information that could affect sexual rights, such as interactions with social workers, women's unions, and community clubs, is missing. The study also has crucial variable limitations, such as religion and ethnicity, which are significant socio-demographic characteristics that can affect women's autonomy in Myanmar. Furthermore, the cross-sectional design limits its ability to establish causal relationships between identified factors and women's autonomy.



CONCLUSIONS

This study examined the association between socio-demographic factors and women's autonomy in sexual and reproductive health rights in Myanmar. Education and employment emerged as crucial for empowering women to assert these rights. Various factors, including age differences and the number of children, influence women's autonomy.

Based on the study's findings, recommendations are proposed for the policymakers and further research. This study may propose appropriate policies to promote women's sexual rights and family planning services in Myanmar. The Myanmar government should encourage women to pursue education and provide career or vocational training opportunities to enhance their roles in the family and society. Policymakers should promote sexual rights and gender equality programs, especially in rural areas, and integrate human rights and comprehensive sexual and reproductive education into the school curriculum to raise awareness for everyone.

Further research should address existing gaps and this study's limitations using different study designs, such as qualitative cohort studies or mixed-method studies, which could explore women's experiences in different cultural, social norms, and socioeconomic contexts. Moreover, it would contribute to a more nuanced understanding of the interplay between sociocultural factors and women's autonomy in sexual rights and reproductive health decision-making.

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INDOOR ENVIRONMENT FACTORS AND CHILDHOOD ASTHMA IN RURAL AREA OF MYANMAR

Cherry Thet ^{1*}, Nutta Taneepanichskul ¹

¹College of Public Health Sciences, Chulalongkorn University, Sabbasatavicaya Building, Phayathai Road, Bangkok 10330, Thailand

***Corresponding Author:** Cherry Thet, College of Public Health Sciences, Chulalongkorn University
Sabbasastravicaya Building, Phayathai Road, Bangkok 10330, Thailand, E-mail:
6674006253@student.chula.ac.th

ABSTRACT

Introduction: Indoor environmental pollution poses a rising health risk. The impact of childhood asthma in rural Myanmar remains under-researched. In 2019, Global Burden of Disease data indicated an incidence rate of 731.07 per 100,000 and a mortality rate of 2.54 per 100,000 for childhood asthma in Myanmar. Childhood asthma prevalence was higher in rural areas (16%) compared to urban areas (12%) and the prevalence of asthma in rural children aged 5-9 years was 3.34%, compared to 0.83% in urban children of the same age group, highlighting a more significant burden in rural regions. Additionally, limited studies have been conducted to explore the relationship between indoor environmental factors and childhood asthma in rural areas.

Objectives: This study aimed to find the association between indoor environment factors and childhood asthma in rural areas of Myanmar.

Methods: A preliminary cross-sectional survey was conducted with 400 participants, males (51.5%) and females (48.5%), from Kamarsae village of Thanatpin Township, Bago region. The trained health workers questioned the surveys, explained them to parents or primary caretakers, and provided accurate information about their children's household environment, indoor environment, and asthma. Descriptive statistics were conducted, and a Chi-square test was used to evaluate the association between indoor environment factors and childhood asthma.

Results: Among the participants, 51.5% were male and 48.5% were female. Most children, 27%, were six years old, and 45.8% had a birth weight of 3.1 kg. 34.3% reported premature delivery of their children. Indoor environmental factors included mold in 2.5% of homes and parental tobacco use in 51% of homes. Pets were common, with 64% of households having pets, 28.7% having cats, and 42.5% having dogs. Additionally, 26% of homes had flowering plants, 53.8% used mosquito incense or spray, and 29.5% used wood as a cooking fuel. Among the participants, a significant association was found between a history of asthma and several factors from indoor environmental factors. The association was determined to be statistically significant with a p-value of 0.05.

Conclusion: The study reveals significant associations between a history of asthma and various indoor environmental factors. Factors such as tobacco at home, having pets, home ventilation, air refresher use, and having new furniture at home were associated with asthma in children living in rural areas of Myanmar. Addressing childhood asthma requires enhancing indoor air quality and reducing pollutants. Initiatives should prioritize proper kitchen ventilation and educate families about indoor air quality and household product risks to effectively lower asthma prevalence among children.

Keywords: Children Asthma, Indoor environment, Rural area, Myanmar

INTRODUCTION

Asthma is a chronic respiratory condition characterized by inflammation and narrowing of the airways, causing symptoms like wheezing, coughing, chest tightness, and shortness of breath. It varies in severity and can be triggered by allergens, respiratory infections, exercise, cold air, and stress. Childhood

asthma, common in children under 18, affects millions worldwide. Symptoms are similar to those in adults, with younger children often experiencing coughing as the main symptom. Diagnosis involves medical history, physical examination, and lung function tests, though younger children may be diagnosed based on symptoms and treatment response. Childhood



asthma impacts quality of life, leading to missed school days and hospitalizations.

Addressing indoor environmental triggers such as allergens, pollutants, and dampness through measures like improving air quality, reducing allergen exposure, controlling moisture, and implementing smoke-free policies is essential for preventing and managing asthma in children (1).

Globally, the estimated number of incident childhood asthma cases in 2019 was nearly 22 million (95% UI 15 to 31 million). Childhood asthma prevalence was higher in rural areas (16%) compared to urban areas (12%). The data for the 5-9 years age group indicates the incidence of cases in this age group slightly increased, from 5.56 million cases in 1990 to 6.42 million in 2019. Regarding disability-adjusted life years (DALYs), there was a slight decrease from 1.60 million in 1990 to 1.49 million in 2019. In Myanmar, childhood asthma is a significant public health concern, impacting a notable portion of the population. According to recent data, the prevalence of childhood asthma in Myanmar is noteworthy. In 2019, the incidence of childhood asthma in Myanmar was 731.07 per 100,000 population, while the mortality rate was 2.54 per 100,000 population (2). Children aged 5-9 years show a prevalence of 3.34%, compared to 0.83% in urban children of the same age group. This highlights a more significant burden in rural regions and underscores the need for more studies to explore the relationship between indoor environmental factors and childhood asthma (2).

In Myanmar, asthma triggers, particularly pollutants, are widespread, with 73% of households using wood, charcoal, or crop byproducts for cooking, resulting in daily exposure to indoor pollutants at levels 100 times higher than healthy limits. This exacerbates asthma and other chronic respiratory diseases. Additionally, the high rates of preterm and low birth weight newborns, alongside smoking rates of over 50%, further increase asthma risks. Poverty, worsened by COVID-19 and political turmoil, strains the economy, raising asthma medication costs and hindering symptom management for many families (3,4). There are associations between children's characteristics and childhood asthma in rural areas of Myanmar. There are

associations between indoor environmental factors and childhood asthma in rural areas of Myanmar.

Previous studies have investigated the indoor environment in rural areas, highlighting factors such as biomass fuel use, proximity to agricultural activities, and housing conditions as potential triggers for respiratory conditions like asthma. However, it still needs to be completed. This study aims to find the association between indoor environment factors and childhood asthma in rural areas of Myanmar. This study aims to contribute to understanding the disease burden across diverse socioeconomic and environmental contexts, allowing for the development of more equitable and effective public health strategies. Conducting this study research in rural areas of Myanmar is essential for advancing our understanding of asthma, promoting respiratory health equity for all populations, and promoting the association between the indoor environment and childhood asthma in rural areas of Myanmar.

METHODOLOGY

A preliminary cross-sectional survey involved 400 participants (51.5% male, 48.5% female) from Kamarsae village, Thanatpin Township, Bago region, with the hypothesis that there are associations between children's characteristics and indoor environment factors towards childhood asthma in rural areas of Myanmar. The dependent variable is childhood asthma, and the independent variables include children's characteristics and indoor environmental factors. Trained health workers conducted surveys to ensure accurate data collection on household environments and asthma using school-based screenings and the community for data collection. Inclusion criteria required Myanmar parents or primary caregivers with 5-9-year-old children living together in Kamarsae village, residency of at least 12 months, the ability to speak the Myanmar language, and willingness to participate. Exclusion criteria included children without parental consent, children with disabilities, those with chronic respiratory diseases such as COPD or chronic bronchitis, and participants with physical or psychological disorders, including illiteracy. These criteria ensure the study outcomes' integrity, safety, and relevance while upholding ethical standards



and protecting the participants' rights and well-being. The questionnaire for this study is structured into three distinct parts, each serving a specific purpose. Each part of the structured questionnaire collected comprehensive data to investigate the relationship between indoor environmental factors and childhood asthma and was approved by Chulalongkorn University's ethics committee (COA No 131/67); the study used a validated 24-question survey with an average IOC score above 0.50. The researcher checked Data and questionnaires before data entry, which was performed using a double-entry process before analysis. Statistical significance was defined as $p < 0.05$, and data were analyzed using SPSS software. Descriptive statistics reported frequency and percentage for categorical variables, mean (standard deviation) for normally distributed continuous data, and median (interquartile range) for non-normally distributed data. The Chi-square test assessed the association between dependent and independent variables, which is suitable for analyzing categorical data to determine significant relationships between indoor environmental factors and childhood asthma. As a cross-sectional study, potential limitations include information bias due to data being collected at a specific time and selection bias since participants were only from one region, not the entire Myanmar population.

RESULTS

This study aimed to determine the prevalence of childhood asthma in rural Myanmar and identify associations between children's characteristics, indoor environmental factors, and asthma in Kamarsae Village, Thanatpin Township, Bago region. It involved children aged 5 to 9 years, with results split into descriptive and inferential findings, examining dependent and independent variables.

Children characteristic

Table 1 represents the children's characteristics of the respondents. The age distribution of children had a median value of 7, ranging from 5 to 9. Mainly, 108(27.0%) were six years old. Regarding sex distribution, 51.5% were male and 48.5% were female. Regarding birth weight, most children had a birth weight of 3.1 kg, with 183 children falling into this category, representing 45.8%. There were even fewer children in the higher and lower extremes of birth weights. Other birth weights were less common. Premature delivery was reported for 34.3% of the children, while 65.7% were not born prematurely. The children's birth weight(kg) had a median value of 3.1, ranging from 2.5 to 3.8. The majority of children -3.1 kg, with 183 children representing 45.8%.Less common children (0.3%) weighed 2.6 kg, and 1 child (0.3%) weighed 3.7 kg.

Table 1 Children Characteristics Profile (n=400)

Characteristics		Number	Percent (%)
Age (years)	5	75	18.8
Median (Interquartile Range)	6	108	27.0
	7	91	22.8
	8	61	15.3
Minimum, Maximum	9	65	16.3
	5,9		
Sex	Male	206	51.5
	Female	194	48.5
Birth weight (kg)	2.5	9	2.3
Median (Interquartile Range)	2.6	1	0.3
	2.7	19	4.8
	3.10(.3)	7	1.8
Minimum, Maximum	2.8	21	5.3
	2.9	54	13.5
	2.5,3.8	3.0	
	3.1	183	45.8
	3.2	6	1.5
	3.3	45	11.3



Characteristics		Number	Percent (%)
	3.4	14	3.5
	3.5	17	4.3
	3.6	15	3.8
	3.7	1	0.3
	3.8	8	2.0
Premature delivery	No	263	65.7
	Yes	137	34.3
Breastfeeding Period	Less than one month	14	3.5
	One to three months	95	23.8
	Four to six months	82	20.5
	More than six months	209	52.3

Indoor Environment Factors

Table 2 details the indoor environment factors. Mold or dampness was present in the homes of 2.5% of the children. Parental use of tobacco products in the home was reported by 51.0% while Tobacco used by other family members in the home was reported by 54.5%. Pets were present in 64.0% of homes, with cats in 44.7% and dogs in 66.4% of homes. Flowers with pollen were present in 26.0% of homes, and 53.8% of families used mosquito incense or spray in the last 12 months. The usage frequency of mosquito incense or spray was sometimes (36.8%) and every time (17.5%). Cooking fuels used included charcoal (29.0%), wood (29.5%), gas (21.3%), electricity (16.5%), and other fuels (3.8%). Kitchen ventilation was available in 60.5% of homes.

Windows were frequently opened every time by 33.0% of families, sometimes (2-3 times/week) by 34.0%, and never by 33.0%. Air fresheners were used in the last 12 months by 58.5% of families, with frequencies of daily (13.0%), weekly (28.5%), and monthly (16.8%), and air purifiers were used by 10.8% with frequencies of daily (0.8%), weekly (5.8%), and monthly (4.3%). Redecoration or new furniture was present in 22.5% of homes in the last 12 months. The number of persons living in the home had a median value of 6, ranging from 3 to 9. Frequency distributions for the number of persons living in the home were: 3 persons (12.5%), four persons (13.0%), five persons (18.3%), six persons (15.5%), seven persons (12.0%), eight persons (13.5%), and nine persons (15.3%).

Table 2 Indoor Environment Factors Profile (n=400)

Characteristics		Number	Percent (%)
Presence of mold/damp	No	390	97.5
	Yes	10	2.5
Parental tobacco products used in the home	No	196	49.0
	Yes	204	51.0
Family member's tobacco products used in the home	No	182	45.5
	Yes	218	54.5
Pets at home	No	144	36.0
	Yes	256	64.0
Cats at home	No	142	55.3
	Yes	115	44.7
Dogs at home	No	86	33.6
	Yes	170	66.4



Characteristics		Number	Percent (%)
Presence of flowers with pollen	No	296	74.0
	Yes	104	26.0
Mosquito incense /spray used during last 12 months	No	185	46.2
	Yes	215	53.8
Frequency of Mosquito incense /spray used during last 12 months	Never	-	-
	Sometimes	147	36.8
	Every time	70	17.5
Cooking fuels	Charcoal	116	29.0
	Wood	118	29.5
	Gas	85	21.3
	Electricity	66	16.5
	Others	15	3.8
Kitchen ventilation	No	158	39.5
	Yes	242	60.5
Frequent opening of the window	Never	132	33.0
	Sometimes (2-3times per week)	136	34.0
	Every time	132	33.0
Using Air fresher during the last 12 months	No	166	41.5
	Yes	234	58.5
Frequency of using air fresher	Daily	52	13.0
	Weekly	114	28.5
	Monthly	67	16.8
Using an Air purifier during the last 12 months	No	357	89.3
	Yes	43	10.8
Frequency of using an air purifier	Daily	3	0.8
	Weekly	23	5.8
	Monthly	17	4.3
Redecoration/new furniture used during last 12 months	No	310	77.5
	Yes	90	22.5
Numbers of person living in the home Median(Interquartile Range) 6.00(4) Minimum, Maximum 3,9	3	50	12.5
	4	52	13.0
	5	73	18.3
	6	62	15.5
	7	48	12.0
	8	54	13.5
	9	61	15.3

**Childhood Asthma**

Table 3 presents information on childhood asthma. Asthma was prevalent, with

64.8% having a history of the condition while 35.3% had no history of asthma.

Table 3 Childhood Asthma Profile (n=400)

Characteristics	Variables	Frequency	Percent (%)
History of Asthma	No	141	35.3
	Yes	259	64.8

Association between children characteristics and indoor environmental factors towards childhood asthma by chi-square.

The dependent variable, which is childhood asthma, has dichotomous categorical data, and all independent variables are also grouped into categorical data, as mentioned in the data analysis part of the methodology. A chi-square test was used in bivariate analysis to determine the association between independent and dependent variables. The Chi-square test results showed several factors with significant associations with childhood asthma, characterized by p-values less than 0.05.

Notably, individuals with Premature delivery, Breastfeeding, and Indoor

Environmental factors within the home, such as parents and family members using tobacco, Pets, especially dogs, poor kitchen ventilation, frequent opening of windows, and regular use of air fresheners and decoration/new furniture, are linked to higher asthma rates.

In contrast, certain factors, such as sex, the presence of mold or dampness, and the use of mosquito incense or sprays, do not exhibit significant associations with asthma, with p-values exceeding the 0.05 threshold. This suggests that these elements may have a lesser impact on asthma risk compared to the more significant factors identified.

Table 4 Association of children's characteristics and indoor environmental factors towards childhood asthma (n=400)

Characteristics	History of Asthma		P-value ^a
	No	Yes	
Sex			0.617
Male	75	131	
Female	66	128	
Premature Delivery			<0.001*
No	138	125	
Yes	3	134	
Breastfeeding Period			<0.001*
≤6months	32	159	
>6months	109	100	
Presence of mold/damp			0.725
No	138	252	
Yes	3	7	
Parental tobacco products used in the home			<0.001*
No	101	95	
Yes	40	164	



Characteristics	History of Asthma		P-value ^a
	No	Yes	
Family members' tobacco products used in the home			<0.001*
No	98	84	
Yes	43	175	
Pets at home			<0.001*
No	78	66	
Yes	63	193	
Cats at home			0.120
No	30	112	
Yes	34	81	
Dogs at home			0.036*
No	28	58	
Yes	35	135	
Presence of flowers with pollen			0.080
No	97	199	
Yes	44	60	
Mosquito incense /spray used during last 12 months			0.102
No	73	112	
Yes	68	147	
Frequency of Mosquito incense /spray used during last 12 months			0.623
Sometimes	49	98	
Every time	21	49	
Cooking fuels			0.549
Dirty	85	164	
Green	56	95	
Kitchen ventilation			<0.001*
No	27	131	
Yes	114	128	
Frequent opening of the window			<.001*
Never	29	103	
Sometimes	50	86	
Every time	62	70	
Using Air Fresher during the last 12 months			<0.001*
No	41	125	
Yes	100	234	
Frequency of using air fresher			<0.001*
Daily	36	16	
Weekly	38	76	
Monthly	27	40	



Characteristics	History of Asthma		P-value ^a
	No	Yes	
Using of Air Purifier during last 12 months			.776
No	125	232	
Yes	16	27	
Frequency of using an air purifier			.555
Daily	1	2	
Weekly	7	16	
Monthly	8	9	
Redecoration/new furniture used during last 12 months			<.001*
No	83	227	
Yes	58	32	

^a. Bivariate analysis, *p value<0.05

DISCUSSION

This study aimed to identify associations between indoor environment factors and childhood asthma and was conducted in Kamarsae Village, Thanatpin Township, Bago region; it involved 400 children aged 5 to 9 years, using school-based screenings and the community for data collection. The study offers valuable insights into factors linked to childhood asthma. Data analysis comprehensively examined demographic characteristics, early life factors, and indoor environments, highlighting the multifactorial nature of asthma development.

Children characteristics, Indoor environmental factors and Childhood asthma

Firstly, the age distribution of the children indicates a diverse age range, with a notable representation across different age groups. This broad age spectrum allows for a comprehensive analysis of how age-specific factors might influence asthma prevalence. Sex distribution was almost equal boys (51.5%) and girls (48.5%), which ensures that the findings are a higher prevalence of asthma in boys than in girls. This balance is crucial as it allows for the identification of gender-specific risk factors and their implications in asthma management. (5). The near-equal representation of males and females aids in drawing more generalized conclusions applicable to the broader pediatric population. Birth weight emerged as a significant variable, with most children having a birth weight within the normal range. This finding suggests that. This finding aligns with existing literature (5), emphasizing the

vulnerability of premature infants to respiratory conditions. Birth weight is a vital measure of newborn health and is influenced by various factors, including maternal nutrition, prenatal care, and exposure to environmental pollutants. The study found that only 34.3% of the children had a history of premature delivery. The high percentage of children with a history of Premature delivery is associated with alterations in immune function and airway structure, contributing to persistent airway inflammation and hyperresponsiveness characteristic of asthma (5). A significant proportion of children with asthma have a history of premature delivery, which is linked to changes in immune function and airway structure, leading to chronic airway inflammation and hyperresponsiveness. 5. Breastfeeding duration showed a protective effect against asthma, with more extended breastfeeding periods associated with lower asthma prevalence. Breastfeeding offering immunological, nutritional, and respiratory benefits to infants. (5). This reinforces the importance of breastfeeding support programs and policies encouraging prolonged breastfeeding.

Indoor Environmental factors, such as mold or dampness in the home (2.5%), were also examined. While not all environmental factors significantly correlated with asthma, pets, particularly dogs, were associated with higher asthma prevalence (6,7). The finding that Pets were present in 64.0% of homes, with cats in 44.7% and dogs in 66.4% of homes, suggests that pet ownership should be carefully managed in households predisposed to asthma,



potentially limiting exposure to pet dander and other allergens. The use of mosquito incense, sprays, and air fresheners had varied impacts on asthma prevalence. These findings suggest that while some household practices may help reduce allergen exposure, others might introduce irritants that exacerbate asthma symptoms. It emphasizes the need for careful selection and use of household products to minimize respiratory irritants.

Kitchen ventilation and using clean cooking fuels were associated with lower asthma prevalence, indicating the importance of good indoor air quality. Ensuring proper ventilation and reducing exposure to indoor pollutants from cooking can be effective strategies in asthma prevention (6,7). These findings highlight the practical steps families can take to create a healthier home environment. The frequent windows opening for ventilation also showed a protective effect, reinforcing the importance of good ventilation in preventing asthma. Regularly airing out homes can reduce indoor allergen levels and improve air quality, thus reducing the risk of asthma. This simple yet effective practice can be promoted as part of broader public health recommendations. Redecoration and introducing new furniture were associated with lower asthma prevalence, suggesting that maintaining a clean home environment can be beneficial. This may be due to reduced accumulation of dust mites and allergens in newer furnishings. The findings suggest that periodic home improvements can contribute to better respiratory health. Families with more members may be a higher likelihood of exposure to environmental triggers such as secondhand smoke, dust mites, pet dander, and mold, which are known to exacerbate asthma symptoms (8). The findings indicate that 15.3% of households had nine persons. Increased crowding and inadequate household ventilation can contribute to indoor air pollution, exacerbating asthma symptoms.

Asthma was prevalent among the respondents' children, with 64.8% having a history of the condition and 35.3% having no history of asthma. Childhood asthma significantly impacts and affects children's quality of life (QoL), as highlighted by numerous studies. Physically, symptoms like wheezing and shortness of breath limit activities and disrupt sleep. Emotionally,

children with asthma often experience increased anxiety and stress. Socially, the condition can lead to peer rejection and stigmatization, affecting social interactions and relationships.

Additionally, academic performance can be negatively impacted due to absences and difficulties concentrating. Interventions to improve QoL include pharmacological treatments, patient education, environmental modifications, and psychosocial support (9).

Association between children's characteristics and indoor environmental factors towards childhood asthma

The study highlights several significant factors associated with childhood asthma, demonstrating the complexity of the disease's etiology and the interplay of various environmental, genetic, and lifestyle factors. A shorter breastfeeding period (six months or less) is strongly associated with a higher incidence of asthma, as breast milk contains essential nutrients and antibodies that help develop the infant's immune system, potentially reducing asthma risk. Additionally, tobacco use by parents and other family members significantly increases the risk, underscoring the detrimental impact of tobacco smoke exposure on children's respiratory health. Poor kitchen ventilation strongly correlates with asthma, indicating that exposure to indoor pollutants like cooking fumes may exacerbate respiratory issues. Surprisingly, frequent window opening is associated with asthma rates.

Conversely, using air fresheners is associated with a risk of asthma. Homes that have not undergone redecoration or added new furniture within the past year show a higher incidence of asthma, likely due to the off-gassing of volatile organic compounds (VOCs) from new materials. Having pets, especially dogs, significantly increases the risk of childhood asthma, as pet allergens like dander can trigger asthma symptoms in susceptible children.

Several variables did not show a statistically significant association with childhood asthma, including mold, dampness, mosquito incense, air purifiers, cats, and flowers with pollen. These findings highlight the complexity of asthma etiology and the need for personalized risk assessments. The study



underscores the importance of a holistic approach to asthma prevention and management, addressing genetic, environmental, and lifestyle factors. Tailored interventions for high-risk groups in Myanmar can improve the quality of life for affected children in rural areas by better understanding and mitigating asthma risks.

CONCLUSIONS

Environmental factors within the home, such as poor kitchen ventilation, frequent use of air fresheners, and the presence of pets, particularly dogs, are identified as significant contributors to asthma prevalence. These findings illustrate the critical role of indoor air quality and household environment in influencing respiratory health. Overall, the findings highlight the complex interplay of genetic, environmental, and lifestyle factors in childhood asthma, providing a comprehensive framework for understanding the disease and identifying potential intervention points.

Recommendations

Based on the study's findings, several recommendations can be made to mitigate the risk factors associated with childhood asthma. First and foremost, public health initiatives should focus on reducing prenatal and early postnatal risk factors. Ensuring optimal prenatal care and promoting breastfeeding for at least six months can significantly reduce asthma prevalence. Public health campaigns should also target smoking cessation among parents and caregivers, highlighting the severe impact of secondhand smoke on children's respiratory health. Policies to restrict smoking in homes and around children could further mitigate this risk. Improving indoor air quality through better kitchen ventilation can also help lower asthma rates. Public awareness campaigns should educate families about the importance of maintaining good indoor air quality and the potential hazards of certain household products. Genetic counseling and early monitoring of respiratory health can be beneficial for families with a history of asthma. Environmental regulations should also address industrial and agricultural pollutants, reducing exposure to harmful substances for children near factories and farms. Implementing stricter air quality standards and monitoring pollution levels in residential areas can contribute to healthier environments.

Moreover, fostering environments that limit exposure to allergens, such as pet dander, is crucial. For families with pets, measures, particularly for dogs, such as regular cleaning and restricting pets' access to certain home areas, may help reduce asthma triggers. In conclusion, a multifaceted approach that addresses genetic, environmental, and lifestyle factors is essential for effectively reducing childhood asthma prevalence. Public health policies and interventions should be tailored to address these diverse factors, promoting healthier environments and reducing the burden of asthma on children and their families.

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SOCIO-ECOLOGICAL DETERMINANTS OF DENGUE PREVENTIVE PRACTICES AMONG MYANMAR MIGRANTS IN SAMUT SAKHON PROVINCE, THAILAND

Tin Soe Oo¹, Cheerawit Rattanapan^{1*}, Piyapong Janmaimool¹, Orapin Laosee¹, Tarinee Buadit¹

¹ASEAN Institute for Health Development, Mahidol University, Salaya, Phuttamonthon, Nakhon Pathom 73170, Thailand

*Corresponding Author: Cheerawit Rattanapan, ASEAN Institute for Health Development, Mahidol University, Nakhon Pathom, 73170 Thailand, E-mail address: cheerawit.rat@mahidol.edu

ABSTRACT

Introduction: Dengue is an emerging and re-emerging mosquito-borne viral disease and has become endemic in many parts of the world, with continuing outbreaks. Almost half of the world's population is now at risk of dengue, with the estimated infections ranging from 1 to 3.9 billion annually. In Thailand, dengue has become a serious problem according to recent statistics, with more than 8,000 people contracting dengue infection in January 2024, almost double the number reported in the same period in 2023.

Objective: This study investigated socio-ecological factors associated with dengue preventive practices among Myanmar migrants in Samut Sakhon Province, Thailand.

Methodology: A cross-sectional study was performed among Myanmar migrant communities in Samut Sakhon Province, Thailand. A total of 200 participants were recruited from two migrant clusters using the voluntary response sampling technique. The study subjects were approached during their spare time with the assistance of local community leaders. Data were collected in July 2024 through an interviewer-administered Enketo web form questionnaire.

Results: Descriptive analysis indicated that 52.5% of respondents had good levels of dengue preventive practices. Having moderate to high levels of knowledge and a high level of social support were significantly associated with a good level of dengue preventive practices. No significant associations were observed between socio-demographic variables, previous dengue experience, level of community capacity, and dengue preventive practices.

Conclusion: This study suggests that targeted educational campaigns should be considered to address misperceptions about dengue among migrant communities in Samut Sakhon. In addition, the networking between migrant communities in Samut Sakhon Province and nearby health counterparts should be strengthened to increase the accessibility of resources required for effective dengue prevention (e.g., larvicide).

Keywords: Dengue, Prevention, Socio-ecological Factors, Myanmar Migrants, Thailand

INTRODUCTION

Dengue is an emerging and re-emerging mosquito-borne viral disease transmitted from one person to another through the bite of infected mosquitoes. The dengue virus (DENV) is generally transmitted by *Aedes* mosquitoes (1, 2). The infection has become endemic in many parts of the world, with persistent outbreaks (3). Dengue fever (DF) occurs at high rates in countries with tropical and subtropical climates, mostly in urban and semi-urban areas (1, 4). Nearly half of the world's population is at risk of dengue, with an estimated 1 to 3.9 billion infections

yearly. Dengue is now endemic in over 100 WHO countries, and Asia bears 70% of the global disease burden (1).

Dengue cases are exceptionally high in Southeast Asia (SEA); inhabitants from SEA are 18 times more likely to contract the disease compared to their American counterparts (4). Between 2015 and 2019, dengue cases in the SEA region increased by 46%, and five countries – including Thailand – were ranked among the 30 most highly dengue-endemic countries worldwide. Global warming, high population growth rate, inadequate water supply, improper water storage practices, and



waste management systems mainly contribute to the expansion and distribution of dengue vectors and the transmission of dengue viruses (5).

Dengue fever has become a severe problem in Thailand, with over 8,000 people infected with dengue in January 2024, nearly double the reported number during the same period in 2023 (6). Dengue remains Thailand's significant public health concern and is a leading cause of hospitalization (2). Dengue outbreaks in Thailand typically occur every two to three years, with a significant outbreak in 1958 (7). In 2021, dengue mortality was the fifth highest among diseases under surveillance in Thailand, with 10,671 reported cases and six deaths (8).

Thailand has become a key destination for migrant workers from neighboring countries. According to Thailand's Ministry of Labour statistics, there were 2.3 million documented migrants in October 2023; 1.7 million (74%) came from Myanmar (9). High population movements within and across countries exacerbate the dengue risk, and conducive social, entomological, and environmental factors favor the proliferation of *Aedes* mosquitoes (10-12). High migration rates and poverty often result in poor living conditions, such as poorly built homes with drainage problems, insufficient water supply, and poor waste management systems; these conditions can create breeding places for *Aedes* mosquitoes (13).

The Samut Sakhon Province, commonly known as "Little Myanmar," is a hosting province of a vast population of Myanmar migrants; the majority of them are employed in fishing and seafood processing industries that contribute to three percent of Thailand's GDP. Migrant workers are among the poorest people and live in overcrowded dorms with no cleaning services and limited access to clean tap water and sanitary infrastructure (14, 15). Many migrant households in Samut Sakhon are located in places polluted with garbage, trash, and wastewater (16), creating the ideal places for mosquito breeding.

The only effective measure to limit dengue transmission is to combat mosquitoes through mosquito control and awareness campaigns, given that there is no specific treatment for dengue (17). A sustainable

dengue prevention approach demands full involvement of the community (18), and therefore, it is crucial to assess the community's capacity regarding dengue prevention and control. Previous studies conducted among Myanmar migrants assessed individual determinants such as knowledge, attitudes, and practices toward dengue. However, interpersonal and community-level factors of dengue preventive practices still need to be more focused. Hence, this study aimed to examine the socio-ecological factors associated with dengue preventive practices among Myanmar Migrants in Samut Sakhon Province, Thailand. These include socio-demographics, knowledge, social support, and community capacity on dengue. Results obtained from this study provide policymakers with essential information to design effective community engagement programs to sustain vector-control efforts and enhance disease awareness among Myanmar migrant communities.

METHODOLOGY

Study Design

A cross-sectional study was conducted in Samut Sakhon, one of the provinces in Thailand with a considerable population of Myanmar migrants. Samut Sakhon Province is home to the world's largest seafood processing industry, and there were an estimated 660,000 migrant workers, of which 400,000 (61%) originated from Myanmar. The study was conducted in two migrant clusters, namely Talad Kung and Thai Union.

A questionnaire reliability test involving 30 participants was separately done in the Bang Pla migrant cluster, located in Nakhon Pathom Province. Cronbach's alpha values for knowledge, social support, community capacity, and practice were 0.66, 0.79, 0.78, and 0.87, respectively. Data were collected using an interview-administered questionnaire using the Enketo web form.

Research Instrument

A structured questionnaire was developed by adapting standard questionnaires from previous literature (2, 3, 13, 18-21). The knowledge section included 15 items assessing knowledge regarding dengue transmission, dengue symptoms, characteristics of the dengue vector, and dengue prevention methods. The respondents were asked to respond "true,"



"false," or "not sure" in each statement, and the responses were coded as "1" if the participants answered "true" and "0" if "false/not sure." The reversed coding was applied for negative statements, and then the scores were summarized and transformed into percentages. Bloom's cutoff points were adopted to classify low (<60%), moderate (60-79%), and high ($\geq 80\%$) levels of knowledge (22). For social support, a shortened version of the Social Provisions Scale (SPS-5) consisting of 5 items was adopted (23). A five-point Likert scale was used to rate each statement (1, Strongly Disagree; 2, Disagree; 3, Neither Disagree nor Agree; 4, Agree; 5, Strongly Agree). Then, the scores were summarized and converted into percentages. The possible scores ranged from 5 to 25. A median cutoff point is used to classify between "low" and "high" levels of social support. The Dengue Community Capacity Assessment Tool (DCCAT) was adapted to assess the respondents' perceptions toward community capacity on dengue (24). Each of the nine items included in this domain was rated on a five-point Likert scale (1, Very low; 2, Low; 3, Moderate; 4, High; 5, Very High). The overall score of each respondent was transformed into a percentage, and each respondent's level of community capacity was classified as "adequate" or "inadequate" using a 50% cutoff point (25). The practice section included 15 items describing personal protection practices and vector control practices in dengue prevention. The scores were given according to categories of Likert scale (0, Not at all; 1, Rarely; 3, Sometimes; 4, Often; 5, Always). The overall score was calculated for each participant, and a median cutoff point was used to differentiate between "poor" and "good" levels of practice.

Data Collection Procedures

The data collection was performed after the protocol was approved by the Mahidol University – Central Institutional Review Board (MUCIRB). The community leaders in selected migrant clusters were informed of this study's purpose and detailed procedures, and the researcher sought permission to collect data. Two data collectors were recruited in this study.

The study subjects were gathered during their spare time with the assistance of community leaders, and face-to-face interviews were conducted using an Enketo web form powered by KoboToolbox (26). We performed data collection in July 2024.

Statistical Analysis

200 participants were included in the data analysis, and IBM Statistical Package for Social Science (SPSS) version 25 was used to analyze the data. Descriptive analyses were employed to describe the characteristics of respondents. Additionally, Chi-square analysis was performed to examine the association between independent variables and dengue preventive practices. Variables with a p-value < 0.05 were considered statistically significant.

Ethical Considerations

The ethical approval for this study was obtained from the Mahidol University – Central Institutional Review Board (MUCIRB). The protocol number was MU-CIRB 2024/205.1405. The objectives of the study and confidentiality considerations were clearly stated on the first page of the questionnaire.

RESULTS

Table 1 presents the characteristics of study participants. Among the participants, 51% were females and 49% were males. Half of the participants were between the ages of 18 and 33. A substantial proportion (59%) had an education level of secondary school or lower. The majority (70%) had resided in Thailand for three years or more, and they originated from various states or regions of Myanmar, notably Mon (37%), Tanintharyi (29%), and Kayin (13%). Most participants were employed in various sectors, particularly seafood processing and factory work. Two-thirds of the employed participants earned a minimum monthly income of 10,000 THB; approximately 70% worked more than five days weekly. Dengue experience was reported by 9% of respondents. Nearly two-thirds of the respondents demonstrated moderate to high.

**Table 1** Characteristics of Respondents (n=200).

Variable	Number	Percent (%)
Sex		
Male	98	49.0
Female	102	51.0
Age (years)		
18-33	100	50.0
34-49	85	42.5
> 49	15	7.5
(Median=33.5; Q.D=8.375; Min=18; Max=67)		
Educational level		
Secondary school level and lower	117	58.5
Higher than secondary school level	83	41.5
Duration of stay		
1-2 years	60	30.0
≥ 3 years	140	70.0
(Median=5; Q.D=6.5; Min=1; Max=30)		
State/Region of origin		
Mon	64	32.0
Kayin	26	13.0
Tanintharyi	57	28.5
Others	53	26.5
Employment status		
Unemployed/dependent	32	16.0
General worker/laborer	23	11.5
Factory worker	57	28.5
Seafood Processing work	42	21.0
Fishing	7	3.5
Others	39	19.5
Monthly income (THB) (n=168)		
<10000	33	16.5
≥10000	135	67.5
(Median=10000; Q.D=1500; Min=2000; Max=30000)		
Number of working days (per week) (n=168)		
1-5 days	30	15.0
More than 5 days	138	69.0
Dengue experience (past 12 months)		
No	182	91.0
Yes	18	9.0
Level of knowledge		
Low level	73	36.5
Moderate level	73	36.5
High level	54	27.0
Level of social support		
Poor (< Median)	97	48.5
High (≥ Median)	103	51.5
Level of community capacity		
Inadequate	69	34.5
Adequate	131	65.5
Level of practice		
Poor (< Median)	95	47.5
Good (≥ Median)	105	52.5



Levels of dengue knowledge, and slightly over 50% of respondents reported having good levels of social support. A majority (66%) of the respondents opined that the community capacity regarding dengue was adequate in their residential area.

A little over half of the respondents (53%) were observed to have good levels of dengue preventive practices. Table 2 shows the distribution of respondents according to the

types of dengue preventive methods. The most frequently practiced method was “using a fan to avoid mosquito bites”, with nearly all respondents (95%) always practicing it. Conversely, the least common practices were “using a bed net when sleeping daytime,” with 94% never practicing this measure, and “adding larvicide to water tanks,” with 76% of respondents never applying this method.

Table 2 Percentage of respondents according to types of preventive methods (n=200)

Type of preventive practices	Always	Often	Sometimes	Rarely	Not at all
Use insecticide spray	10%	11%	21%	4%	55%
Use mosquito repellent	6%	9%	21%	4%	62%
Use mosquito coils	15%	13%	23%	4%	47%
Use a bed net when sleeping during the daytime	2%	2%	3%	0%	94%
Wear long-sleeved shirts/pants	7%	8%	13%	7%	65%
Use a fan to avoid mosquito bite	95%	3%	0%	1%	2%
Use electric mosquito repellent	6%	4%	14%	6%	72%
Inspect mosquito larvae	11%	41%	19%	3%	27%
Proper disposal of household garbage	69%	29%	2%	0%	1%
Cut down bushes	15%	35%	10%	7%	34%
Change the vase water	62%	30%	2%	1%	6%
Cover water container	40%	28%	9%	3%	21%
Change stored water	56%	36%	5%	1%	3%
Scrub the inner side of the water containers	54%	37%	3%	3%	5%
Put larvicide in water tanks	6%	13%	5%	2%	76%

Chi-square analysis indicated that level of knowledge and social support were significant factors associated with the level of dengue preventive practices. In contrast, no significant associations were found between socio-demographic factors (such as age, educational level, income, duration of stay, dengue experience, etc.), level of community capacity, and dengue preventive practices (Table 3). The results show that approximately 60% of respondents with moderate to high

levels of knowledge were identified as having a good level of dengue preventive practices, while only 39.7% of respondents with low levels of knowledge were observed as having good levels of practices ($p = .009$). Likewise, nearly 70% of participants with high levels of social support were reported to have a good level of dengue preventive practices, while only 35.1% of respondents with low levels of social support were examined to have good levels of practices ($p = .000$).

**Table 3** Association between independent variables and level of dengue preventive practices (N=200)

Variables	Number	Level of preventive practice, N (%)		P-value*
		Poor	Good	
Sex				0.766
Male	98	45 (45.9)	53 (54.1)	
Female	102	50 (49)	52 (51)	
Age (years)				0.571
18-33	100	45 (45)	55 (55.)	
> 33	100	50 (50)	50 (50)	
Educational level				0.157
Secondary school level and lower	117	61 (52.1)	56 (47.9)	
Higher than secondary school level	83	34 (41)	49 (59)	
Duration of stay				0.354
1-2 years	60	25 (41.7)	35 (58.3)	
≥ 3 years	140	70 (50)	70 (50)	
State/Region of origin				0.101
Mon	64	36 (56.3)	28 (43.8)	
Kayin	26	15 (57.7)	11 (42.3)	
Tanintharyi	57	25 (43.9)	32 (56.1)	
Others	53	19 (35.8)	34 (64.2)	
Employment				0.908
No	32	16 (50)	16 (50)	
Yes	168	79 (47)	89 (53)	
Monthly income (THB) (n=168)				0.053
<10000	33	21 (63.6)	12 (36.4)	
≥10000	135	58 (43)	77 (57)	
Number of working days (per week) (n=168)				0.874
1-5 days	30	15 (50)	15 (50)	
More than 5 days	138	64 (46.4)	74 (53.6)	
Dengue experience (past 12 months)				1.000
No	182	86 (47.3)	96 (52.7)	
Yes	18	9 (50)	9 (50)	
Level of knowledge				0.009
Low	73	44 (60.3)	29 (39.7)	
Moderate and High	127	51 (40.2)	76 (59.8)	
Level of social support				< 0.001
Low	97	63 (64.9)	34 (35.1)	
High	103	32 (31.1)	71 (68.9)	
Level of community capacity				0.088
Inadequate	69	39 (56.5)	30 (43.5)	
Adequate	131	56 (42.7)	75 (57.3)	

*Chi-square test

DISCUSSION

In general, only 52.5% of respondents reported high levels of dengue preventive practices in this study, consistent with findings from a previous study conducted among migrant workers in Malaysia (13). Higher proportions of respondents were observed in

other Malaysian studies (3, 27). In contrast, in an Indonesian study, only 32% of respondents reported having good dengue fever preventive practices (19). This study found that using a fan to avoid mosquito bites and disposing of household garbage were the most practiced preventive measures, probably due to Thailand's hot climate and the availability of



fans in households. A similar finding was obtained in Malaysia, where 89% of respondents properly disposed of water-collecting garbage (27). According to the Ministry of Public Health, Thailand, sleeping under a bed net and adding larvicide into water storage containers effectively eliminated dengue (7). However, in this study, sleeping under a bed net during the daytime and adding larvicide were practiced by study participants least frequently. This contrasts with a study conducted in Thailand, where 51.9% of respondents reported that sleeping under a net was the most effective method (28). A comparable finding was found in a study conducted among Myanmar migrant woman caretakers in Thailand, with only 8.8% of women adding larvicide into water containers (29). This may be due to the limited accessibility of resources required for dengue prevention. This finding was aligned with another finding in the present study; nearly half (47%) of study respondents perceived a low level of community network partnership (i.e., networking between migrant communities and nearby health counterparts) in their residential area, resulting in limited availability of larvicide.

Overall, only 27% of study respondents were identified as having a high level of knowledge. Conversely, a scoping review identifying barriers to knowledge, attitudes, and practices (KAP) on dengue prevention revealed that the percentage of respondents with good awareness ranged from 60% to 90% of the total respondents. However, a substantial proportion (44%) of the study participants were unaware that dengue is caused by a virus, which contrasts with a study done in Bangladesh, where 84.5% of respondents perceived that dengue is caused by a virus (20). Furthermore, a notable percentage (20%) of respondents mistakenly believed that dengue can be transmitted through the bite of any mosquito. Moreover, only 47% of respondents correctly responded that dengue mosquitoes breed in clean and stagnant water. A comparable finding was obtained in a study among Myanmar migrant woman caretakers, where nearly 80% reported that dengue mosquitoes lay their eggs in wastewater (29). Significant proportions of misperceptions about dengue knowledge were observed in this study. This finding was supported by another finding in this study that

nearly half (51%) of respondents opined that communication of dengue information in their residential area was inadequate, ranging from "very low" to "low."

According to a framework for prevention (Centers for Disease Control and Prevention), a person's closest social circle influences his/her likelihood to engage in particular behaviors (30). In the present study, a high level of social support was significantly associated with good preventive practices. A similar association was found in another study where respondents with good levels of social support were 69.1 times more likely to engage in household environmental practices for dengue prevention compared to those with low levels of social support (28). Nonetheless, the leader group–community networking was somewhat inadequate among migrant communities, with nearly half of the respondents perceiving this network as poor. No significant association was observed between community capacity and dengue preventive practices.

CONCLUSION

In this study, slightly more than half of respondents (52.5%) reported having high levels of dengue preventive practices. Chi-square analysis revealed that having moderate to high levels of knowledge and a high level of social support was strongly associated with good dengue preventive practices.

RECOMMENDATIONS

Targeted educational campaigns should be tailored for migrant communities to address misperceptions about dengue. These campaigns should include disseminating health information in native languages through posters, pamphlets, and the engagement of migrant health volunteers. Furthermore, it is recommended that social support networks be strengthened by actively encouraging family members, friends, and neighbors to engage in dengue prevention efforts through targeted social campaigns. Lastly, this study suggests enhancing the networking between migrant communities in Samut Sakhon Province and nearby health authorities to increase accessibility to essential resources required for dengue prevention.



Study Limitations

A previous dengue experience in this study was self-reported by study respondents, so it might not reflect the actual incidence. Since participation in this study is voluntary, the participants who respond have strong opinions, and there is no way to be assured that the responses indicate the opinions of the targeted population.

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CORRELATES OF DIETARY PATTERNS AMONG MYANMAR MIGRANTS IN SAMUT SAKHON PROVINCE, THAILAND: CROSS SECTIONAL STUDY

Nandar Linn Aung¹, Orapin Laosee^{1,*}, Thunwadee Suksaroj¹, Cheerawit Rattanapan¹

¹ ASEAN Institute for Health Development, Mahidol University, Salaya, Nakhon Pathom 73170, Thailand

*Corresponding Author: Orapin Laosee, ASEAN Institute for Health Development, Mahidol University, Salaya, Nakhon Pathom 73170, Thailand, E-mail: Orapin.lao@mahidol.edu

ABSTRACT

Introduction: Migrants are considered a vulnerable population group for nutrition due to changes in dietary patterns. Myanmar migrants are predominantly engaged in low-paying jobs. Remittances are a vital source of income for their families left behind, and 51% of remittances to their families are left behind. This leads to dietary compromises and budget constraints and affects dietary patterns. Moreover, migrants face a variety of mental health problems, which can result in changes in appetite and weight when they arrive in the host nation. The obesity rate among Myanmar migrants in Thailand is 24.3%.

Objectives: This study aims to identify dietary patterns and their associated factors among Myanmar migrants in Samut Sakhon Province, Thailand.

Methodology: A cross-sectional study was conducted in Myanmar migrant communities, involving face-to-face interviews with 180 participants. The questionnaires were validated by experts, translated into the local language, and tested for reliability using Cronbach's alpha. The Chi-square test assessed the association between independent variables and dietary patterns. Preliminary data was reported.

Results: The results revealed that 46% of the participants needed better dietary patterns. Most participants reported that recommended carbohydrate, protein, and fiber servings were 57.2%, 88.9%, and 75%, respectively. Over half (57%) participants reported consuming 1-2 sugary drinks daily. The chi-square test indicated statistically significant associations between dietary patterns.

Conclusion: Our findings show that participants with income and cultural and social support are likelier to have poor dietary patterns. Therefore, creating peer support groups helps newcomers adapt to the host country's culture for better dietary patterns among the Myanmar migrant population.

Keywords: Dietary Patterns, Myanmar Migrants, Thailand

INTRODUCTION

Thailand is the second largest economy in Southeast Asia in terms of social and development indicators (1, 2). Thus, the number of non-Thai nationals living in the country increased from an estimated 3.7 million in 2014 to 4.9 million in 2018. There are about 3.9 million migrant workers from neighboring countries. Among them, a significant number of people from Myanmar have migrated to Thailand for a variety of reasons (3). According to the latest estimate, around 1.9 million, or 75 percent, are citizens of Myanmar (4).

The majority of migrants in the Mahachai subdistrict, Samut Sakhon Province, come from Myanmar, accounting for over 60% of the region's total migrant population (5). Interestingly, about 51% of migrants sent money back to their families left behind, as

remittances were always a vital source of household income in Myanmar. They are balancing the need to send money home by meeting basic needs, including food expenses, which results in dietary compromises or budget constraints. Moreover, migrants face a variety of mental health challenges at various stages of the migration journey. As a result of their declining mental state, they have changes in appetite and weight when they arrive in the host nation (4). According to global statistics, immigrants and refugees' comorbidity data show that 24% of them are obese, and 37% of them are overweight (7). Furthermore, the obesity rate among Myanmar migrants is 24.3%, and this may lead to non-communicable diseases (8).

Immigrants are more likely to suffer from inadequate nutrition due to socio-cultural



and economic factors like limited financial resources, language barriers, and cultural food preferences. It is not surprising that the individuals' social networks had an impact on their eating habits and increased nutrition knowledge, which in turn led to adopting healthier eating habits (9). Due to the restricted availability and accessibility, immigrants have resorted to measures like combining host country and traditional cuisines (9,10). Regarding affordability, as a consequence of higher prices, healthy foods are compared to their home country, and so, migrants alter their eating habits by choosing less expensive foods and eating fewer fruits (9),(11). Therefore, the dietary patterns of Myanmar migrants differ from the origin of the country due to their socio-economic conditions, availability, social supports, and cultural differences, which are of interest to this study.

This study's purpose was to identify dietary patterns and associated factors among Myanmar migrants in Samut Sakhon Province. Investigating the association between dietary patterns and related factors such as individual characteristics and social, cultural, and environmental factors may provide a rationale for public health interventions.

METHODOLOGY

Study design, population, and sample size

A cross-sectional study was conducted to identify the dietary patterns among Myanmar migrants in Samut Sakhon Province. The Mueang Samut Sakhon district was chosen due to the high-density population of Myanmar migrants, estimated at approximately 208,627 individuals (12). There are 32 communities under Mueang Samut Sakhon. From these, two communities around the Thai Union and Talaat Kung were selected using a simple random sampling method. The participants from two migrant clusters were chosen according to their voluntary response with Myanmar migrants aged (18- 60) years residing in Thailand regardless of their registration status. Regarding the exclusion criteria, the participants who had difficulties speaking Burmese and were unavailable during the data collection period were excluded.

The sample size was calculated using the (Cochran, 1977) infinite population formula based on the proportion of participants with a good dietary pattern (13). A total of 423

samples were included in this study. Data collection was conducted during June-July 2024, and 43 % was completed; thus, preliminary data were reported in this analysis.

Measurement Tools

Face-to-face interviews with structured questionnaires were used to collect data. The questionnaire consists of five sections: socio-demographic factors, individual factors, cultural norms and social supports, environmental factors, and questions related to dietary patterns. In this study, nutrition knowledge questions were assessed with yes or no and do not know questions (13), language skill was measured related with 4 points rating scale (can't too good), and eating habits were measured by using five-point Likert skill (9), (Never to always). Cultural norms and social supports were measured with a five-point Likert scale (14) regarding the environmental factors related questionnaires with yes or no, Likert skills, and multiple choice and fill-the-blank forms.

In this study, dietary patterns are defined as the quantities, frequency, and variety of food groups that are habitually consumed. The study participants are classified as having good and poor dietary patterns. Eating a more varied diet that is good for their health, such as a variety of fruits, vegetables, carbohydrates, and protein-source foods in moderation, suggests a good dietary pattern. Otherwise, they eat a limited variety of food groups and consume large quantities of food, which is assumed to be a poor pattern. Respondents' dietary patterns were assessed using the 24-hour recall method. The Chi-square test assessed the association between independent and dependent variables. The pretest was conducted among Myanmar migrants with 30 participants in Bang Pla, Nakhon Pathom Province, Thailand. Experts checked the validity and internal consistency of questionnaires. The reliability score for nutrition knowledge questions was 0.7, and social support and cultural norms were 0.75 and 0.7, respectively.

Data Analysis

The data was cleaned and coded in Microsoft Excel and then imported into SPSS version 25 for data analysis. The detailed food items from the 24-hour recall were categorized



into carbohydrates, proteins, and fibers. The sugary drinks were compared with the recommended daily servings to define each respondent's diet as good or poor. The study used a chi-square test to identify the association between the independent variable and dietary patterns. If the p-value was less than 0.05, associations were considered statistically significant.

Ethical Consideration

Data was collected after approval by the Ethical Committee of the Mahidol University IRB, with approval number (COA No. 2024-207.1405). All information was coded and analyzed to protect respondent privacy. Data was securely stored on a password-protected laptop and database.

RESULTS

In this study, the total number of participants was 180. The primary outcome was determining the good and poor dietary patterns among Myanmar migrants in Samut Sakhon Province, Thailand. Table 1 describes the socio-demographic characteristics of the participants. The sex distribution was 33.9% male and 66.1% female. Most participants fall into the age group of 18 and 33 years (52%). The most common ethnicity was Burmese, accounting for 54.4%. Educational status: 32.8% of the participants had completed middle school. Regarding the duration of stay, most respondents stayed in Thailand for 4-10 years, representing 40.0% with a mean of 8.7 years (SD = 6.9). Most respondents (87.2%) were employed, with the most significant proportion working in manufacturing (31.7%). Half of the participants worked six days a week (50.6%), and a significant portion (65.1%) were in the high-income category.

Table 1 Number and Percentage of the respondents by Socio-demographic characteristics (n=180)

Variables	Number	Percent (%)
Sex		
Male	61	33.9
Female	119	66.1
Age group (in years)		
18-33	94	52.2
34-54	86	47.8
(Median=33, Q. D=12, Min= 18, Max=54)		
Ethnicity		
Burma	98	54.4
Mon	39	21.7
Dawei	23	12.8
Karen	10	5.6
Shan	3	1.7
Rakhine	2	1.1
Education		
No formal education	6	3.3
Primary school	42	23.3
Middle school	59	32.8
High school	49	27.2



Variables	Number	Percent (%)
University/College	24	13.3
Duration of Stay (in years)		
1-3	57	31.7
4-10	72	40.0
11-14	20	11.1
21-30	31	17.2
(Mean=8.7, SD=6.9, Min=1, Mix=30)		
Employment Status		
Employed	157	87.2
Unemployed	23	12.8
Type of work		
Manufacturing	57	31.7
Food production	26	14.4
Fishing	13	7.2
Selling goods or foods	10	5.6
Construction	4	2.2
Services	3	1.7
Domestic work	2	1.1
Transportation	1	0.6
Others	41	22.8
Working days		
3	1	0.6
4	1	0.6
5	15	8.3
6	91	50.6
7	49	27.2
Monthly Income (in Baht)		
Low income (<10000)	52	27.5
High income (>=10000)	123	65.1
(Median=10000, Q. D= 4000, Min=0, Max=35000)		

Table 2 shows that most respondents had good nutrition knowledge; the proportion is 70.6%. However, 59.4% of respondents had poor eating habits, defined as a score of less

than 19. Thai language skills were categorized into three levels, with the mean score being 7.2 (SD = 2.5). Most of the respondents had fair Thai language skills, and it was about 74.4%.

**Table 2** Number and Percentage of the Respondents by Individual Factors (n=180)

Variables	Number	Percent (%)
Nutrition knowledge		
Poor	53	29.4
Good	127	70.6
(< 80% = poor, ≥ 80% =good)		
Eating habits		
Poor (<19)	107	59.4
Good (≥ 19)	73	40.6
(Median=22, Q. D=4, Min=10, Mix=28)		
Thai language skills		
Poor (≤ 5)	28	15.6
Fair (6-9)	134	74.4
Good (≥ 10)	18	10.0
(Mean=7.2, SD=2.5, Min=4, Max=16)		

Table 3 shows that seasonal variation in preferred food was equally distributed, at about 50% each. Nearly 89% of respondents purchased food at local markets, with the majority (59%) accessing these markets by

walking. Estimate travel time < 30 minutes was reported by 93% of respondents. Moreover, A majority (53.9%) reported low food expenses (<30% of their income), while nearly 53% could afford to buy food.

Table 3 Number and Percentage of the Respondents by Environmental Factors

Variables	Number	Percent (%)
Availability of preferred foods		
Yes	90	50.0
No	90	50.0
Types of foods challenging to obtain		
Fruits	22	12.2
Vegetables	28	15.6
Meat	18	10.0
Dairy products	4	2.2
Grains	3	1.7
Nuts and Legumes	6	3.3
Others	35	19.4
Accessibility		
Local Market	160	88.9
Grocery Store	31	17.2
Convenience store	33	18.3
Street Vendor	6	3.3
Sent by family member from home country	4	2.2
Order online	6	3.3



Variables	Number	Percent (%)
Types of transportation use		
On foot	106	58.9
Vehicles	74	41.1
Distance to nearest Market		
< 30 min	168	93.3
30 to 60 min	12	6.7
Monthly food expense (%)	97	53.9
Low Expense (< 30%)	81	45.0
High Expense (\geq 30)		
Affordability		
Expensive, do not usually buy	2	1.1
Regardless of high prices, I usually buy	75	39.7
Affordable	100	52.9
Cheap	3	1.6

Table 4 describes the cultural norms and social support among respondents. The majority reported low adherence to cultural norms related to dietary patterns (mean = 17.79, SD = 2.2). Social support levels with healthy

eating were almost equally distributed, with 49.4% reporting low support and 50.6% reporting high support (mean = 17.57, SD = 4.6).

Table 4 Number and Percentage of the Respondents by Social and Cultural Factors (n=180)

Variables	Number	Percent (%)
Cultural norms	103	57.2
Low (\leq 18)	77	42.8
High (19-24)		
(Mean=17.79, SD= 2.2, Min=11, Max=24)		
Social Support		
Low (\leq 18)	89	49.4
High (\geq 19)	91	50.6
(Mean=17.57, SD= 4.6, Min=6, Max=28)		

Table 5 demonstrates that more than half of the respondents (54.4%) exhibited a good dietary pattern, meeting all recommended servings in all categories. In comparison, 45.6% had a poor dietary pattern, missing one or more categories. This indicates a relatively balanced distribution between good and poor dietary habits among the participants. Most respondents (57.2%) consumed the

recommended amount of carbohydrates. Regarding protein, most respondents (88.9%) consumed the recommended amount of protein. Regarding fiber, three-quarters of the respondents (73.5%) met the recommended fiber intake. Additionally, most respondents (56.7%) consumed sugary drinks at a moderate level of about 1-2 drinks per day.

**Table 5:** Number and Percentage of the respondent by Dietary Patterns (n=180)

Items	Number	Percent (%)
Dietary Pattern		
Good	98	54.4
Poor	82	45.6
Carbohydrates		
Low Carbohydrate (1-8)	67	37.2
Recommended Carbohydrate (9-15)	103	57.2
High Carbohydrate (16-40)	10	5.6
Protein		
Low Protein (0)	5	2.8
Recommended Protein (1-4)	160	88.9
High Protein (5-8)	15	8.3
Fiber		
Low (0)	37	20.6
Recommended Fiber (1-4)	139	77.2
High (5-24)	4	2.2
Sugary drinks		
Low (0)	73	40.6
Moderate (1-2)	102	56.7
High (3-4)	5	2.8

Table 6 illustrates the factors associated with dietary patterns among (n=180) using Pearson's Chi-squared test. There were statistically significant associations between

dietary patterns and income (p-value 0.17), cultural norms (p-value = 0.004), and social support (p-value = 0.017), respectively.

Table 6 Factors associated with dietary patterns (Chi-squared test analysis)

Variables	Number	Dietary Patterns		P-value (Pearson Chi-squared)
		Poor N(%)	Good N (%)	
Sex				
Male	61	31 (50.8)	30 (49.2)	0.484
Female	119	67 (56.3)	52 (43.7)	
Age (in years)				
18-33	94	49 (52.1)	45 (47.9)	0.815
34-54	86	49 (57.0)	37 (43.0)	
Ethnicity				
Burma	98	50 (51.0)	48 (49.0)	0.313
Others	82	48 (58.5)	34 (41.5)	
Education				
Low education	107	60 (56.1)	47 (43.9)	0.595
High Education	73	38 (52.1)	35 (47.9)	



Variables	Number	Dietary Patterns		P-value (Pearson Chi-squared)
		Poor N(%)	Good N (%)	
Duration of Stay				
Short stay	88	49 (56.1)	39 (43.9)	0.744
Long stay	92	49 (52.1)	43 (47.9)	
Employment Status				
Employed	157	86 (56.1)	71 (43.9)	0.815
Unemployed	23	12 (52.2)	11 (47.8)	
Working days				
Normal working days (3-5)	17	10 (58.8)	7 (41.2)	0.723
High working days (6-7)	140	76 (50.5)	64 (49.5)	
Income (in Baths)				
Low income (<10000)	52	36 (69.2)	16 (30.8)	0.017
High income (≥ 10000)	123	61 (49.6)	63 (50.4)	
Nutrition knowledge				
Good	127	66 (52.0)	61 (48.0)	0.302
Poor	53	32 (60.4)	21 (39.6)	
Thai language skills				
Good	73	41 (56.2)	32 (43.8)	0.702
Poor	107	57 (53.3)	50 (46.7)	
Availability				
Yes	90	54 (60.0)	36 (40.0)	0.134
No	90	44 (48.9)	46 (51.1)	
Types of transportation use				
On foot	106	67 (63.2)	39 (36.8)	0.05
Vehicle	74	31 (41.9)	43 (58.1)	
Distance to the nearest market				
< 30 min	168	95 (56.5)	73 (43.5)	0.034
30 to 60 min	12	3 (25.0)	9 (75.0)	
Affordability				
Low Expense (<30%)	52	23 (44.2)	29 (55.8)	0.062
High Expense (≥ 30 %)	126	75 (59.5)	51 (40.5)	
Social Support				
Low support (≤18)	89	58 (65.2)	31 (34.8)	0.004
High Support (≥19)	91	40 (44.0)	51 (56.0)	
Cultural				
Low (≤18)	103	64 (62.1)	39 (37.9)	0.017
High (19-24)	77	34 (44.2)	43 (55.8)	



DISCUSSION

Although most of the participants fall within the recommended servings for carbohydrates (57%), protein (88.9%), and fiber (73%), their overall dietary diversity was found to be inadequate when compared to daily requirements. Another interesting finding from this study is that over half of the participants consumed sugary drinks 1-2 drinks per day. This may be due to the influence of the host country's environment, as 34.2% of Thai nationals consume carbonated drinks regularly (15). Myanmar migrants consume rice as a staple food for daily energy intake, but rice lacks micronutrients. Poor diet quality lacks diversity due to the particularly nutrient-dense, which needs to be more sufficient to provide micronutrients (16,17). Additionally, this study found that low fiber consumption was about 21%. This dietary pattern could increase the risk of noncommunicable diseases and contribute to micronutrient deficiency.

This study also indicated that income is associated with dietary patterns and lower income is linked to a higher likelihood of poor dietary patterns (69.2%). Our findings were consistent with several studies in migrant populations that found low income was a significant barrier to adopting good eating habits in the host country (18-20).

It was discovered that the low level of cultural norms was significantly associated with poor dietary patterns, with 62% of participants reporting low cultural norms. The participants perceived that cultural factors such as food preparation methods, frequency of eating traditional foods, and taste preferences were unimportant. These changes may be influenced by the availability of local foods and the acculturation process. These findings are consistent with other studies, which suggest that external factors like economic constraints and the acculturation process can lead to decreased adherence to culturally related dietary patterns (21,22). A decrease in typical eating habits could result in poor dietary outcomes. This study highlights the need for interventions that support the maintenance of culturally preferred food while adapting to the local food environment.

In this study, participants with low social support were found to have poor dietary patterns, with nearly 65% of participants reporting low levels of social support. Social

support for healthy eating includes sharing information and advice to avoid high-calorie food intake, providing low-fat foods, and encouraging conversations about healthy eating. Social support networks can be a source of information, understanding of nutritious foods, and helpful advice when choosing a better diet. Therefore, individuals who receive less support from their environments make it more challenging to maintain good dietary patterns. Similarly, other studies have found that family support was a powerful facilitator of good eating habits (8, 18, 24). However, this study finding is inconsistent with another study conducted among Chinese migrants, where neighborhoods with larger immigrant populations were linked to good eating patterns and reduced unhealthy food consumption in the host nation (22).

CONCLUSIONS

According to this study, the poor pattern among migrant populations was about 46% due to income, cultural, and social support but not related to other factors. Financial barriers play an important role in making good dietary choices. Furthermore, cultural norms related to dietary patterns can promote or inhibit good eating habits. At the same time, social support can provide knowledge and advice that encourage good eating patterns among the Myanmar migrant population in Samut Sakhon Province, Thailand.

LIMITATIONS

There are some limitations in this study. Because of the cross-sectional design used in the study, the smaller sample size may not be fully representative of all Myanmar migrants. The dietary assessment may not have fully captured all aspects of dietary quality because it focused primarily on the frequency and types of food consumed but not on diet quality and specific nutrient intake. This can result in an incomplete picture of the participants' overall dietary patterns.

RECOMMENDATIONS

It is recommended that policymakers consider it beneficial to identify local or similar foods available within the community. Access to reasonably priced and culturally suitable food options can help migrants maintain good dietary patterns. At the community level, peer



support groups should be formed so that new migrants can adjust to their new surroundings. These groups should strengthen social bonds and encourage good eating habits. Moreover, migrants should integrate their nation's and host country's diet culture, offering culturally relevant dietary education and promoting local food options to encourage healthier eating patterns.

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WHAT DRIVES WOMEN'S CHOICE FOR INDUCED ABORTION IN NEPAL?

Sharmila Bhandari¹, Jongjit Rittirong, PhD^{1*}

¹*Institute for Population and Social Research, Mahidol University, Salaya, Phuttamonthon, Nakhon Pathom 73170, Thailand*

***Corresponding Author:** *Jongjit Rittirong, Institute for Population and Social Research, Mahidol University, Salaya, Phuttamonthon, Nakhon Pathom 73170, Thailand, E-mail: jongjit.rit@mahidol.edu*

ABSTRACT

Introduction: The increasing rate of induced abortion (IA) in Nepal has emerged as a pressing concern, demanding urgent attention and intervention. Studies have explored safe and unsafe abortions, however, this study attempts to provide an updated status of induced abortion and determinants. Exploring the proximate determinants of IA will open up discussion around evaluating existing abortion policies and programs and designing evidence-based strategies to strengthen women's health and services throughout the country.

Objectives: To explore induced abortion and its proximate determinants in Nepal for the year 2022.

Methodology: Study analyzed secondary data from the 2022 Nepal Demographic and Health Survey, which is a nationally representative sample survey with a weighted sample of 11,180 women in their reproductive ages (15-49 years). Descriptive analysis was performed followed by Chi-square test and multivariable binary logistic regression analysis to examine the significance among the dependent and independent variables. Results are presented as unadjusted and adjusted odds ratio at a 95% confidence interval.

Results: The result shows that a significant (24%) percentage of the participants had induced abortion as per the survey. Women's age, education, occupation, contraception use, pregnancy intention, women's autonomy, children ever born (CEB), ecological regions, provinces, and wealth quintile were associated with induced abortion ($P < 0.05$). Furthermore, women above 35 years of age (AOR: 4.38; 95% CI: 3.13-6.01), the richest women (AOR: 1.82; 95% CI: 1.26-2.64), women with no pregnancy intention (AOR: 5.97; 95% CI: 4.66-7.62), and women from Karnali province (AOR: 1.75; 95% CI: 1.26-2.44), living near private healthcare facilities (AOR: 1.29; 95% CI: 1.07-1.55) had higher odds of having induced abortions compared to their counterparts. In contrast, women with two or more children (AOR: 0.66; 95% CI: 0.54-0.80) and women living in Terai (AOR: 0.53; 95% CI: 0.37-0.76) were less likely to experience induced abortion compared to those with one or no child and women living in hilly and mountain regions respectively. These results highlight the intricate interactions between geographic, socioeconomic, and demographic factors that influence induced abortion in Nepal.

Conclusion: The study presents an increasing prevalence of induced abortions in Nepal, influenced by factors such as age, occupation, contraception use, pregnancy intention, women's autonomy, children ever born (CEB), type of nearest healthcare, wealth, and provincial differences. Future policies should prioritize promoting modern contraceptive methods and enhancing women's autonomy, particularly among those in the lower wealth quintiles. Additionally, targeted educational and healthcare interventions should be designed to address regional disparities and improve access to reproductive health services, ensuring that all women have the support and resources they need to make informed decisions about their reproductive health.

Keywords: Induced abortion, determinants, reproductive health, human rights

INTRODUCTION

Nepal has made progress in the field of abortion by taking it from the era of criminalization to legalization and implementation. According to the Safe

Motherhood and Reproductive Health Rights (SMRHR) Act 2018, abortion is legal for the first 12 weeks of gestation on request and is conditional after that. Not only are the services made available in all the districts of the country,



but abortion services are also available for free in government-approved facilities (1).

The socio-ecological model (SEM) provides the foundation for this research including the methodology, data analysis, and data interpretation. The socio-ecological model considers the complex interplay between individual, community, and societal factors to understand the range of factors that affect the uptake of induced abortion among women in the country (2). Nepal is a small country in Southeast Asia with a patriarchal mindset, where male is given a higher role in society. Women's decisions are not respected. Service providers and abortive women are stigmatized and considered sinners, ill-luck, and murderers; they are prohibited from participating in religious activities (3). Abortion is considered taboo in Muslim, Dalit, and Madhesi cultures. They believe that children are God's gifts and should be accepted at any cost. Therefore, aborting a child means disrespecting the God (4).

Previous studies have identified that the challenges in accessing safe abortion services in Nepal were the gaps in equity, quality, access, and availability of the service including trained healthcare providers and healthcare centers, socioeconomic factors, stigma, and awareness (5). Even though abortion services are made free, women still have to pay for medical bills and transportation, which creates an economic burden for poor people affecting their access to abortion services (6). Abortion services are still confined to district hospitals in some districts, which are a three to four-day walk from some settlements (3). The number of service providers and available healthcare facilities is insufficient to meet the rising demand for abortion (6).

Since abortion legalized in 2002, it has significantly transformed women's health and rights with implications for reproductive health outcomes (7). However, there is no exact data available on the uptake of induced abortion in the country. While previous studies have explored the prevalence and determinants of safe and unsafe abortion in Nepal, none of the studies have explored the prevalence and determinants of induced abortion as a whole and its determinants using the latest nationally representative data. The prevalence of induced abortion can be used to justify contraception

use, its unmet need, service access, and many other relevant factors. This study analyzed NDHS data for induced abortion to identify the proximate determinants of induced abortion in Nepal. The findings from this study would open up discussion around evaluating existing abortion policies and programs and designing evidence-based strategies to strengthen abortion services and achieve the maternal health-related target of 3.2 of Sustainable Development Goals 3.

METHODOLOGY

Data Source and Study Design

This quantitative study used secondary data from the Nepal Demographic Health Survey (NDHS) 2022, the sixth DHS survey conducted in Nepal. The primary purpose of the NDHS is to collect information on the socio-demographic and health status of the country. This study will use the latest round of NDHS to explore induced abortion and its determinants. The 2022 NDHS uses stratified sample selection in two stages by dividing each province into urban and rural areas, resulting in 14 sampling strata. In the first sampling stage, 476 primary sampling units (PSUs) were selected with probability proportional to the PSU size and independent selection in each sampling stratum within the sample allocation. Among the 476 PSUs, 248 were from urban areas, and 228 were from rural areas. Thirty households were selected from each cluster for a total sample size of 14,280 households. Of these, 7,440 households were in urban areas, and 6,840 households were in rural areas. Weighting factors have been calculated, added to the data file, and applied to the sample results, which are representative at the national and provincial levels.

Study Sample

Among the households selected for the interview in the whole survey, 14,845 women in the age group 15–49 were obtained as a weighted sample. Among them, women with a history of induced abortion were the target population of the study. Pregnancy outcomes were analyzed to categorize women with and without abortion. Missing values were removed from the dataset to come up with the total number of women to be analyzed (Figure 1).

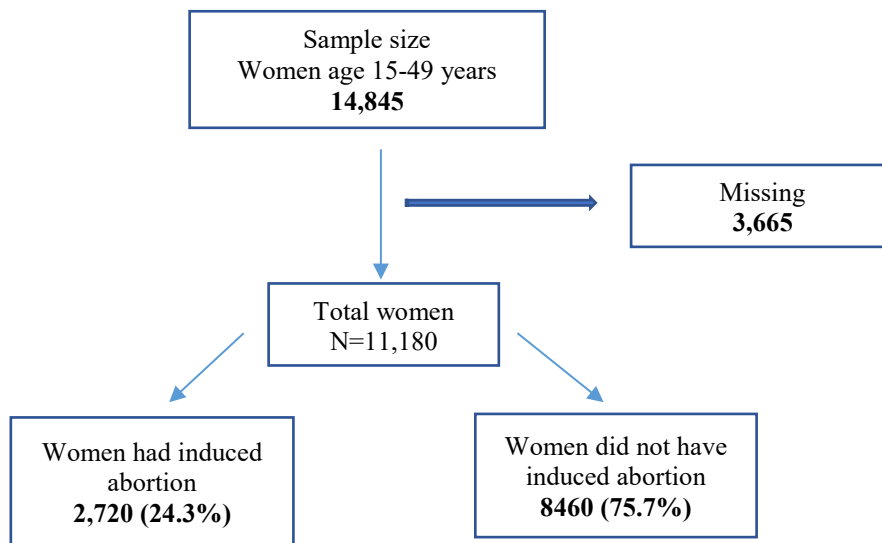


Figure 1 Study population

Operational Definition

In this study, induced abortion, the dependent variable, is defined by the respondent's pregnancy outcome, with outcomes categorized as either not having an induced abortion (born alive, born dead, miscarriage) or having an induced abortion (abortion). Independent variables are divided into individual, community, and societal factors. Individual factors include age (15-24, 25-34, >35 years), education (none, primary, secondary, higher), occupation (not working, skilled, unskilled/agricultural), marital status (ever, never married), religion (Hindu, non-Hindu), current contraception use (none, modern, traditional), pregnancy intention (wanted then, later, no more), children ever born (none/one, two/more), and women's autonomy (autonomous, not autonomous). Women's autonomy measures a woman's decision-making capacity in the household, influencing her ability to seek necessary health services. Women's autonomy is assessed through seven questions on decision-making regarding her earnings, her husband's/partner's earnings, her healthcare, major household purchases, family visits, contraception use, and pressure to become pregnant. Responses are scored from 0 to 6, with 0 indicating that all responses are "not autonomous" and 6 indicating "most autonomous." Scores between 0 and 6 depend on the number of "autonomous" responses. A median score of 4 is used to

determine autonomy: women scoring 4 or higher are categorized as "autonomous," while those scoring below 4 are categorized as "not autonomous." Community factors include place of residence (urban, rural), travel time to healthcare (<30 minutes, 30-60 minutes, >1 hour), type of nearest healthcare facility (public, private, NGO/other), ecological region (Mountain, Hill, Terai), and province (Koshi, Madhesh, Bagmati, Gandaki, Lumbini, Karnali, Sudurpashchim). The societal factor is the wealth quintile (poorest, poorer, middle, richer, richest).

Statistical Analysis

STATA, a statistical software, was used to analyze the proximate determinants of induced abortion in Nepal using data from the 2022 NDHS. The analysis includes univariate (descriptive), bivariate, and multivariate analysis to study induced abortion by individual, community, and societal-level factors. Univariate analysis provides the descriptive statistics of the variable, including the frequency and percentages of induced abortion for the respective independent variables. Bivariate analysis was performed to observe the Chi-Square value to examine the significance level of the independent variables with induced abortion. The significant variables ($P < .05$) and conceptually significant variables were selected for the adjusted logistic models. The regression outcomes for the adjusted



models are reported as odds ratio (OR) at 95% CI. Since the measurement scale of the dependent variable is dichotomous, binary (binomial) logistic regression was performed to analyze the data and assess the effect of the independent variables on induced abortion. A hierarchical model is used given the nature of the data that spans various levels of influence (individual, communal, and society, for example). This method enables a structured analysis that takes into account the data's nested structure and the effects of various elements at different levels. Three different regression models were performed.

Ethical Consideration

Ethical approval for this study was granted by the Mahidol University Institutional Review Board (IRB). Also, the first author got approval from the DHS program to access datasets used in the study.

RESULTS

Prevalence of Induced Abortion and Associated Factors

A total of 11,180 women in the age group 15-49 who reported induced abortion in

the past four years during the time of survey were included in the study, which included seven provinces and three ecological regions of Nepal. Among these, 2,720 (24.33%) women had induced abortions as of 2022. The prevalence of induced abortion was higher in urban areas (24.78% vs 23.39% rural), in hilly regions (26.62% vs 25.72% Mountain and 22.62% Terai), and among those living in Karnali province (34.85%) (Table 1). Of total induced abortions reported in the country, the highest percentage of women had received abortion services from NGO/other sectors (29.62% vs 25.64% private and 23.25% public sector). Of the total induced abortions in Nepal, as of 2022, it was reported highest among the richest (28.42%), autonomous (30.29%), ever married (24.35%), women aged more than 35 years (28.95%), with a higher level of education (27.39%), those working in skilled jobs (28.75%). Induced abortions were higher among women using traditional contraceptive methods (28.2%). Induced abortion was highest among unintended pregnancies (69.63% vs 23.65% intended) and women who had two or more children (27.23%) (Table 1).

Table 1 Descriptive and bivariate regression analysis results of induced abortion and its determinants

Background characteristics	Total women	Ever had induced abortion (IA)				P-value
		Yes		No		
		Number	%	Number	%	
<i>Induced abortion</i>	11,180	2,720	24.3	8,460	75.7	
Age						<0.001
<i>15-24years</i>	2,346	328	14.0	2,018	86.0	
<i>25-34 years</i>	4,224	1,057	25.0	3,167	75.0	
<i>More than 35</i>	4,609	1,335	28.9	3,275	71.1	
Women's education						<0.001
<i>No education</i>	3,475	848	24.4	2,627	75.6	
<i>Basic</i>	3,701	934	25.2	2,766	74.8	
<i>Secondary</i>	3,536	809	22.9	2,727	77.1	
<i>Higher</i>	468	128	27.4	340	72.6	
Women's occupation						<0.001
<i>Not Working</i>	2,677	621	23.2	2,056	76.8	
<i>Skilled</i>	2,090	601	28.8	1,489	71.3	
<i>Unskilled/Agriculture</i>	6,413	1,498	23.4	4,915	76.6	



Background characteristics	Total women	Ever had induced abortion (IA)				P-value
		Yes		No		
		Number	%	Number	%	
Women's current marital status						0.47
<i>Never married</i>	25	4	15.7	21	84.3	
<i>Ever Married</i>	11,155	2,716	24.4	8,439	75.7	
Religion						0.47
<i>Hindu</i>	11,155	2,716	24.4	8,439	75.7	
<i>Non-Hindu</i>	25	4	15.7	21	84.3	
Current contraception usage						<0.001
<i>Not using</i>	4,781	1,103	23.1	3,678	76.9	
<i>Modern methods</i>	4,769	1,157	24.3	3,612	75.7	
<i>Traditional</i>	1,629	460	28.2	1,170	71.8	
Pregnancy intention						<0.001
<i>Wanted then</i>	2,358	558	23.7	1,800	76.3	
<i>Wanted later</i>	500	164	32.8	336	67.2	
<i>Wanted no more</i>	395	275	69.6	120	30.4	
Women Autonomy						0.001
<i>Autonomous</i>	392	119	30.3	273	69.7	
<i>Non-autonomous</i>	10,788	2,601	24.1	8,187	75.9	
Children ever born (CEB)						<0.001
<i>None or one</i>	3,577	650	18.2	2,927	81.8	
<i>Two or more</i>	7,602	2,070	27.2	5,533	72.8	
Place of residence						0.191
<i>Urban</i>	7,553	1,871	24.8	5,681	75.2	
<i>Rural</i>	3,627	848	23.4	2,779	76.6	
Travel time to the nearest healthcare						0.074
<i>30 min</i>	9,893	2,424	24.5	7,469	75.5	
<i>30-60 min</i>	806	201	25.0	605	75.0	
<i>More than 1 hour</i>	480	94	19.6	386	80.4	
Type of nearest healthcare facility						0.285
<i>Public sector</i>	6,250	1,453	23.3	4,797	76.7	
<i>Private sector</i>	4,874	1,250	25.6	3,624	74.4	
<i>NGO/others</i>	56	17	29.6	39	70.4	
Ecological regions						<0.001
<i>Mountain</i>	629	162	25.7	467	74.3	
<i>Hill</i>	4,275	1,138	26.6	3,137	73.4	



Background characteristics	Total women	Ever had induced abortion (IA)				P-value
		Yes		No		
		Number	%	Number	%	
Terai	6,276	1,420	22.6	4,856	77.4	<0.001
Provinces						
<i>Koshi</i>	1,887	359	19.0	1,528	81.0	
<i>Madhesh</i>	2,419	497	20.5	1,922	79.5	
<i>Bagmati</i>	2,156	540	25.1	1,616	74.9	
<i>Gandaki</i>	1,046	327	31.2	720	68.8	
<i>Lumbini</i>	2,020	490	24.3	1,530	75.7	
<i>Karnali</i>	691	241	34.9	450	65.1	
<i>Sudurpashchim</i>	960	266	27.7	694	72.3	
Wealth quintile						<0.001
Poorest	2,031	497	24.5	1,534	75.5	
Poorer	2,217	450	20.3	1,767	79.7	
Middle	2,323	526	22.6	1,797	77.4	
Richer	2,381	614	25.8	1,767	74.2	
Richest	2,228	633	28.4	1,595	71.6	

Bivariate and Multivariate Regression Analysis

Variables like women's age, education, occupation, contraception usage, pregnancy intention, autonomy, CEB, ecological regions, provinces, and wealth quintile were significantly associated with induced abortion with the Chi-square P-value less than 0.05 ($P < 0.05$). Marital status, religion, place of residence, religion, place of residence, time travel to the nearest healthcare, and type of nearest healthcare facility were insignificant ($P > 0.05$) (Table 1).

Three regression models are designed using multivariate analysis for model comparisons. Model I provide adjusted regression results for all individual-level variables. Six out of nine variables were

significant with induced abortion, with an adjusted odds ratio (OR) ranging from 0.67 to 5.90 (Table 2). Model II includes variables from Model I along with the community-level factors. Women's marital status was omitted from the model due to the small sample size. Among 14 variables from Model II, eight variables were significantly associated with induced abortion, with an adjusted odds ratio (OR) ranging from 0.61 to 5.89 (Table 2). Model III includes variables from Model II and one societal-level variable, the wealth quintile. As compared to the poorest women, induced abortion is highest among the richest women (OR 1.82, 95% CI 1.26, 2.64). Among fifteen variables, seven variables from Model III are significantly associated with induced abortion, with OR ranging from 0.53 to 5.97 (Table 2).

**Table 2** Regression results of binary logistic regression for three model assumptions

Background characteristics	Adjusted OR (95% CI)		
	Model I	Model II	Model III
Induced abortion			
Age			
<i>15-24years</i>	Ref.	Ref.	Ref.
<i>25-34 years</i>	2.22***[1.83, 2.69]	2.32***[1.90, 2.83]	2.22***[1.82, 2.71]
<i>More than 35</i>	4.41***[3.23, 6.01]	4.65***[3.37, 6.42]	4.34***[3.13, 6.01]
Women's education			
<i>No education</i>	Ref.	Ref.	Ref.
<i>Primary</i>	1.27*[1.0, 1.60]	1.31*[1.02, 1.67]	1.22[0.95, 1.57]
<i>Secondary</i>	1.15[0.90, 1.46]	1.16 [0.90, 1.50]	1.00[0.76, 1.30]
<i>Higher</i>	0.90[0.58, 1.40]	0.87 [0.56, 1.38]	0.70[0.43, 1.11]
Women's occupation			
<i>Not Working</i>	Ref.	Ref.	Ref.
<i>Skilled</i>	1.43**[1.10, 1.86]	1.34[1.03, 1.76]	1.34[1.03, 1.76]
<i>Unskilled/Agriculture</i>	1.16[0.97, 1.40]	1.14 [0.94, 1.40]	1.26[1.03, 1.55]
Women's current marital status			
<i>Never married</i>	Ref.		
<i>Ever Married</i>	#	#	#
Religion			
<i>Hindu</i>	Ref.	Ref.	Ref.
<i>Non-Hindu</i>	0.96 [0.21, 4.29]	0.95 [0.22, 4.12]	0.94[0.22, 4.10]
Current contraception usage			
<i>Not using</i>	Ref.	Ref.	Ref.
<i>Modern methods</i>	0.82* [0.68, 0.98]	0.85 [0.71, 1.02]	0.85[0.71, 1.02]
<i>Traditional</i>	0.96 [0.76, 1.22]	1.01 [0.79, 1.28]	0.95[0.74, 1.21]
Pregnancy intension			
<i>Wanted then</i>	Ref.	Ref.	Ref.
<i>Wanted later</i>	1.81*** [1.46, 2.24]	1.81***[1.46, 2.24]	1.85***[1.49, 2.30]
<i>Wanted no more</i>	5.90*** [4.63, 7.50]	5.89***[4.61, 7.52]	5.97***[4.66, 7.62]
Women Autonomy			
<i>Autonomous</i>	Ref.	Ref.	Ref.
<i>Non-autonomous</i>	0.90 [0.55, 1.45]	0.97[0.59, 1.58]	0.95[0.58, 1.56]
Children Ever Born (CEB)			
<i>None or one</i>	Ref.	Ref.	Ref.
<i>Two or more</i>	0.67***[0.55, 0.81]	0.65***[0.54, 0.80]	0.66***[0.54, 0.80]



Background characteristics		Adjusted OR (95% CI)		
		Model I	Model II	Model III
Place of residence				
	<i>Urban</i>	-	Ref	Ref
	<i>Rural</i>	-	0.92[0.81, 1.14]	1.03[0.86, 1.22]
Travel time to the nearest healthcare				
	<i>30 min</i>	-	Ref	Ref
	<i>30-60 min</i>	-	0.94 [0.72, 1.23]	1.01[0.76, 1.55]
	<i>More than 1 hour</i>	-	0.61**[0.42, 0.90]	0.66[0.42, 2.93]
Type of nearest healthcare facility				
	<i>Public sector</i>	-	Ref	Ref
	<i>Private sector</i>	-	1.34***[1.11, 1.61]	1.29**[1.07, 1.55]
	<i>NGO/others</i>	-	1.13[0.43, 2.96]	1.11[0.42, 2.93]
Ecological regions				
	<i>Mountain</i>	-	Ref	Ref
	<i>Hill</i>	-	0.82[0.61, 1.09]	0.79[0.60, 1.06]
	<i>Terai</i>	-	0.65**[0.46, 0.91]	0.53***[0.37, 0.76]
Provinces				
	<i>Koshi</i>	-	Ref	Ref
	<i>Madhesh</i>	-	1.58**[1.14, 2.18]	1.63***[1.18, 2.26]
	<i>Bagmati</i>	-	1.05[0.73, 1.50]	0.92[0.64, 1.33]
	<i>Gandaki</i>	-	1.81***[1.26, 2.61]	1.65**[1.14, 2.39]
	<i>Lumbini</i>	-	1.56**[1.15, 2.12]	1.55**[1.14, 2.11]
	<i>Karnali</i>	-	1.74***[1.25, 2.40]	1.75***[1.26, 2.44]
	<i>Sudurpashchim</i>	-	1.63***[1.20, 2.22]	1.67***[1.23, 2.28]
Wealth quintile				
	<i>Poorest</i>	-	-	Ref
	<i>Poorer</i>	-	-	1.02[0.79, 1.32]
	<i>Middle</i>	-	-	1.34*[1.0, 1.79]
	<i>Richer</i>	-	-	1.69***[1.24, 2.31]
	<i>Richest</i>	-	-	1.82***[1.26, 2.64]

Significance codes: '***' 0.001 '**' 0.01 '*' 0.05



Among all three models, Model I, II, and III, Model III is the best-fitted model suggested by the lowest AIC value (3762.32). According to Model III, the odds of IA were significantly higher among women of age group 25-34 years (OR 2.21, 95% CI 1.82-2.71) or women more than 35 years (OR 4.34, 95% CI 3.13-6.01) compared with those in the age group of 15-24 years. The odds of IA were significantly higher among women with unintended pregnancy (OR 1.85, 95% CI 1.49-2.30 who wanted later and OR 5.97, 95% CI 4.66-7.62 who wanted no more) as compared to those who wanted pregnancy then. Model III suggests the odds of IA were 0.66 (95% CI 0.54-0.80) for women with two or more children. The odds of having IA were significant for those who lived near a private healthcare facility (OR 1.29, 95% CI 1.07-1.55). The odds of IA among women were positively significant for each province except for Bagmati province, ranging from 1.55 (95% CI 1.14-2.11) for Lumbini province to 1.75 (95% CI 1.26-2.44) for Karnali province, compared to those residing in Koshi province.

DISCUSSION

Analysis of secondary data of the nationally representative survey with the sample size of 11,180 women within the reproductive age group (15-49 years) nested within seven provinces from three ecological regions of Nepal demonstrated the uptake of induced abortion in the country, which was 24.33% for the year 2022. The likelihood of IA was higher among older women with higher education, skilled jobs, those with the richest wealth status, those following Hinduism, those residing in hilly urban areas, and those with access to NGO sector health facilities. The uptake of IA was highest in Karnali province, among ever-married women, autonomous women with two or more children, those using traditional contraception methods, and those with unintended pregnancies.

These findings are in line with previous literature. A study from Iran (8), Sierra Leone (9), and Ghana (10) suggest higher abortion rates among educated women willing to continue their career or education and poor access to IA among women working in low-skilled manpower or the agricultural field (3)(8) as compared to skilled workers. My study reported a higher prevalence of IA across the

country among the wealthier population, which is similar to the findings of previous studies that suggest limited abortion access among poor people. Even though abortion services are free in Nepal, medical bills and transportation create an economic burden that acts as a barrier to accessing the services (6).

This study concludes that there are higher rates of induced abortion in older women (more than 35 years), which contradicts the study conducted in Ghana where women over 35 years are less likely to have induced abortion (11). It is suggested by the worldwide review of the characteristics of women who seek an induced abortion. Some countries have a high prevalence of induced abortion among adolescents, for example, 16% in Kenya, 20.3% in Brazil, 18% in Thailand, and 29% in Nigeria (12). The social proscriptions against sex outside of marriage could limit unmarried women's access to abortion services. A study conducted at the largest women's hospital in Nepal found that most induced abortions were performed on married women (13), which supports my study finding.

CEB is often associated with induced abortion when the couple does not wish to increase the family size. Women with more than one child are more likely to get abortions than those who have only one or no child (8). Furthermore, another study in Nepal highlights that the main reasons for abortion practice among women were related to unwanted pregnancies and birth spacing after achieving a desired family size (3). There are numerous reasons why pregnancies become unwanted. Some of them are due to not having enough resources to expand the family, no desire for children, achieved an ideal family size, and health complications that put the mother or child at risk. In the Iranian context, where contraceptive failure is very high, abortion is also viewed as a method to control family size in the case of unintended pregnancy (8). My study explores a unique variable, women with greater autonomy in decision-making had greater access to induced abortion. This finding is similar to a study from Senegal that suggests higher use of contraception among autonomous women (14). Women in South Asia face gender discrimination that prioritizes family interests over their own, leading to poor sexual and reproductive health outcomes including abortion. Improving women's decision-making



autonomy is crucial for reducing their health vulnerabilities(15).

LIMITATIONS

The data source used by this study is the Nepal Demographic Health Survey (NDHS 2022), which has different objectives from mine. The analyses were confined to the data available in the sources undertaken. Unlike DHS from previous years, 2022 DHS has included very few questions related to abortion. With limited questions, I was unable to explain some important determinants of abortion, such as women's knowledge about legal conditions of abortion, the place where the women accessed the service, and the type of service provider to access the quality of service provided. Hence, the findings of the study might not be adequate to capture some important criteria of induced abortion, such as quality of the service, adequate counselling, methods used, and many more. Other factors determine abortion uptake, like husbands and family involvement, which was unavailable in the dataset. The findings of the study might not provide the complete determinants of induced abortion in the country.

CONCLUSIONS

Based on the findings of the study, the proximate determinants of induced abortion in Nepal as of 2022 are age, occupation, contraception usage and intention, pregnancy intention, women's autonomy, parity, nearest healthcare, travel time to nearest healthcare, wealth, and provinces. To conclude, educated women belonging to the wealthiest households are more likely to have induced abortions. Induced abortion was higher with higher parity with no association with the area of residence. Women with higher decision-making power (autonomy) are more likely to undergo abortion.

It is imperative to note that promoting the use of modern contraception among women and achieving women's autonomy in decision-making can reduce the need for induced abortion by promoting safe sex and family planning. Future policies should prioritize promoting modern contraceptive methods and enhancing women's autonomy, particularly among those in the lower wealth quintiles. Additionally, targeted educational and healthcare interventions should be designed to

address regional disparities and improve access to reproductive health services, ensuring that all women have the support and resources they need to make informed decisions about their reproductive health.

ABBREVIATIONS

AIC: Akaike Information Criterion
CI: Confidence Interval
DHS: Demographic Health Survey
IA: Induced Abortion
NDHS: Nepal Demographic Health Survey
NGO: Non-Governmental Organization
OR: Odds Ratio
PSUs: primary sampling units
SDG: Sustainable Development Goal
SMRHR: Safe Motherhood and Reproductive Health Rights

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UNDERSTANDING FACTORS ASSOCIATED WITH HELP-SEEKING BEHAVIOUR OF CURRENTLY MARRIED WOMEN AFFECTED BY INTIMATE PARTNER DOMESTIC VIOLENCE IN MYANMAR

Soe Myat Htet¹, Dyah Anantalia Widyastari^{1*}, Aree Jampaklay¹

¹Institute for Population and Social Research, Mahidol University, Salaya, Nakhon Pathom, 73170 Thailand

***Corresponding Author:** Dyah Anantalia Widyastari, Institute for Population and Social Research, Mahidol University, Salaya, Nakhon Pathom, 73170 Thailand, E-mail: dyah.ana@mahidol.edu

ABSTRACT

Introduction: Intimate partner domestic violence (IPDV) against women involves various abusive behaviours by spouses, posing a significant public health and human rights issue globally. In Myanmar, about one-third of ever-married women reported abuse by their husbands. However, only 22% sought help. This situation underscores the urgent need to address IPDV due to its profound impact on women, their children, families, and society at large.

Objectives: This study investigates factors associated with help-seeking behaviour (HSB) among married women who experienced IPDV from current husbands using data from a cross-sectional study of a nationally representative survey.

Methodology: This study utilized data from the Myanmar Demographic Health Survey (2015 -16), specifically extracted from the domestic violence module within the women's file. Among 3425 ever-married women aged 15-49, 811 women reported experiencing violence from their current husbands, which informed the study's results. Using binary logistic regression analysis, the dependent variable is help-seeking behaviour (HSB), while the independent variables include individual characteristics, socioeconomic factors, and needs.

Results: Among the sample, 18.37% sought help. The majority sought assistance from informal sources (99.07%). Findings revealed that women's geographic locations and socio-economic status shaped the decision to pursue HSB. Women facing severe physical abuse and injuries, and emotional violence were more likely to seek help.

Conclusion: The findings emphasize the urgent requirement to create widely accessible hotline services for IPDV victims in Myanmar. By investing in an accessible support network tailored to key factors, interventions can effectively reach those most in need. Additionally, a quality hotline service model should be considered to reduce severe physical consequences, ensure safety, and improve emotional well-being.

Keywords: Help-Seeking Behaviour (HSB), Intimate Partner Domestic Violence (IPDV), Women

INTRODUCTION

IPDV is a significant public health problem and serious human rights violation globally. The existing global estimates reported the lifetime prevalence of physical and sexual violence among ever-partnered women ages 15-49 to be 27%. However, the majority of IPDV women (55-95 %) have never opened up their feelings or reached out to someone else globally (1). In Myanmar, the prevalence of IPDV among married women aged 15-49 was reported at 32% (2). Previous studies indicated that factors such as socio-economic, demographic, and husband's abusive

behaviours were associated with women experiencing IPDV(3). The Myanmar Demographic Health Survey (2015-16) found that only 22 % had ever sought help from someone when women experienced sexual and physical violence. Factors such as lower ages, residence in Rakhine State, no education, poverty, residing in rural areas, and complex violence influence the pattern of less HSB (2).

While women do not report their IPDV experiences, it causes negative impacts such as severe physical injuries, further violence, and mental illness (4-6). Thus, understanding the factors underlying HSB is pivotal in preventing



such consequences. However, such a study has not yet been reported. According to Andersen's Model, various predisposing, enabling, and need factors influence HSB for IPDV among women (7). Evidence indicated that plus MDHS's finding factors, childhood witness to parental violence, nuclear family, husband's socio-economic status, severe injuries, fear, husband's control, and alcohol consumption significantly correlated with women's decision to seek help in low- and middle-income countries (6, 8, 9).

When looking at the Myanmar context, Myanmar people experienced serious basic needs and safety challenges due to disasters, crime, conflict, food insecurity, human trafficking, and migration under military rule (1962-2011). These sociopolitical issues increased poverty and collapsed institutional systems including education, health, and justice. Despite IPDV occurring nationwide, no specific law protecting against it is in line with international human rights standards (10). People believe that IPDV is a private matter. Men abuse their power and control over women. Women also accept that men are the breadwinners of the household and that they must provide for their husband's needs, including sex. For these reasons, women feel ashamed and afraid of community blame and stigmatisation when they disclose or seek help for their abuse. Thus, this issue remains silent (11, 12).

This study investigates the factors associated with HSB for IPDV among currently married women using data from the latest national representative cross-sectional survey in Myanmar.

METHODOLOGY

Study population and data collection

This study employed MDHS 2015-16, a nationally representative survey implemented by the Ministry of Health and Sports of the Republic of the Union of Myanmar. A stratified two-stage cluster sample design was applied in area or ward/village tracts from 15 states and regions for this survey. The variables were considered from the domestic violence module and participated 3,425 married women between 15 and 49 (2). A total of 811 currently married women who experienced any form of violence by husbands were included in the analysis. Out of 811, 56% faced one type of violence of

physical, sexual, or emotional, 35% endured two types, such as physical and sexual violence or physical and emotional violence, as well as 9% suffered from three types of physical, sexual, and emotional violence.

Variables

The outcome variable of this study was help-seeking behaviour (HSB). The explanatory variables were standardized with data availability and determined using a conceptual framework of Andersen's Model, which indicated three main factors: predisposing, enabling, and need factors contributing to HSB. The explanatory variables comprised of predisposing factors (respondent's age, region, childhood witness to parental violence, number of children, educational level, living arrangement, husband's education level, and occupational status), enabling factors (respondent's place of residence, income status, and wealth index), and need factors (physical violence, sexual violence, emotional violence, controlling behaviour, severity of violence, injuries, complex violence, fear of husband actions and husband's alcohol consumption).

Statistical Analysis

The data extraction, cleaning, and analysis were performed utilizing R version 4.3.0. Descriptive statistics showed the baseline characteristics of the study population. Subsequently, cross-tabulations were performed between 20 independent variables and one dependent variable, along with binary logistic regression, to identify association and assess the statistical significance of differences using Pearson's Chi-Square test. A multicollinearity test was carried out before multivariate analysis. Results were presented as p-values and odds ratios with 95% confidence intervals (CIs) to determine statistical significance. Associations are considered statistically significant if the p-values are < 0.05.

RESULTS

Sociodemographic characteristics of women who experienced IPDV

In Myanmar, two-thirds of women who experienced IPDV aged 30-49. The prevalence of IPDV was varied by region (Table 1), ranging from 3.58% in Yangon to 11.47% in



Rakhine. Among these women, 37.11% of IPDV women witnessed interparental violence during childhood. Most IPDV women had a moderate number of children (78.05%) and attended middle school (79.40%). Two-thirds of IPDV women lived in nuclear families and rural areas. Their husbands generally had higher socio-economic status. Surprisingly, 63.63% of women with an income job experienced IPDV, while 55.98% of those residing in poorer families reported abuse.

Most women (70.16%) reported physical violence, followed by emotional violence (67.08%), and (16.15%) experienced sexual violence. Besides, 94.08% of IPDV women reported abusive control by their husbands, and 96.18 % experienced complex forms of violence. Physical injuries were reported by 89.52% of these women, although only one-fifth of these reported severe injuries. Half of the sample (48.58%) disclosed fear of their husband's actions and (70.53%) reported their husband's alcohol use.

Table 1 Socio-demographic Information of Women Affected IPDV in Myanmar (N = 811)

Characteristics	Number	Percent(%)
<i>Age</i>		
15 – 19	25	3.08
20 – 24	87	10.73
25 – 29	141	17.39
30 – 39	314	38.72
40 - 49	244	30.09
<i>State/region</i>		
Kachin	67	8.26
Kayah	60	7.40
Kayin	64	7.89
Chin	42	5.18
Mon	48	5.92
Rakhine	93	11.47
Shan	31	3.82
Yangon	29	3.58
Mandalay	31	3.82
Nay Pyi Taw	64	7.89
Ayeyarwady	50	6.17
Sagaing	63	7.77
Tanintharyi	70	8.63
Bago	45	5.55
Magway	54	6.66
National	811	100.00
<i>Childhood Witness to Parental Violence</i>		
No	510	62.89
Yes	301	37.11
<i>Having Children</i>		
0	67	8.26
1-2	387	47.72
3-4	246	30.33
5+	111	13.69
<i>Women Education</i>		
No	131	16.15
Primary	416	51.29
Secondary	228	28.11
Higher	36	4.44
<i>Living Arrangement (Living with)</i>		
Nuclear family	597	73.61



Characteristics	Number	Percent(%)
Extended family	187	23.06
Foster family	14	1.73
Non-family members	13	1.60
<i>Husband's Education</i>		
No	125	15.41
Primary	357	44.02
Secondary	287	35.39
Higher	26	3.21
Do not Know	16	1.97
<i>Husband's Employment</i>		
Unemployed	129	15.91
Employed	682	84.09
<i>Women's Residence</i>		
Rural	632	77.93
Urban	179	22.07
<i>Women Income</i>		
Not Paid	14	1.73
Cash Only	516	63.63
Cash & In-kind	37	4.56
In-kind Only	38	4.69
Do not Know	206	25.40
<i>Wealth Index</i>		
Poorest	256	31.57
Poorer	198	24.41
Middle	139	17.14
Richer	122	15.04
Richest	96	11.84
<i>Physical Violence</i>		
No	242	29.84
Yes	569	70.16
<i>Sexual Violence</i>		
No	680	83.85
Yes	131	16.15
<i>Emotional Violence</i>		
No	267	32.92
Yes	544	67.08
<i>Controlling Behaviours</i>		
No	48	5.92
Yes	763	94.08
<i>Severity</i>		
No	634	78.18
Yes	177	21.82
<i>Physical Injuries</i>		
No	85	10.48
Yes	726	89.52
<i>Complex Violence</i>		
One	31	3.82
Two	436	53.76
Three	272	33.54
Four	72	8.88
<i>Fear</i>		
No	417	51.42
Yes	394	48.58



Characteristics	Number	Percent (%)
<i>Husband's Alcohol Consumption</i>		
No	239	29.47
Yes	572	70.53
<i>Seeking help</i>		
No	662	81.63
Yes	149	18.37

Help-seeking behaviour of women who experienced IPDV

The majority of the IPDV women did not prefer to seek help from someone (81.63%) but preferred (18.37%). (99.03 %) women sought help from informal persons such as their own family, neighbor, husband family, friend, former husband/partner, religious leader, and others, and (0.97%) went to formal services such as doctors and social service organizations.

Table 2 suggests that the various predisposing, enabling, and need factors may influence HSB for IPDV among women. The highest prevalence of HSB was observed in women aged 30-49, residing in Kayin, without

a history of witnessing interparental violence, having more children, moderate education, living in nuclear families, with husbands of higher socio-economic status, rural residence, earning an income, and living in the poorer families. Additionally, reporting physical and emotional violence, controlling behaviour, complex violence, fear of husbands, or their alcohol use appeared to increase HSB, unlike sexual violence, severity and injuries.

The bivariate analysis (Table 2) revealed that variables such as regions, husbands having jobs and alcohol consumption, physical violence, severity, injuries, and fear were significantly associated with HSB for IPDV among women.

Table 2 Cross Tabulation of Help-Seeking Behaviour by Predisposing, Enabling, & Need Factors

Variable	No (%)	Yes (%)	P-value
<i>Predisposing Factors</i>			
<i>Age</i>			0.79
15 – 19	3.17	2.68	
20 – 24	10.42	12.08	
25 – 29	17.82	15.44	
30 – 39	37.92	42.28	
40 - 49	30.66	27.52	
<i>Region/State</i>			<0.05
Kachin	8.61	6.71	
Kayah	7.4	7.38	
Kayin	6.49	14.09	
Chin	5.28	4.69	
Mon	6.19	4.69	
Rakhine	12.9	4.69	
Shan	4.07	2.68	
Yangon	2.71	7.38	
Mandalay	3.63	4.69	
Nay Pyi Taw	8.15	6.71	
Ayeyarwady	5.89	7.38	
Sagaing	7.7	8.05	
Tanintharyi	8.91	7.38	
Bago	5.59	5.37	
Magway	6.34	8.05	



Variable	No (%)	Yes (%)	P-value
<i>Childhood Witness</i>			
No	61.63	68.46	0.12
Yes	38.37	31.54	
<i>Number of Living Children</i>			
No	8.61	6.71	0.49
(1-2)	47.73	47.65	
(3-4)	30.21	30.87	
5+	13.44	14.77	
<i>Women Education</i>			
No	16.31	15.44	0.99
Primary	51.81	48.99	
Secondary	26.59	34.89	
More than secondary	5.29	0.67	
<i>Living Arrangement</i>			
Nuclear family	73.41	74.49	0.94
Extended family	23.41	21.48	
Other relatives	0.6	1.34	
Foster family	1.81	1.34	
Non-family members	0.76	1.34	
<i>Men Education</i>			
No	15.41	15.44	0.87
Primary	43.66	45.64	
Secondary	35.65	34.23	
More than secondary	3.47	2.01	
Do not Know	1.81	2.68	
<i>Men Occupation</i>			
Unemployed	14.5	22.15	<0.05
Employed	85.49	77.85	
<i>Enabling Resources</i>			
<i>Place of Residence</i>			
Rural	78.39	75.84	0.49
Urban	21.6	24.16	
<i>Women Income Status</i>			
Not paid	1.81	1.34	0.60
Cash only	62.54	68.46	
Cash and in-kind	4.38	5.37	
In-kind only	5.29	2.01	
Do not Know	25.98	22.82	
<i>Wealth Index</i>			
Poorest	31.42	32.21	0.58
Poorer	24.02	26.17	
Middle	17.07	17.45	
Richer	15.71	12.08	
Richest	11.78	12.08	
<i>Specific Needs</i>			
<i>Physical Violence</i>			
No	35.65	4.03	<0.05
Yes	64.35	95.97	



Variable	No (%)	Yes (%)	P-value
<i>Sexual Violence</i>			
No	84.74	79.86	0.14
Yes	15.25	20.13	
<i>Emotional Violence</i>			
No	33.08	32.21	0.84
Yes	66.92	67.79	
<i>Husband Controlling Behaviour</i>			
No	6.04	5.37	0.75
Yes	93.96	94.63	
<i>Severity</i>			
No	83.38	55.03	<0.05
Yes	16.62	44.97	
<i>Physical Injuries</i>			
No	73.21	52.38	<0.05
Yes	26.79	47.62	
<i>Complex Violence</i>			
One	4.38	1.34	0.34
Two	57.7	36.24	
Three	30.97	44.96	
Four	6.95	17.45	
<i>Fear</i>			
No	53.47	42.28	<0.05
Yes	46.52	57.72	
<i>Alcohol</i>			
No	30.97	22.82	<0.05
Yes	69.03	77.18	

Factors associated with HSB for IPDV among women

When multivariate logistic regression analysis was performed, women living in service-accessible and developed areas such as Kayin and Yangon were significantly more likely to seek help, with odds ratios of 5.08 (95% CI: 1.79 – 15.29) and 6.23 (95% CI: 1.80 – 22.53), respectively, compared to women in Kachin, a region affected by conflict, internal displacement, lower economic status, and limited access to services (13). Additionally, women with higher education were less likely to seek help than those without (OR: 0.26, 95% CI: 0.01 – 2.09). Besides, financial dependency on husbands discouraged women from seeking external assistance (OR = 0.67, 95% CI = 0.34 – 1.34) compared to women who were not financially dependent.

The likelihood of HSB among women who experienced physical violence, severity, and injuries was higher (OR = 2.58, 95% CI = 0.83 – 9.94), (OR = 2.25, 95% CI = 1.36 – 3.72), and (OR = 1.81, 95% CI = 1.12 – 2.91) compared to no experiences. Women who experienced emotional violence were more likely to seek help (OR = 1.26, 95% CI = 0.76 – 2.09).

**Table 3** Factors associated with HSB for IPDV among women

Variable	Adjusted Odds Ratio (95% CI)^a
Region/State	
Kachin	Ref
Kayah	2.42 (0.77, 7.75)
Kayin	5.08 (1.79, 15.29) **
Chin	1.35 (0.37, 4.73)
Mon	1.02 (0.27, 3.59)
Rakhine	0.35 (0.11, 1.12)
Shan	1.19 (0.26, 4.86)
Yangon	6.23 (1.80, 22.53) **
Mandalay	3.54 (0.93, 13, 36)
Nay Pyi Taw	0.95 (0.32, 2.85)
Ayeyarwady	0.98 (0.33, 2.97)
Sagaing	1.14 (0.38, 3.39)
Tanintharyi	1.07 (0.37, 3.13)
Bago	1.25 (0.39, 3.95)
Magway	1.32 (0.46, 3.91)
Women Education	
<i>No</i>	Ref
<i>Primary</i>	1.35 (0.69, 2.71)
<i>Secondary</i>	2.27 (1.05, 5.03)
<i>More than secondary</i>	0.26 (0.01, 2.09) *
Men Occupation	
<i>Unemployed</i>	Ref
<i>Employed</i>	0.67 (0.34, 1.34) *
Physical Violence	
<i>No</i>	Ref
<i>Yes</i>	2.58 (0.83, 9.94) **
Emotional Violence	
<i>No</i>	Ref
<i>Yes</i>	1.26 (0.76, 2.09) *
Severity of Physical Violence	
<i>No</i>	Ref
<i>Yes</i>	2.25 (1.36, 3.72) ***
Physical Injuries	
<i>No</i>	Ref
<i>Yes</i>	1.81 (1.12, 2.91) **

DISCUSSION

This study analyzed predictors of HSB among women experiencing IPDV in Myanmar using MDHS (2015-16). Only 18.37% sought help, reflecting trends in other low- and middle-income countries (6, 9). The low HSB rate in Myanmar may be due to limited formal and informal support systems compared to high-income countries (14).

The high HSB in Yangon and Kayin is due to service accessibility. Yangon had ten organizations, and Kayin had four, aiding gender-based violence survivors (14). These organizations raised awareness and improved access, encouraging women to seek help. The 2015 democratic victory enhanced service availability, especially in Yangon (15). This study found that women's education predicted HSB for IPDV, with higher-educated



women being less likely to seek help due to their greater access to resources, fostering a sense of self-sufficiency in preventing violence recurrence (6). The Stage Model Theory supports this, suggesting survivors utilize personal resources before seeking help (16). Additionally, psychological and cognitive barriers such as fear and stigma might deter education women from HSB (16). Conversely, other studies indicated that higher education increased HSB for IPDV because it could empower women with information, particularly legal knowledge (6).

Husband's income significantly decreased HSB for IPDV among women in Myanmar, where cultural norms designate men as household heads and breadwinners in the families (10). This finding is consistent with Feminist Theory that posits that women are accepted to be self-sacrificing and obedient wives, leading them to remain silent when their husbands commit abuse (11). Women's views of IPDV as a private family matter and desire to maintain a stable family further deter HSB, particularly among lower socio-economic groups (9).

When violence resulted in visible injuries, women were more likely to seek help. This finding aligns with previous literature indicating that women who perceived violence as not serious did not seek help (6). In Myanmar, strict gender roles may normalize non-visible violence (10). Liang et al.'s (2005) help-seeking model supports the idea that recognizing violence is an identification step. If women cannot recognize the violent nature, it might impact the HSB process (17). Interestingly, psychological violence was related to HSB, likely due to its severe emotional impact. Women may prefer informal sources, feeling more comfortable sharing their experiences with trusted family, neighbours, or friends (6).

This study highlights the significant impact of Myanmar's socio-cultural norms on women's vulnerability to IPDV. Despite efforts by the government, non-governmental organizations, and civil society organizations to provide gender-based violence response services, these services remain limited and inaccessible to many women (14, 18, 19). Thus, this study should be an evidence-based tool to push for a more comprehensive and widely accessible hotline service. Such a service can

offer immediate psychological first aid, a safety plan, and referrals to appropriate services to prevent severe consequences. This model was successfully implemented in other low-and-middle-income countries (20). Given Myanmar's current context, a hotline service model is feasible and can overcome barriers like transport costs, checkpoint concerns, gender-specific norms, and household roles. UN agencies can be important in leading this initiative, ensuring it aligns with interagency guidelines for a sustainable and practical GBV response (20).

Due to the analysis of the cross-sectional study, we can explore the association of study variables but cannot conclude causality. Also, this survey only included women aged 15 and 49 for the domestic violence module. Thus, there will be variable limitations, and we need help understanding the entire capture.

Nevertheless, the survey conducted using scientific methodology is a strength of the analysis. Regarding domestic violence, many previous studies have already used this survey; however, this important study, which has never been reported, was a unique contribution to the IPDV response in Myanmar.

CONCLUSIONS

The prevalence of HSB for IPDV among women was low, and it may be underreported. The above-mentioned factors may cause them to stay silent and not seek help. Based on the significant associated factors with HSB, the appropriate implementation should be considered. The delivery of a hotline service model should be the best option to prevent severe physical consequences, ensure safety, and improve emotional well-being in the current situation.

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ASSOCIATION BETWEEN SOCIODEMOGRAPHIC FACTORS AND PRACTICES RELATED TO SOLID WASTE MANAGEMENT AMONG RURAL RESIDENTS OF LONDHE-KRISHNAPURI, JALGAON DISTRICT IN INDIA: A CROSS-SECTIONAL STUDY

Priyanka Chavan¹, Kraiwuth Kallawicha^{1*}

¹College of Public Health Sciences, Chulalongkorn University, Sabbasastravicaya Building, Payathai Road, Bangkok 10330, Thailand

*Corresponding Author: Kraiwuth Kallawicha, College of Public Health Sciences, Chulalongkorn University Sabbasastravicaya Building, Phayathai Road, Bangkok 10330, Thailand, Email: Kraiwuth.K@chula.ac.th

ABSTRACT

Introduction: Improper solid waste management is a critical issue in developing nations, and they eventually need more proper infrastructure in rural areas. This study investigates the association between sociodemographic factors and practices related to solid waste management among rural residents of Londhe-Krishnapuri, Jalgaon district in India. There is no formal waste management system, so this study explores residents' sociodemographic characteristics and waste disposal methods, which will help identify gaps in waste management practices. Information will be instrumental in targeting interventions and educational programs within the community and also offer insights for policymakers to address rural waste disposal challenges.

Objectives: To find the association between sociodemographic factors and practices related to solid waste management among rural residents of Londhe-Krishnapuri, Jalgaon district in India.

Methodology: This is quantitative cross-sectional study research with Purposive sampling done on (n=316) households, one adult per house, conducted on 13th May 2024, using Google forms with sociodemographic (10 questions) and practices (20 questions with scoring as good practices: >50%, poor practices: <50%). Experts validated content and obtained ethical consideration from the Rural Hospital, Gram Panchayat.

Results: A total of 316 respondents were used for data analysis where the Chi-square showed gender ($\chi^2=5.231$, p-value=0.022) and occupation ($\chi^2=22.247$, p-value <0.001) showed significant associations with good practices. At the same time, marital status ($\chi^2=6.887$, p-value=0.032) had a weak association. Other factors that no significant association with good practices like age ($\chi^2=3.430$, p-value=0.330), education level ($\chi^2=5.499$, p-value=0.240), monthly income ($\chi^2=3.920$, p-value=0.141), number of residence ($\chi^2=2.772$, p-value=0.428), length of residence ($\chi^2=1.342$, p-value=0.159), and access to waste collection services ($\chi^2=0.617$, p-value=0.432).

Conclusion: This study examines rural residents without formal waste management systems who need help with irresponsible practices. Residents must understand proper disposal, rely on burning plastic and improper waste dumping, and resist taking personal responsibility. The study highlights the need to inform policymakers to target education, motivation, and solutions to address public health.

Keywords: Solid waste, waste management, rural residents, improper practices.

INTRODUCTION

Our daily lives create a lot of solid waste, from food scraps and paper to electronics and yard waste from homes, businesses, and farms. Proper management is crucial to protect our health and environment by responsibly collecting, transporting, and disposing of waste (1). Several methods:

recycling turns waste into new products, composting breaks down organic materials for reuse, and landfills store waste for long periods. Historically, waste management focused on public health by removing trash from populated areas (2). However, this often led to uncontrolled dumping. Today, it is a key part of



sustainable development, aiming to reduce the negative impact of waste (3).

In developing countries across Asia, rapid economic growth presents a challenge alongside its benefits: a surge in solid waste driven by population, industrialization, and urbanization is dominated by biodegradable waste, with each person producing between 0.2 and 0.5 kg daily (4). Biodegradable waste is a significant portion of this trash, reaching over 70% in some Indonesian cities (5). Unfortunately, inefficient collection systems and open dumping practices create massive landfills that pollute the environment, contaminating solids, water, and air (6). Swachh Bharat Mission in India aims to address this challenge by tackling it. India produced 147,613 tons of waste daily in 2020, which is expected to rise 5% yearly due to population and urbanization. By 2050, daily waste could reach 1,195,000 tons daily. (7). However, the problem is further compounded by the growing volume of waste itself. Existing waste management systems need help to keep pace, leading to overflowing landfills and uncollected trash, significantly threatening public health and the environment. Effectively managing this growing challenge requires a nuanced approach. Different waste streams, from households to industries, require specific collection methods (8). Unfortunately, technological solutions in high-income countries, like sensor networks and radio-frequency identification (RFID) for waste tracking, are often too expensive for developing nations (9). Various economic factors, including geographic area, population density, and transportation costs, influence the overall cost of waste management.

The Sustainable Development Goals (SDGs) aim to create a better future for all, and achieving them relies on interconnectedness. It is linked to environment conservation, public health, poverty reduction, and the creation of eco-friendly smart communities (10). Major Indian cities like Pune generate massive amounts of waste, reaching 1000-2000 tons daily (11). Despite studies highlighting these issues, Jalgaon district needs more similar research, especially in rural areas with limited disposal facilities, forcing residents to dispose of trash improperly. This study addresses the gap by evaluating sociodemographic factors and practices related to solid waste

management. This will inform local interventions and serve as a foundation for future research, ultimately improving waste management.

METHODOLOGY

Study design, Study population, and sampling technique

A quantitative cross-sectional study was conducted among 316 residents from 316 houses, one individual per house, in May 2024 to identify the association between sociodemographic factors and practices related to solid waste management among rural residents of Londhe-Krishnapuri, Jalgaon district in India. The study was done considering the association between sociodemographic factors like Age, gender, education, occupation, income level, marital status, no. of household members, length of residence, Type of residence, and access to waste collection services like community bins as independent variable and practices such as sound and poor practices as dependent variable.

Respondents included those above 18 who were responsible for housework, living for more than six months, were familiar with the community, and could understand and communicate in the local language, 'Marathi.' Other family members, such as those who had not lived in the community for six consecutive months, were excluded—purposive sampling was done on the household manager. One representative per household, i.e., Total of 316 houses, has 316 respondents. Three academic experts set and validated a questionnaire on sociodemographics and practices, and an IOC score of 0.85 was obtained. The questionnaire was in English language and read out in the local language, 'Marathi', by well-educated research assistants. The practice questionnaire covering 20 questions was structured and set on a Likert scale with a Scoring of Never-1, Sometimes-2, Often-3, Always-4, and vice versa for negative questions—highest possible score for positive question: Always-4, and highest possible score of negative question: Never-4. The cut-off point was selected by calculating the median of the total responses of 316 respondents and coded as good practice-1 and poor practice-0, scoring for good practices >30 and Poor practices ≤30. Questions were about recycling habits,



including sorting waste, repurposing items, and reducing waste generation.

Data Analysis

After data collection, responses were cleaned and coded in Microsoft Excel. The Excel data was imported into Chulalongkorn University's licensed SPSS version 29.0. Descriptive statistics are used to calculate frequency and percentage to describe the characteristics of the respondents. Chi-square was used to find the association between dependent and independent variables. After this test, the independent variable showing a p-value <0.05 was considered statistically significant.

Ethical consideration

Ethical consideration was approved by Londhe-Krishnapuri Government Rural

Table 1 Sociodemographic factors of respondents (n=316).

Variable	Number	Percent (%)	
Age	18-30 years	151	47.8
	31-45 years	71	22.5
	46-60 years	71	22.5
	Over 60 years	23	7.3
Gender	Male	184	58.2
	Female	132	41.8
Education Level	Illiterate	125	39.6
	Primary education (up to 5th grade)	55	17.4
	Secondary education (6th to 10th grade)	47	14.9
	Higher secondary education (11th to 12th grade)	72	22.8
Occupation	Undergraduate or higher	17	5.4
	Farmer	155	49.1
	Homemaker	82	25.9
	Student	62	19.6
Monthly Income in US Dollars	Other	17	5.4
	Below \$59.91	284	89.9
	\$59.91 - \$119.81	26	8.2
Marital Status	More than \$119.82	6	1.9
	Single	65	20.6
	Married	219	69.3
No. of Household members, including yourself	Other	32	10.1
	1-2 people	111	35.1
	3-4 people	140	44.3
	5-6 people	56	17.7

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RESULTS

Sociodemographic factors of the respondents

Table 1 shows that nearly half (47.8%) fell within the 18-30 age range. Gender distribution was almost balanced, with 58.2% males and 41.8% females. Almost 40% lacked literacy, and only a tiny portion (5.4%) held undergraduate or higher degrees. Farming was the primary occupation of nearly half (49.1%) respondents. A significant portion (89.9%) reported monthly income below \$59.91. A large portion (96.5%) lived in the village for 5-10 years, and the majority (93.7%) owned their homes. Surprisingly, almost all respondents (97.2%) lacked access to waste collection services.



Variable		Number	%
Length of Residence in the village	Seven or more people	9	2.8
	5 – 10 years	305	96.5
	2 – 5 years	11	3.5
Do you own or rent a place of residence	Own	296	93.7
	Rent	20	6.3
Have you been provided access to waste collection services?	No	307	97.2
	Yes	9	2.8

In Figure 1, 32.91% of the 316 respondents had good practices for managing solid waste, while 67.09% had poor practices for solid waste disposal methods.

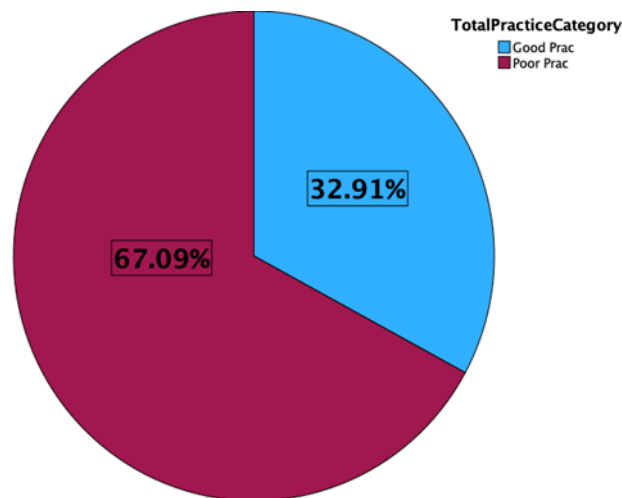


Figure 1 Percentage of respondent's Good and Poor practices of solid waste management

Association between sociodemographic factors and practices of solid waste management (n=316)

Table 2 reveals gender ($\chi^2=5.231$, p-value=0.022) and occupation ($\chi^2=22.247$, p-value <0.001) showed significant associations with good practices, while marital status ($\chi^2=6.887$, p-value=0.032) had a weak association. Conversely, several factors

displayed no significant association with good practices like age ($\chi^2=3.430$, p-value=0.330), education level ($\chi^2=5.499$, p-value=0.240), monthly income ($\chi^2=3.920$, p-value=0.141), number of residence ($\chi^2=2.772$, p-value=0.428), length of residence ($\chi^2=1.342$, p-value=0.159), and access to waste collection services ($\chi^2=0.617$, p-value=0.432).

Table 2 Association between sociodemographic factors and practices of solid waste management (n=316).

Category	Total	Good Practice N (%)	Poor Practice N (%)	χ^2	P-value
Age				3.430	0.330
18-30	151	59(39.1)	92(60.9)		
31-45	71	22(31.0)	49(69.0)		
46-60	71	24(33.8)	47(66.2)		
Over 60	23	5(21.7)	18(78.3)		



Category	Total	Good Practice N (%)	Poor Practice N (%)	χ^2	P-value
Gender				5.231	0.022
Female	132	36(27.3)	96(72.7)		
Male	184	73(39.7)	111(60.3)		
Education Level				5.499	0.240
Illiterate	125	45(36.0)	80(64.0)		
Primary education (up to 5th grade)	55	23(41.8)	32(58.2)		
Secondary education (6th to 10th grade)	47	15(31.9)	32(68.1)		
Higher secondary education (11th to 12th grade)	72	24(33.3)	48(66.7)		
Undergraduate or higher	17	2(11.8)	15(88.2)		
Occupation				22.247	<.001
Farmer	155	72(46.5)	83(53.5)		
Homemaker	82	16(19.5)	66(80.5)		
Student	62	19(30.6)	43(69.4)		
Other	17	2(11.8)	15(88.2)		
Monthly income in US dollars				3.920	0.141
Below \$59.91	284	103(36.3)	181(63.7)		
\$59.91 - \$119.81	26	5(19.2)	21(80.8)		
More than \$119.82	6	1(16.7)	5(83.3)		
Marital Status				6.887	0.032
Single	65	20(30.8)	45(69.2)		
Married	219	84(38.4)	135(61.6)		
Other	32	5(15.6)	27(84.4)		
No. of household members, including yourself				2.772	0.428
1-2 people	111	32(28.8)	79(71.2)		
3-4 people	140	51(36.4)	89(63.6)		
5-6 people	56	24(42.9)	34(60.7)		
Seven or more people	9	4(44.4)	5(55.6)		
Length of residence in the village				1.342	0.247
2 – 5 years	11	2(18.2)	9(81.8)		
5 – 10 years	305	9(3.0)	198(64.9)		
Do you own or rent a place of residence?				1.985	0.159
Own	296	105(35.5)	191(64.5)		
Rent	20	4(20.0)	16(80.0)		
Have you been provided access to waste collection services?				0.617	0.432
Yes	9	2(22.2)	7(77.8)		
No	307	107(34.9)	200(65.1)		

*Note: Significance level p -value <0.05.

† Fisher-exact test was used instead of Chi-square when the observed value is less than 5.



DISCUSSION

Rural areas often lack infrastructure for efficient waste disposal compared to cities, making targeted interventions crucial for promoting sustainable practices.

This study revealed that among 316 participants, 32.91% followed good practices, and 67.09% had poor solid waste disposal practices. The chi-square study showed an association between sociodemographic factors and practices related to solid waste management among rural residents. The study showed that gender (p -value=0.022) was statistically significant with practices, but males (39.7%) were more likely to engage in good practices than females as there were several factors, such as traditional gender roles where waste management is considered a male responsibility in some cultures as studied in (12). Occupation with p -value <0.001 was statistically significant with practices where farmers were more likely to engage in good practices than homemakers. Farmers often generate more organic waste, like agricultural waste and yard trimmings, which is composted later, as observed in (13). Marital status with p -value=0.032 showed a significant association with good practices due to shared responsibilities and potentially more resources within a married household helping manage waste effectively, as studied in (14).

Also, the study focuses on the findings of the sociodemographic factors and waste management practices. The study found a gender imbalance, with more men participating than women. This was due to societal norms and how participants were recruited in similar studies (15). The farmers were the largest group surveyed, reflecting the rural setting. This is likely because many residents without farming opportunities have migrated to cities as observed in (16). Most residents with low-income levels due to limited education and low job opportunities suggest economic challenges in the area. This limits access to recycling facilities and composting bins, hindering responsible waste disposal studies (17). The study identified a link between occupation and waste management practices. Homemakers were more likely to engage in good practices due to spending more time managing the household and having opportunities to implement solutions like reducing, reusing, and

composting waste, as observed similarly in (18).

Furthermore, the study focuses on practices related to solid waste management in rural areas where waste segregation is limited due to a lack of infrastructure and awareness. Some compost kitchen scraps, but many lack facilities. Also, the community engagement had low participation in clean-up activities or programs, suggesting a need for better strategies to encourage involvement similar to (19). There were positive aspects, including avoiding littering trash and some responsible disposal; however, burning plastic, dumping waste in water, and improper hazardous waste disposal are concerning practices, such as "umpi'g medical waste in open pits. Unfortunately, low participation suggests the need for improved outreach and exploring peer-to-peer learning or community action initiatives.

Strength and Limitation

Firstly, it provides a quick and cost-effective way to understand the current waste management situation among rural residents. This allows for immediate action on pressing issues and designing targeted interventions. Secondly, focusing on a rural community yields insights into their specific challenges and existing practices, which are crucial for developing sustainable solutions. Finally, the study can identify opportunities to leverage existing practices and promote innovative solutions suited to rural contexts.

Furthermore, the findings could be more generalizable due to the small sample size and focus on a specific rural area. Secondly, extremely hot weather affected participant responses. Also, technological hurdles limited data collection methods due to network issues and electricity cut-offs.

CONCLUSIONS

This study examines how sociodemographic factors influence waste management practices in rural areas. It reveals a concerning gap between proper waste disposal and current practices. The study highlights the need for interventions that address these poor practices and empower residents to adopt responsible waste management habits. This will help conduct comprehensive awareness campaigns about



improper waste disposal's environmental and health impacts and educate residents about segregation, recycling, and composting. Also, adequate waste collection and disposal facilities, including bins, collection points, and processing plants, must be provided, and regular and efficient waste collection services must be ensured. This may incentivize households and communities to adopt good waste management practices. This will involve community leaders and organizations in planning and implementing waste management initiatives and encourage community participation through clean-up drives and awareness programs. This will also develop and enforce clear regulations and policies related to waste management. Provide financial and technical support to local governments for effective waste management implementation. Lastly, this will also consider the socioeconomic conditions of the community and their intervention accordingly, for example, providing affordable waste management solutions for low-income households.

RECOMMENDATIONS

This study offers recommendations for improving rural waste management. Policymakers should focus on targeted incentives, infrastructure, and education. Local authorities can implement tailored programs, engage communities, and promote knowledge sharing. Residents can participate in community initiatives and share their knowledge. Future research should expand the study area and delve deeper into the role of attitudes. By collaborating, stakeholders can create a sustainable waste management system for rural communities.

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HIV-RELATED STIGMA AMONG HEALTHCARE PROVIDERS IN LIUZHOU, CHINA: A CROSS-SECTIONAL STUDY

Huiming Jia¹, Wandee Sirichokchatchawan^{1,2*}

¹College of Public Health Sciences, Chulalongkorn University Sabbasastravicaya Building, Payathai Road, Bangkok, 10330, Thailand

²Health and Social Sciences and Addiction Research Unit, Chulalongkorn University

*Corresponding Author: Wandee Sirichokchatchawan, College of Public Health Sciences, Chulalongkorn University Sabbasastravicaya Building, Phayathai Road, Bangkok 10330, Thailand, Email:wandee.s@chula.ac.th

ABSTRACT

Introduction: HIV-related stigma among healthcare providers is a significant barrier to effective care for people living with HIV/AIDS (PLWHA). In China, stigmatizing attitudes can lead to discrimination, affecting patient care quality and discouraging individuals from seeking treatment. Liuzhou, a city in Guangxi Province, has the highest HIV infection rate in the region, making it a critical area for examining these issues. Although many studies focus on PLWHA's perspectives on HIV-related stigma, there is limited understanding of healthcare providers' attitudes towards PLWHA in Liuzhou. This study aimed to assess the levels of HIV-related stigma among healthcare providers in Liuzhou, China, and to examine the correlation among stereotyping, discrimination, and prejudice subscales.

Methodology: This cross-sectional study included 280 healthcare providers, doctors, nurses, and laboratory physicians recruited through convenient sampling from tertiary hospitals across the five districts of Liuzhou, China. Participants completed an online questionnaire that assessed socio-demographic characteristics, professional characteristics, HIV-related knowledge, HIV-related experience, and HIV-related stigma using the Health Care Provider HIV/AIDS Stigma Scale (HPASS). The HPASS consists of 30 items scored on a 6-point Likert scale, divided into stereotyping, discrimination, and prejudice subscales. The total HPASS score was calculated by summing the scores of all subscales. Participants were categorized into "less stigma" (total HPASS score \leq mean) or "more stigma" (total HPASS score $>$ mean). Mean scores of the subscales were also used to categorize participants into "less" or "more" stigma groups. Pearson's correlation analyzed the relationships among the three subscales of the HPASS.

Results: Among the 280 participants, the majority were aged 20-30 years (53.6%), female (65.0%), and held a bachelor's degree (70.0%). Most were married (57.5%) and worked as nurses (44.3%), doctors (30.4%), and laboratory technicians (25.4%). Additionally, 24.3% had received training on HIV stigma reduction less than one year ago, 36.8% had received such training more than one year ago, and 38.9% had never received stigma reduction training. Regarding professional experience, 59.3% had provided care to PLWHA, and 45.4% had experienced an accident or exposure risk. The majority (62.1%) had not encountered any HIV cases in the last six months, while 29.3% had encountered 1-3 cases, and smaller percentages had encountered more cases. Furthermore, 53.6% were satisfied with the exposure protective system in their workplace.

The mean score for the total HPASS scale was 89.93, with 46.1% of participants reporting less stigma and 53.9% reporting more stigma. The mean scores for the stereotyping, discrimination, and prejudice subscales were 36.75, 12.74, and 40.45, respectively. Among participants, 55.7% reported less stereotyping and 44.3% more stereotyping; 62.9% reported less discrimination and 37.1% more discrimination; and 42.9% reported less prejudice and 57.1% more prejudice. Significant positive correlations were found between stereotyping and discrimination ($r = 0.289$, $p < 0.001$), stereotyping and prejudice ($r = 0.309$, $p < 0.001$), and discrimination and prejudice ($r = 0.654$, $p < 0.001$).

Conclusion: This study highlights the need for targeted interventions to reduce HIV-related stigma among healthcare providers in Liuzhou. By addressing the identified factors, such as socio-demographic characteristics, professional experience, and HIV-related knowledge, effective programs can be designed to mitigate stigma and improve care for PLWHA. Potential strategies include enhancing HIV-



related education and training, promoting awareness programs, and improving workplace support systems to address all three dimensions of stigma: stereotyping, discrimination, and prejudice.

Keywords: China, Discrimination, Healthcare providers, HIV, Stigma

INTRODUCTION

Human Immunodeficiency Virus (HIV) remains a global public health challenge, with approximately 39.9 million people living with HIV (PLWHA) worldwide as of 2023[1]. HIV-related stigma among healthcare providers is a significant barrier to effective care for PLWHA. Defined by the Joint United Nations Programme on HIV and AIDS (UNAIDS) as negative beliefs, feelings, and attitudes toward PLWHA and associated groups, HIV-related stigma remains pervasive globally. Earnshaw and Chaudoir's HIV Stigma Framework identifies three critical mechanisms of stigmatization: stereotyping, discrimination, and prejudice. Prejudice involves emotionally charged attitudes toward PLWHA, stereotyping includes negative thoughts and cognitive schemas, and discrimination is the behavioral manifestation of these prejudiced attitudes [2].

In healthcare settings, stigma can manifest as verbal and physical abuse, social exclusion, denial of healthcare services, and breaches of confidentiality [3]. These actions not only harm the mental and emotional well-being of PLWHA but also create substantial barriers to addressing the HIV epidemic effectively. Stigma in healthcare settings is particularly detrimental as it affects the willingness of PLWHA to seek and adhere to treatment, potentially contributing to the spread of the virus [4, 5].

In high-income countries like the United States, HIV-related stigma in healthcare settings includes patient avoidance and extreme precautionary measures by healthcare providers[6]. In China, HIV/AIDS remains a significant public health issue, with 1.053 million PLWHA and 351,000 recorded deaths by the end of 2020 [7]. Despite the Chinese government's initiatives to combat HIV-related stigma, discrimination against PLWHA persists, particularly in healthcare settings[8]. This issue is particularly acute in regions like Liuzhou in Guangxi Province, which has the highest HIV infection rate in the region and has limited research on HIV-related stigma[9].

Previous research, such as qualitative interviews with PLWHA, provided in-depth insights into their experiences with HIV-related

stigma [10]. However, this study was limited by its small sample size and lack of quantitative data. Another study, using a larger sample and quantitative methods, identified factors related to HIV stigma among adults in Liuzhou, yet it did not focus on healthcare providers' attitudes.[11]. Therefore, this study aims to assess the levels of HIV-related stigma among healthcare providers in Liuzhou, China, and to examine the relationships among stereotyping, discrimination, and prejudice subscales.

METHODOLOGY

Study design and population

A cross-sectional study was employed. Two hundred eighty healthcare providers, including doctors, nurses, and laboratory physicians, were recruited using convenient sampling from tertiary hospitals in the five districts in Liuzhou, China.

Measurement Tool

Participants completed an online questionnaire that assessed socio-demographic characteristics, professional characteristics, HIV-related knowledge, HIV-related experience, and HIV-related stigma using the Health Care Provider HIV/AIDS Stigma Scale (HPASS)[12]. The HPASS consists of 30 items scored on a 6-point Likert scale. HPASS is divided into three subscales: stereotyping, discrimination, and prejudice. For subscales, higher scores indicate higher stereotyping, discrimination, and prejudice. The total HPASS score was calculated by summing up the scores of all subscales. Participants were categorized into "less stigma" (total HPASS score \leq mean) or "more stigma" (total HPASS score $>$ mean). Mean scores of the subscales were also used to categorize participants into "less" or "more" stigma groups[13].

Data Collection

Survey forms were created using the online WJX Form, including the research participant information sheet, consent form, screening questions, and questionnaire. To avoid potential biases, participants were encouraged to answer honestly. Responses were kept confidential and anonymous, with no personal information collected. The



questionnaire was destroyed after data entry. The survey link was shared through three methods: online distribution via the WeChat platform, in-person hospital visits, and collaboration with head healthcare providers.

Data Analysis

Descriptive statistics were used to describe the results of all variables. Mean and standard deviation (normal distribution) or median and interquartile ranges (non-normal distribution) were reported for continuous data. For categorical data, frequencies and percentages were reported. Pearson's correlation analyzed the relationships among the three subscales of the HPASS.

Validity and Reliability

A professional translator translated The questionnaire from English to Chinese and back-translated it to English to ensure semantic and content validity. Feedback from one expert in Thailand and two in China helped refine the questionnaire. An IOC index > 0.8 confirmed its suitability for the study.

The questionnaire was pre-tested with 40 healthcare providers from another province. Cronbach's alpha, calculated using SPSS software version 28 (IBM Corp., Armonk, NY, USA), showed good internal consistency reliability: total HPASS scale ($\alpha = 0.926$), Stereotyping Subscale ($\alpha = 0.846$), Discrimination Subscale ($\alpha = 0.917$), and Prejudice Subscale ($\alpha = 0.83$).

RESULTS

Table 1. Sociodemographic characteristics of healthcare providers in Liuzhou, China(n=280)

Variable	Number	Percent (%)
Age		
20-30 years old	150	53.6
31-40 years old	98	35.0
> 40 years old	32	11.4
Median	30	
IQR	8	
Gender		
Male	98	35.0
Female	182	65.0
Religion		
Religion	43	15.4
Non-religion	237	84.6
Perceived religiosity		
Very religious	4	1.4
Somewhat religious	22	7.9
Not religious	254	90.7
Education Level		
Junior college degree or lower	24	8.6
Bachelor's degree	196	70.0
Graduate Degree (Master's or PhD)	60	21.4
Marital Status		
Single	114	40.7
Married	161	57.5
Divorced/Separated	5	1.8
Average monthly income (Yuan)		
≤ 3000	9	3.2
3001-6000	112	40.0
6001-9000	104	37.1
> 9000	55	19.6
Median	7000	
IQR	3375	

Note: n: Number; IQR: Interquartile Range



Two hundred eighty participants completed the questionnaire, and Table 1 presents the sociodemographic characteristics of healthcare providers in Liuzhou, China. This table shows that the majority are aged between 20 and 30 (53.6%), with a median age of 30 and an IQR of 27-35 years. Females comprised 65.0% of the sample. Regarding religion, most providers are non-religious (84.6%), 15.4% identified with a religion, including Buddhism,

Taoism, Islam, Protestantism, Catholicism, and others, and nearly 90% perceive themselves as not religious. Educationally, 70.0% hold a Bachelor's degree, while 8.6% have a junior college degree or lower. Marital status indicates that 57.5% are married. The average monthly income showed that 40.0% earned between 3001-6000 yuan, with a median income of 7000 yuan and an IQR of 5500-8875 yuan.

Table 2 Professional Characteristics of healthcare providers in Liuzhou, China(n=280)

Variable	Number	Percent (%)
Profession		
Doctor/Physicians	85	30.4
Nurse	124	44.3
Laboratory technicians	71	25.4
Department		
Internal medicine	104	37.1
Surgical department	96	34.3
Clinical Laboratory	67	23.9
Administrative	13	4.6
Year of work experience		
<=5	126	45.0
6-10	73	26.1
11- 15	43	15.4
>15	38	13.6
Median	6	
IQR	9	
Job title		
Associate Senior	15	5.4
Intermediate	97	34.6
Primary	168	60.0
HIV Training		
Less than one year ago	118	42.1
One year or more ago	121	43.2
Never received	41	14.6
HIV Stigma Reduction Training		
Less than one year ago	68	24.3
One year or more ago	103	36.8
Never received	109	38.9

Note: n: Number; IQR: Interquartile Range

Table 2 presents the professional characteristics of healthcare providers in Liuzhou. The sample is mainly composed of nurses (44.3%), doctors (30.4%), and laboratory technicians (25.4%). Departmental distribution showed that 37.1% were in internal medicine, 34.3% in the surgical department, 23.9% in the clinical laboratory department, and 4.6% in the administrative department.

Regarding work experience, 45.0% have five years or less, 26.1% between 6-10 years, with a median of 6 years and an IQR of 3-12 years. Job titles are mostly primary (60.0%) and intermediate (34.6%). HIV training had been received by 42.1% within the past year, while 38.9% had never received HIV stigma reduction training.

**Table 3** HIV-related experience of healthcare providers in Liuzhou, China(n=280)

Variable	Number	Percent (%)
Provide care to PLWHA		
Yes	166	59.3
No	114	40.7
Number of HIV cases encountered in the last six months		
None	174	62.1
1-3	82	29.3
4-6	13	4.6
Seven or more	11	3.9
Experience of exposure risk		
Yes	127	45.4
None	153	54.6
Needle stick injury		
No	209	74.6
Yes	71	28.9
Blood splash		
No	198	70.7
Yes	82	29.3
Mucous splash		
No	185	66.1
Yes	95	33.9
Post-exposure prophylaxis (PEP) is available in this facility		
Yes	235	83.9
No	45	16.1
Satisfaction with the Exposure Protective System in workplace		
Satisfied	150	53.6
Neutral/Not satisfied	130	46.4

Table 3 presents the HIV-related experience of healthcare providers in Liuzhou. 59.3% had provided care to PLWHA. In the past six months, 62.1% encountered no HIV cases, 29.3% dealt with 1-3 cases, and smaller percentages encountered more frequent cases. Nearly half of the participants (45.4%) had

experienced some form of accident or exposure risk, with 28.9% having had needle stick injuries, 29.3% blood splashes, and 33.9% mucous splashes. Post-exposure prophylaxis was available in 83.9% of facilities, and 53.6% of participants were satisfied with their workplace's protective systems.

Table 4 Distribution of level of HIV-Related Knowledge (n=280)

Level of HIV-Related Knowledge	Number	Percent (%)
Knowledgeable (10-12 points)	168	60.0
Less Knowledgeable (Below 10 points)	112	40.0
Mean ± SD	9.52 ± 1.648	
Min – Max score	2 - 12	

Table 4 presents the HIV-related knowledge level of healthcare providers in Liuzhou. It was found that 60.0% showed knowledge, while 40.0% showed less

knowledge, with a mean score of 9.52 ± 1.648 and scores ranging from 2 to 12. Additionally, the knowledge test revealed high awareness of HIV transmission routes, such as HIV



transmission through needle sharing (98.9%) and from mother to unborn baby (95.4%). However, only 33.6% knew the correct timeframe for initiating post-exposure

prophylaxis. Only 58.2% correctly identified that HIV cannot be transmitted by sharing a glass of water, and 60.0% understood that HIV and AIDS are not the same.

Table 5 Total HPASS score and grouping of healthcare providers in Liuzhou, China

Variable	Less Stigma		More Stigma	
	Number	Percent (%)	Number	Percent (%)
Total HPASS	129	46.1	151	53.9
Mean ± SD	89.93 ± 17.93			
(Min-Max)	48 - 141			

Table 6 The HPASS subscale of healthcare providers in Liuzhou, China

Subscale	Level of Stigma				Mean ± SD	Min-Max
	Less		More			
	n	%	n	%		
Stereotyping	156	55.7	124	44.3	36.75 ± 7.115	16 - 59
Discrimination	176	62.9	104	37.1	12.74 ± 4.927	6 - 31
Prejudice	120	42.9	160	57.1	40.45 ± 10.567	13 - 67

Table 7 Correlations between HPASS subscales of healthcare providers in Liuzhou, China

Subscale	r	P-value
Stereotyping - Discrimination	0.289	<0.001
Stereotyping - Prejudice	0.309	<0.001
Discrimination - Prejudice	0.654	<0.001

Note: Pearson correlation coefficients (*r*) indicate significant associations ($p < 0.001$) between stereotyping, discrimination, and prejudice subscales.

Table 5 presents the results of the total HPASS scale among healthcare providers in Liuzhou; 53.9% of the participants reported more stigma, while 46.1% reported less stigma, with a total mean score of 89.93 ± 17.93 (range: 48-141).

Table 6 presents the mean scores for the stereotyping, discrimination, and prejudice subscales were 36.75, 12.74, and 40.45, respectively. Among participants, 55.7% reported less stereotyping and 44.3% more stereotyping; 62.9% reported less discrimination and 37.1% more discrimination; and 42.9% reported less prejudice and 57.1% more prejudice. These mean scores indicate higher scores suggesting greater perceptions of stereotyping, discrimination, and prejudice towards PLWHA. Discrimination has the highest percentage of respondents reporting less stigma than stereotyping and prejudice.

Moreover, Table 7 presents significant positive correlations between stereotyping and discrimination ($r = 0.289$, $p < 0.001$),

stereotyping and prejudice ($r = 0.309$, $p < 0.001$), and discrimination and prejudice ($r = 0.654$, $p < 0.001$).

DISCUSSION

This study aimed to assess the levels of HIV-related stigma among healthcare providers in Liuzhou, China, and to examine the relationships among stereotyping, discrimination, and prejudice subscales. The findings highlight significant HIV-related stigma among healthcare providers, which poses a considerable barrier to effective care for PLWHA. ;



HIV-Related Stigma in Liuzhou

HIV-related stigma is a worrying issue in China. The findings from this study show that more than half of the participants reported higher levels of stigma. This is consistent with findings from other regions in China. For instance, the research from Dong and Colleague in 2018 showed that 77.7% of healthcare workers in Guangzhou had discriminated against PLWHA while providing medical attention [14]. Similarly, another study in Liangshan, China, also found a high mean score of HIV-related stigma among nurses [15]. In Shenzhen, research revealed that 60.7% of healthcare providers believed that PLWHA should not give birth, and 81.9% of participants were worried when assisting a woman living with HIV during delivery [16]. This issue is not confined to China; a study in Laos showed that nearly 50% of doctors and nurses had high levels of stigmatizing attitudes towards PLWHA [17]. Additionally, in Egypt, the majority of healthcare providers expressed concerns about contracting HIV from their patients, and nearly half of them believed they had the right to refuse to provide care to these patients to protect themselves [13].

The high levels of stigma observed in our study can be partly attributed to insufficient training on HIV stigma reduction. 39% of participants had never received such training, highlighting the need for more comprehensive and frequent educational interventions. Previous studies have shown that formal HIV training can lower stigma scores and improve attitudes and behaviors. Nyblade et al. (2019) present that comprehensive healthcare provider training significantly reduces HIV-related stigma and discrimination, particularly when addressing both fear-based and stigma [18]. Training on stigma topics in Southwest Ethiopia resulted in lower stigma scores [19]. These findings underscore the need for ongoing, up-to-date training interventions and the importance of targeted HIV stigma training to reduce stigma effectively.

Our study focused on tertiary hospitals, which typically have more abundant medical resources, advanced equipment, and better exposure protection than primary and secondary hospitals. Despite these advantages, high levels of stigma persist. Similarly, the study population was mainly young and well-educated, with the majority holding a

Bachelor's degree. Despite these favorable sociodemographic characteristics, significant stigma persisted, suggesting that educational attainment alone is insufficient to reduce stigma. Factors such as profession, satisfaction with protective systems, HIV knowledge, and experience working with PLWHA influenced stigma levels. Dong's research has shown that healthcare providers with lower HIV transmission knowledge and dissatisfaction with the occupational exposure protection system were more likely to discriminate against PLWHA [14]. Therefore, it is critical to increase satisfaction with protection systems and ensure that healthcare providers can protect themselves through universal precautions, such as the availability of safety protocols, personal protective equipment (PPE), and PEP, as well as to correct misconceptions about HIV transmission. Comprehensive educational programs that enhance understanding of HIV transmission, prevention, and treatment are crucial.

Stereotyping

The stereotyping subscale analysis reveals that while 55.7% of respondents report lower levels of stereotyping, specific items within this subscale indicate strong moral judgments towards PLWHA, particularly those who contracted HIV through injection drug use (mean 4.5) and sexual activity (mean 3.56). In China, the criminalization of selling sex and injection drug use, coupled with public awareness associating PLWHA with men who have sex with men (MSM), injection drug users (IDU), and sex workers, fosters a deep-rooted prejudice that views HIV/AIDS as a punishment for perceived immoral behavior [20]. Our study finds that these stereotypes and moralistic biases are still prevalent among healthcare providers, who harshly judge behaviors associated with HIV transmission. Combatting stereotypes involves comprehensive education that provides accurate information about HIV.

Discrimination

In our study, 37.1% of participants reported high levels of discrimination. Discriminatory behaviors include refusing care, breaching confidentiality, and delivering lower-quality services. Despite the Chinese government's Regulations on the Prevention



and Control of HIV/AIDS, which stipulate that healthcare providers cannot refuse to treat HIV+ patients, the reality differs[21]. High mean scores on the discrimination subscale, such as "I would avoid conducting certain procedures on HIV+ patients" (mean 2.63) and "I believe I have the right to refuse to treat HIV+ patients if I am concerned about legal liability" (mean 2.26), reveal concerning attitudes and discrimination among healthcare providers. Reducing discrimination requires training and strict enforcement of anti-discrimination policies and a work environment that supports PLWHA rights.

Prejudice

Compared to stereotyping and discrimination, 57.1% of healthcare providers reported high levels of prejudice. This is evident from high mean scores on the prejudice subscale, with items like "I worry that universal precautions are not good enough to protect me from HIV+ patients" (mean 3.77), "I would want to wear two sets of gloves when examining HIV+ patients" (mean 3.68), and "I worry about contracting HIV from HIV+ patients" (mean 3.65). These scores show that healthcare providers express significant concern about HIV transmission and exposure risk despite established safety protocols. Consistent with previous research, prejudice often stems from fear and lack of knowledge about HIV transmission and treatment[5]. Addressing these attitudes requires targeted educational programs to eliminate misunderstandings.

Notably, the findings highlight China's policy issues regarding HIV. Addressing these requires reinforcing regulations with stricter penalties for non-compliance and ensuring healthcare providers understand the consequences of discriminatory behavior. Confidentiality protocols must protect patient information; regular training on legal and ethical obligations is crucial. Establishing enforcement bodies to investigate complaints and ensure compliance is essential. Clear reporting procedures should be available, including anonymous hotlines and online portals. Supporting advocacy groups and conducting public education campaigns can empower PLWHA to exercise their legal rights[21].

Correlations among Stigma Subscales

The significant correlations found between stereotyping, discrimination, and prejudice suggest that these components of stigma are interrelated and reinforce each other. The strong correlation between discrimination and prejudice ($r = 0.654$) indicates that discriminatory behaviors are closely linked to prejudiced attitudes. This relationship highlights the need for comprehensive interventions targeting attitudes and behaviors to reduce stigma effectively. To address this, regular, comprehensive training programs should address specific prejudices, discriminatory behaviors, and stereotypes.

Limitations of this study

This study faced several limitations. Firstly, convenience sampling could lead to selection bias, potentially representing only some of the population of healthcare providers in Liuzhou. Additionally, due to the topic's sensitive nature, participants might have given socially desirable responses instead of their true beliefs, resulting in biased results. To gain a more comprehensive understanding of HIV-related stigma in China, future research should expand to a broader range of healthcare institutions and regions.

CONCLUSIONS

This study found significant levels of HIV-related stigma among healthcare providers in Liuzhou, indicating the need for targeted interventions to reduce such stigma. By addressing the identified factors, such as socio-demographic characteristics, professional experience, and HIV-related knowledge, effective programs can be designed to mitigate stigma and improve care for PLWHA. Potential strategies include enhancing HIV-related education and training, promoting awareness programs, and improving workplace support systems to address all three dimensions of stigma: stereotyping, discrimination, and prejudice.

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UNMET HEALTHCARE NEEDS AND RELATED FACTORS AMONG MYANMAR MIGRANTS IN SAMUT SAKHON PROVINCE, THAILAND

Myat Thinzar Oo¹, Mathuros Tipayamongkholgul^{1*}, Cheerawit Rattanapan¹, Orapin Laosee¹

¹ASEAN Institute for Health Development, Mahidol University, 999 Phuttamonthon 4 Road, Phuttamonthon, Nakhon Pathom 73170, Thailand

***Corresponding Author:** Mathuros Tipayamongkholgul, ASEAN Institute for Health Development, Mahidol University, 999 Phuttamonthon 4 Road, Phuttamonthon, Nakhon Pathom 73170 Thailand
E-mail: Mathuros.tip@mahidol.ac.th

ABSTRACT

Introduction: Unmet healthcare needs refer to situations where an individual reported health examination or treatment needs within the past 12 months but did not receive or seek it. Unmet healthcare needs among the population can lead to poorer health outcomes and increased health inequities, particularly among vulnerable populations such as migrants. Although Thailand has implemented universal health coverage among documented migrants, accessibility to health services among them remains a challenge. The majority of migrants in Thailand are unskilled workers and commonly have language barriers, and time and financial constraints. Understanding how documented migrants' healthcare unmet their needs in the area with rich availability of health services can provide crucial input to improve the health status of this vulnerable population, migrants.

Objectives: The objective of this study is to examine the proportion of unmet healthcare needs and determine its relationship with predisposing, enabling, and need factors among documented Myanmar migrants in Samut Sakhon Province.

Methodology: A cross-sectional survey was conducted in three communities in Samut Sakhon Province. Myanmar migrants were voluntarily selected for face-to-face interviews using a structured questionnaire. Descriptive statistics, Fisher's exact test, and binary logistic regression were applied for data analysis.

Results: A total of 214 completed datasets were used for preliminary analysis. The proportion of unmet healthcare needs among documented Myanmar migrants was 2.8%. Binary logistic regression indicates that language barrier was associated with unmet healthcare needs. Respondents who are self-employed reported a higher proportion of unmet healthcare needs than temporary employment.

Conclusion: Language barriers can predict unmet healthcare needs among documented migrants. Therefore, disseminating information about the availability of migrant volunteers at health facilities among Myanmar migrants can ease this challenge. Lastly, it is encouraged to provide health promotion awareness to migrants through employers or community-based organizations to increase awareness of their health status and reduce unmet healthcare needs.

Keywords: Myanmar Migrants, Thailand, Unmet Healthcare Needs

INTRODUCTION

In recent years, continuous economic and social progress has fostered an environment conducive to the rise of the global migrant population, resulting in a notable surge in international migration (1). In many developing nations, inconsistent economic growth drives migrants to seek better economic prospects in other regions. Living in new environments and maintaining a healthy status is somehow a

major challenge among migrants, particularly unskilled migrants. Additional challenges among migrants emerge when trying to access healthcare services in their new environment (2).

Because of its central geographical location in Southeast Asia, Thailand has become a regional migration hub due to a higher number of migrants compared to others. According to the 2019 Thailand Migration Report, the country hosted approximately 4.9



million migrants, the majority from Cambodia, Lao PDR, Myanmar, and Vietnam, collectively known as the CLMV nations. Recent research suggests that one-third of migrants are undocumented, and 49% of them are from Cambodia, Lao PDR, Myanmar, and Vietnam (CLMV) (3). To accomplish Universal Health Coverage, Thailand provides various types of health insurance for migrants, such as Social Security Scheme (SSS) and Migrant Health Insurance Scheme (MHIS) (4).

Thailand's universal health coverage scheme covers documented migrants via the Social Security Scheme (SSS) for documented migrants working in the formal sector (5, 6) and the Migrant Health Insurance Scheme (MHIS), a voluntary health insurance program for migrant workers and their dependents (7). Migrants can register for the Migrant Health Insurance Scheme (MHIS) at a public hospital and can only receive health care at the hospital where they registered after they have paid for the insurance plan with an annual fee (6). For MHIS, migrants must proactively re-register at a new health facility in their new residence, which is quite challenging for the highly mobile migrant population (4). Unpublished data from a non-government organization reported few migrants register for MHIS. It was reported that 17% of migrant households in Samut Sakhon did not register any kind of health insurance (8). Moreover, it was mentioned that migrants without health insurance had lower access to needed healthcare services than those with health insurance. The result also indicated that while 37.2% of migrant workers experienced illness in the past year, only 14% initiated needed healthcare services (9). The figure suggests a likelihood of unmet healthcare needs among migrant workers.

Unmet healthcare needs refer to situations where an individual reported a need for a health examination or treatment for any type of health issue within the past 12 months but did not receive or seek it (10). Unmet healthcare needs, often used as indicators of healthcare accessibility, represent individuals' subjective experiences when they are unable to receive the necessary health services (11,12). The primary cause of unmet healthcare needs is the restricted or non-existent provision of healthcare services, including hospitalizations, outpatient visits, and physical examinations when needed (13). Unmet healthcare needs can

lead to a population with poorer health outcomes as well as increased health inequalities. This makes it one of the most crucial issues regarding healthcare access that needs to be addressed (14). To understand the way the needs of migrant's healthcare change while they reside in their new countries, an ongoing study to assess changing trends and influencing factors is needed (2). Despite an abundance of research on the utilization of healthcare services, there is an obvious gap in the literature examining the diverse unmet healthcare needs of migrants and the factors influencing them (2).

Moreover, studies on unmet healthcare needs examined the prevalence of unmet healthcare needs and the types of those unmet needs. However, few studies examine the types of healthcare services needed and episodes of unmet healthcare needs during the past 12 months (15). Although previous studies found accessibility to healthcare i.e., accessibility, availability, affordability, and acceptability related to unmet healthcare needs, few of the studies include accommodation as a factor influencing unmet healthcare needs. Accommodation is a critical factor for migrants because of the long working hours and limited available time to seek healthcare services when needed. According to the concept of "access" by Penchansky, the "5As" of access, such as availability, accessibility, accommodation, affordability, and acceptability, form a chain and are interconnected with each other. Without improving all "5As" of access, there will not be a significant change to improve access if other domains are left to be considered (16). Therefore, this study will examine the perception of migrants on the "5 As" of access as enabling factors of unmet healthcare needs.

As a result of the above research gaps, addressing unmet healthcare needs is a crucial step in developing targeted interventions and healthcare delivery strategies that effectively meet the diverse and evolving needs of migrant populations and reduce healthcare disparities. Moreover, it is crucial to acknowledge unmet healthcare needs as they can lead to significant adverse health effects, increase the burden of disease, and increase expenses for people as well as society as a whole. Therefore, this study will examine the proportion of unmet healthcare needs and factors related to unmet



healthcare needs among Myanmar migrants in Samut Sakhon Province, Thailand.

Andersen's Health Behaviour Model is applied to develop the conceptual framework for this study because it can provide a comprehensive framework for comprehending the factors influencing unmet healthcare needs. It consists of predisposing factors, enabling factors, and need factors. Predisposing factors are age, sex, marital status, or other demographic and social structure characteristics that affect an individual's likelihood of unmet healthcare needs (17). Previous literature mentioned that individuals between the ages of 18 and 44, female, unmarried respondents, and respondents with low education, low income, and language barriers, had higher chances of experiencing unmet healthcare needs compared to their counterparts (3, 18-20).

The term "enabling factors" functions to facilitate service utilization, such as the availability of resources, including accessibility to cost-free services, and the overall availability of these services (31). A study highlighted that immigrants without health insurance had higher rates of unmet healthcare needs than either recent immigrants or citizens with health insurance (20). Moreover, unmet healthcare needs occurred when there were issues with the availability of healthcare services or accessibility challenges such as financial constraints for transportation or inconvenient transportation (18, 21). Regarding accommodation, affordability, and acceptability, unmet healthcare needs arise from not having enough time, inconvenient appointment hours, communication issues, and financial burdens (22, 23). From the perspective of social support, individuals who lacked social support were more likely to experience unmet healthcare needs (24).

Need factors are related to the particular disease profile or underlying health needs that drive people to seek medical attention (25). One study mentioned that, compared to patients with poor health status, those with good self-reported health status were more likely to have an unmet need for outpatient services (1). In addition, a study in Malaysia found that the history of the underlying disease, stroke, was associated with unmet healthcare needs (26)

METHODOLOGY

Study design and study area

This study was a cross-sectional study conducted in Mueang district, Samut Sakhon Province. According to the Foreign Workers Administration Office, 2019, following Bangkok, Samut Sakhon holds the second position in popularity, hosting 239,341 migrant workers (27). The province's economic expansion and industrial development attract substantial migrant labour, making it an ideal location to assess unmet healthcare needs among this population.

Research instrument

Based on a literature review and conceptual framework, data collection was carried out in the study areas by using a structured questionnaire. The questionnaire was translated from English into Myanmar after being reviewed by thesis advisors. The questionnaire was divided into four parts. They are (1) predisposing factors, (2) enabling factors, (3) need factors, and (4) analysis of unmet healthcare needs. The total number of questions is 42. For the measurement of the outcome variable, the question from the survey question of EU Statistics on Income and Living Conditions (EU-SILC) OECD 2020 was adopted (28). "Was there any time during the last 12 months when you needed healthcare for any health concern but did not receive it? The answer will be "yes or no." The answer "yes" will be defined as unmet healthcare need and "no" will be defined as met healthcare needs. Questions about the type of healthcare services needed, the reasons for unmet healthcare needs, and the number of episodes of unmet healthcare needs in the last 12 months were asked of those defined as unmet healthcare needs. Under the enabling factors, participants who have never been to healthcare facilities were not asked about their perception of healthcare services, such as availability, accessibility, accommodation, affordability, and acceptability.

Study population and sample

Myanmar migrants, aged 18 years and above, who can speak Burmese and have been living in Samut Sakhon Province for at least one year at the time of study, were recruited. Myanmar migrants were included as samples in this study rather than Myanmar migrant



workers because healthcare needs exist in every individual regardless of their employment status.

Data collection procedure

The study was approved by the Mahidol University - Central Institutional Review Board (MU-CIRB). The questionnaire was pre-tested and modified based on the results of pilot testing with 30 Myanmar migrants in Samut Sakhon Province. Two research assistants were recruited and trained after pilot testing. The reliability was assessed using Cronbach's alpha, which was 0.89. Myanmar migrants in three clusters were voluntarily selected for face-to-face interviews using a structured questionnaire. Respondents were asked to provide informed consent before the interview.

Statistical analysis

A total of 214 completed datasets of documented migrants were used for preliminary analysis. The data were verified, entered into Excel, and analysed using the IBM Statistical Package for Social Science (SPSS) version 25. Under the enabling factors, variables related to the perception of migrants on availability, accessibility, accommodation, affordability, and acceptability were analysed using data from only 107 participants who had been to health facilities. Descriptive statistics were conducted to describe the characteristics of the participants. Fisher's exact test was performed to identify the associations between

independent variables and dependent variable. Variables that were significant in Fisher's exact test underwent multicollinearity testing to assess correlations among them. Binary logistic regression was conducted to identify predictors of the outcome, which was presented as an odds ratio with a 95% confidence interval.

Ethical Consideration

Ethical approval was approved by MU-CIRB, No. 2024/156.1704, in May 2024. The participant information sheet and informed consent were stated and mentioned along with the questionnaire.

RESULTS

Table 1 presents the characteristics of the participants. Over one-third of the respondents were more than 38 years of age or older. Over half of the participants were female (65.4%), and more than four-fifths (81.3%) were in permanent employment. Approximately one-third of the respondents (26.6%) faced a language barrier, and almost all respondents (98.1%) were enrolled in health insurance. Two-thirds of the employed participants earned a monthly income of more than 9,000 THB. A majority (69.2%) of respondents reported their self-perceived health status as good, and nearly a quarter (24.3%) reported having at least one chronic disease. Moreover, around two-thirds of respondents (67.3%) reported that they had social support.

Table 1 Characteristics of respondents (n=214)

Characteristics	Number	Percent (%)
Age (in years)		
18 - 28	63	29.4
29 - 38	67	31.3
≥ 39	84	39.3
Mean ± SD = 35.99 ± 10.062; Min = 18; Max = 58		
Sex		
Male	74	34.6
Female	140	65.4
Marital status		
Married	158	73.8
Single/Separated/Widow/ Divorced	56	26.2



Characteristics	Number	Percent (%)
Education	93	43.5
Primary school and lower	77	36.0
Middle school	44	20.6
High school and higher		
Type of employment		
No/ Temporary employment	15	7.0
Permanent employment	174	81.3
Self-employment	25	11.7
Language barrier		
Yes	57	26.6
No	157	73.4
Monthly income (Baht)		
≤ 9000	79	36.9
> 9000	135	63.1
Mean ± SD = 10,093.27 ± 2391.014; Min = 4,000; Max = 17,000		
Health insurance		
Yes	210	98.1
No	4	1.9
Self-perceived health status		
Good	148	69.2
Fair and poor	66	30.8
Underlying disease		
Yes	52	24.3
No	162	75.7
Social support		
Yes	144	67.3
No	70	32.7
Ever been to hospital		
Yes	107	50.0
No	107	50.0

Regarding perceptions of healthcare services, over a quarter (28%) had a negative perception of availability, and nearly half (44.9%) had a negative perception of accessibility. In addition, over half of

respondents (52.3%) had a positive perception of accommodation, (56.1%) had a positive perception of affordability, and (60.7%) had a positive perception of acceptability.

Table 2 Association between predisposing factors and unmet healthcare needs (n= 214)

Factor	Unmet Healthcare Needs		Met Healthcare Needs		P-value*
	n	%	n	%	
Age (in years)					
18 – 28	3	4.8	60	95.2	0.384
29 – 38	2	3.0	65	97.0	
≥ 39	1	1.2	83	98.8	



Factor	Unmet Healthcare Needs		Met Healthcare Needs		P-value*
	n	%	n	%	
Sex					
Male	2	2.7	72	97.3	1.000
Female	4	2.9	136	97.1	
Marital Status					
Married	4	2.5	154	97.5	0.653
Single/Separated/Widow/ Divorced	2	3.6	54	96.4	
Education					
Primary school and lower	2	2.2	91	97.8	
Middle school	1	1.3	76	98.7	0.216
High school and higher	3	6.8	41	93.2	
Type of employment					
No employment/temporary employment	0	0.0	15	100.0	
Permanent employment	0	0.0	174	100.0	<0.001**
Self-employment	6	24.0	19	76.0	
Language barrier					
Yes	5	8.8	52	91.2	0.006*
No	1	0.6	156	99.4	
Monthly income (Baht)					
≤ 9000	1	1.3	78	98.7	0.417
> 9000	5	3.7	130	96.3	

Regarding enabling factors, migrants enrolled in health insurance more often reported unmet healthcare needs compared to those without health insurance, although this difference was not statistically significant ($p =$

1.000). Similarly, migrants with a positive perception of affordability of healthcare services reported unmet healthcare needs more often than the other group ($p = 0.693$).

Table 3 Association between enabling factors and unmet healthcare needs

Factor	Unmet Healthcare Needs		Met Healthcare Needs		P-value*
	n	%	n	%	
Health insurance (n= 214)					
Yes	6	2.9	204	97.1	1.000
No	0	0.0	4	100.0	
Social support (n= 214)					
Yes	5	3.5	139	96.5	0.666
No	1	1.4	69	98.6	



Factor	Unmet Healthcare Needs		Met Healthcare Needs		P-value*
	n	%	n	%	
Perception of availability of healthcare services (n= 107)					
Positive	5	6.5	72	93.5	1.000
Negative	1	3.3	29	96.7	
Perception of accessibility of healthcare services (n= 107)					
Positive	5	8.5	54	91.5	0.221
Negative	1	2.1	47	97.9	
Perception of accommodation of healthcare services (n= 107)					
Positive	3	5.4	53	94.6	1.000
Negative	3	5.9	48	94.1	
Perception of affordability of healthcare services (n= 107)					
Positive	4	6.7	56	93.3	0.693
Negative	2	4.3	45	95.7	
Perception of acceptability of healthcare services (n= 107)					
Positive	6	9.2	59	90.8	0.079
Negative	0	0.0	42	100.0	

Regarding need factors, migrants with better self-perceived health status more commonly reported unmet healthcare needs

than those with worse self-perceived health status, even though it was not statistically significant ($p = 0.669$).

Table 4 Association between need factors and unmet healthcare needs (n= 214)

Factor	Unmet Healthcare Needs		Met Healthcare Needs		P-value*
	n	%	n	%	
Self-perceived health status					
Good	5	3.4	143	96.6	0.669
Fair and poor	1	1.5	65	98.5	
Underlying disease					
Yes	2	3.8	50	96.2	0.634
No	4	2.5	158	97.5	

**Table 5** Related factor of Unmet healthcare needs

Predictor	Adjusted OR	Crude OR	Lower	Upper	P-value
Language barrier					
No	1				
Yes	12.353	15.000	1.342	113.706	0.026

DISCUSSION

The proportion of unmet healthcare needs among documented Myanmar migrants was 2.8%, among this, 17% needed screening and treatment for non-communicable diseases, and 83% needed treatment for common illnesses. The percentage of unmet healthcare needs is slightly over the annual prevalence of unmet healthcare needs among Thais (2.5%). However, higher proportions of unmet healthcare needs were observed in previous studies; 23.6% of the general population in Myanmar, and 18% in Vietnam (18, 23, 29).

Regarding predisposing factors, the younger age group reported unmet healthcare needs more frequently than their counterparts, although there was no statistically significant difference ($p = 0.384$). Similarly, previous studies mentioned that individuals between the ages of 18 and 44 had an increased risk of experiencing unmet healthcare needs (18). Moreover, female migrants more commonly reported unmet healthcare needs than males ($p = 1.000$). This finding was aligned with another study where female participants had a 2.7 times higher chance of experiencing unmet healthcare needs compared to male counterparts (18). This was also supported by prior literature in Myanmar, which indicates that females who are generally dependent and responsible for household matters often face issues travelling to healthcare facilities independently (18).

The present study indicated that migrants who completed high school and higher more often reported unmet healthcare needs compared to their counterparts ($p = 0.216$). The reason could be that migrants with higher education have higher expectations of healthcare services. It was noted that migrants who completed higher education had a lower percentage of positive perceptions of accommodation and acceptability of healthcare services compared to their counterparts. In contrast, another study revealed that the highest prevalence of unmet healthcare needs was found among respondents with low education (18). This could be due to lower health

awareness and knowledge regarding available healthcare services.

Likely, self-employed migrants showed a higher probability of unmet healthcare needs probably due to a lack of time among self-employed migrants to go and consult with healthcare personnel. It was supported by previous studies that self-employed migrants might neglect their healthcare needs due to income constraints and a lack of time because the income of an individual in self-employment is often directly linked to their ability to work compared to that of a wage worker (30, 31). However, a study in Myanmar indicated that daily-waged workers were more likely to experience unmet healthcare needs compared to self-employed or dependent workers due to a lack of time to visit healthcare facilities and inconvenient operation hours of healthcare facilities (18).

In this study, the language barrier was identified as a significant factor associated with unmet healthcare needs. A similar pattern was found in a Korean study among migrants. Poor and inadequate communication between patients and providers was caused by language barriers (22). Moreover, a study in Canada among migrants found that unmet healthcare needs occurred when migrants struggled to follow the conversation with healthcare personnel because of language barriers. It was mentioned that even with an interpreter, language barriers made it difficult and slow for patients to communicate with doctors and hindered them from speaking up for themselves (32).

Regarding enabling factors, previous research indicated that immigrants without health insurance had higher rates of unmet healthcare needs than either recent immigrants or citizens with health insurance (20). Nonetheless, our study found that respondents who enrolled in health insurance reported unmet healthcare needs tends to more frequently than uninsured migrant ($p = 1.000$). A slightly higher percentage of younger age groups and those with good health perceived



health statuses were found in insured migrants compared to uninsured groups. Noticeably, all migrants enrolled in health insurance had negative perceptions of the accommodation and acceptability of healthcare services. There may be issues related to accommodation and acceptability among insured migrants although they can receive healthcare services from registered hospitals with full coverage of health insurance. The barriers were “long waiting times” and “uncomfortable discussing health problems with interpreters and health personnel.” As a result, migrants had limited access to necessary healthcare services and experienced unmet healthcare needs.

This study identified that migrants with a positive perception of affordability of healthcare services more often reported unmet healthcare needs compared to those with a negative perception ($p = 0.693$). The reasons behind this were inconvenience of operation hours, appointment system, and long waiting hours regarding accommodation. A similar finding was found in one study among migrants, indicating that obstacles for migrant workers included time constraints in making appointments with doctors for their healthcare needs (22). Moreover, they were dissatisfied with the services and communication provided by interpreters and healthcare personnel at the public hospitals where they were registered. A study in Vietnam confirmed this finding; 16% of unmet healthcare needs were due to communication issues with healthcare providers regarding the acceptability issue (23). Our finding was aligned with the concept of the “5As of Access” by Penchansky. There will not be a significant improvement in access to healthcare services if one of the domains among them is unimproved (16).

Relating to need factors, it was indicated that migrants with better self-perceived health status more frequently reported unmet healthcare needs than those with worse self-perceived health status, even though it was not statistically significant ($p = 0.669$). This could be due to migrants ignoring health risks and seeking necessary healthcare services only when they are seriously ill, due to concerns about the daily wage reduction. This finding was aligned with another study reporting that patients with good self-reported health status were more likely to have an unmet

need for outpatient services compared to those with poor health status (1).

CONCLUSIONS AND RECOMMENDATIONS

The proportion of unmet healthcare needs among documented Myanmar migrants is 2.8%. Language barriers can predict unmet healthcare needs among documented migrants. Therefore, disseminating information about availability of migrant volunteers at health facilities among Myanmar migrants can ease this challenge. Lastly, it is encouraged to provide health promotion awareness to migrants through employers or community-based organizations to increase awareness of their health status and reduce unmet healthcare needs.

STRENGTHS AND LIMITATIONS

One of the strengths of this study is that it cooperates with individual-level and community-level factors, including perceptions of the distribution of healthcare facilities, healthcare personnel, and healthcare services. Another strength is that this study also included types of needed healthcare services for respondents who experienced unmet healthcare needs. This can be a clue for developing needed healthcare delivery interventions among Myanmar migrants.

As for limitations, it was a cross-sectional study, could capture a snapshot at a certain point in time, and could provide causality between factors and unmet healthcare needs. Secondly, this study relied on self-reported data, which can be subjective depending on the individual. Therefore, further qualitative research is recommended among Myanmar migrants to fill the gap.

CONFLICT OF INTEREST

There is no conflict of interest.

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OPTIMIZATION OF MULTI-KINASE INHIBITOR ENCAPSULATED POLYMERIC NANOPARTICLES FOR POTENTIAL THERAPY OF HEPATOCELLULAR CARCINOMA

Mattika Thaweessuvannasak¹, Nathachit Limjunyawong^{1,3}, Vorapan Sirivatanauksorn¹,
Chatchawan Srisawat¹, Primana Punnakitikashem^{1,2*}

¹ Department of Biochemistry, Faculty of Medicine Siriraj Hospital, Mahidol University, Thailand

² Siriraj Center of Research Excellence in Theranostic Nanomedicine, Faculty of Medicine Siriraj Hospital, Mahidol University, Thailand

³ Siriraj Center of Research Excellence in Allergy and Immunology, Faculty of Medicine Siriraj Hospital, Mahidol University, Thailand

***Corresponding Author:** Primana Punnakitikashem, Department of Biochemistry, Faculty of Medicine Siriraj Hospital, Mahidol University, Thailand, E-mail: primana.pun@mahidol.ac.th

ABSTRACT

Introduction: Hepatocellular carcinoma (HCC) is the most common liver cancer and the third leading cause of cancer-related deaths worldwide. Lenvatinib, a multi-targeted tyrosine kinase inhibitor, has been recently FDA-approved as a first-line treatment for HCC. However, its clinical use is limited by poor solubility and low bioavailability. Thus, developing nanocarriers is essential for sustained drug delivery to HCC cells. Polymeric nanoparticles have shown promise in drug delivery, particularly those comprising biodegradable, biocompatible, and non-toxic polymers.

Objectives: Herein, our study aims to develop and optimize a drug delivery system utilizing lenvatinib encapsulated polymeric nanoparticles. We hypothesized that this system can sustainably release and significantly inhibit HCC progression.

Objectives: Lenvatinib encapsulated polymeric nanoparticles were synthesized by emulsification solvent evaporation, optimizing drug encapsulation efficiency by varying the ratio of drug and nanoparticles. Nanoparticles were characterized for size and zeta potential through dynamic light scattering and observed the morphology by transmission electron microscopy. To investigate cellular uptake, fluorescent marker coumarin 6 was encapsulated in polymeric nanoparticles for measurement and visualization. CellTiter-Blue® cell viability assay was performed to determine the cytotoxic effect on HCC cells in vitro.

Results: This finding showed that different ratio of drug and nanoparticles affected encapsulation efficiency, but not nanoparticle size and zeta potential. The nanoparticles had average hydrodynamic diameters of 203-215 nm, a negative charge, and a spherical shape. Lenvatinib was encapsulated with a maximum efficiency of 57.09±9.59%. In vitro studies showed that nanoparticles encapsulated with coumarin 6 demonstrated efficient uptake by HCC cells in a time-dependent manner. Furthermore, lenvatinib encapsulated polymeric nanoparticles significantly reduced cell viability in HCC cells compared to the control.

Conclusion: In summary, our finding presents a promising strategy using lenvatinib-encapsulated polymeric nanoparticles as a novel drug delivery system for the targeted therapy of HCC.

Keywords: Primary care, Service plan, Chronic Kidney Disease, Public Health Center

INTRODUCTION

In 2020, liver cancer ranked the third largest cause of cancer-related death worldwide (1, 2). Hepatocellular carcinoma (HCC) is the most common type of liver cancer, accounting for 90% of all cases and causing at least 500,000 deaths annually. In general, HCC occurs more frequently in men, and its

mortality rate is currently increasing (3). Various therapy approaches for HCC have been investigated, but traditional surgery and other locoregional treatments have limited clinical utility (4, 5). Chemotherapy is regarded as one of the most effective therapies when administered early and appropriately (6). Tyrosine kinase inhibitors (TKIs) have



emerged as a promising targeted therapy approach. Between 2017 and 2019, the United States Food and Drug Administration (FDA) approved lenvatinib (LEN) as the first-line treatment for HCC (7).

LEN, an oral multi-kinase inhibitor, targets vascular endothelial growth factor receptor (VEGFR) 1-3, fibroblast growth factor receptor (FGFR) 1-4, platelet-derived growth factor receptor alpha (PDGFR- α), rearranged during transfection (RET), and c-Kit proto-oncogene (c-Kit). It has demonstrated significant improvements in overall survival compared to sorafenib. It has shown significant advantages in overall survival over sorafenib. However, due to its hydrophobicity, oral administration is the only practical alternative, resulting in a short half-life. To improve chemotherapy efficacy in cancer treatment, an effective therapeutic strategy is required.

Therefore, we have applied an alternative approach by utilizing a drug delivery system to improve drug efficacy, extend drug half-life, and target HCC cells specifically. The development of drug-nanocarriers is essential to overcome the challenges associated with chemo-therapeutic drugs. Poly(lactic-co-glycolic) acid (PLGA) nanoparticles (NPs), a copolymer of lactic and glycolic acids, represent one type of inorganic nanoparticle. The FDA has approved PLGA NPs for drug delivery. Due to their superior biocompatibility and safety, PLGA NPs receive extensive attentions and are widely used as drug nanocarriers to deliver chemotherapeutic drugs to targeted cancer cells (8, 9). These nanoparticles offer several advantages over free drugs, including prolonged half-life, controlled release of drugs, and preferential accumulation at cancer sites (6, 10, 11). In recent years, PLGA NPs have been developed to encapsulate chemotherapeutic drugs for HCC treatment. Studies have shown that drug-loaded PLGA NPs exhibit a robust cytotoxic effect on HCC cells, demonstrating a more significant cancer cell-killing effect than free drugs. Moreover, published work suggests that (1) orafenib-encapsulated PLGA nano-carriers, as another first-line TKI for HCC treatment aimed at enhancing drug delivery in liver cancer cells, exhibited significantly lower viability compared to those treated with free sorafenib. This suggests that using nanocarriers can enhance TKI delivery for cancer treatment (1).

In this study, our purpose was to develop a novel drug delivery system, aiming to target HCC cells and enhance their cytotoxic effects. This system, designated as LEN-NPs, was prepared and optimized using a single emulsion-solvent evaporation method. These LEN-NPs were characterized by size, zeta potential, polydispersity index (PDI), drug encapsulation efficiency (EE) and morphology. Furthermore, we investigated the cellular uptake and cytotoxic effects of LEN-NPs on HCC cell progression in vitro.

METHODOLOGY

Cell Line

Human hepatocellular carcinoma cell line HuH7 (CLS, Eppelheim, Deutschland) was cultured in low glucose DMEM supplemented with 10% (v/v) fetal bovine serum (FBS) and 1% (v/v) penicillin-streptomycin, and incubated at 37°C and 5% CO₂.

Nanoparticle Synthesis

LEN-NPs developed by a single emulsion-solvent evaporation method (oil emulsion in water (O/W)) were prepared as follows: LEN and PLGA powder were dissolved in dichloromethane (oil phase) with the ratio of 1:10, 1:12 and 1:36 (w/w) or coumarin 6 (Cou6) powder with the ratio of 1:15 (w/w) (12, 13). This solution (oil phase) was added dropwise into 2% (w/v) poly(vinyl alcohol) (PVA) (water phase). The mixture was sonicated for 10 min at a 20% amplitude according to the one sec-on and one sec-off sequence (Cole-Parmer, US). The resulting emulsion was continuously stirred at room temperature for 4 h to allow complete evaporation of dichloromethane. Produced NPs were collected by centrifugation at 17,000 rpm for 20 min twice (Thermo Fisher Scientific, US) (14). Finally, NPs were lyophilized at standard conditions for 24 h and stored at -20°C until further use.

Physical characterization of nanoparticle properties

Nanoparticle size, zeta potential and polydispersity index (PDI) were analyzed by dynamic light scattering (DLS) (Malvern Instruments, UK). The nanoparticle morphology was observed under transmission electron microscope (TEM) (Minato-ku, Tokyo, Japan). The drug encapsulation



efficiency (EE) of LEN-NPs was determined using UV–visible spectrophotometry at 250 nm (BioTek Instruments, Winooski, VT, US).

Cytotoxicity assay of NPs

The cytotoxic effect of NPs was measured by CellTiter-Blue® cell viability assay. The defined concentrations of LEN-NPs (31.25-125 µg/mL), containing free LEN at 6.25-25 µM, respectively, were tested with HCC cells for 24 h. After treatment, the mixture of DMEM and CellTiter-Blue reagent (10:1) (v/v) was prepared and added to each well. Then, the plate was incubated at 37°C for 2 h. The samples were measured by spectrofluorometry at an excitation wavelength of 545/40 nm and an emission wavelength of 590/20 nm (BioTek Instruments, Winooski, VT, US).

Statistical Analysis

Data analyses were conducted by a one-way analysis of variance (ANOVA) with the Tukey's multiple comparisons test using GraphPad Prism (GraphPad, CA, USA, version 8.0.2) to identify significant differences between groups, and $P < 0.05$ will be considered as a statistically significant.

RESULTS AND DISCUSSION

As demonstrated in Table 1, the nanoparticle size, polydispersity index (PDI) and zeta potential of NPs were measured by DLS. The average hydrodynamic size of unloaded-NPs was 203.00 ± 22.90 nm. After drug encapsulation, resulting in LEN-NPs at all ratios, the mean nanoparticle size was larger than that of unloaded-NPs with the size of 215.00 ± 28.80 nm, 215.00 ± 22.80 nm, and 209.00 ± 29.40 nm for ratios 1:10, 1:12, and 1:36, respectively. All synthetic NPs exhibited negative surface charges, with zeta potentials of -12.80 ± 0.85 mV (unloaded-NPs), -14.90 ± 0.35 mV (LEN-NPs 1:10), -12.40 ± 0.58 mV (LEN-NPs 1:12), and -13.00 ± 1.69 mV (LEN-NPs 1:36). Moreover, the size distribution of unloaded-NPs (PDI = 0.36 ± 0.03) was slightly narrower than that of LEN-NPs (1:10) (PDI = 0.45 ± 0.12), whereas LEN-NPs at the ratio of 1:12 and 1:36 did not show a significant difference (PDI = 0.24 ± 0.04 and 0.26 ± 0.09), and their PDI values were much narrower than those of unloaded-NPs and LEN-NPs (1:10). Morphological analysis of NPs determined by

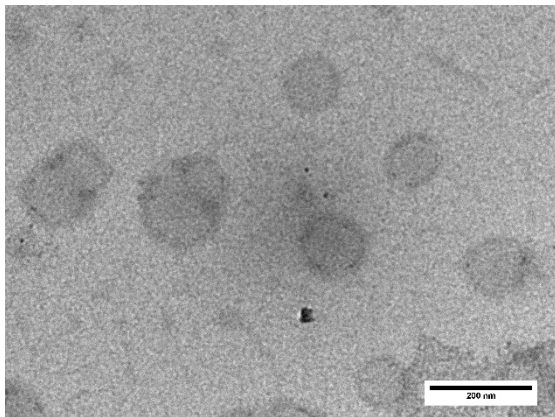
TEM showed that unloaded-NPs were uniformly distributed spherical shape of nanoparticle with a size around 160 nm (Figure 1). These physicochemical properties of NPs were consistent with the previous studies of Lee et al. (14) and Amin et al. (15), which synthetic PLGA NPs synthesized using O/W method exhibited a smooth spherically shaped nanoparticles observed by TEM, and presented the nanoparticle size of ~200 nm by DLS and ~165 nm by TEM with a negative surface charge (-12 mV) and low PDI less than 0.4. Furthermore, a PDI value below 0.5 generally indicates nearly monodispersed nanoparticles, which is acceptable for polymeric nanoparticles (15, 16).

The encapsulation efficiency (EE) values, determined by UV–visible spectrophotometry, are presented in Table 1. For LEN-NPs, the EE was $57.09 \pm 09.59\%$ for the 1:10 ratio, $21.36 \pm 1.52\%$ for the 1:12 ratio, and $25.38 \pm 1.63\%$ for the 1:36 ratio. LEN-NPs at the 1:10 ratio demonstrated significantly higher drug encapsulation efficiency compared to other ratios, indicating efficient encapsulation of LEN with an EE exceeding 55%, which is consistent with findings from Soltani's study (13). The process parameter, such as polymer concentration, was determined to achieve optimal processing conditions based on this manufacturing technique. Increasing polymer (PLGA) concentration likely raises the viscosity of the solution, leading to poorer dispersion of the PLGA in the water phase (PVA). At higher PLGA concentration in the ratio of 1:10 (LEN:NPs), the polymer concentration influences the solution's viscosity. Increased viscosity can slow drug diffusion out of the nanoparticles during preparation, thereby enhancing encapsulation efficiency (13). As a result, this process may lead to the formation of a uniform population of nanoparticles with a mean diameter of approximately 215.00 nm (PDI <0.5) and improved encapsulation efficiency, as evidenced by efficiencies ranging from 21% to 25% for LEN:NPs ratios of 1:12 and 1:36, and increasing to 57% for the LEN:NPs ratio of 1:10(13). This suggests that the optimized drug-to-polymer ratio in the LEN-NPs was 1:10

**Table 1** DLS measurement and %EE of nanoparticles

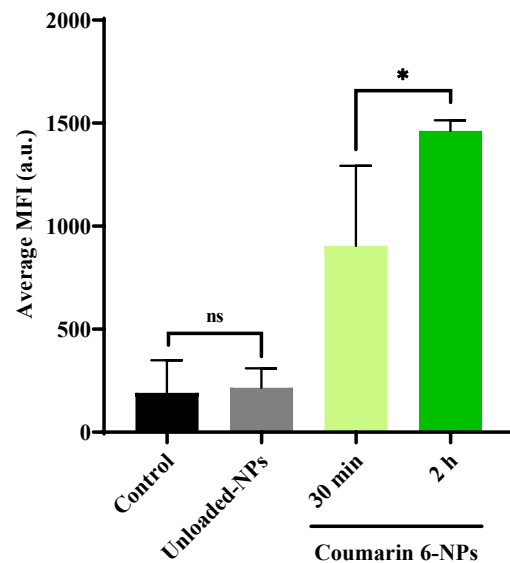
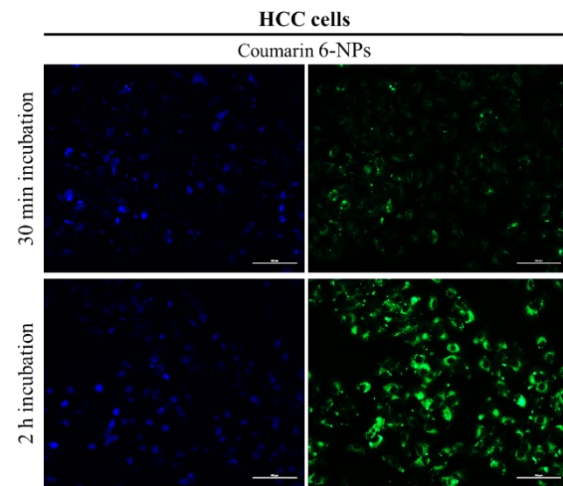
NPs	D _h (nm)	PDI	ZP (mV)	EE (%)
Unloaded-NPs	203.00 ± 22.90	0.36 ± 0.03	-12.80 ± 0.85	-
Cou6-NPs	200.56 ± 31.20	1.12 ± 0.18	-21.00 ± 0.61	21.43 ± 0.79
LEN-NPs (1:10)	215.00 ± 28.80	0.45 ± 0.12	-14.90 ± 0.35	57.09 ± 09.59
LEN-NPs (1:12)	215.00 ± 22.80	0.24 ± 0.04	-12.40 ± 0.58	21.36 ± 1.52
LEN-NPs (1:36)	209.00 ± 29.40	0.26 ± 0.09	-13.00 ± 1.69	25.38 ± 1.63

D_h: average hydrodynamic diameter; PDI: polydispersity index; ZP: zeta potential; EE: encapsulation efficiency; Unloaded-NPs: unloaded polymeric nanoparticles; Cou6-NPs: coumarin 6 encapsulated polymeric nanoparticles; LEN-NPs: lenvatinib encapsulated polymeric nanoparticles.

**Figure 1** TEM image of unloaded-NPs under 50k magnification. The scale bar represents 200 nm.

To investigate the cellular uptake of NPs by HCC cells, we encapsulated coumarin 6 (Cou6), a fluorescent maker, into NPs. We then cultured the Cou6 loaded NPs (Cou6-NPs) with HCC cells for 30 min and 2 h, and observed their endocytosis by HCC cells with inverted fluorescence microscope and flow cytometry as shown in Figure 2. In this study, cell nuclei were stained in blue by DAPI staining, while green dots represented fluorescently labeled NPs by Cou6. Cells cultured with Cou6-NPs displayed efficient

uptake in time-dependent manner, which cells showed greater fluorescence intensity at 2 h incubation than at 30 min incubation (Figure 2). As represented in Figure 2A, this finding indicated that NPs were located in the cellular cytoplasm, and thus could have a stronger effect of chemotherapeutic drug on the cancer cells than free drug (10). Moreover, flow cytometric analysis also confirmed this time-dependent uptake (Figure 2B). Our results were consistent with previous studies of Caputo et al. (1), Tang et al. (10), and Gaonkar et al. (17).

**Figure 2** (A) In vitro cellular uptake of coumarin 6-NPs by HCC cells after 30 min and 2 h incubation, DAPI (blue) and coumarin 6 (green). Bar: 100 μ m. (B) flow cytometric analysis. Control: untreated control. *P < 0.05



were considered significant. ns: not significant. Fluorescence coumarin 6 (cou6) marker is detected at 460 nm for excitation, and 500 nm for emission.

The cytotoxic effects of unloaded-NPs, free LEN and LEN-NPs were evaluated by CellTiter-Blue® cell viability assay. The results represented that HCC cell viability after the treatment of blank NPs (unloaded-NPs) showed no significant difference compared to control as shown in Figure 3. As the assessment of cytotoxicity level according to ISO 10993-5:2009 (18) indicated that PLGA NPs have a slightly toxic effect on the HCC cells, but their cell viability remained high (over 80%), suggesting a healthy culture and indicating cytocompatibility. Treatment with free LEN and LEN-NPs resulted in a concentration-dependent cytotoxicity, with LEN-NPs showing significantly stronger cytotoxic effects on HCC cells than free LEN at all concentrations as represented in Figure 3. This indicated the potential of encapsulated therapeutics, and corresponded to Caputo's work (1), which reported that drug loaded PLGA NPs induce a significant increase in cytotoxic effect compared to cells treated with free drug.

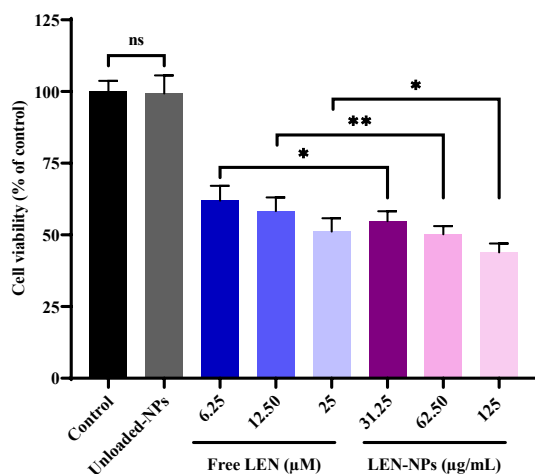


Figure 3 Cytotoxic effect on HCC cell viability after 24 h incubation with unloaded-NPs, free LEN and LEN-NPs at 37°C. Control: untreated control. **P < 0.005 and *P < 0.05 were considered significant comparison between free LEN and LEN-NPs. ns: not significant.

CONCLUSIONS

Overall, the novel lenvatinib-encapsulated polymeric nanoparticles (LEN-

NPs) were successfully developed for targeted therapy of HCC. These synthetic NPs exhibited high encapsulation efficiency, making them suitable for drug delivery system. LEN-NPs efficiently targeted HCC cells in vitro, with cellular uptake increasing over time. In vitro cytotoxic effect of LEN-NPs indicated that LEN-NPs achieved a potential anticancer effect, reducing cell viability more effectively than free LEN. As our results, the polymeric nanocarriers should be considered for the promising drug delivery system of HCC treatment.

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DEVELOPMENT OF MESOPOROUS SILICA NANOPARTICLES COATED WITH PH-RESPONSIVE POLYMERS AND ENCAPSULATED WITH KINASE INHIBITOR FOR THE TREATMENT OF COLORECTAL CARCINOMA

Kornrawee Srichan¹, Nathachit Limjunyawong^{1,3}, Vorapan Sirivatanauksorn¹,
Chatchawan Srisawat¹, Primana Punnakitikashem^{1,2,*}

¹ Department of Biochemistry, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok 10700, Thailand

² Siriraj Center of Research Excellence in Theranostic Nanomedicine, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok 10700, Thailand

³ Center of Research Excellence in Allergy and Immunology, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, 10700, Thailand

*Corresponding Author: Primana Punnakitikashem, Department of Biochemistry, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok 10700, Thailand, E-mail: primana.pun@mahidol.ac.th

ABSTRACT

Introduction: Colorectal carcinoma (CRC) is a cause of cancer-related deaths worldwide. Dysregulated epidermal growth factor receptor (EGFR) related to the mitogen-activated protein kinases (MAPK) signaling pathway is the leading cause of CRC development. Current treatments for CRC, including surgery, radiotherapy, and chemotherapy, have severe side effects. Therefore, targeted therapy is a promising alternative for CRC treatment. Encorafenib (En), a small-molecule drug that inhibits the MAPK signaling pathway, has demonstrated potential as a targeted therapy for CRC, but it has been limited to drug degradation. Thus, mesoporous silica nanoparticles (MSNs) coated with carboxymethyl chitosan (CMC) have many properties, such as large pore volumes and tunable pore sizes, and are used as gatekeepers to protect the drug from leakage during circulation in the body. **Objectives:** This study aims to develop a drug delivery system for CRC treatment using encorafenib-loaded MSNs coated with carboxymethyl chitosan (En@MSNs-CMC). The system is proposed to increase drug accumulation in cancer cells and enhance the therapeutic efficacy of the drug, leading to improved clinical outcomes for CRC patients.

Methodology: MSNs demonstrated uniform spherical morphology with a size in the range of 70–90 nm. Moreover, the hydrodynamic size of unloaded nanoparticles (MSNs and MSNs-CMC) and encorafenib-loaded nanoparticles (En@MSNs and En@MSNs-CMC) was 115–320 nm. Next, encapsulation efficiency of En was approximately 90%. Cytotoxicity on CRC cells exposed to unloaded nanoparticles indicated no significant impact on cell viability, as determined by CellTiter®-Blue Cell Viability Assay. Furthermore, nanoparticles were internalized by CRC cells, which were observed by inverted fluorescence microscopy. In addition, En@MSNs-CMC demonstrated enhanced efficacy in inhibiting CRC cells compared to the control group.

Conclusion: These results suggest that mesoporous silica nanoparticles coated with carboxymethyl chitosan improve drug delivery performance and provide a therapeutic drug delivery system for efficient CRC therapy.

Keywords: Colorectal cancer, MAPK inhibitor, Mesoporous silica nanoparticles, carboxymethyl chitosan

INTRODUCTION

Colorectal carcinoma (CRC) is a cancer that develops from the epithelial cells in the colon or rectum and is a cause of cancer death worldwide. Because of advances in diagnostics in recent years, most patients are

found in late stages with metastases, resulting in one of the most severe oncologic diseases. Therefore, it is important to develop effective therapeutic strategies to improve the treatment of CRC patients (1).



One of the major causes of CRC is related to the epidermal growth factor receptor (EGFR), which involves the mitogen-activated protein kinase (MAPK) pathway. The dysregulated MAPK pathway can cause increased growth, proliferation, survival, and metastasis of cancer cells (2).

Currently, surgery combined with radiotherapy and chemotherapy is the main treatment for CRC. However, these chemotherapies have many side effects, such as killing healthy cells (3). Thus, targeted therapy is a promising new option for CRC treatment because targeted therapy involves the use of drugs that specifically target pathways involved in cancer development (4). Encorafenib, a targeted small-molecule drug, has shown potential as an ATP-competitive RAF kinase inhibitor that inhibits the MAPK signaling pathway, affecting cellular processes such as differentiation, proliferation, and apoptosis (5). Encorafenib has been approved for use in CRC treatment, but its clinical efficacy is limited due to issues with drug delivery, such as high dosages and drug degradation (6).

To overcome these challenges, nanoparticles are essential for drug delivery. Mesoporous silica nanoparticles (MSNs) have unique properties, such as large pore volume, tunable pore size, and biocompatibility, which are appropriate for nanocarriers. Moreover, MSNs can be modified with gatekeepers, such as polymers to control drug release and prevent premature release (7). Therefore, carboxymethyl chitosan (CMC) is a material for modifying MSNs due to its biodegradability, nontoxicity, good water solubility, and use as a gatekeeper to protect drug release (8).

Therefore, this research aims to develop a drug delivery system for treating CRC using encorafenib-loaded MSNs coated with carboxymethyl chitosan (En@MSNs-CMC). By releasing the drug into CRC cells, it inhibited the MAPK signaling pathway, resulting in CRC cell suppression. This might improve therapy effectiveness for CRC patients.

METHODOLOGY

Synthesis and characterization of nanoparticles (NPs) Synthesis of MSNs

Firstly, 5% (w/v) of CTAB and 0.6% (w/v) of TEA were mixed at 95 °C under a

stirring rate of 200 rpm for 1 hour. Then, TEOS was added. After stirring for 1 hour, the as-synthesized MSNs were collected. The solution was centrifuged at 13,870.08 x g for 10 min and then washed with ethanol to remove the residual reactants twice. Next, the as-synthesized MSNs were refluxed in a mixed solution containing 12 mL of ethanol and 1.5 mL of hydrochloric acid at 60 °C under a stirring rate of 200 rpm for 4 hours. The as-synthesized MSNs were washed with 12 mL of ethanol three times. The same operation was repeated twice. The final product was dried by incubation at 70 °C for 24 hours (9).

Synthesis of amine-functionalized MSNs (MSNs-NH₂)

Briefly, MSNs were mixed with aminopropyltriethoxysilane (APTES) in 1.5 mL of milli-Q water (ratio 2:1). The mixture was stirred at 200 rpm for 24 hours. After that, MSNs-NH₂ were collected and centrifuged at 13,870.08 x g for 10 min to remove the residual reactants. Next, milli-Q water was added to the sample, and followed by centrifugation at 13,870.08 x g for 10 min to wash the sample. Subsequently, the MSNs-NH₂ was incubated at 70 °C for 24 hours.

Loading of encorafenib into amine-functionalized MSNs (En@MSNs-NH₂)

Encorafenib 1 mg/mL was prepared in milli-Q water, and 1 mg/mL of MSNs was prepared in milli-Q water. Next, the solution was mixed and stirred at 200 rpm for 24 hours. Next, En@MSNs-NH₂ was collected by centrifugation at 13,870.08 x g for 10 min. The sample was washed with milli-Q water and incubated at 70 °C for 24 hours.

MSNs coated carboxymethyl chitosan (MSNs-CMC)

Firstly, 5% (w/v) of CMC was mixed with EDC and sulfo-NHS (ratio 1:1) overnight. The CMC solution was centrifuged at 13,870.08 x g for 5 min, and followed by removing the supernatant. CMC was resuspended with milli-Q water and centrifuged at 13,870.08 x g for 5 min to remove the supernatant and redispersed in milli-Q water. After that, 5 mg of MSNs-NH₂ was dispersed in 0.5 mL of milli-Q water. Then, MSN-NH₂ solution was added to the activated CMC solution in a ratio 1:1 and stirred for 2 hours.



Next, the solution was centrifuged at 13,870.08 x g for 10 min to obtain MSNs-CMC. The sample was incubated at 70 °C for 24 hours. Moreover, encorafenib-loaded MSNs-CMC (En@MSNs-CMC) was prepared by using the same protocol.

Characterization of materials

The materials were prepared before being evaluated with standard techniques. Transmission electron microscopy (TEM) images and field emission scanning electron microscopy (FE-SEM) images were performed to observe the morphology of materials. Zetasizer was used to measure hydrodynamic size, zeta potential, and polydispersity index (PDI).

Percent encapsulation efficiency of encorafenib-loaded nanoparticles

UV/Vis spectrophotometer was used to measure the absorbance of encorafenib at the wavelength of 320 nm to calculate encapsulation efficiency (%EE). This experiment detects an indirect method by measuring the supernatant of nanoparticles.

In vitro cell studies

Cell culture

HT29 cells were used as colorectal carcinoma cell line (ATCC, Virginia, USA) in this experiment and cultured in McCoy's medium with 10% fetal bovine serum (FBS) and 1% penicillin-streptomycin. This cell line was incubated at 37 °C in a 5% CO₂ incubator for 24 hours.

Cytotoxicity of unloaded and encorafenib-loaded mesoporous silica nanoparticles coated with carboxymethyl chitosan on HT29 cell viability

MSNs related to CRC were evaluated using the CellTiter®-Blue Cell Viability Assay. Briefly, HT29 cells were seeded at a density of 10,000 cells/well of 96-well plates and incubated at 37°C in a 5% CO₂ incubator for 24 hours. Then, MSNs at concentrations of 0, 3.125, 6.25, 12.5, 25, 50, 100, and 200 μg/mL were treated in HT29 cells for 24, 48, and 72 hours. After that, the treated cells were tested using the CellTiter®-Blue Cell Viability Assay and incubated at 37 °C in a 5% CO₂ incubator for 2 hours. Finally, treated cells were measured

the fluorescence intensity using a microplate reader.

After that, nontoxicity concentrations of MSNs were selected to optimize the concentration of En@MSN-CMC to evaluate cytotoxicity using the same method.

Cell internalization of Cou@MSNs-CMC on HT29 cells

Qualitative cell internalization of Cou@MSNs-CMC was verified by using inverted microscopy. Firstly, HT29 cells were seeded at a density of 100,000 cells/well in 24-well plates and incubated at 37 °C in a 5% CO₂ incubator for 24 hours. Then, MSNs-CMC and Cou@MSN-CMC

Coumarin-6 (Cou) served as an encorafenib representative because Cou has a similar molecular weight to encorafenib, which is 350.44 g/mol for Cou and 540.39 g/mol for encorafenib. Both Cou and En exhibited hydrophobic properties that encapsulated nanoparticles by using the same method. Cou-loaded nanoparticles were treated in the cells for 4 hours. Next, treated cells were washed with PBS twice and fixed with 4% paraformaldehyde at room temperature for 10 minutes. After that, the paraformaldehyde was discarded, and the cells were washed with PBS twice. The nuclei of cells were stained with 100 nM DAPI for 5 minutes, and then the cells were washed with PBS twice. Finally, the cells were added to PBS to prevent them from drying out and observed under an inverted microscope. Furthermore, coumarin-6 showed green fluorescence with an excitation peak of 457 nm and an emission peak of 501 nm (10). As a result, we chose Cou-loaded nanoparticles to study their cellular uptake using inverted microscopy to determine their fluorescence intensity in CRC cells (11).

RESULTS AND DISCUSSION

Characterization of nanoparticles (NPs)

MSNs were successfully synthesized, and the morphology of unloaded MSNs was observed by using TEM and FE-SEM, as shown in Figure 1. TEM images presented more porosity, as illustrated in Figure 1 (left). This result corresponds to the study of Xun et al., which showed more porosity of unloaded MSNs (12). While FE-SEM images revealed a homogeneous distribution, a spherical shape, and a rough surface, as shown in Figure 1



(right). This result was consistent with the previous study that revealed the rough surface of MSNs (13).

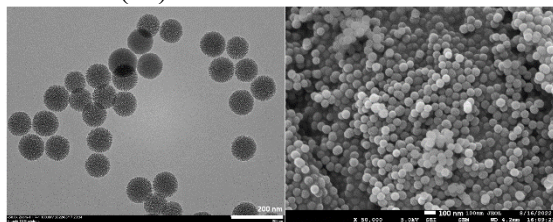


Figure 1 Morphology of unloaded MSNs by TEM and FE-SEM techniques. TEM image, Scale bar: 200 nm (left) and FE-SEM image, Scale bar: 100 nm (right) of MSNs.

Moreover, the size distribution of unloaded MSNs showed a diameter of 70.00–90.00 nm, as shown in Figure 2. This result was consistent with Xun et al., which MSNs demonstrated that the size of MSNs was 50–100 nm (12).

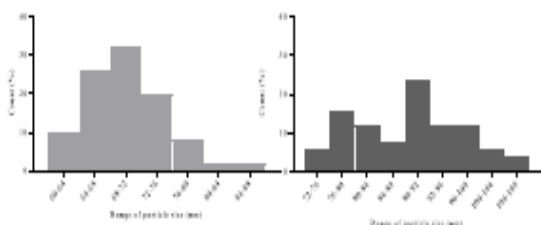


Figure 2 Particle size distribution of unloaded MSNs. MSNs size distribution obtained from TEM images (left) and FE-SEM images (right).

Table 1 Hydrodynamic size, zeta potential, polydispersity index, and percent encapsulation efficiency

	Hydrodynamic size (nm)	Zeta potential (mV)	PDI
MSNs	114.48 ± 2.69	-11.80 ± 0.21	0.22 ± 0.12
MSNs-CMC	271.33 ± 12.54	-28.30 ± 3.28	0.19 ± 0.20
En@MSNs	112.56 ± 13.48	-10.34 ± 0.48	0.25 ± 0.19
En@MSNs-CMC	252.98 ± 20.61	-30.57 ± 4.79	0.24 ± 0.26
Cou@MSNs-CMC	414.77 ± 47.62	-40.00 ± 0.80	0.69 ± 0.16

The hydrodynamic size, zeta potential, and PDI of unloaded and encorafenib-loaded nanoparticles were measured by Zetasizer. The hydrodynamic size of unloaded MSNs was 114.48 ± 2.69 nm with a PDI of 0.22 ± 0.12,

and a zeta potential of -11.80 ± 0.21 mV. Then, the hydrodynamic size of unloaded MSNs@CMC was 271.33 ± 12.54 nm with a PDI of 0.19 ± 0.20, and a zeta potential of -28.30 ± 3.28 mV. In the case of encorafenib-loaded nanoparticles, the hydrodynamic size of En@MSNs was 112.56 ± 12.48 nm with a PDI of 0.25 ± 0.19, and a zeta potential of -10.34 ± 0.48 mV. Next, the hydrodynamic size of En@MSNs-CMC was 252.98 ± 20.61 nm with a PDI of 0.24 ± 0.26, and a zeta potential of -30.57 ± 4.79 mV. Moreover, the hydrodynamic size of Cou@MSNs-CMC was 414.77 ± 47.62 nm with a PDI of 0.69 ± 0.16, and a zeta potential of -40.00 ± 0.80 mV, as shown in Table 1. Unloaded MSNs revealed a zeta potential value as a negative charge due to the external surface of unloaded MSNs composed of surface silanol groups (14, 15).

Moreover, unloaded MSNs-CMC revealed a negative charge due to the carboxyl group (16). Furthermore, almost modified nanoparticles displayed a slight increase in PDI value around 0.20 (Table 1), demonstrating that the nanoparticles were more homogeneous in solution (17).

To confirm the encapsulation of encorafenib-encapsulated nanoparticles, a UV/Vis spectroscopy method was used to measure the absorbance of encorafenib. The result revealed the encapsulation efficiency of nanoparticles at 92.55 ± 4.17%. This encapsulation efficiency represents the mesoporous structure of MSNs and provides a large specific area for the loading of encorafenib (18).

In vitro cell studies

To investigate the cytotoxic effect of unloaded MSNs on HT29 cell viability, unloaded MSNs at various concentrations were treated to HT29 cells for 24, 48, and 72 hours, and the viability of HT29 cells was measured using the CellTiter-Blue® cell viability assay, as shown in Figure 3. The results indicated that HT29 cell viability showed non-toxicity compared to untreated cells. This was consistent with Liu et al., where MSNs demonstrated no apparent cytotoxicity on CRC cells (19).

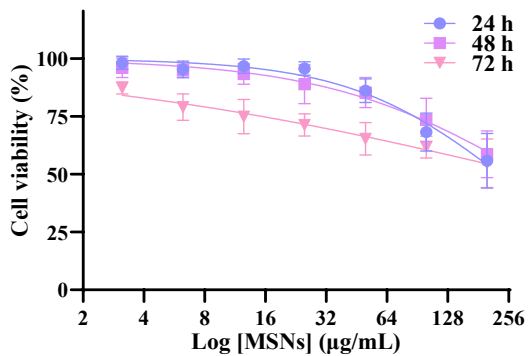


Figure 3 Cytotoxic effects of unloaded MSNs on HT29 cell viability at various concentrations for 24, 48, and 72 hours. The data were presented as mean \pm S.D. of three independent experiments

To investigate the qualitative cell internalization of Cou@MSNs-CMC on HT29 cells, an inverted fluorescence microscope was used for observation of the nanoparticle-treated cells. In brief, the HT29 cells were treated with unloaded MSNs-CMC, Cou@MSNs-CMC for 4 hours, followed by observation under an inverted fluorescence microscope. The microscopic images illustrated that cells treated with unloaded MSNs-CMC did not show any fluorescence signal compared to untreated cell control. This evidence indicated that the fluorescence signal came from coumarin-6 only (Figure 4). The Cou fluorescence of the cells treated with Cou@MSNs-CMC appeared in the cells due to increased permeability and the retention impact of the tumor, comparable with previous study (20).

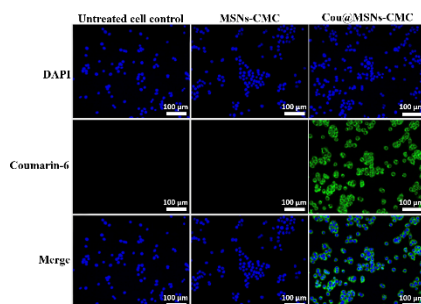


Figure 4 Qualitative cell internalization of Cou@MSNs-CMC on HT29 cells.

To evaluate the cytotoxic effect of En@MSNs-CMC on HT29 cell viability, we treated the cells with En@MSNs-CMC for 24 hours. After that, the cell viability was verified by using the CellTiter-Blue® cell viability assay. In this work, we used nanoparticles at a concentration of 12.5-25 $\mu\text{g/mL}$ for treating the cells to prevent the cause of toxicity from nanoparticles. The HT29 cell viability after treated with En@MSNs-CMC at concentrations of 6.25, 12.5, and 25 $\mu\text{g/mL}$ for 24 hours was shown in Figure 5. From this result, we found that the cell viability of HT29 cells treated with En@MSNs-CMC concentration of 6.25, 12.5 $\mu\text{g/mL}$ was not significant compared to the control group. In contrast, the cell viability of HT29 cells treated with En@MSNs-CMC at a concentration of 25 $\mu\text{g/mL}$ was significantly different compared to the control group. The cytotoxicity of En@MSNs-CMC at concentrations of 6.25, 12.5, and 25 $\mu\text{g/mL}$ on HT29 cell viability was 92.02 ± 0.34 , 75.52 ± 12.05 , and 78.51 ± 3.93 , respectively. This result suggests that En@MSNs-CMC at concentrations of 12.5, and 25 $\mu\text{g/mL}$ was significantly toxic to cells compared to the control. Furthermore, our results were consistent with Bhattacharya's study, which reported that encorafenib-loaded polymeric nanoparticles increase the toxicity of HT29 cells (6)

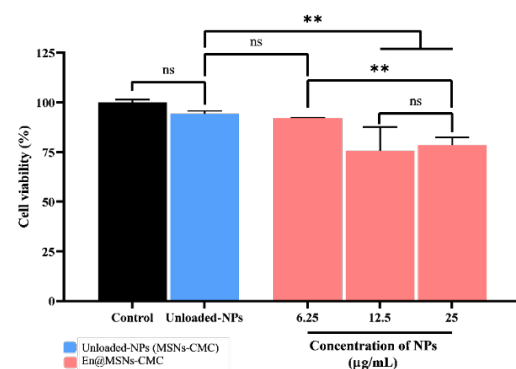


Figure 5 Cytotoxic effects of En@MSNs-CMC on HT29 cell viability. The data were presented as mean \pm S.D. of three independent experiments. A statistically significant difference between the sample and control groups was identified with **: $p < 0.01$. ns = not significant.



CONCLUSIONS

In this study, we developed a drug delivery system that uses encorafenib encapsulated in MSNs coated with carboxymethyl chitosan (En@MSNs-CMC). Our findings confirm the potential of nanoparticles as a drug delivery system, where Cou@MSNs-CMC can promote cellular uptake *in vitro*. En@MSNs-CMC effectively suppressed HT29 cell growth. These results suggested that mesoporous silica nanoparticles coated with carboxymethyl chitosan can improve drug delivery performance and provide a drug delivery system for efficient CRC therapy. Further research will focus on evaluating the anti-cancer efficacy of En@MSNs-CMC *in vivo*.

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THE EVALUATION OF PULP CHAMBER MORPHOLOGY OF THE MANDIBULAR FIRST MOLAR IN A SELECTED THAI POPULATION USING CONE-BEAM COMPUTED TOMOGRAPHY

Pitcha Suwannasin^{1*}, Somsinee Pimkhaokham¹, Phonkit Sinpitaksakul¹, Uraiwan Chokechanachaisakul¹

¹ Faculty of Dentistry, Chulalongkorn University, Bangkok 10330, Thailand

*Corresponding Author: Pitcha Suwannasin, Faculty of Dentistry, Chulalongkorn University, Bangkok 10330, Thailand, E-mail: nanastation33@gmail.com, pitcha.su@psu.ac.th

ABSTRACT

Introduction: The mandibular first molar is often leading to carious lesion, necessitating root canal treatment. Accurate access opening during root canal procedure is crucial, with the pulp chamber serving as a critical landmark. Dentists' understanding of tooth morphology and tactile perception play significant roles in successful treatment outcomes. However, calcification of the pulp chamber can diminish sensitivity and increase the risk of perforation. Despite its importance, there is limited literature on assessing pulp chamber morphology using cone-beam computed tomography (CBCT) in the Thai population.

Objectives: This study aimed to analyze the pulp chamber morphology of mandibular first molars in a selected Thai population using CBCT images.

Methodology: Total 479 CBCT images of mandibular first molars were included. Central sagittal CBCT scans of each tooth were evaluated, and measurements were taken from the central occlusal surface. A line marking the mesiodistal extension of the cemento-enamel junction (CEJ) was drawn on the central sagittal slice to assess its spatial relationship with the pulp chamber. Measurements included the distance from the central occlusal surface to the roof of the pulp chamber (distance A), pulp chamber height (distance B), distance between the floor of the pulp chamber and furcation (distance C), and the relationship of the pulp chamber roof to the CEJ (distance D).

Results: The study found that the roof of the pulp chamber coincided with the CEJ in 42.5% of cases. The average distance from the central occlusal surface to the roof of pulp chamber was 5.06 ± 0.80 mm, while the average distance to the floor of the pulp chamber was 6.04 ± 0.95 mm, showing significant differences across age groups ($p < 0.05$, median age = 35). The total distance from the central occlusal surface to the furcation averaged 8.75 ± 1.05 mm.

Conclusion: The findings reveal that a considerable proportion of mandibular first molars in the Thai population have the roof of the pulp chamber aligned with the cemento-enamel junction. Additionally, age-related differences in pulp chamber dimensions were observed. These results emphasize the importance of morphometric analysis in preoperative planning to minimize the risk of perforation, especially in populations with distinct anatomical variations. This study underscores the value of utilizing CBCT imaging for detailed evaluation of pulp chamber morphology in dental practice.

Keywords: Mandibular First Molar; Pulp chamber; Cone-beam Computed Tomography; Thai population

INTRODUCTION

The mandibular first molar frequently presents with carious lesions that necessitate root canal treatment. Achieving accurate access opening during the root canal therapy

is critical for successful treatment, with the pulp chamber serving as a vital landmark. However, perforating into the furcation area is one of the irreversible complications in endodontics while opening access to the pulp chamber of molar. Perforations can cause



severe complications, often leading to extraction if irreparable (1).

To achieve complete removal of pulp tissue, it is essential to access the coronal portion of the pulp complex that facilitates pulp removal while also allowing for the location and debridement of root canals, without compromising the strength of the coronal enamel and dentin. These are basic concepts of access opening. The dentist's tactile perception and knowledge of tooth morphology are critical for accurate access openings. However, calcification of the pulp cavity can impair tactile sensitivity, increasing the risk of perforation and treatment failure (2). In such cases, the roof and floor of the pulp chamber are in close proximity, and perforation may occur when the bur traverses the relatively thin floor. This highlights the necessity for enhanced diagnostic tools and techniques to accurately identify the anatomical landmarks and avoid such complications. Although numerous researchers have documented the anatomical complexities of the pulp chamber, conclusive evidence regarding the relationship between external landmarks and the locations of pulp chambers remains lacking (3). And also there is limited literature on the topic of pulp chamber morphology of mandibular first molars, particularly within the context of the Thai population.

Previous studies have been investigated tooth morphology have primarily employed intraoral periapical radiographs or in vitro techniques involving demineralization and dye injection into the pulp chamber and root canal system (4-6). Nowadays, Cone-beam computed tomography (CBCT) has emerged as a valuable imaging modality in dental practice, offering high-resolution, three-dimensional views of in vivo tooth structures (7, 8). This advanced imaging technique allows for precise assessment of dental morphology, which is crucial for preoperative planning and risk minimization. Therefore, this study, CBCT was utilized, providing a detailed visualization of dental anatomy.

Given these considerations, the objective of this study was to analyze the pulp chamber morphology of mandibular first molars in a selected Thai population using CBCT images.

METHODOLOGY

Sample Collection

This research was approved by the Human Research Ethics Committee of the Faculty of Dentistry, Chulalongkorn University, Bangkok, Thailand (study code HREC-DCU 2021-099). CBCT images taken by oral and maxillofacial radiologists at between January 2017 and December 2020 from patients at the department of radiology, Faculty of Dentistry, Chulalongkorn University, using A 3D Accuitomo CBCT machine (J. Morita Manufacturing Corp, Kyoto, Japan). The selected radiographic parameters had been adjusted according to the patient's size and treatment objective (90 kVp, 5-8 mA, 17.5-30.8 sec exposure time, field of view 8x8 cm and voxel size 0.16 mm³) were collected. These images were obtained for various dental diagnostic or treatment planning objectives, including dental implant placement, surgical extraction of impacted or embedded teeth, and orthodontic treatment interventions. This retrospective study of CBCT images required neither clinical information nor additional radiation exposure for patients. The sample size for the study was determined using the guidelines proposed by Naing et al (9).

CBCT images of 479 mandibular first molars which met the following inclusion criteria were screened and assessed.

1. Thai patients aged between 12 to 70 years.
2. Good quality CBCT images with a field of view 8 x 8 cm, containing at least one fully erupted mandibular first molar.
3. Mandibular first molars with mature apices, and without periapical lesion or root resorption.
4. Mandibular first molars without c-shaped roots or root canals.
5. Teeth without previously root canal treatment, or crown restorations

Patient age, gender, and bilateral or unilateral appearance were recorded to analyze correlations with tooth anatomical data.

Morphologic Evaluation of the Pulp Chamber

When screened CBCT images, Multi-planar reconstructed images were displayed on a diagnostic monitor screen



(Dell Inc., Texas, USA) using Infinitt© PACS software (Infinitt Healthcare Co., Seoul, South Korea). The density and contrast of the images were adjusted using the image processing tools in the software to maximize image clarity. The tooth which was evaluated was set in an upright position in a corrected sagittal and coronal view.

To evaluate pulp chamber morphology, the centermost sagittal CBCT scan of each mandibular first molar was selected. Measurements were obtained from the central occlusal surface. A line delineating the mesiodistal extension of the cementoenamel junction (CEJ) was drawn on the central sagittal slice to investigate its spatial alignment with the pulp chamber. This method was adapted from Reuben's investigation (10). Subsequently, the image was analyzed and evaluated for these four distances (Figure 1 and 2):

Distance A: From the central occlusal surface to the roof of the pulp chamber.

Distance B: From the roof to the floor of the pulp chamber (pulp chamber height).

Distance C: From the floor of the pulp chamber to the furcation.

Distance D: From the CEJ to the roof of pulp chamber.

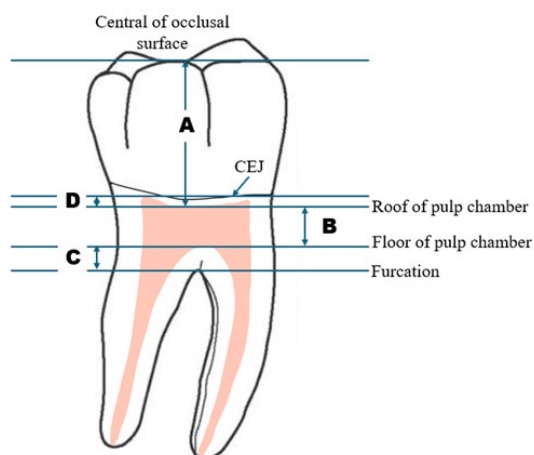


Figure 1 A diagram show the measurement to investigate the distance of the central of occlusal surface to the roof (A)/floor (B) of pulp chamber and to the furcation (C), and the relationship of CEJ to the roof of pulp chamber.

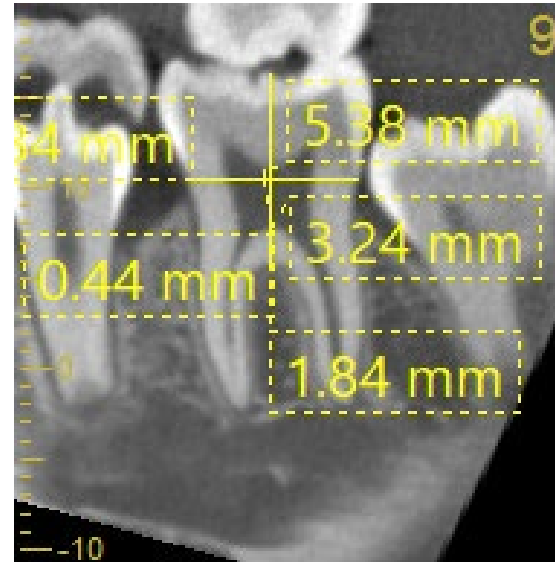


Figure 2 the actual measurements taken to evaluate pulp chamber.

Statistical Analysis

Mean measurements were analyzed for correlations with age, gender, and tooth position (right or left side) using the t-test and the relationships between CEJ and roof of the pulp chamber were compared between groups using the chi-squared test (χ^2) performed by IBM SPSS (Version 28.0; SPSS Inc, Chicago, IL). The level of statistical significance was set at 0.05. Summary statistics are given in terms of means and standard deviations.

RESULTS

A total of 303 patients, comprising 118 males and 185 females, with a mean age of 39.5 ± 17.1 years, were included based on the specified inclusion criteria. Among these patients, unilateral mandibular first molars were observed in 46.2% of cases, while bilateral first molars were present in 53.8% of cases.

The analysis included 479 mandibular first molars from these 303 patients, with 306 (63.9%) molars from female patients and 173 (36.1%) from male patients. Of these, 242 (50.5%) molars were on the left side and 237 (49.5%) on the right side.

Relationships between the CEJ and the Roof of Pulp Chamber

This study found that the roof of the pulp chamber was located at an average



distance of 0.38 mm below the CEJ. Notably, the CEJ coincided with the roof of the pulp chamber in only 42.5% (203 teeth) of the samples. In 32.3% (155 teeth) of the samples, the roof of the pulp chamber was situated below the CEJ, whereas in 25.2% (121 teeth) of the samples, the roof of the pulp chamber was found above the CEJ. The standard deviation for the relationship between the CEJ and the roof of the pulp chamber was 0.41

Morphologic Evaluation of the Pulp Chamber

The average distance from the central occlusal surface to the roof of the pulp chamber (A) was determined to be 5.06 ± 0.80 mm. The average height of the pulp chamber (B) was 0.99 ± 0.69 mm. The average distance between the central of occlusal surface to the floor of pulp chamber (A+B) was measured at 6.04 ± 0.95 mm, which found the difference between age groups ($p < 0.05$, median age = 35). The average distance from the floor of the pulp chamber to the furcation of roots (C) was 2.71 ± 0.54 mm. And the total distance from the central occlusal surface to the furcation (A+B+C) averaged 8.75 ± 1.05 mm.

Table 1 Measurement (mm) of Pulp Chamber Morphology (N=479)

	A	B	C	D	A+B	A+B+C
Mean	5.06	0.99	2.71	0.38	6.04*	8.75
SD	0.80	0.69	0.54	0.41	0.95	1.05

* mean measurement; between age group $p < 0.05$

DISCUSSION

Endodontic literature reveals a scarcity of studies that specifically measure anatomic landmarks related to the pulp chamber. The considerable variance in overall mandibular first molar tooth size, morphology, and arch position has likely led to the assumption that the dimensions of the pulp chamber would exhibit such great variability as to render these measurements clinically irrelevant.

This study examined the morphologic characteristics of the pulp

chamber in the Thai population, a field infrequently reported. The average distance from the central occlusal surface to the roof of the pulp chamber was 5.06 mm. The central occlusal surface was chosen as the reference point for its consistent presence and common use in initiating access openings, unlike previous studies that used the central fissure and studied in vitro samples with clear fissures (4, 5, 10). Our study used samples from a diverse demographic, including teeth with worn central fissures due to functional use and the central occlusal surface could be represented as the landmark.

The average distance from the pulp chamber floor to the furcation was 2.71 mm, aligning with previous studies (2.53-2.96 mm). The distance from the central occlusal surface to the furcation averaged 6.04 mm, with significant variation between age groups under and over 35 years old, a finding not previously reported. This suggested that aging may influence pulpal morphology. Several studies indicate that secondary dentin apposition predominantly occurs on the pulp chamber floor rather than the roof of pulp chamber. For instance, one study investigated both elder and adult populations found no significant changed in dentin thickness at the roof of the pulp chamber with increasing age. In contrast, a definite increase in thickness was observed at the pulp chamber floor with age (11). Another study reported a significant reduction in the height of the pulp chamber of the mandibular first molar, primarily attributed to an increase in the thickness of the pulpal floor (12). Tidmarsh (13) highlighted that "the growth of dentin upon the floors of pulp chambers, apparently without cause, is some significance to the endodontist who must gain entrance to the root canals". These findings underscore the importance of considering secondary dentin apposition in endodontic procedures, particularly when access opening to the root canals. The increased pulpal floor thickness with age necessitates careful assessment and technique modification to ensure successful access opening. And clinicians should be cautious if the access cavity depth exceeds 6.04 mm when open an access in Thai patient to avoid furcation damage. Furthermore, Sue et al.



indicated that pulp chamber area of mandibular first molar had correlation with age which be useful in dental practice and age estimation in forensic science (14).

The CEJ is the landmark to dentists for access opening to root canals orifices in the root canal treatment. The roof of pulp chamber is usually the first barrier to the pulp chamber and usually found located at the level of the CEJ. Deutsch and Musikant (4) study of pulp chamber of extracted one hundred mandibular molar using two-dimensional radiographs, found the CEJ coincided with the roof of the pulp chamber in 97% of cases. However, the patients' age, gender were unknown. While current study showed 42.5% of cases which the CEJ coincided with the roof of the pulp chamber, similar to Reuben et al evaluated randomly chosen one hundred twenty-five Indian extracted adult mandibular first molars via spiral computed tomography scan, a type of three dimensional radiographs, and found that the CEJ coincided with the roof of pulp chamber in 37.09% of cases. Although the CEJ can be a landmark for access opening to the roof of pulp chamber, for 32.3% of the samples, the roof of the pulp chamber was below the CEJ, whereas the rest 25.2% of the samples, the roof of the pulp chamber was found above the CEJ, with an averaging deviations at 0.38 mm from the CEJ were noted in this study. These results may cause researchers to reconsider CEJ as a reliable indicator for the location of the roof of pulp chamber.

Numerous research has illustrated that genetic, racial, and ethnic variables significantly influence the morphology of mandibular first molar roots and their root canal configuration (15). Variations in root and canal anatomy have been observed both within individual populations and across different demographic groups (16, 17). However, there were limitations in the existing studies evaluation of the pulp chamber morphology on a worldwide scale. Further research needs to be conducted in diverse populations to validate these findings.

Multiple evidence-based studies have indicated that while the clearing technique is considered the gold standard for evaluating the root canal system, CBCT

demonstrates comparable accuracy and stands as a non-invasive alternative (18). CBCT has been widely utilized in the assessment of large populations, primarily due to its low radiation levels, and its high-resolution capabilities, particularly in evaluation of the complex root canal morphology of mandibular first molars (19, 20). In the current investigation, a CBCT scan with a field of view (FOV) measurement of 80x80 mm was used, consistent with research methodologies that frequently employ medium to large FOV CBCT images (19, 21, 22). These images cover at least the dentoalveolar area, capable for the bilateral assessment and comparison of the teeth of interest.

This understanding of pulp chamber morphology should be integrated with the evaluation of preoperative radiographs and intraoperative tactile feedback during endodontic access preparations. These combined approaches provide valuable insights for clinicians, offering a thorough understanding of pulp chamber morphology. This knowledge plays a substantial role in guiding clinicians to improve their access opening procedures in root canal therapy, avoid procedural errors, and enhance the success and prognosis of root canal treatments.

CONCLUSIONS

This study highlighted the significant variability in pulp chamber morphology of the mandibular first molars in the Thai population,. The findings give researchers a guideline for more quantitative management to access of root canal treatment from measurement of all distances, with some notable age-related differences suggesting the influence and awareness of aging on pulpal morphology. While the CEJ has traditionally been used as a landmark for access opening, its reliability is questioned by our finding that CEJ coincides with the roof of the pulp chamber in only 42.5% of cases. Integrating detailed morphological knowledge with preoperative radiographs and intraoperative tactile perception is crucial for enhancing the accuracy and success of root canal treatments. Further research in diverse populations is essential to validate these findings and improve clinical outcomes in root canal therapy.



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PREVENTING MATERNAL DEATHS FOR ATTAINING SUSTAINABLE DEVELOPMENT GOAL 3.1: ANALYSIS OF SOCIAL DETERMINANTS OF NON-UTILISATION OF SKILLED BIRTH AND POSTPARTUM SERVICES IN NORTH-WESTERN NIGERIA

Abubakar Yakubu Abbani^{1*}

¹*Institute for Population and Social Research, Mahidol University, Salaya, Phuttamonthon, Nakhon Pathom
73170, Thailand*

**Corresponding Author: Abubakar Yakubu Abbani, Institute for Population and Social Research, Mahidol
University, Salaya, Phuttamonthon, Nakhon Pathom 73170 Thailand, E-mail:
abubakar.abb@student.mahidol.edu*

ABSTRACT

Introduction: Women continue to die due to preventable pregnancy- and childbirth-related causes in Nigeria. The country's maternal mortality ratio of 1,047 deaths per 100,000 live births is the third highest globally according to the World Health Organization's estimates for 2020. This is largely due to the very low utilization of skilled maternal healthcare services, especially during childbirth and the postpartum period. The situation is likely to cause the country to miss the target of Sustainable Development Goal (SDG) 3.1 by 2030.

Objectives: To estimate the prevalence and trend of the non-utilization of skilled birth and postpartum services from 2003 to 2018 and assess the influence of social determinants for the benefit of policymakers towards meeting the target of SDG-3.1.

Methodology: Data from the 2003, 2008, 2013, and 2018 Demographic and Health Survey rounds were pooled together by fitting multivariate logistic regression models. Two models, one for each service, were fit to assess the likelihood of non-utilization at a 95% confidence interval. The independent variables were selected based on the UNDP's Social Determinants of Maternal Health framework.

Results: Between 2003 and 2018, the prevalence of non-utilization of skilled birth services slightly reduced from 87% to 84%, while that of postpartum services increased from 77% to 87%. Education, ethnicity, religion, family planning, parity, family structure, decision-making, wealth, place of residence, distance to health facilities, and cost of care were the statistically significant ($p < .05$) social determinants of the non-utilization of the services in the sub-region.

Conclusion: Policymakers should prioritize promoting education, engaging in massive awareness campaigns on the necessity of utilizing skilled birth and postpartum services, and creating wealth to empower households to meet maternal healthcare needs.

Keywords: Postpartum, Skilled Birth, Social Determinants, Sustainable Development Goal-3.1, North-Western Nigeria

INTRODUCTION

Maternal death is "the death of a woman while pregnant or within 42 days of termination of pregnancy from any cause related to or aggravated by the pregnancy or its management" [1]. The first target of Sustainable Development Goal number three (SDG-3.1) aims to reduce maternal deaths by lowering the global maternal mortality ratio (MMR) from 227 deaths per 100,000 live births in 2015 to less than 70 deaths per 100,000 live births by 2030, and not more than 140 deaths in any country [1,2]. However, hundreds of thousands of Nigerian women are

still dying yearly in the process of giving birth and in the postpartum period, making it unlikely to meet the SDG-3.1 mark. The estimates of the MMR for the country from the Demographic and Health Survey (DHS) report of 2018 was 512 deaths per 100,000 live births [3], which is very high by global standards. The situation becomes more worrisome based on the recent estimates released by the World Health Organization (WHO) [1] which revealed that the MMR for Nigeria has risen to an extremely high level of 1,047 deaths per 100,000 live births in 2020, which is the third highest globally, behind Chad



(1,063) and South Sudan (1,223). The approximately 82,000 women who died due to pregnancy and childbirth causes is the highest globally, accounting for 28.5% [1].

Maternal deaths are preventable as the causes are known and classified into direct or proximate causes such as hemorrhage, eclampsia, unsafe abortions, hypertensive disorders, etc., and indirect causes such as non-communicable diseases and infections (1,4). Preventing maternal deaths requires women to seek pregnancy, childbirth, and postpartum care from skilled health professionals (5,6). However, most maternal deaths occur during childbirth and the immediate postpartum period (7,8), hence, seeking skilled birth and postpartum care becomes very critical to preventing such deaths. However, the majority of women in Nigeria do not utilize these preventive services and most of them are from the northern region of the country where most maternal deaths occur (9–12). The results from the Nigeria DHS of 2018 revealed that 59% of all births in the country took place at homes rather than in health facilities and 56% of those who gave birth did not receive postpartum checks within 42 days after delivery. In the North-Western zone of the country, the situation is worse with 84% of women delivering their babies at home and 77% not seeking postpartum care (3). The poor utilization of skilled maternal healthcare services in the northern region, especially the North-Western zone, has continued to cause high maternal deaths in the country (13,14) and could hinder the efforts toward attaining SDG-3.1.

Evidence has shown that high maternal deaths are related to poor utilization of maternal healthcare services (15,16), and the utilization of these services is also influenced by social determinants such as education, income, ethnicity, place of residence, etc. (1,17). However, despite the very poor maternal health situation in the North-Western of Nigeria, there is a dearth of evidence to assist policymakers in understanding the extent and the influence of social determinants on the very poor utilization of skilled birth and postpartum services in the sub-region. Although the determinants of maternal healthcare services utilization are similar in many countries in the world, it is important to generate local evidence because sociocultural and geographical contexts can vary and the influence of social determinants are not the same everywhere (18–22), hence, requiring context-

specific policy responses for optimal results. This is particularly relevant in Nigeria considering the heterogeneity of the country and the disparity in socio-economic conditions between the southern and northern regions (23–28). However, no study has been conducted in the north-western zone to identify the specific determinants for the benefit of policymakers in the sub-region. Moreover, the evidence has also shown that the maternal health condition in the southern region of the country is far better than in the northern region, with the MMR for the northern region always above the southern region and the national average (9,11,12). Even within the northern region, the North-West has the worst maternal health situation with estimates of MMR above 1000 deaths per 100,000 live births (9,29).

The very poor maternal health situation and the dearth of evidence on the influence of social determinants in the non-utilization of skilled birth and postpartum services in the North-Western geographical zone of Nigeria necessitate empirical investigations for the benefit of policymakers to address the deplorable maternal health condition in the sub-region for the attainment of SDG-3.1 by 2030. This is the first study in North-Western Nigeria to assess the trends in the non-utilization of skilled birth and postpartum services and identify the social determinants, using nationally representative data to generate evidence for policymakers in the zone.

The study aims to estimate the prevalence and trend of the non-utilization of skilled birth and postpartum services from 2003 to 2018 in North-Western Nigeria and identify the associated social determinants and their influence for the benefit of policymakers towards meeting the target of SDG-3.1.

METHODOLOGY

Data and sample

Data from the Nigeria DHS of 2003, 2008, 2013, and 2018 were used. The Nigeria DHS uses a stratified two-stage cluster sampling design to collect data from households in all the geo-political zones in the country. The 2003, 2008, 2013, and 2018 data was collected from a nationally representative sample of 121,774 women of reproductive age (15–49 years). The respondents from the North-Western zone were 28,890 for the four rounds [National Population Commission Nigeria & ICF, 2019; 2014; 2009; National Population Commission Nigeria &



ORC Macro, 2004]. The sample for this study consists of 18,528 women who gave birth in the five years preceding each round of the surveys in the North-Western zone of the country.

Study variables

The dependent variables for this study are (a) non-utilization of skilled birth services and (b) non-utilization of postpartum services. Women who delivered their last child in health facilities were considered to have ‘used’ skilled birth services while those who delivered at home were considered to have ‘not used’. Likewise, women who were checked by skilled professionals within six weeks after childbirth were considered to have ‘used’ postpartum services while those who were not checked at all were considered to ‘not used’.

The independent variables were selected based on the social determinants of maternal health framework of the United Nations Development Programme (UNDP) (17). The framework classifies the social determinants of maternal health into two broad determinants, namely structural and intermediary determinants. The structural determinants include factors covering governance and policies [health insurance, family planning (knowledge and use)] and cultural and social values [education, employment, ethnicity, religion]. The intermediary determinants consist of individual attributes [age, parity], family and community contexts [family structure (marital type), decision-making, wealth, place of residence, distance to health facilities], and health services context [cost of care].

Data analysis

Descriptive and regression analyses were used in this study. The descriptive analysis consists of a frequency table of the sociodemographic characteristics of the sample and a bar graph for the prevalence of non-utilization of skilled birth and postpartum services. Binary logistic regression analysis was used to assess the determinants of the non-utilization of the services. Two models, one for each service, were fitted and the adjusted odd ratios were used to estimate the likelihood of non-utilization of the services at a 95% confidence interval. STATA statistical software version 17 was used for the analyses. To account for sampling weight and stratification used in the DHS, the SVY command was used.

Ethical consideration

This study utilized secondary data that was collected by the Nigeria Population Commission which obtained the ethical approval for data collection of the survey and the data is freely available for public use.

RESULTS

Socio-demographic characteristics of respondents

Table 1 shows the background characteristics of respondents for this study. A total of 18,528 women of reproductive age who gave birth within five years before each round of the surveys were included in the study. More than half of the respondents (55%) were below the age of 30. An overwhelming majority had no education (77%) and more than half (56%) were in employment. Respondents from the Hausa ethnic group were the absolute majority with 82% and the majority were Muslims (95%). Most of them were married (97%), in a monogamous marriage (57%), had three or more children (72%), and resided in rural areas (79%).

Characteristics	Category	Frequency	%
Age	15–19	1,550	8.37
	20–29	8,589	46.36
	30–39	6,086	32.85
	40–49	2,303	12.43
Mean = 28.9 (SD: 7.66)			
Education	None	14,342	77.41
	Primary	2,149	11.60
	Secondary/ Tertiary	2,037	10.99
Employment status	Yes	10,314	55.90
	No	8,137	44.10
Religion	Islam	17,471	94.63
	Christianity	991	5.37
	& Others		
Ethnic group	Fulani	1,747	9.45
	Hausa	15,216	82.33
	Others	1,519	8.22
Marital status	Never married	36	0.19
	Married	18,080	97.59
	Widowed/ Divorced	411	2.22
Marital type	Monogamous	10,257	56.97
		7,747	43.03
Number of children	Polygynous	2,661	14.36
	One	2,603	14.05
	Two	13,264	71.59
	Three or more	3,854	20.80
Place of residence	Urban	14,674	79.20
	Rural		

Prevalence and Trend of Non-Utilization of Skilled Birth and Postpartum Services

The findings revealed that 88% of all women who gave birth in the 15 years between 2003 and 2018 did not utilize both skilled birth and postpartum services while only 12% have used the services during the period in the study area. The trend in non-utilization only slightly reduced from 87% in 2003 to 84% in 2018 for skilled birth services while it increased from 77% in 2003 to 87% in 2018 for postpartum services (Figure 1).

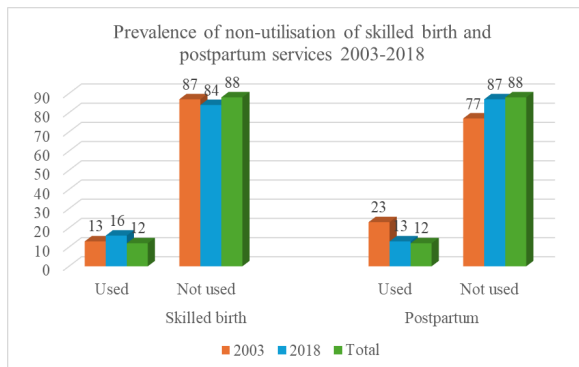


Figure 1 Prevalence of non-utilization of skilled birth and postpartum services between 2003 and 2018 in North-Western Nigeria.

Social Determinants of Non-Utilization of Skilled Birth and Postpartum Services

The results from the multivariable logistic regression analyses of social determinants of non-utilization of skilled birth and postpartum services are presented in Table 2. The results revealed that education, ethnicity, religion, family planning, number of children born, family structure, wealth, place of residence, distance to health facilities, and cost of care were the significant social determinants of the non-utilization of skilled birth services, while employment, age, and decision-making were not significant. The significantly influential social determinants of the non-utilization of postpartum services include family planning, number of children born, family structure, decision-making, and wealth, while education, employment, ethnicity, religion, age of respondents, place of residence, distance to health facilities, and cost of care were not significant.

The detailed results indicated that, for structural determinants, women with no education were 2.28 times more likely not to use skilled birth services than those with secondary or tertiary education. Women with primary

education were 1.63 times more likely not to use the services than those with secondary or tertiary education. Women from the Fulani ethnic group and those from the Hausa ethnic group were 1.75 times and 1.52 times, respectively, more likely not to use skilled birth services than those from other ethnic combined groups in the sub-region. Muslim women in northwestern Nigeria were 1.75 times more likely not to use skilled birth services than Christian or other religious groups. For family planning, the results revealed that women who were not aware of any contraceptives were 1.91 times more likely not to use skilled birth services and 1.36 times more likely not to use postpartum services than those who were aware of any methods. Similarly, those who had never used any contraceptives were 2.01 times more likely not to use skilled birth services and 1.72 times more likely not to use postpartum services than those who had ever used any contraceptive.

For the intermediary determinants, the results showed that women who had two children, three children, and four or more children had more than twice greater odds not to use skilled birth services. Similarly, those with two children and those with four or more children were 1.29 and 1.48 times, respectively, more likely not to use postpartum services in the sub-region. Women in polygynous marriages were 1.19 and 1.17 times more likely not to use skilled birth and postpartum services, respectively than those who were in monogamous marriages. For decision-making autonomy, women who decide alone on their healthcare were 41%, and those who decide jointly with their partners were 33%, less likely than those who had no autonomy at all to decide on their healthcare not to use postpartum services.

Women from the poorest (7.98 times), poorer (5.14 times), middle (3.36 times), and richer (2.29 times) wealth index had greater odds of not utilizing skilled birth services than those from the richest wealth index. Likewise, women from the poorest (2.60 times) and poorer (2.19 times) wealth index had more than twice greater odds of not using postpartum services than those from the richest wealth index. Women who reside in rural areas were 1.46 times more likely not to use skilled birth services than those who reside in urban areas. Women who reported distance to health facilities as a problem to services utilization were 1.53 times more likely not to use skilled birth services than those who considered



distance not to be a problem. Likewise, women who reported the cost of healthcare as a problem to services utilization were 1.16 times more likely not to use skilled birth services than those who did not consider the cost of care to be a problem.

Table 2 Binary logistic regression models of social determinants of non-utilization of skilled birth and postpartum services

Determinants	Skilled birth services		Postpartum services	
	AOR [CI]		AOR [CI]	
Structural determinants				
Education	Ref.		Ref.	
Secondary/Tertiary	2.28		1.13	
None	[1.89-2.76]		[0.91-1.41]	
Primary	1.63		1.07	
	[1.34-1.98]		[0.86-1.34]	
Employment	Ref.		Ref.	
Yes	1.02		1.09	
No	[0.89-1.18]		[0.96-1.24]	
Ethnicity	Ref.		Ref.	
Others	1.75		1.40	
Fulani	[1.19-2.58]		[0.89-2.20]	
Hausa	1.52		1.41	
	[1.15-1.99]		[0.96-2.09]	
Religion	Ref.		Ref.	
Others	1.75		0.86	
Islam	[1.27-2.40]		[0.57-1.29]	
Contraceptive knowledge	Ref.		Ref.	
Yes	1.91		1.36	
No	[1.55-2.36]		[1.07-1.75]	
Contraceptive use	Ref.		Ref.	
Yes	2.01		1.72	
No	[1.71-2.35]		[1.39-2.13]	
Intermediary determinants				
Age	Ref.		Ref.	
15-19	0.99		1.03	
20-29	[0.76-1.29]		[0.82-1.29]	
30-39	0.90		1.06	
40-49	[0.66-1.22]		[0.81-1.38]	
Number of children	0.79		1.23	
One	[0.56-1.11]		[0.91-1.65]	
Two				
Three	Ref.		Ref.	
Four or more	2.16		1.29	
Marital type	[1.69-2.77]		[1.02-1.63]	
Monogamous	2.40		1.26	
	[1.90-3.04]		[0.99-1.59]	
Polygynous	2.22		1.48	
	[1.77-2.79]		[1.20-1.84]	
	Ref.		Ref.	
	1.19		1.17	
	[1.04-1.36]		[1.04-1.31]	
Decision-making	Ref.		Ref.	
Husband/someone	0.91	0.58	0.59	
Alone	[0.66-1.27]	3	[0.44-0.78]	
Jointly	0.88	0.11	0.67	
	[0.75-1.03]	5	[0.54-0.78]	
Wealth	Ref.		Ref.	
Richest	7.98		2.60	
	[5.67-11.23]		[1.76-3.85]	
Poorest	5.14		2.19	
			[1.52-3.14]	

Determinants	Skilled birth services		Postpartum services	
	AOR [CI]		AOR [CI]	
Poorer	[3.77-7.04]		1.19	
	3.36		[0.85-1.65]	
Middle	[2.56-4.41]		0.95	
	2.29		[0.67-1.34]	
Richer	[1.78-2.94]			
Place of residence				
Urban	Ref.		Ref.	
Rural	1.46		1.02	
	[1.18-1.80]		[0.82-1.28]	
Distance to health facilities				
Not a problem	Ref.		Ref.	
	1.53		0.99	
	[1.27-1.84]		[0.82-1.22]	
A problem	Ref.		Ref.	
Cost of care	1.16		0.89	
Not a problem	[1.00-1.34]		[0.76-1.04]	
A problem	0.07		1.35	
Constant	[0.05-0.11]		[0.85-2.15]	

DISCUSSION

This study was undertaken to estimate the prevalence of the non-utilization of skilled birth and postpartum services from 2003 to 2018 in North-Western Nigeria and identify the associated social determinants and their influence for the benefit of policymakers towards meeting the target of SDG-3.1. The findings revealed that in the 15 years, an overwhelming 88% of all women who gave birth did not use the services of skilled health professionals during childbirth and in the postpartum period; the prevalence of non-utilization of skilled birth services only slightly reduced from 87% in 2003 to 84% in 2018, while that of postpartum services increased from 77% in 2003 to 87% in 2018. By implication, it is unlikely that the target of reducing maternal deaths in Nigeria may not be attained by the year 2030 in line with the SDG-3.1 target because reducing maternal deaths is hinged on women's utilization of skilled maternal healthcare services to prevent maternal mortality and morbidity. Consequently, the country's federal and state governments in the northwest zone and other stakeholders must pay more attention and put more effort into promoting the utilization of skilled birth and postpartum services in the North-West zone.

The study found numerous social determinants were significantly influential in the non-utilization of skilled birth and postpartum services in North-Western Nigeria. The influence of education in the non-utilization of skilled birth services was highly significant and it conforms with findings from other studies in Nigeria and other developing countries (13,30-33).



Education is a very important factor in maternal health services utilization because educated women may be more aware of the risks of pregnancy and the dangers of unskilled birth attendance which could make them use skilled birth services (34,35). However, in North-Western Nigeria, there is very low educational attainment by women as girl-child education is given less priority by parents, especially in rural areas. The government must ensure that compulsory education is guaranteed for all, irrespective of sex, in the North-West.

Cultural factors such as ethnicity and religion were also significantly influential in the non-utilization of skilled birth services in the North-Western zone. It was found that Fulani, Hausa, and Muslim women were more likely not to use skilled birth services than their counterparts from other ethnic groups and religions. This may be because the Fulani and Hausa ethnic groups are predominantly Muslims and it is a common practice among them to prefer privacy during childbirth and not expose themselves to skilled professionals from the opposite sex following religious prohibitions against such exposures, hence, they opt for the services of traditional birth attendants who are of the same sex with them (36,37). To address this will require the involvement of traditional and religious leaders to create awareness of the dangers of unskilled birth attendance and the necessity to utilize skilled birth services even from male skilled providers when female providers are unavailable. There is also a need to train more female skilled providers in the region to provide skilled birth services.

Family planning knowledge and use were found to be influential in the non-utilization of both skilled birth and postpartum services in the North-Western zone. Family planning is important for skilled birth and postpartum care services because family planning clinics are important sources of relevant educative messages for women on pregnancy prevention and utilization of maternal healthcare services when they become pregnant. Hence, there is a need to promote more awareness and the utilization of contraceptives in the zone. Presently, the North-West has the lowest contraceptive prevalence rate in Nigeria with only 7% (30).

Furthermore, it was found that the higher the number of children by women, the higher the probability of not utilizing skilled birth and postpartum services. This situation could be

promoted due to many reasons such as negative experiences from previous childbirths and longer distances to health facilities (38,39). Others may feel confident that they do not need skilled assistance because they have never experienced complications with their previous childbirth (40,41), probably not aware that every pregnancy is different and may come with different risks during childbirth.

The findings also revealed that women in polygynous marriages were more likely to not utilize both skilled birth and postpartum services. This situation may be due to financial difficulties associated with large family sizes that are common with polygynous homes. Decision-making autonomy was found to influence postpartum services such that women who decide alone and those who decide together with their partners had lower odds of not using the services. This implies that women's empowerment is important in promoting the utilization of the services as empowered women can access services without requiring the approval of their partners which may cause delays in accessing care or disapproval when the partner does not understand the need for such services.

The wealth status of households was a greatly significant determinant of the non-utilization of skilled birth and postpartum services. The findings revealed that women from the poorest and poorer households had far greater odds of not utilizing both services than those from the richest households. Wealth status affects the affordability of health services (42), as those who are from poor households find it difficult to pay for skilled birth and postpartum services and medications (18,43). Therefore, governments in the northwest zone must ensure the provision of free services for maternal healthcare to mitigate the influence of wealth. This is further supported by the findings which showed that the cost of care and distance to health facilities also influence the utilization of skilled birth services. Also, women who reside in rural areas were more likely to not utilize skilled services at birth which may be due to lack of or limited availability of health facilities in rural areas. The government should ensure the adequate provision of health facilities offering maternal healthcare services in rural areas.

CONCLUSIONS

The findings from this study should guide policymakers in the direction to focus in



the formulation of programs toward increasing the utilization of skilled birth and postpartum services for reducing maternal deaths in line with the SDG-3.1 target. Policymakers should especially prioritize promoting education, engaging in massive awareness campaigns on the necessity of utilizing these services, and creating wealth to empower households to meet maternal healthcare needs.

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THE OPTIMIZATION OF M1-LIKE MACROPHAGE-DERIVED EXTRACELLULAR VESICLES PARENTAL CELL CULTURE CONDITIONS

Sa Punyahotra¹, Primana Punnakitikashem^{1,2}, Ladawan Khowawisetsut^{3,4}, Nathachit Limjunyawong^{5,6}, Chatchawan Srisawat^{1,2,*}

¹ Department of Biochemistry, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand

² Siriraj Center of Research Excellence in Theranostic Nanomedicine, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand

³ Department of Parasitology, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand

⁴ Siriraj Center of Research Excellence for Microparticle and Exosome in Diseases, Research Department, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand

⁵ Research Department, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand

⁶ Siriraj Center of Research Excellence in Allergy and Immunology, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand

***Corresponding Author:** Chatchawan Srisawat, Department of Biochemistry, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, 10700 Thailand, E-mail: Chatchawan.sri@mahidol.ac.th

ABSTRACT

Introduction: Extracellular vesicles (EVs) are vesicles released from all cell types, with sizes ranging from 30 nm to 10 μ m. EVs are subcategorized into three subtypes according to their size and biogenesis: apoptotic bodies, microvesicles (MVs), and exosomes. MVs and exosomes are crucial communication factors as they can carry and transfer many components between cells. EVs derived from M1 macrophages (M1-EVs) have been reported to have pro-inflammatory and anti-cancer effects.

Objectives: This study aims to optimize the production of M1-EVs under various cell culture conditions while reducing irrelevant EVs.

Methodology: THP-1 monocytes were differentiated into M0 by phorbol-12-myristate-13-acetate. To determine the optimal conditions for M1 polarization and M1-EVs production, various concentrations of EVs-depleted fetal bovine serum (FBS) from 0 to 10%, lipopolysaccharides (LPS) from 20 to 100 ng/mL, and polarization incubation times from 24 to 72 hours were used for M1 macrophage polarization. The M1 polarization was confirmed by flow cytometry and M1-EVs were characterized by nanoparticle tracking analysis (NTA).

Results: Upon M0 stimulation with LPS at 100 ng/mL for 24 and 48 hours, the M1 macrophages showed a similar percentage of CD80-expressing cells compared to the control M1 polarization condition, with 22.8% and 28.6% at 24 and 48 hours, respectively. The effect of FBS concentration in the culture media revealed that from 0% to 10% FBS, a similar trend in the percentage of live cells was observed, ranging from 79.6% to 92% at 24 hours and from 63.4% to 75.2% at 48 hours. The concentration of M1-EVs collected from culture media supplemented with 0% to 10% FBS showed a dose-dependent correlation, with M1-EVs concentrations ranging from $1.57 \times 10^9 \pm 7.76 \times 10^6$ to $2.42 \times 10^9 \pm 2.33 \times 10^7$ particles/mL. However, the presence of EVs in FBS may contribute to an increase in irrelevant EVs in the culture media. Additionally, the M1-EVs concentration in culture media with 48-hour incubation was $1.77 \times 10^9 \pm 1.16 \times 10^7$ particles/mL.

Conclusion: This finding illustrates the optimal conditions for M1-EVs production from cell culture. FBS-free RPMI showed an adequate percentage of live cells at 48 hours while reducing a significant amount of EV background compared to RPMI with FBS. This condition can be considered optimal for M1-EVs production for further applications, such as functional molecules and nanocarriers, which can be engineered using various strategies for the treatment of several diseases, including cancer.

Keywords: Extracellular Vesicle (EV), Flow cytometry, M1-like Macrophage, Nanoparticle tracking analysis (NTA)



INTRODUCTION

Extracellular vesicles (EVs) are vesicles that release from all cell types to function as intercellular communication (1). EVs can be subcategorized into 3 subtypes according to their size and biogenesis. The first subtype is apoptotic bodies (>1000 nm) which occur from the blebbing of the dying apoptotic cell. The second subtype is microvesicles (MVs) which originate from the budding of the cell's plasma membrane with a size between 100-1,000 nm. The third subtype is exosome which emerges from the endocytic pathway with the smallest size between 30-200 nm. Both microvesicles and exosomes can be found in normal and abnormal (disease) intercellular communications. According to Minimal information for studies of extracellular vesicles (MISEV2023) (2), small EV (sEV) refers to EVs with a diameter <200 nm.

Small EVs are released from the cells and play a crucial role in intracellular communication by carrying various biomolecules such as nucleic acids (DNA, RNA, microRNA), proteins, and other metabolites (3). This involvement is significant in both health and illness situations, including cell survival, proliferation, immune response, angiogenesis and wound healing, pathogenic interaction, tumor cell migration, and metastasis. EVs are also proposed as potential drug carriers because they have high bioavailability, extremely low immunogenicity, extremely low cytotoxicity, and can easily penetrate the human blood-brain barrier (4). Besides natural EVs, the engineering of EVs for therapeutic drug carriers can strengthen their therapeutic outcomes toward targeted diseases. There are two main strategies to encapsulate therapeutic drugs into EVs: endogenous loading and exogenous loading. Firstly, endogenous loading, or pre-modification loading, can be done by engineering the EVs' parental cells. Secondly, exogenous loading, or post-modification loading, is subcategorized into passive loading and active loading to isolated EVs (5). Many studies have discovered that EVs derived from macrophages show diverse properties. M1 macrophage-derived EVs (M1-EVs) possess pro-inflammatory responses and antitumor effects against various types of cancer, while M2 macrophage-derived EVs possess anti-inflammatory properties (6). Jiang H et al (7)

found anti-cancer properties of M1 macrophage-derived exosomes that could suppress proliferation, migration, and invasion and promoted apoptosis in head and neck squamous cell carcinoma. Exosomal long noncoding RNA (lncRNA) HOTTIP was identified as the key molecule responsible for these effects. Wang X et al (8) studied the important role of M1 macrophage-derived exosomes in inhibiting cancer proliferation and promoting cancer apoptosis via their essential component, miR-181a-5p. This microRNA directly targets the ETS proto-oncogene 1 transcription factor (ETS1) and serine/threonine kinase 16 (STK16), leading to lung adenocarcinoma cell apoptosis.

Nonetheless, the lack of standard cultural conditions for EVs collection results in excessive cultural instructions to follow. For example, cell density, incubation time, Evs inducer supplement, and FBS percentage in culture media. Furthermore, the proportion of FBS could affect the purity of isolated Evs. Also, FBS itself contains FBS-derived Evs, lipoproteins, protein aggregates, etc., which could influence cell behaviors (9, 10) or alter their phenotype (11) which are the main drawbacks that should be diminished. These studies support the importance of M1-Evs as modifiable nanocarriers or therapeutic components. The optimized conditions of M1-Evs parental cell culture, which minimize the number of irrelevant Evs, would be a useful procedure for obtaining appropriate M1-Evs for therapeutic purposes. Hence the study aims to optimize conditions for culturing M1-EVs parental cells with minimize irrelevant EVs, and characterize EVs for potential therapeutic applications

METHODOLOGY

Cell line and cell culture

Human peripheral blood monocyte cell line, THP-1 (ATCC, USA), the EVs parental cells in this study, were cultured in Roswell Park Memorial Institute (RPMI) culture medium with 10% Fetal bovine serum (FBS) and 1% penicillin-streptomycin (cRPMI). THP-1 monocytes were maintained at a density of 10,000,000 cells/flask in T75 cell culture flasks and incubated at 37 °C in a 5% CO₂ incubator.

Optimization of EVs parental cell culture conditions



Three factors were optimized in the EVs parental cell culture conditions: LPS concentration, FBS concentration, and incubation time.

1. Optimization of LPS concentration

Although the standard reagents used to induce the polarization of M0 macrophage to M1 macrophage are LPS and IFN- γ (12), in this experiment, we decided to use only LPS for M1 polarization. To differentiate from monocytes into M0 macrophages, the THP-1 monocytes were incubated with phorbol-12-myristate-13-acetate (PMA) at 100 ng/mL for 48 hours. Then the medium was replaced with fresh complete RPMI medium, and the cells were incubated for an additional 24 hours. Next, the cells were treated with various concentrations of LPS at 20, 50, and 100 ng/mL and incubated for 24 and 48 hours. After the incubation period, the cells were detached, stained with fixable viability dye, and incubated for 20 minutes. Next, the cells were stained with Fc blocking reagent for 10 minutes and stained with fluorescent-labeled anti-CD80 antibody for 30 minutes. Then stained cells were analyzed with a FACSCelestaTM multicolor flow cytometer.

2. Optimization of FBS concentration

To reduce the irrelevant EVs from FBS in the culture medium, EVs in FBS were depleted by continuous ultracentrifugation at 110,000 \times g for 16 hours. This EVs-depleted FBS was used in the culture media. Furthermore, the volume of EVs-depleted FBS in the culture media was optimized to minimize irrelevant EVs while maintaining cell viability. After differentiation of THP-1 monocyte into M0 macrophages, the cells were washed with phosphate-buffered saline (PBS) solution twice, followed by replacement with fresh RPMI medium containing EVs-depleted FBS at concentrations 0%, 1%, 2.5%, 5%, and 10%. The differentiation to M1 macrophages was performed as described above. The optimized LPS concentration of 100 ng/mL was used to polarize M0 to M1 macrophages. After the incubation period, the cells were detached and stained with fixable viability dye, and the stained cells were analyzed with FACSCelestaTM multicolor flow cytometer to determine the percentage of viable cells. At the same time, collected the conditioned medium was collected, and centrifuged at 4°C, 1,500 \times g

for 15 minutes to deplete the cells and debris, and the supernatant part was analyzed with NTA to detect EVs size and concentration, whereas, EV-depleted FBS and RPMI with 1% Penicillin-Streptomycin were separately analyzed to investigate background EVs.

3. Optimization of incubation time

To optimize the LPS-stimulated time for EV production, THP-1 monocytes were seeded in 24-well plates at a density of 500,000 cells/well followed by the PMA stimulation to become M0 macrophage, Then M0 were culture in optimized culture media (0% FBS in RPMI medium) and stimulated with optimized LPS concentration (100 ng/mL). The LPS incubation times were optimized by varying the incubation time from 24, 48, and 72 hours. The conditioned medium was collected at each time point, centrifuged at 4°C, 1,500 \times g for 15 minutes to deplete the cells and debris, and the supernatant was analyzed with NTA to detect EVs size and concentration.

Extracellular vesicle isolation

The conditioned media were thawed at 4°C, filtered through a 1.2 μ m filter, and centrifuged at 13,000 \times g for 2 minutes at 4°C. Then the upper part of the supernatant was transferred into a new tube and centrifuged at 13,000 \times g for 70 minutes at 4°C. Next, the supernatant was further filtered through a 0.2 μ m filter and centrifuged at 110,000 \times g for 90 minutes at 4°C. After discarding the supernatant, the pellets (isolated EVs) were washed 1 time with 0.2 μ m filtered PBS. Then the isolated EVs were resuspended in filtered PBS and kept at -80°C freezer until use for NTA analysis.

Nanoparticle Tracking Analysis (NTA)

The isolated EVs were diluted with 0.2 μ m-filtered PBS at the proper concentration to reach the instrument's recommendation at around 20-100 particles per frame. Next, the samples were injected into the NanoSight NS300 Instrument (Malvern Panalytical Ltd., Worcester, UK) using a syringe pump. Five sequential of 1 minute videos were captured to acquire the data, with detector threshold at 5. Data analysis was performed using NTA 3.4 software.

RESULTS

Optimization of LPS concentration

The flow cytometric data showed that LPS at concentrations of 20, 50, and 100 ng/mL induced upregulation of CD80 expression, which is a surface marker of M1 macrophages. The LPS stimulation at 20 and 50 ng/mL showed that the percentage of CD80-expressing cells was 18.4% and 16.8% at 24 hours, and 22% and 25% at 48 hours, respectively. In addition, LPS at 100 ng/mL induced CD80 expression at levels comparable to standard polarized M1 macrophages. The percentages were 22.8% and 28.6% at 24 and 48 hours, respectively. Therefore, LPS at 100 ng/mL was used to polarize M0 macrophages toward M1 macrophages for the remainder of the experiment. (Table 1)

Table 1 Percentage of CD80-expressing cell analyzed by flow cytometry

LPS concentration	24 hr		48 hr	
	CD80 (%)	Mean (MFI)	CD80 (%)	Mean (MFI)
M0 (negative)	0.26	74.8	0.16	72.9
LPS 20 ng/mL + IFN- γ 20 ng/mL	22.2	189	24.8	199
LPS 20 ng/mL	18.4	173	22.0	189
LPS 50 ng/mL	16.8	168	25.0	201
LPS 100 ng/mL	22.8	196	28.6	224

Optimization of FBS concentrations

After incubating M1-polarized macrophages with RPMI culture media containing 1%, 2.5%, 5%, and 10% FBS, flow cytometric results showed that the percentages of live cells in the free FBS culture media were 79.6% and 63.9% at 24 hours and 48 hours, respectively. These values were slightly lower than those in other groups, which ranged from 87.1% to 92% at 24 hours and from 55.7% to 73.9% at 48 hours. (Figure 1) NTA measurement results of culture media supplemented with 0%, 5% 10% FBS after 48 hours showed dose-dependent correlation with EVs concentrations of $1.57 \times 10^9 \pm 7.76 \times 10^6$, $2.34 \times 10^9 \pm 1.29 \times 10^7$, $2.43 \times 10^9 \pm 2.33 \times 10^7$ particles/mL, respectively, and with size ranges of 155.6 ± 4.0 , 137.6 ± 3.8 , and 145.6 ± 1.3 nm, respectively. EVs-depleted FBS showed a concentration of $10.64 \times 10^9 \pm 1.18 \times 10^7$ particle/mL with size 118.9 ± 1.0 nm while RPMI without FBS showed a concentration of

$4.78 \times 10^6 \pm 1.0 \times 10^6$ particles/mL with size 213.3 ± 17.0 nm. (Table2)

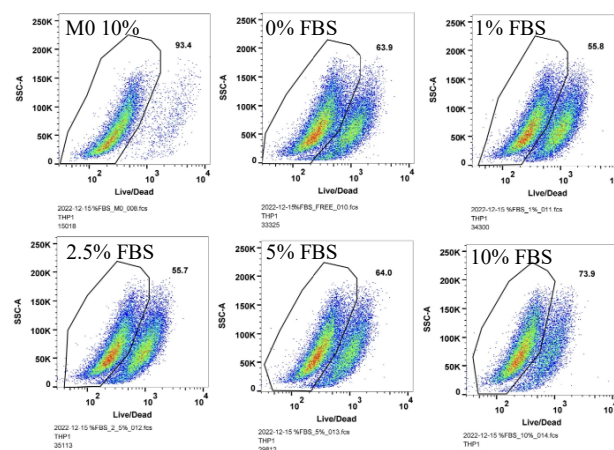


Figure 1 The representative flow cytometric data of live cell analysis at 48 hours

Table 2 NTA results of isolated EVs from cultured medium of FBS optimization experiment

EVs-depleted FBS concentration	Size (nm)	Mode (nm)	SD (nm)	Concentration (particles/mL)
0%	155.6 ± 4.0	115.4	62.1	$6.28 \times 10^9 \pm 7.76 \times 10^6$
5%	137.6 ± 3.8	96.2	58.1	$1.17 \times 10^{10} \pm 1.29 \times 10^7$
10%	145.6 ± 1.3	103.9	63.0	$1.22 \times 10^{10} \pm 2.33 \times 10^7$
EVs-depleted FBS ^a	118.9 ± 1.0	113.1	34.1	$10.64 \times 10^9 \pm 1.18 \times 10^7$
RPMI with P/S ^b	213.3 ± 17.0	70.2	123.5	$4.78 \times 10^6 \pm 1.0 \times 10^6$

Note: sample of FBS at concentration 1%, 2.5% were failed to analyze with NTA due to the technical problem and limited time usage

^aEVs-depleted FBS was measured along as control, also to check for remain EVs from itself after the EVs depletion by ultracentrifugation

^bRPMI media with Penicillin/Streptomycin was measured to check for EVs

Incubation time optimization

The EVs were isolated from conditioned media at different incubation periods (24, 48, and 72 hours) and then analyzed for size and concentration using Nanoparticle Tracking Analysis (NTA). The

results showed that incubation time directly correlated with the release of EVs from M1-polarized macrophages. The longer the incubation time, the more EVs were released from donor cells: 1.044×10^9 particles/mL at 24 hours, 1.768×10^9 particles/mL at 48 hours, and 2.165×10^9 particles/mL at 72 hours (Table 3).

Table 3 NTA results of isolated EVs from cultured medium of incubation period optimization experiment

Incubation time (hr)	Size (nm)	Mode (nm)	SD (nm)	Concentration (particles/mL)
24	147.9±1.9	105.4	70.6	$1.044 \times 10^9 \pm 4.84 \times 10^6$
48	159.3±1.7	112.8	64.6	$1.768 \times 10^9 \pm 1.16 \times 10^7$
72	138.9±2.8	94.4	61.4	$2.165 \times 10^9 \pm 1.89 \times 10^7$

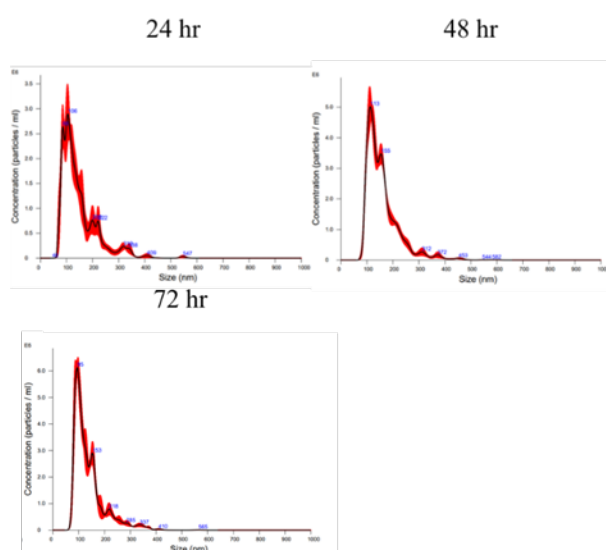


Figure 2 Representative NTA analysis. The EVs size distribution of isolated EVs from cultured medium at 24, 48, and 72 hours.

DISCUSSION

Flow cytometric analysis revealed that using 100 ng/mL of LPS to polarize M0 THP-1 macrophages towards M1 macrophages resulted in a high percentage of CD80-positive cells, similar to the standard M1 polarization group. Specifically, at 24 and 48 hours, the percentages of CD80-positive cells were 22.8% and 28.6%, respectively, comparable to 22.2% at 24 hours and 24.8% at 48 hours in the control group. Therefore, 100 ng/mL of LPS was selected for M1 macrophage polarization in subsequent experiments.

When M1-polarized macrophages were cultured in RPMI media with varying FBS

concentrations (1%, 2.5%, 5%, and 10%), the percentage of live cells was significantly lower in FBS-free media at both 24 hours (79.6%) and 48 hours (63.9%) compared to media containing FBS (87.1% - 92% at 24 hours and 55.7% - 73.9% at 48 hours). Despite the reduced viability, FBS-free media was chosen for M1 macrophage culture before EVs isolation to avoid unrelated Evs interference. The FBS concentration optimization was done because FBS proportion in the culture medium could gradually affect the amount of released Evs from the cells for several reasons. First, FBS itself contains an immense amount of Evs and other particles which are unwanted but somewhat unavoidable if those cell type has to be maintained and grown with FBS. Unless they use the commercially available EV-depleted FBS that would increase the cost of the study. At the same time, the use of EV-depleted FBS possibly develop the impaired of cell growth and cell viability (13). Second, a high FBS proportion will keep cells in the relaxing stage but full of unwanted Evs from FBS that will impure the target Evs in the subsequent isolation. The reduction of EV background is particularly crucial because it ensures a higher purity of the M1-Evs, which is essential for subsequent applications. With lower contaminants, the produced M1-Evs can be more efficiently applied in biomedical applications. This includes their potential use as functional molecules that can be modified for specific therapeutic purposes (14). Moreover, M1-Evs can serve as nanocarriers (15), which can be engineered to deliver drugs (16), genes (17), or other therapeutic agents (18) directly to target cells, enhancing the precision and effectiveness of treatments. Optimizing M1-Evs production conditions paves the way for their use in treating various diseases (19), especially cancer. Engineered M1-Evs can target cancer cells specifically, delivering anti-cancer agents (20) directly to tumors. This approach reduces side effects (21) and improves treatment outcomes, highlighting the broad potential and versatility of M1-Evs in modern medicine.

Analysis of conditioned media from different incubation periods (24, 48, and 72 hours) using NTA showed a direct correlation between incubation time and Evs release. Longer incubation times resulted in higher Evs concentrations: 1.044×10^9 particles/mL at 24



hours, 1.768×10^9 particles/mL at 48 hours, and 2.165×10^9 particles/mL at 72 hours. However, based on the FBS optimization results, the viability of M1-polarized macrophages dropped to 64.9% at 48 hours, indicating that a 72-hour incubation might further decrease cell survival. Therefore, a 48 hour incubation period was selected for the Evs production process.

CONCLUSIONS

This study provides sufficient conditions for the production of M1-EVs from cell culture. Specifically, it found that using an FBS-free RPMI medium yielded a satisfactory percentage of live cells after a 48-hour incubation period. These conditions not only supported cell viability but also significantly reduced the amount of unwanted background Evs compared to the traditional RPMI medium supplemented with EV-depleted FBS.

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HOUSEHOLD FOOD SECURITY STATUS OF MYANMAR MIGRANT WORKERS IN SAMUT SAKHON PROVINCE, THAILAND

Ei Ei Nyein¹, Cheerawit Rattanapan¹, Piyapong Janmaimool¹, Thunwadee Sukasaroj^{1*}

¹ASEAN Institute for Health Development, Mahidol University, Salaya, Phuttamonthon, Nakhon Pathom 73170, Thailand

*Corresponding Author: Thunwadee Suksaroj, ASEAN Institute for Health Development, Mahidol University, Salaya, Phuttamonthon, Nakhon Pathom 73170, Thailand, E-mail: thunwadee.suk@mahidol.edu

ABSTRACT

Introduction: Food security is a global issue exacerbated by urbanization, population growth, and migration. In 2022, approximately 29.6% of the global population experienced moderate or severe food insecurity. Addressing food security comprehensively is crucial to achieving Sustainable Development Goal 2: End hunger, achieve food security, and improve nutrition by 2030.

Objectives: This study aims to assess the status of household food security among Myanmar migrant workers and identify the factors associated with their food security status in Samut Sakhon Province, Thailand.

Methodology: A cross-sectional survey was deployed with 130 Myanmar migrant households residing in Samut Sakhon Province for employment purposes. Simple random sampling was applied to select the Myanmar communities, followed by voluntary response sampling to choose the households. Data was collected through face-to-face interviews using structured questionnaires. Descriptive statistics and chi-square tests were applied using IBM SPSS software for data analysis.

Results: Among 130 Myanmar migrant households, only one-third (33.8%) of the households were food secure and 66.2 % experienced food insecurity with 9.2% severely food insecure. Paying debt/rent, nutritional knowledge, food safety practices, and perceived job insecurity were statistically associated with household food security status (p -values<0.05).

Conclusion: This study highlighted the high prevalence of food insecurity among Myanmar migrant workers in Samut Sakhon Province. The findings underscored the need for targeted interventions for promoting nutritional knowledge, food safety practices, and financial and job security to improve the household food security status of Myanmar migrant workers.

Keywords: Food Security, Migrant Workers, Migration, SDG 2

INTRODUCTION

Food security has emerged as a global issue due to urbanization, population growth, and migration. As of 2022, approximately 29.6% of the global population experienced moderate or severe food insecurity, with about 11.3% facing severe food insecurity (1). Factors such as conflict, economic crises, and climate change have exacerbated food insecurity, necessitating humanitarian assistance, including food and nutrition support. The COVID-19 pandemic further amplified food insecurity, posing challenges to achieving global targets aimed at eradicating hunger, addressing malnutrition in all its forms, and achieving food security by 2030 (2). Achieving these goals will require a

comprehensive approach and more understanding of the broad determinants of food security as a complex global issue.

In the 2022 Global Food Security Index (GFSI), Thailand ranked 64th globally, which assesses and reports on food security across 113 countries worldwide. However, despite this ranking, Thailand continues to grapple with challenges according to the FAO's definition of food security, which encompasses four key components: food availability, accessibility, utilization, and stability (3). Specifically, Thailand faces a moderate level of hunger, ranking 53rd out of 116 countries according to The Global Hunger Index (GHI) report in 2023 (4).



International Organization for Migration (IOM) conducted a multisectoral need assessment among Myanmar migrant workers in Thailand in 2022. The findings reported that 93% of respondents had acceptable food consumption and 90 % had no or little hunger. However, 46% of respondents adopted coping strategies with 19% scoring high on the reduced Coping Strategy Index, indicating frequent adoption of coping strategies such as relying on less preferred and cheaper food, borrowing food, reducing adult consumption, and/or reducing the number of meals due to insufficient food or financial constraints (5). This report highlighted the need for further studies on the household food security status of Myanmar migrant workers because every individual experiencing hunger is considered food insecure, but not everyone facing food insecurity experiences hunger (6). Food insecurity can negatively impact the mental health of the migrants, causing stress, anxiety, and depression due to the uncertainty of the ability to access the required foods (7). Additionally, a study reported that migrant workers have low dietary intake which can affect the nutritional status and physical health of the migrant workers (8).

Although many studies on food security in Thailand exist, those studies could not represent the food security status of Myanmar migrant workers because food security status may differ between native Thai and migrant workers. Limited research focused on migrant workers' food security in Thailand. Therefore, this study aims to explore the household food security status and identify its associated factors among Myanmar migrant workers in Thailand.

METHODOLOGY

Study design and study area

This cross-sectional study was conducted in two Myanmar communities under Samut Sakhon Province, Thailand which has one of the highest densities of Myanmar migrant workers in Thailand.

Study population and samples

A total of 130 Myanmar migrant households were included in this study. The simple random sampling was applied to select the Myanmar communities and then representatives from Myanmar migrant

households from the selected communities who are 18 years old and above and prepare the meals for the households were chosen based on voluntary response sampling.

Data collection

Data were collected through face-to-face household representative interviews using structured questionnaires with Kobo collection tool which is a free and user-friendly data collection tool on any devices including mobile phones online or offline. The questionnaires consisted of six sessions: socio-demographic and household characteristics, food availability, food accessibility, food utilization, food stability, and the Household Food Insecurity Access Scale (HFIAS). The Household Food Insecurity Access Scale (HFIAS) is a validated standard questionnaire which was developed by USAID's Food and Nutrition Technical Assistance (FANTA) project. The questionnaire includes nine occurrence questions that reflect the level of severity of food insecurity (access), and nine "frequency-of-occurrence" questions for each occurrence question to determine how often the condition occurred. If the answer is "yes", a frequency-of-occurrence question is asked to determine whether the condition happened rarely (once or twice), sometimes (three to ten times) or often (more than ten times) in the past four weeks. The outcome will be categorized into 4 groups: food secure, mildly food insecure, moderately food insecure, and severely food insecure (9).

Data analysis

A total of 130 responses were used in the data analysis. All data from the Kobo collect tool were checked and imported to SPSS (version 29 for Mac) for data analysis. Descriptive statistics were used to describe the socio-demographic characteristics and other independent variables. The chi-square test was applied to identify the association between the independent variables and household food security status of Myanmar migrant workers.

Ethical consideration

The protocol was approved by the Mahidol University Central Institutional Review Board (MU-CIRB) in June 2024 and the Certificate of Approval number was MU-CIRB 2024/206.1405.



RESULTS

Table 1 shows the socio-demographic and household characteristics of the Myanmar migrant households. The average age of household food providers was 35.8 years (± 10.4), the median was 35.5 and the range was 18. The majority of the participants (75.4%) were female. More than half (58.5%) had secondary school and above level and half (50%) are working in seafood processing. Nearly two-thirds (62.3%) of the households had 3 or less than 3 family members. More than two-thirds (70%) had 2 or more dependent family members. A total of 77.7% of households imported foods from Myanmar. Over half (53.1%) of the households had ≤ 12000 THB per month and more than half (50.8%) used ≤ 4000 THB per month for food. The majority of the participants (78.5%) had good knowledge and over half (50.8%) had good practice. Most of the participants (78.5%) experienced high perceived job insecurity.

Table 1 Sociodemographic

Socio-demographic	Number	Percent(%)
Age group		
≤ 35	65	50
> 35	65	50
Mean-35.8, median-35.5, SD-10.39, minimum-18, maximum-57		
Sex		
Male	32	24.6
Female	98	75.4
Education		
Below secondary school	54	41.5
Secondary school and above	76	58.5
Employment		
Seafood processing workers	65	50
Others	65	50
Household food stock		
No stock	60	46.2
Having stock	70	53.8
Dependent members		
No or 1 dependent member	96	73.8
2 or more dependent member	34	26.2
Food imported from Myanmar		
Yes	29	22.3
No	101	77.7

Socio-demographic	Number	Percent(%)
Household monthly income		
≤ 12000 THB	69	53.1
> 12000 THB	61	46.9
House monthly food expenditure		
≤ 4000 THB	66	50.8
> 4000 THB	64	49.2
Paying debt/rent		
Yes	92	70.8
No	38	29.2
Nutritional knowledge		
Good knowledge	98	75.4
Poor knowledge	32	24.6
Food safety Practice		
Good practice	61	46.9
Poor practice	69	53.1
Job insecurity		
No/Low job insecurity	67	51.5
High job insecurity	63	48.5

Table 2 describes the household food insecurity access scale category of Myanmar migrant workers. Only one-third (33.8%) of the respondent households were food secure. A total of 66.2 % of the households experienced food insecurity, with 9.2% facing severe food insecurity, 28.5% experiencing moderate food insecurity, and another 28.5% being mildly food insecure.

Table 2 Household food insecurity (HFIAS) (n=130)

HFIAS category	Number	Percent (%)
Food secure	44	33.8
Food insecure	86	66.3
<i>Mildly food insecure</i>	37	28.5
<i>Moderately food insecure</i>	37	28.5
<i>Severely food insecure</i>	12	9.2



Table 3 shows the association between independent variables and household food security status. Household food security status was categorized into two groups: food secure and food insecure. According to the Chi-square test, paying debt/ rent (p-value=<0.001), nutritional knowledge (p-value=0.038), food safety and preparation practice (p-value = 0.018), job insecurity (p-value = 0.002) were statistically associated with household food insecurity.

Table 3 Association between independent variables and household food security status (n = 130)

Independent variables	Number of participants (n)	N	%	N	%	P-value
Age group	130					
≤ 35	65	26	40.0	39	60.0	0.138
>35	65	18	27.7	47	72.3	
Sex	130					0.351
Male	32	13	40.6	19	59.4	
Female	98	31	31.6	67	68.4	
Education	130					0.917
Below secondary school	54	18	33.3	36	66.7	
Secondary school and above	76	26	34.2	50	65.8	
Employment	130					0.266
Seafood processing workers	65	19	29.2	46	70.8	
Others	65	25	38.5	40	61.5	
Household size	130					0.544
≤ 3 members	81	29	35.8	52	64.2	
>3 members	49	15	30.6	34	69.4	
Dependent members	130					0.139
No or 1 dependent member	96	36	37.5	60	62.5	
2 or more dependent member	34	8	23.5	26	76.5	
Food imported from Myanmar	130					0.156
No	101	31	30.7	70	69.3	
Yes	29	13	44.8	16	55.2	
Household monthly income	130					0.895
≤ 12000 THB	69	23	33.3	46	66.7	
>12000 THB	61	21	34.4	40	65.6	
Household monthly food expenditure	130					0.084
≤ 4000 THB	66	27	40.9	39	59.1	
> 4000 THB	64	17	26.6	47	73.4	
Paying debt/rent	130					<0.001
Yes	92	22	23.9	70	76.1	
No	38	22	57.9	16	42.1	

Independent variables	Number of participants (n)	N	%	N	%	P-value
Good knowledge	98	38	38.8	60	61.2	
Poor knowledge	32	6	18.8	26	81.2	
Food safety Practice	130					0.018
Good practice	61	27	44.3	34	55.7	
Poor practice	69	17	24.6	52	75.4	
Job insecurity	130					0.002
No/Low job insecurity	67	31	46.3	36	53.7	
High job insecurity	63	13	20.6	50	79.4	

DISCUSSION

In this study, food security is defined as a situation when all people, at all times, have physical and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life (10). The study found that 66.2% of sample households were food insecure, which was higher than 46% of Myanmar migrant workers who adopted coping strategies because of food insecurity (5). Moreover, the prevalence of food insecurity in this study was higher compared to another study which reported that 59.5% of migrant worker households in northeastern Thailand had a low level of food security and only 18.4 % had a high level of food security (11). Another study conducted among migrant workers in Malaysia reported that about 57.6% of the studied households had food insecurity, with the highest food insecurity rate among Myanmar migrants (8). The high prevalence of household food security may be because of job instability among Myanmar migrant workers especially in seafood processing areas as well as the application of different measurement tools to assess household food security.

Households with debt/rent payments were associated with household food insecurity. A similar finding was reported by a study conducted in Thailand that respondents who had debt were more likely to experience food insecurity than those without debt (12). Furthermore, another study reported that food insecurity was more likely among migrants who paid rent compared to those who did not pay rent (13). This correlation can be explained by the financial burden of paying debt/rent reduces the available budget for buying food.

This study measured nutritional knowledge related to a healthy diet, diet-related



diseases, and main food sources of nutrients using an adjusted questionnaire according to literature reviews (14,15). Nutritional knowledge was statistically associated with household food security status. This finding was consistent with the result of a study that indicated that inadequate nutritional knowledge could contribute to household food insecurity (16). Moreover, nutritional knowledge had a negative impact on food security and should be considered in food security studies (17). Another study indicated that nutritional knowledge was inversely associated with food security among men (18). This association could be explained that households with good nutritional knowledge are more likely to make informed decisions on food choices and food expenditure. Moreover, nutritional knowledge is crucial for choosing safe and nutritious food for healthy diet that meets dietary needs and plays an essential component in achieving household food security.

This study found that food safety practice was statistically associated with household food security status (p-value 0.018). A study conducted in Iran found an inverse relationship between home food safety practices and household food security (19). Food security cannot be achieved without food safety. Therefore, ensuring food safety practices at the household level is crucial to improve household food security.

This study found that households with high job insecurity were more prone to food insecurity than those who had low or no job insecurity. This result was supported by a study which estimated that a one standard deviation increase in unemployment risk for the household head can reduce household food consumption by 1.6% (20). Additionally, households experiencing job loss during Covid-19 were more susceptible to food insecurity (21). Having a stable income and job is crucial to access food all the time and uncertainties of job and incomes limit household food expenditure.

CONCLUSIONS

This study highlighted the high prevalence of household food insecurity among Myanmar migrants' workers in Samut Sakhon Province. About two-thirds (66.2%) of the households reported food insecurity with 9.2 % being severely food insecure. Paying debt/rent,

nutritional knowledge, food safety practices, and perceived job insecurity were statistically associated with household food insecurity.

RECOMMENDATIONS

The findings of this study underscored the need for targeted programs or interventions to promote nutritional knowledge and food safety practices among Myanmar migrant workers to improve the household food security status. It is also recommended that policy strengthening to improve job security and income opportunities to reduce financial burdens of the debt/rent payments and to ensure the ability of households to have financial access to sufficient, safe, and nutritious food at all times. Further research on household food security was suggested to consider broader determinants of household food security as it is a multidimensional issue.

LIMITATIONS

The study has some limitations including a small sample size that limits the generalization of the results and being a cross-sectional study, limits the ability to establish a causal relationship. Further research should aim to address these limitations and explore the predictors of household food security with unmeasured factors in this study.

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KNOWLEDGE, ATTITUDE, AND PRACTICE OF WHO MENTAL HEALTH GUIDELINES FOR NON-SPECIALIST PRIMARY HEALTHCARE PROVIDERS IN WUHUA DISTRICT, KUNMING, CHINA: A CROSS-SECTIONAL STUDY

Liesha Luohe¹, Alessio Panza^{1*}

¹College of Public Health Sciences, Chulalongkorn University, Bangkok 10330, Thailand

*Corresponding Author: Alessio Panza, College of Public Health Sciences, Chulalongkorn University, Bangkok 10330, Thailand, E-mail: alessio3108@hotmail.com

ABSTRACT

Introduction: The Healthy China 2030 policy emphasizes the importance of mental healthcare at the primary healthcare level. Globally, primary healthcare (PHC) service delivery is considered the most effective approach for managing mental health (MH) disorders. The WHO's mental health gap intervention guide version 2 (mhGAP-IG.v2), is a decision support tool for non-specialists for the assessment, management, and follow-up of mental, neurological, and substance use disorders. However, no studies have assessed primary healthcare providers' (HCPs) knowledge, attitudes, and practices on MH services in the western part of China.

Objectives: To determine the PHC providers' characteristics and MH service provision level in Wuhua District, Kunming. Specifically, to describe socio-demographic characteristics, knowledge, attitudes, and their associations with mental healthcare practices, particularly in the use of mhGAP-IG v2.

Methodology: A cross-sectional study was conducted in primary healthcare centers (PHCs) in Wuhua District. Data were collected over 22 days in March 2023. Data were coded and analyzed in Excel and SPSS for descriptive, bivariate (Mann-Whitney U test, Kruskal-Wallis test, chi-square), and multinomial logistic regression.

Results: The study involved 261 HCPs. Participants mean age was 32.8 (24-44) years, predominantly female (85.4%), nurses (69.4%), and had a Bachelor's degree (77.4%). Knowledge scores for mhGAP-IG v2 had a median of 9.0 (IQR = 7.0 to 10.0) out of 11, indicating moderate knowledge (64.0%), low (28.0%), and high (8.1%). Combined attitudes towards mental health disorders and mhGAP-IG v2 had a median score of 81.0 (IQR = 79.0 to 84.0) out of 125, categorized as neutral (70.9%), positive (17.2%), and negative (11.9%). Only 15.8% of HCPs used mhGAP-IG v2, with the practice increasing to 50% among doctors. The results indicated significant associations for the following variables: attitude on MH disorders (AOR=1.214, p-value <0.001), knowledge of mhGAP-IG v2 (AOR=1.755, p-value=0.003), and attitude on mhGAP-IG v2 (AOR=1.628, p-value=0.007), with the odds of being in the "Moderate" or "High practice" levels compared to "No practice" increasing with higher scores in those variables.

Conclusion: This study highlights significant gaps in knowledge, attitudes, and practices related to MH service provision among HCPs in PHCs in Wuhua District. Despite a foundation of positive attitudes towards mental health and mhGAP-IG v2 guidelines, practical engagement is very limited. Enhancing training, improving attitudes, and reducing barriers to guidelines' implementation are crucial for improving MH service delivery.

Keywords: Mental Health, Primary Healthcare Providers, mhGAP-IG V2, Kunming, KAP

INTRODUCTION

Mental health (MH) disorders represent a significant global health challenge, affecting individuals across all regions and socioeconomic strata. According to the Global Burden of Disease study, mental disorders contribute substantially to

years lived with disability worldwide, with an estimated 125.3 million years lived with disability attributed to mental disorders in 2019 alone.(1) The prevalence of mental disorders varies across different regions, with China reporting a prevalence of approximately 16.6%.(2)



Community-based services are widely regarded as the best approach for providing mental health treatment and care. Similarly, the 'Healthy China 2030' policy emphasizes the importance of mental healthcare at the primary healthcare level, recognizing the critical role that primary healthcare providers (HCPs) should play in addressing mental health needs within their communities. However, like many other low- and middle-income countries, China continues to spend the vast majority of its scarce mental health resources managing people with mental disorders in mental hospitals instead of at the primary healthcare level.⁽³⁾ In China, the ratio of mental health professionals is significantly lower than in high-income countries, with 5.68 MH nurses and 2.55 psychiatrists per 100,000 population, compared to the global median of 13 per 100,000 population, according to the Mental Health Atlas reported in 2021^(4, 5)

In response to the shortage of specialized workforce, the World Health Organization (WHO) released the Mental Health Gap Action Programme Intervention Guide Version 2.0 (mhGAP-IG V2) in 2016. These guidelines provide non-specialized HCPs with support for the diagnosis, management, and follow-up of common mental disorders. The mhGAP-IG V2 empowers HCPs working in primary healthcare centers to conduct in-depth case interviews with patients, enabling early detection of mental health problems. Additionally, it offers insights into future MH community networks, helping patients with mild and moderate mental disorders gradually return to live in society (deinstitutionalization) and improve their family situations.

Despite the potential of mhGAP-IG V2 to enhance mental health service delivery, its implementation and utilization among non-specialist HCPs in LMICs like China remain understudied. Existing literature primarily focuses on high-income areas in China, such as Shenzhen, with limited research exploring its adoption and impact within the primary healthcare system in regions like Wuhua District, Kunming, located in southwestern China.^(6, 7)

Therefore, this study aims to assess the Knowledge, Attitudes, and Practices (KAP) of non-specialist primary healthcare providers towards the WHO Mental Health guidelines, specifically mhGAP-IG V2, in Wuhua District, Kunming, China, and identify the factors influencing practice to enhance mental health

service delivery within this unique cultural and socioeconomic context

METHODOLOGY

Study Design

A cross-sectional study was conducted to assess the knowledge, attitudes, and practices of non-specialist primary healthcare providers (HCPs) regarding the WHO Mental Health guidelines in Wuhua District, Kunming, China.

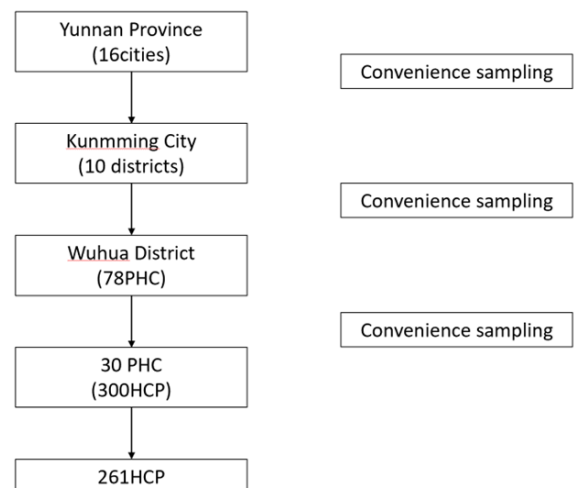
Study Population

The study population comprised all non-specialist primary healthcare providers in Wuhua District, Kunming, China, including 309 licensed doctors and 506 registered nurses, totaling 815 HCPs across 78 primary healthcare centers (PHCs).

Sampling Technique

The selection of Wuhua District was based on convenience sampling due to its accessibility, and the researcher's residence and familiarity with local healthcare centers, which facilitated the research process. It was employed at each stage: selecting Yunnan Province, Kunming City, Wuhua District, and the specific primary healthcare centers (PHCs).

Sample Size Calculation



The sample size was calculated using the Yamane formula:

$$n = \frac{z^2 \cdot p \cdot (1-p)}{e^2} \Bigg/ \left[1 + \left(\frac{z^2 \cdot p \cdot (1-p)}{e^2 \cdot N} \right) \right]$$

Where:

n = sample size

N = total population (815)



e = desired precision (0.05, 5%)
 z = Z-score corresponding to the desired confidence level (1.96 for 95% confidence level)
 p = estimated proportion of population that has a particular characteristic (0.5 for maximum variability)
 Using the formula, the calculated sample size was 261.

Data Collection

Data were collected using a structured questionnaire designed to capture the knowledge, attitudes, and practices of the HCPs regarding the mhGAP-IG v2.0 guidelines. The questionnaire included sections on demographic information, knowledge of mental health service provision, attitudes towards mental health disorders, and practices in providing mental health services.

The socio-demographic section was developed by the researchers (Q1-10). The knowledge section was developed partially by the researchers (Q11-13) and partly by adapting the WHO published mhGAP pre-and-post knowledge test for mhGAP-based training (Q14-21).

The attitude section was partially adopted from the Community Attitudes toward Mental Illness (CAMI) scale developed by Taylor and Dear in previous published studies, and the Chinese Version of Short-Form Community Attitudes Toward Mentally Illness Scale developed by Tong, et al. (Q22-41). The remaining questions (Q42-46) of the attitude part were developed by the researchers.

The practice section (Q47-53) was developed by the researchers.

Data were collected over 22 days in March 2023 by researchers and one research assistant in primary healthcare centers using a paper-based self-administered questionnaire.

Data Analysis

Data were entered into Excel and coded before analysis. The Statistical Package for Social Sciences (SPSS Version 26) was used for statistical analysis.

Uni-variate Analysis

Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize the data.

Bivariate Analysis

Monte Carlo simulation method of the chi-square test, Mann-Whitney U test and Kruskal-Wallis test were used to examine relationships between categorical variables such as sex, age group, educational level, occupation, working years, knowledge and attitude level related to the practice level

Multivariate Analysis

Multinomial logistic regression analysis was performed to identify associations between independent predictors and the dependent variable related to the mhGAP Intervention Guideline v2.0. Adjusted regression coefficients, odds ratios, and their corresponding 95% confidence intervals were reported.

Ethical Consideration

Ethical approval for the study was obtained from The Research Ethics Review Committee for Research Involving Human Research Participants, Group I, Chulalongkorn University. Informed consent was obtained from all participants, and confidentiality was strictly maintained.

RESULTS

Socio-Demographic Characteristics

The mean age of the respondents was 32.8 years. Most respondents were female (85.44%) with a mean age of 32.68 years, while males comprised 14.56% with a mean age of 33.53 years. The majority of respondents (83.91%) had education above a Bachelor's degree. Nurses constituted 69.35% of the sample. Most respondents (59.00%) had 1-3 years of work experience, with a mean of 3.25 years. 81.23% rated their income level as neutral. 63.22% of respondents' primary healthcare centers (PHCs) had a daily average of 5-10 patients. All respondents worked 41-50 hours per week. 57.50% of doctors and 71.83% of nurses rated their daily average patient ratio as between 1:5 and 1:10.

Table 1 Socio-Demographic Characteristics of respondents(n=261)

Variables	Number	Percent (%)
Age		
<31 years	83	31.80
31-34 years	87	33.33
≥35 years	91	34.87



Variables	Number	Percent (%)
Gender		
Male	38	14.6
Female	223	85.4
Educational level		
Associate degree	42	16.1
Bachelor degree	202	77.4
Master degree	17	6.5
PhD and above	0	0.0
Occupation		
Doctor	80	30.7
Nurse	181	69.4
Years of working experience		
1-3	154	59.0
4-6	98	37.6
7-10	9	3.5
Satisfaction of income		
Totally unsatisfied	0	0.0
Unsatisfied	29	11.1
Neutral	212	81.2
Satisfied	20	7.7
Completely satisfied	0	0.0
Daily Average number of patients administered		
<5	48	18.4
5-10	165	63.2
>10	48	18.4

Variables	Number	Percent (%)
Working hours per week		
Less than 30 hours	0	0.0
30-40 hours	0	0.0
41-50 hours	261	100
More than 50 hours	0	0.0
Daily average doctor-patient ratio		
< 1:5 (Total 80)		
= 1:5	0	0.0
> 1:5, but <1:10	14	17.5
=1:10	46	57.5
>1:10	16	20.0
Daily average nurse-patient ratio		
< 1:5 (Total 181)		
= 1:5	10	5.52
> 1:5, but <1:10	41	22.65
=1:10	130	71.83
>1:10	0	0.00

Knowledge section of respondent

Table 2 provides an overview of respondents' knowledge scores: Part I focuses on mental health service provision, with a mean score of 1.68 ± 1.065 out of a possible 3. Part II assesses knowledge on mhGAP-IG v2 guidelines, yielding a mean score of 6.67 ± 1.243 out of 11. The total knowledge score, combining both parts, averages 8.34 ± 1.731 out of 14.

Table 2 Descriptive of Knowledge Section and Total Knowledge Scores(n=261)

Domain	Mean	SD	Minimum	Maximum
Part I Knowledge on mental health service provision (Full score: 3)	1.68	1.065	0	3



Domain	Mean	SD	Minimum	Maximum
Part II	6.67	1.243	4	10
Knowledge on mhGAP-IG v2 guidelines (Full score: 11)				
Total	8.34	1.731	4	13
Knowledge score(Full score: 14)				

Table 3 categorizes respondents' overall knowledge levels: 27.97% demonstrated a low level (0-7 out of 14), 63.98% exhibited a moderate level (8-11 out of 14), and 8.05% achieved a high level (>80%, 12-14 out of 14). Key findings include significant awareness of mental health treatment gaps (39.08%) and recognition of primary healthcare as optimal for mental health services (over 70%).

Table 3 Descriptive of Total knowledge score based on levels

Level of Knowledge	Cut off Point	Scores	Number	Percent (%)
Low	<60%	0-7	73	27.97
Moderate	60-79%	8-11	167	63.98
High	>80%	12-14	21	8.05

Attitude section of respondent

Table 4 provides an overview of respondents' attitudes towards mental health disorders and mhGAP-IG v2 guidelines. Part I, focusing on attitudes towards mental health disorders, yielded a mean score of 65.36 ± 5.501 , ranging from 46 to 81. Part II, assessing attitudes towards mhGAP-IG v2 guidelines, had a mean score of 16.72 ± 1.527 , ranging from 14 to 23. The total attitude score averaged 82.08 ± 6.36 , ranging from 60 to 101.

Table 4 Descriptive of Attitude Section and Total Attitude Scores(n=261)

Part	Mean	SD	Minimum	Maximum
Part I	65.36	5.501	46	81
Attitude on MH disorders (20-100)				
Part II	16.72	1.527	14	23
Attitude on mhGAP-				

Part	Mean	SD	Minimum	Maximum
IG v2 guidelines (5-25)				
Total	82.08	6.36	60	101
Attitude score (25-125)				

Table 5 categorizes respondents' total attitude scores into three levels: 10.7% exhibited negative attitudes (<76), 72.4% had neutral attitudes (76 to <89), and 16.9% displayed positive attitudes (≥ 89). The distribution highlights that a significant majority of respondents held neutral attitudes towards mental health disorders and mhGAP-IG v2 guidelines.

Table 5 Descriptive of Total Attitude Score Based on Levels(n=261)

Level of score	Cut-off Point	Cut-off score	Number	Percent (%)
Negative	<-1SD	<76	28	10.7
Neutral	-	$76 \leq X < 89$	189	72.4
		$1SD \leq \bar{x} < 1SD$		
Positive	$\geq 1SD$	≥ 89	44	16.9

Practice section of respondent

Table 6 presents the distribution of respondents' practice levels regarding mental health disorders and mhGAP-IG v2 guidelines. The analysis reveals that 84.3% of respondents demonstrated "No practice," scoring below one standard deviation from the mean. In contrast, 7.7% showed "Moderate practice," while 8.0% exhibited "High practice," scoring above one standard deviation from the mean. These findings illustrate varying degrees of implementation of mental health practices among healthcare providers in the study

Table 6 Descriptive of Total Practice Score Based on Levels (n=261)

Level of practice	Cut-off Point	Cut-off Point in score	Number	Percent (%)
No practice	<-1SD	0	220	84.3
Moderate	-	0-0.898(0-1)	20	7.7
		$1SD \leq \bar{x} < 1SD$		
High	$\geq 1SD$	>0.898(>1)	21	8.0

Bivariate analysis

Bivariate analysis used Pearson's Chi-square to examine associations between each



independent categorical variable and the dependent variable—practice of mental health disorders and mhGAP-IG v2 guidelines. Due to expected cell counts < 5, Monte Carlo simulation method was employed for more accurate p-values.

Table 7 presents the summary of bivariate analysis results. Age, educational level, occupation, and working years significantly influence knowledge levels. Educational level and occupation significantly influence attitude levels. Sex, age, educational level, occupation, and working years significantly influence practice levels. Both knowledge and attitude levels are significantly associated with practice levels.

Table 7 Summary of Bivariate Analysis Results

Variables	Chi-square(x ²)	P-value
Knowledge level		
Sex	0.640	0.724
Age	28.227	<0.0001*
Education	70.024	<0.0001*
Occupation	14.043	0.001*
Working years	24.407	<0.0001*
Attitude level		
Sex	0.808	0.688
Age	7.687	0.100
Education	135.307	<0.0001*
Occupation	11.365	0.004*
Working years	7.266	0.112
Practice Level		
Sex	22.002	<0.0001*
Age	18.683	0.001*
Education	44.147	<0.0001*
Occupation	102.566	<0.0001*
Working years	12.524	0.020
Knowledge level	46.177	<0.0001*
Attitude level	41.944	<0.0001*

Note: * indicates a significant value (p < 0.05).

Non-parametric Tests Results

The Kruskal-Wallis Test and Mann-Whitney U Test were conducted to investigate significant differences across educational levels and occupations, which were identified as significantly associated variables in the bivariate analysis, regarding the practice score, which is non-normally distributed in this study.

Educational Levels across Practice Score:

Associate and Master degree holders (adjusted p-value = 0.000)

Bachelor and Master degree holders (adjusted p-value = 0.000)

It indicate that Master degree holders generally exhibit higher practice scores compared to Associate and Bachelor degree holders.

Occupation Groups across Practice score:

Doctors have significantly higher practice scores compared to nurses (U = 3649.500, Z = -10.092, p = 0.000).

Regression analysis

The multinomial logistic regression analysis as shows in Table 8 highlights significant predictors of "Practice level" related to mental health among healthcare providers: Knowledge of mhGAP-IG v2 (B = 0.085, p = 0.001) and Attitude on mhGAPv2 (B = 0.080, p = .003) are both statistically significant, indicating their roles in predicting higher practice levels. In contrast, Knowledge score of mental health service provision (B = 0.004, p = .892) and Attitude on MH disorders (B = 0.012, p = 0.085) did not show significant associations.

Table 8 Coefficients and Collinearity Statistics of Multinomial Logistic Regression Analysis

Factors	B	SE	Beta	t	P-value	Tolerance	VIF
(Constant)	-1.476	0.449	-	-3.289	0.001*	-	-
Knowledge score of mental health service provision	0.004	0.032	0.008	0.136	0.892	0.944	1.060
Knowledge of mhGAP-IG v2	0.085	0.026	0.207	3.244	0.001*	0.788	1.270
Attitude on MH disorders	0.012	0.007	0.112	1.727	0.085	0.765	1.308
Attitude on mhGAP v2	0.080	0.027	0.208	2.993	0.003*	0.666	1.502

Note: * indicates a significant value (p < 0.05).

a. Dependent Variable: Practice level (Reference group: no practice)

All Tolerance values are above 0.1, indicating no severe multicollinearity.

All VIF values are below 10, indicating no severe multicollinearity.



DISCUSSION

Socio-demographic Characteristics of Healthcare Providers

Participants in our study exhibited a balanced age distribution, with 31.80% under 31 years old, 33.33% aged 31-34, and 34.87% aged 35 or older, reflecting a potentially generational shift influenced by Kunming's urban environment. Compared to a 2020 study in Shandong, our sample skewed younger, with higher percentages under 30 (23.75%) and fewer aged 40-49 (6.13%). (8) This divergence may be due to our urban focus and smaller sample size, likely attracting younger healthcare providers eager for research participation. This trend has been noted in various studies, this eagerness is partly due to their greater familiarity with technology and social media, which are common platforms for recruitment. Additionally, younger adults may be more motivated by the incentives offered for participation, such as monetary rewards or the potential for contributing to societal knowledge and progress. (9) Gender distribution was notably skewed towards females (85.44%), mirroring trends in China and globally, where nursing remains predominantly female-dominated due to societal perceptions and gender role stereotypes (10, 11) Educational levels were primarily Bachelor's (77.39%), contrasting with national data showing higher educational qualifications in urban settings. The dominance of nurses (69.35%) over doctors (30.65%) underscores typical workforce distributions in Chinese primary healthcare, akin to findings in Jiangsu Province. (12)

Knowledge of mental health service provision and mhGAP-IG v2 Guidelines

Most respondents (63.98%) had moderate knowledge, with 27.97% low and 8.05% high. This suggests a need for enhanced training, consistent with national studies indicating gaps in mental health literacy among healthcare providers. (13) Awareness of the mhGAP-IG v2 mobile application and guideline sections was limited, highlighting opportunities for educational interventions despite strong knowledge in areas like depression symptoms and treatment.

Attitudes Toward Mental Health Disorders and mhGAP-IG v2 Guidelines

Attitudes towards mental health disorders and the mhGAP-IG v2 guidelines were generally positive, with mean scores of 65.36 (SD = 5.501)

and 16.72 (SD = 1.527) out of 100 and 25, respectively. While most participants (78.6%) found the guidelines accessible and believed in their service effectiveness (76.6%), concerns about time consumption (90.4%) pose implementation challenges. This contrasts with rural settings, where negative attitudes towards mental illness prevail, underscoring urban-rural disparities in mental health stigma and resource access. (14) Despite positive attitudes, integrating mhGAP-IG v2 into practice remains a challenge due to time constraints and policy-practice gaps observed in Shenzhen and national studies

Practice of Mental Health Service Provision and mhGAP-IG v2

Practice levels among healthcare providers revealed significant disparities, with 84.3% scoring below one standard deviation from the mean, indicating "No practice," while 7.7% demonstrated "Moderate practice" and 8.0% "High practice." This disparity highlights the urgent need for interventions aligning clinical practice with mhGAP-IG v2 directives and national policies promoting community mental health services. Barriers identified include under-recognition of mental health needs and uncertainties in primary care roles, emphasizing policy enhancements and workforce development as essential to bridging the gap between policy and practice (6, 7).

Strengths

This study represents the first comprehensive assessment of mental health practices among healthcare providers (HCPs) in Yunnan Province, offering critical insights into service delivery in a less-studied region of China. By employing a structured questionnaire, the research ensures robust data collection and analysis, enhancing its reliability and relevance for policy makers and stakeholders.

Limitations

Due to time constraints, convenience sampling was used, which limiting the generalizability of findings beyond the study sample. The cross-sectional design restricts the ability to establish causality or temporal changes in attitudes and practices. Additionally, the study's urban focus may not fully represent rural healthcare dynamics in Yunnan Province, potentially influencing broader applicability.



RECOMMENDATIONS

Future research should include comparative studies across districts in Yunnan province, including Wuhua District, to assess variations in implementing and effectiveness of mhGAP-IG v2 guidelines, guiding tailored interventions. Qualitative research in Wuhua District should be conducted to explore integrating mhGAP-IG v2 into routine primary healthcare to enhance implementation strategies. Longitudinal studies are needed to investigate the long-term impacts of mhGAP-IG v2 on patient care and mental health outcomes across diverse Yunnan communities, guiding sustainable improvements. Evaluating mhGAP-IG v2 scalability to rural Yunnan areas, considering local infrastructure and community needs, will support expanded mental health services.

Policy recommendations should focus on developing culturally sensitive adaptations of mhGAP-IG v2 for China to enhance the relevance and acceptance of the guidelines. This can be achieved by incorporating traditional Chinese medicine practices and culturally specific mental health concepts. Establishing standard mental health screening tools such as the Chinese versions of the PHQ-9 (Patient Health Questionnaire) for depression and the GAD-7 (Generalized Anxiety Disorder) for anxiety at primary healthcare levels is essential. Clarifying physician roles in mental health service delivery is crucial, particularly in terms of integrating mental health assessment into routine check-ups, providing initial counseling, and making referrals to specialists when necessary. Aligning medication treatments for conditions like depression with national guidelines, such as those provided by the Chinese Society of Psychiatry, can improve the effectiveness and accessibility of mental health care regionally.

CONCLUSIONS

This study reveals disparities in mental health knowledge, attitudes, and practices among HCPs in Wuhua District, Kunming, particularly between doctors and nurses. The majority of respondents (84.3%) do not currently implement mhGAP-IG v2 guidelines in practice, highlighting significant gaps in guideline integration. To bridge these gaps and enhance mental health service delivery in underserved areas like Wuhua District, targeted interventions are essential. These interventions should include comprehensive training programs tailored to both

doctors and nurses, culturally sensitive adaptations of the mhGAP-IG v2, and policy reforms that support the integration of mental health into primary care.

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KAKIDES AND JULAKWAKRI AS COMMUNITY NURSING INTERVENTION STRATEGIES TO PREVENT DFU IN NURSEPRENEUR ACTIVITIES: CASE STUDY

Indah Nursanti^{1,2*}, Yuni Sufyanti Arief¹, Ninik Yunitri³, Syamsul Anwar³, Lily Herlina³, Wahyu Agus Triyono³, Dheni Wahyudi³, Aprilina Sartika³, Novya Ashlahatul³, Eka Sindi MJ³

¹ Faculty of Nursing, Airlangga University, Surabaya East Java, Indonesia

² Faculty of Health Sciences, Dirgantara Marsekal Suryadharma University, East Jakarta, Indonesia

³ Faculty of Nursing, Muhammadiyah University Jakarta, Jakarta, Indonesia

*Corresponding Author: Indah Nursanti, Faculty of Nursing, Airlangga University, Surabaya East Java, Indonesia, E-mail: indah,nursanti-2020@fkip.unair.ac.id

ABSTRACT

Introduction: Nursepreneurial activity with elements of judgment in developing social value, looking for options from alternative problems, proactive attitude and initiative. A continuous process with interaction between tacit and explicit knowledge in the case at hand. Including the management of diabetes mellitus for the prevention of DFU (diabetic foot ulcer), which requires nursing intervention strategies in the community faced by nursepreneurs.

Methodology: The five stages in this study are 1) potential identification area, 2) literature search stage, 3) evaluation stage 4) analysis stage 5) intervention stage in a one-group pre-post test case study with 9 patients with vulnerable DFU (diabetic foot ulcer), using questionnaire instrument. The criteria for respondents in the application of this intervention are Adults over 18 years of age, do not have audio-visual disorders, have a diagnosis of type 2 diabetes diagnosed by a doctor, able to communicate using whatsapp, willing to participate in educational sessions.

Result: This study begins with forming a community in a whatsapp group KAKIDES, then determining the JULAKWAKRI intervention was carried out for 8 weeks in the selected KAKIDES community with inclusion criteria. In the form of a hybrid system with diabetic foot material, independent blood sugar checks, foot assessments, foot exercises, footwear selection, wound care at home and utilization of herbs to lower blood sugar in accordance with the compiled operational standards. The questionnaires used in this study were SKILLD, DES-SF, DPSS which were tested using Wilcoxon. The test results showed SKILLD in pre (mean 55.00, SD = 7.071), post (mean 83.44, SD = 4.391, $p = 0.007$). DES-SF in pre (mean = 24.44, SD = 3.712), post (mean 40.00, SD = 0.000), $p = 0.006$. DPSS pre (mean 74.22, SD = 4.522), while post (mean = 108.44, SD = 5.897), $p = 0.008$.

Conclusion: This intervention strategy can be recommended for DFU prevention in community care settings including in the activities of nursemaids as the spearhead of health services with tacit and explicit knowledge.

Keywords: DFU prevention, community nursing, nursepreneurship

INTRODUCTION

Nursepreneurship activities must have social value that is accepted as a solution, changing and improving customer perceptions, giving impressions and gaining recognition as a good service provider. It is the final part of the value generated by nursepreneurship activities in providing nursing services to patients and families as clients (1). Nursepreneurship in its services uses 3 pillars of knowledge management system: people, processes, and technology (2), with the SECI approach at the internalization stage. Explicit knowledge to tacit knowledge with a continuous process in the

dynamic interaction between knowledge and practice (3), including in preventing DFU in the community. Nursepreneur within the scope of community nursing can address social factors that affect health and provide care that is appropriate to community conditions (4).

DM is a serious threat to global public health, being the third leading cause of death worldwide, and fourth for disability. More than 10.5% of the world's adult population was diagnosed with diabetes in 2021, and this number is expected to increase to 12.2% (783.2 million) by 2045 (5). In Indonesia, according to the International Diabetes Federation (IDF)



report, the number of people with diabetes in Indonesia reached 41.8 thousand people in 2022. This figure makes Indonesia the country with the most diabetics in ASEAN, as well as 34th out of 204 countries on a global scale (6). The prevalence of diabetic foot wounds in Indonesia will continue to increase every year as DM cases increase, which is around 15%, with an amputation rate of 30%, and a mortality rate of 32% (7) One in five people with diabetes can develop a diabetic foot ulcer (DFU). At least a quarter of people with diabetic foot ulcers (DFUs) do not heal completely.

DM patients have a lifetime risk of up to 25% for developing DFUs, and this greatly increases their chances of experiencing lower limb loss by amputation (8). Foot wound problems are one of the most serious complications of DM and are a source of reduced quality of life and financial costs for the people involved. The risk of toe loss, foot, or leg amputation due to diabetes, also looms large for people with DM who are associated with foot care compliance, management of blood glucose levels, and efforts to keep feet healthy (9). This places a considerable burden on the patient's family, healthcare professionals and facilities, and society at large (10). In consideration of this negative impact, it is important to explore the risks and preventive measures that influence the reduction in the number of amputations in patients with diabetic foot (11).

KAKIDES stands for healthy diabetic foot and is a community group formed by nursepreneurs consisting of patients, families and cadres. Support in the community can improve foot care behavior in diabetic patients to obtain care and follow-up information (12). JULAKWAKRI stands for seven steps of independent foot care as a DSME intervention strategy provided by foot assessment, blood

sugar check, self-foot check, diabetes diet, family empowerment with care involvement including, foot exercise, and getting collaboration (13).

METHODOLOGY

Methods used in this research The five stages in this study are :

1. Potential identification area.

The area of application of the intervention is the scope of practice of the nursepreneur, namely in Harapan Mulya RW4, 5, and 6, Kemayoran District, Central Jakarta. The area has previously conducted a general data assessment (the number of adult DM population of 22 people), SWOT analysis (with weaknesses: service programs for adults with vulnerable DFU have not received optimal attention and access to information on DFU sensitive services does not yet exist at the first level of service) and enforcement of community nursing diagnoses. The community nursing diagnoses that are enforced are related to the application of interventions to be provided, namely: diagnoses of ineffective health maintenance and knowledge deficits.

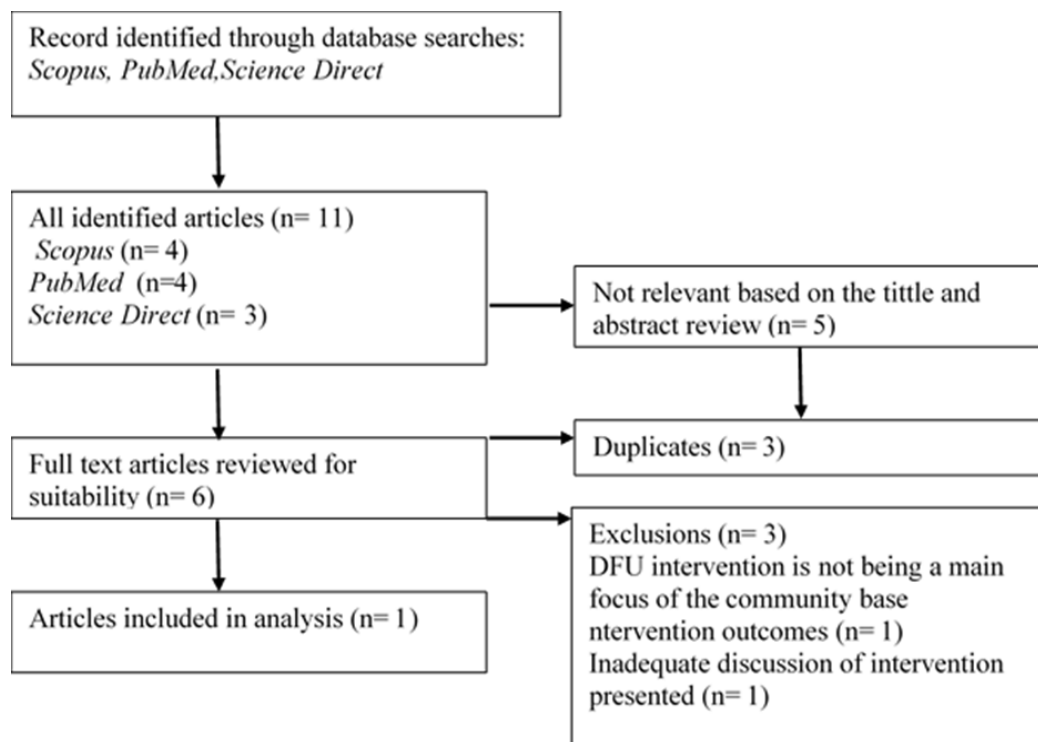
2. Literature search stage

To support the literature review as a literature review, a literature search was conducted on various databases including SCOPUS, PubMed, and Science Direct. The keywords used were community base, diabetes mellitus and foot ulcer; The references used were those using English with a period of 2018 to 2023. Study identification uses the Population, Intervention, Comparison, Outcome, Study design (PICOS) formulation to help identify studies to get the same topic in each database. The following is the formulation used in table 1:

**Table 1** Literature Search

Formulasi PICOST	MeSH Term(s)
Population: Adult, >18 years	"adult AND diabetes AND foot ulcer"
Intervention: DFU	"education"
Comparator: Self care, preventing amputation	"treatment as usual OR education groups behavior OR self care"
Outcome measures: QOL	"diabetes AND self management"
Study design: systematic review or meta-analysis	"systematic review or meta-analysis of RCT"
Time Frame: 2018 – 2023"	"2018 – 2023" AND "English"

Practical also used the PRISMA guide to determine the source article evidence described in Figure 1:

**Figure 1.** PRISMA diagram for article search

The database used in the search is SCOPUS, PubMed, Science Direct. by entering the three keywords above "community base" AND "diabetes mellitus" AND "foot ulcer" and filtering as follows: i) full text availability, ii) systematic review article type, and iii) publication date in the last five years. From the filter results, three articles were obtained, namely:

**Table 2** Results of literature review search

No	Title	Author	Journal	Country	Journal Characteristic	H-Index	Impact Factor	Citation
1	<i>Preventing foot ulceration in diabetes: systematic review and meta-analyses of RCT data</i>	(14)	Diabetologia (2020) 63:49–64 https://doi.org/10.1007/s00125-019-05020-7	Germany	Q1	250	10.46	3349
2	<i>A Systematic Review of the Impact of Foot Care Education on Self Efficacy and Self Care in Patients With Diabetes The Impact of Social Media</i>	(15)	European Journal of Vascular and Endovascular Surgery https://doi.org/10.1016/j.ejvs.2020.03.053	United Kingdom	Q1	133	2.11	1.349
3	<i>Prevention and Management of Diabetes-Related Foot Ulcers through Informal Caregiver Involvement: A Systematic Review</i>	(8)	Hindawi Journal of Diabetes Research Volume 2022, Article ID 9007813, 12 pages https://doi.org/10.1155/2022/9007813	Mesir	Q2	72	3.0	4.018



3. Evaluation stage

The three articles were selected and compared with each other regarding education on DFU prevention in the community

Artikel 1 “Preventing foot ulceration in diabetes: systematic review and meta-analyses of RCT data” (14) describes evidence of beneficial effects of interventions, but it cannot be ascertained which ones are most beneficial and needed in intervention groups with unspecified timing. As the population is also not described and is only individual-based, not community-based, this first article was not selected.

Artikel 2 “A Systematic Review of the Impact of Foot Care Education on Self Efficacy and Self Care in Patients With Diabetes The Impact of Social Media” (15) Describe the impact of the patient foot care education intervention on self efficacy, self care behavior, and self care knowledge in individuals with diabetes. The target population in this journal is not the target group for this intervention so the second article was not selected..

Artikel 3 “ Prevention and Management of Diabetes-Related Foot Ulcers through Informal Caregiver Involvement: A Systematic Review” (8) Describe the impact of the intervention using a series of 8 weekly sessions of 2 hours each, in

groups of approximately 6 to 8 members, facilitated by a nurse practitioner/case manager on the topic of: In each session, participants viewed an educational videotape. The nurse case manager facilitated discussion of the problem situation depicted and encouraged group members to problem-solve the characters in the vignette and then apply the situation to their own lives. The population in this journal targets adults with DM which is the target population included in the targeted group.

4. Analysis stage

The randomized controlled trial covered 16 question domains including seven critical domains (nos. 2,4,7,9,11, 13, 15) and nine non-critical domains (1,3,5,6,8,10,12,14, 16) with answer options of "Yes", or "Partial Yes" and "No". "Partial yes" is permitted in some domains to identify partial compliance with standard protocols. And filled in by giving a check list mark (√) on the answer options that have been provided. If the answer is "No" for a particular domain, the domain is labeled as "weak". After all 16 domains have been answered, an interpretation of the assessment will be generated, namely:

Table 3 Assessment interpretation results

<i>High confidence</i>	≤ 1 non-critical weaknesses
<i>Moderate confidence</i>	≥ 2 non-critical weaknesses, with no critical weaknesses
<i>Low confidence</i>	1 critical weakness, with or without non-critical weaknesses
<i>Critically low confidence</i>	≥ 2 critical weaknesses, with or without non-critical weaknesses

Based on the AMSTAR 2 assessment of the article 'Prevention and Management of Diabetes-Related Foot Ulcers through Informal Caregiver Involvement: A Systematic Review' “ (8). For the implementation strategy of the case study intervention that was developed and adapted from research (16) with a duration of 8 weeks. The implementation of the DFU prevention intervention will use an educational video whose SOP is adopted from (16). Determination of the sample size in this

intervention begins with the calculation of effect size using the practical meta-analysis effect size calculator. The calculation results were determined with the G*Power application with the effect size of the calculation results (1.49) , the value of $\alpha = 0.05$, and β error = 0.95. From this calculation, the number of samples needed is 7. Because this application has a long duration of time, the practitioner considers an attrition rate of 21% (16) of the total sample, so that the total sample in this study is targeted at 9.



5. Intervention Stage

The implementation of the intervention was carried out as follows:

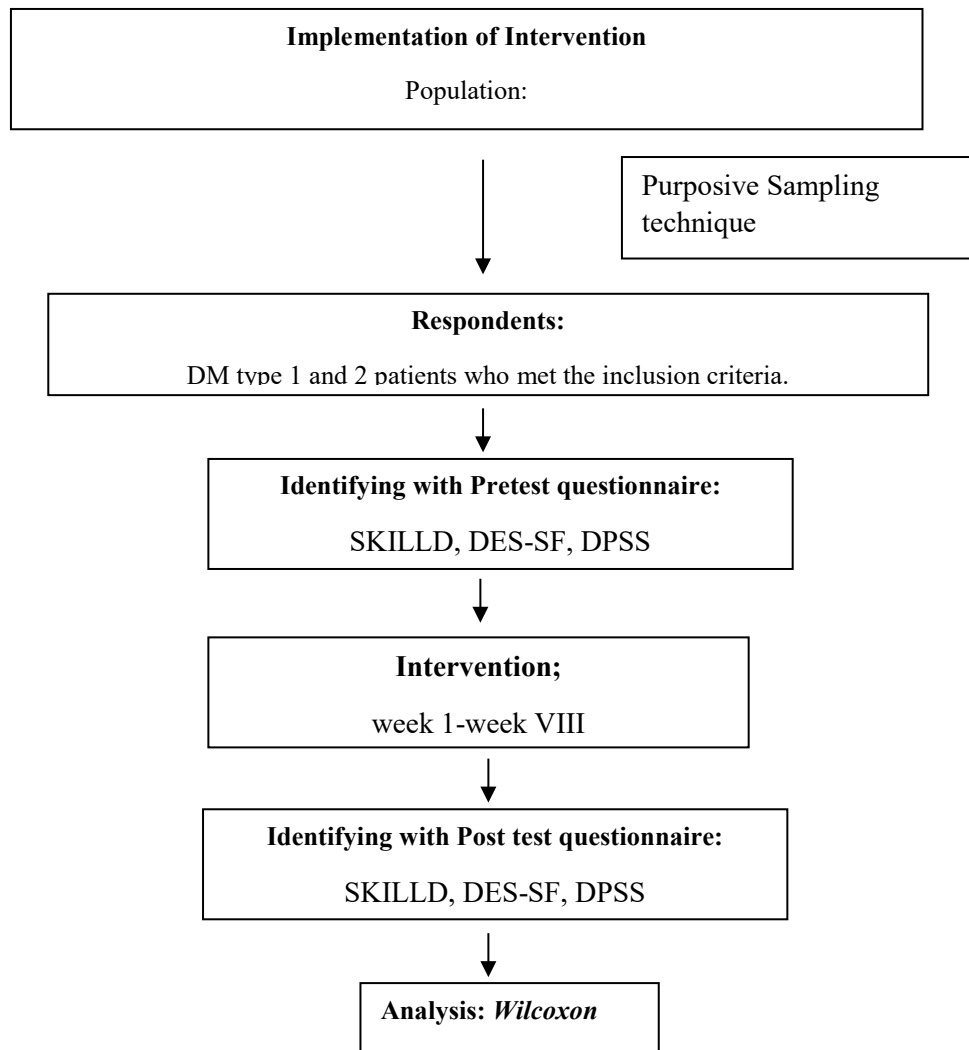


Figure 1 Operational framework of intervention implementation

The sample criteria for this study are as follows:

1. Inclusion Criteria
 - a. Adults over 18 years old
 - b. Does not have audio visual impairment
 - c. Have a diagnosis of type 2 diabetes diagnosed by a doctor
 - d. Reside in the Harapan Mulya urban village area RW 4,5, and 6
 - e. Able to communicate using whatsapp
 - f. Willing to attend the education session
2. Ekslusion Criteria
 - a. Adults over 18 years old with type 1 and 2 diabetes diagnoses who live in RW 4, 5, and 6 of Harapan Mulya Village but are in emergency conditions or hospitalization.
3. Drop Out Criteria
 - a. Withdraw in the middle of an education session.
 - b. Did not participate in the post-test.



Theoretical Framework

A key element of implementing this intervention is to develop a set of skills that promote problem solving in everyday decision making to improve glycemic control, prevent complications, and maintain a balance between managing the disease and a good quality of life. One of the most frequently used conceptual frameworks for studying health behavior is social cognitive theory (SCT), developed by Bandura¹⁸ and adapted to the treatment of diabetes with DFU vulnerability. The application of this intervention teaches how people with diabetes perform beneficial self-management with increased knowledge, problem-solving skills, and confidence for success in diabetes self-management related to vulnerable DFU (16) Other measures included assessing participants' knowledge of diabetes self-management using the Spoken Knowledge in Low Literacy patients with Diabetes (SKILLD) questionnaire (17) self-efficacy among participants was the Diabetes with Empowerment Scale-Short Form (DES-SF) (18), problem-solving ability was measured using the Diabetes Problem-Solving Skills (DPSS) measure, and glycemic control (19).

Data collection procedures

1. The intervention was designed based on the results of the literature review, and implementation focused on groups (n=9) with inclusion criteria.
2. Before the JULAKWAKRI intervention was conducted, preparation is carried out first. Preparation was carried out by face-to-face socialization with policy holders, health cadres and the local community regarding the intervention program being carried out. Then recommendations were made and willing respondents were selected with the specified inclusion criteria, then a pre-test was carried out.
3. Respondents in the implementation of the JULAKWAKRI intervention were included in the KAKIDES whatsapp group for follow a series of weekly sessions and information disseminated over 8 weeks. each for 2 hours according to the literature review. 9 respondents, facilitated by a nursepreneur who is certified in diabetic foot and acts directly as a nurse practitioner/case manager. Each weekly session is organized and planned according to the standard operating procedures. Interactive learning activities are

based on the topic for each session and involve active participation from all participants.

4. Education session in JULAKWAKRI intervention were designed to be both online and offline, with participants viewing a recorded educational video related to managing DFU vulnerability, and the following week of offline practice. sections were shared in the educational video and the nurse case manager facilitated discussion of the problem situations depicted and encouraged respondents to discuss and identify solutions to the problems encountered related to vulnerability to DFU. The education provided includes; stories about DFUs that have been experienced before from the respondent's experience or from other patients if there are no respondents in the group who have experienced wounds, self-blood sugar checks, foot self-examination, foot exercises, and foot care at home, choosing the right footwear, how to deal with hypoglycemia and an appropriate diet, complementary therapies, self-wound care that can be done at home.
5. Data was collected before the intervention/pretest, during the intervention (for blood sugar checks done 1x every week) and at the last meeting of the intervention/posttest. For this data collection time, as anticipated, the practitioner made an appointment in the whatsapp group or visited directly at home to conduct the examination, the survey was returned at the time of the appointment.

Data Analysis

Statistical analysis involved testing for differences before and after the intervention between the main outcomes such as glycemic control, knowledge about diabetes self-management, self-efficacy, changes in self-management behaviors, use of problem-solving skills, achievement of self-management goals. Wilcoxon test was used to analyze pre and post intervention differences.

RESULTS

Implementation of the intervention carried out for 8 weeks in May-June 2024. The implementation was carried out in accordance with the operational standards compiled in the intervention table.

**Table 4** Intervention implementation

Intervention	Freq.	Duration	Total Time	Meeting Content
Week 1	1x	2 hours	120 min	Face to face, Pre test Upload a video story of the patient's disease journey related to problems that arise in DM patients, stories about DM foot wounds that have been experienced before in the KAKIDES group
Week 2	1x	2 hours	120 min	Zoom Sharing session on blood sugar self-testing and uploading a video on how to do a foot self-test.
Week 3	1x	2 hours	120 min	Offline Practice blood glucose self-testing and upload a video on how to do a self-foot check
Week 4	1x	2 hours	120 min	Zoom Meeting Upload videos of foot exercises, and foot care at home
Week 5	1x	2 hours	120 min	Offline Practice foot exercises and foot care that can be done at home, as well as footwear selection
Week 6	1x	2 hours	120 min	Zoom meeting Sharing sessions shared videos on how to manage hypoglycemia and appropriate diets, complementary therapies, and self-directed wound care that can be done at home.
Week 7	1x	2 hours	120 min	Offline Involve the family in hypoglycemia management practices and appropriate diet, complementary herbal therapy, and self-directed wound care that can be done at home.
Week 8	1x	2 hours	120 min	Zoom Meeting Sharing session with patients and families regarding the application of the JULAKWAKRI intervention. filling out the Post test Questionnaire

The results of the intervention in the DFU vulnerable adult group with descriptive analysis that explains the description of the variables studied by looking at the standard

deviation and mean values, and p. The results of the Wilcoxon test are described in table 5 as follows:

Table 5 Effect of intervention implementation value

Output	Kelompok	Mean	SD	P-value
Knowledge: SKILLD	Pretest	55.00	7.071	0.007
	Posttest	83.44	4.391	
Empowerment;DES- SF	Pretest	24.44	3.712	0.006
	Posttest	40.00	0.000	
Problem solving:DPSS	Pretest	74.22	4.522	0.008
	Posttest	108.44	5.897	
Glicemic Control	Pretest	359.00	36.814	0.008
	Posttest	226.44	56.367	



Table 5 explains that the highest post measurement change in DES-SF with the mean value in the post test of the respondent group is in the good category, namely 40, the SD value in the post test of the respondent group is in the good category, namely 0.00, Wilcoxon test $p = 0.006$ ($p < 0.05$). This shows that empowerment in diabetic patients after getting an intervention with indicators of self care behavior and self efficacy has a good effect. Empowerment of vulnerable DFU patients is important so that they can take control of their own lives by improving their quality of life (18) Self-care behaviors and self-efficacy indirectly increase confidence in preventing DFU, which can be modified in interventions for DFU-prone patients (20)

The DPSS results shown in table 5 illustrate the value of the solution obtained with a change in post test value mean; 108, SD; 5.8, Wilcoxon test results $p=0.008$ ($p < 0.05$). The application of the intervention provides a more reliable and faster solution (21) Social support obtained from a community that can be felt, understood, cared for, or accepted by patients vulnerable to DFU, a supportive network can minimize depression by providing patient support to fight negative emotions or helping patients to relieve existing depression with increased self-esteem (22) Families play a diverse and significant role that reinforces the intervention and proves improved outcomes in the prevention and management of DFU (23)

The SKILLD results shown in table 5 illustrate the knowledge gained by respondents with changes in post test values mean; 83.4, SD; 4.39, Wilcoxon test results $p=0.007$ ($p < 0.05$). Diabetes knowledge related to DFU is likely to increase along with more knowledge and younger age in previous experiences affecting cognition and affection consisting of knowledge attitudes and self-efficacy (24) The presence of nursepreneurs in community care is helpful in providing education and self-care management of DFU vulnerable (25).

Glycemic control results shown in table 5 illustrate that in respondents during the intervention with changes in post test values mean; 226.44.4, SD; 56.36, Wilcoxon test results $p=0.008$ ($p < 0.05$). Interventions with lifestyle changes in patients prone to DFU by utilizing herbs, and increasing fruit and vegetable consumption can improve clinical and health status that affects glycemic control (26).

DISCUSSION

After the intervention, the test results illustrate that SKILLD scores have a good effect on the aggregate of vulnerable adults with DFU. The presence of nursepreneurs in the community is very helpful in providing education and self-care management to vulnerable DFU (25). Overall, the influence of past experiences on future perceptions is a process that involves social support, expectations, emotional responses, decision-making processes, attention, interpretation (27).

The test results after the intervention illustrate the value of DES-SF has a good influence on the aggregate of DFU vulnerable adults, Empowerment of DFU vulnerable patients is important so that they can take control of their own lives with improved quality of life (18). Confidence affects one's ability to organize and execute the actions necessary to produce certain achievements (28).

The test results after the intervention illustrate that the DPSS value has a good effect on the DSME intervention in the aggregate adult vulnerable to DFU (diabetic foot ulcer). The application of deep learning in DSME interventions provides more reliable and faster solutions (21) Social support obtained from the community that can be felt, understood, cared for, or accepted by patients vulnerable to DFU, a supportive network can minimize depression by providing patient support to fight negative emotions or help patients to relieve existing depression with increased self-esteem (22) Adherence to medication, diet, and regular foot examinations is associated with significant social support that motivates nursemaids to include these people in care planning in a community (26).

CONCLUSIONS

Social cognitive theory, as a whole, establishes factors that regulate knowledge and can affect both physical and emotional well-being and the regulation of healthy behavior (29). Providing education through audio-visual video media has been shown to increase knowledge in patients with low levels of education, can be quickly applied and does not depend on reading ability with SKILLD measurements (17) This is shown by behavioral changes on the DES-SF diabetes empowerment scale used in different cultural backgrounds, where self efficacy is considered a good predictor of self-care behavior especially for



dietary non-compliance and physical exercise (30). Self efficacy, beliefs, and expectations with an individual's capacity to influence desired outcomes through DFU prevention efforts with self-care at home (12).

The application of management with good knowledge, knowledge assets owned, and the ability to respond to problems that occur affect the running of the nursepreneurship process (18). Nursepreneurship activities with elements of consideration in developing individual or social ideas with good attitudes and motivation in the process emphasize the ability to continue to create new relevant knowledge (31). The nursepreneur's image as a nursing service provider in the community will have a good reputation and can be trusted, with an empathetic attitude with guaranteed service outcomes with good social value (32).

RECOMMENDATIONS

The need for an approach that is carried out by direct home visits, given an explanation of the risks of vulnerable DFU when given informed consent, using communication that motivates enthusiasm with open questions, positive affirmations, being a good listener, being empathetic, straightening out discrepancies between family opinions or assumptions and reality in accordance with the facts and theories applied. Time preparation is also needed by respondents regarding willingness to follow the application of interventions.

Clients with diabetic mellitus need to get support from family, health workers and themes to build adequate ability to make efforts to prevent DFU. Nursepreneur can provide DSME interventions in adult aggregates with vulnerable DFU as a form of support to patients and families where health worker support is one of the determinants of building self-care ability efforts. The application of this intervention can be used as a basis for future program development by health policy makers related to efforts to provide comprehensive nursing services to patients and families at home by nursepreneur.

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CONFLICT OF INTEREST

This research does not involve things that violate regulations and on behalf of personal interests that affect the quality and performance that should be

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HORMONAL CONTRACEPTIVE USE AND MENSTRUAL PROBLEMS AMONG REPRODUCTIVE-AGE INDONESIAN WOMEN

Era Susanti¹, Truc Ngoc Hoang Dang, Ph.D^{1*}, Jongjit Rittirong, Ph.D¹

¹*Institute for Population and Social Research, Mahidol University, Salaya Campus 999 Phuttamonthon 4 Road Phuttamonthon, Nakhon Pathom 73170 Thailand*

***Corresponding Author:** *Truc Ngoc Hoang Dang, Ph.D, Institute for Population and Social Research, Mahidol University, Salaya Campus 999 Phuttamonthon 4 Road Phuttamonthon, Nakhon Pathom 73170 Thailand' E-mail : truc.ngo@mahidol.edu*

ABSTRACT

Introduction: Contraception serves as a means to prevent unwanted pregnancies and lower fertility rates, with the majority of methods relying on hormonal mechanisms. Previous research indicates that hormonal contraceptives can pose various health concerns for women, encompassing both physical and psychological aspects. Despite their widespread use among women in Indonesia due to their popularity, there is a dearth of studies examining menstrual issues stemming from hormonal contraceptive side effects, especially on a national scale.

Objectives: Therefore, utilizing data from the 2017 Indonesia Demographic Health Survey, this study aims to ascertain the correlation between hormonal contraceptive usage and menstrual problems, while also exploring potential disparities in these associations across different types of hormonal contraceptives among Indonesian women of reproductive age. Menstrual problems encompass instances such as the absence of menstruation or irregular menstrual cycles.

Methodology: This study is quantitative research utilizing secondary data. Logistic regression analysis was used to analyze the IDHS 2017 dataset with a total of 6 model analyses for two outcomes in menstrual problems. A total of 2,053 respondents were selected based on data completeness.

Result: The results revealed that the use of three types of hormonal contraceptives - pills, injectables, and implants - was significantly associated with menstrual problems. Injectable users had the highest probability of experiencing no menstruation (AOR=2.592, 95% CI=1.952-3.442) and irregular periods (AOR=1.548, 95% CI=1.183-2.026). Implant users ranked third in the likelihood of having irregular periods (AOR=1.526, 95% CI=1.105-2.108). Furthermore, pill users had a lower probability of experiencing menstrual problems, both irregular periods (AOR=0.245, 95% CI=0.154-0.390) and no menstruation (AOR=0.205, 95% CI=0.128-0.329), compared to other hormonal contraceptive methods.

Conclusion: Reproductive-age women are at risk of having menstrual problems when using these three types of hormonal contraceptives. Findings from this study could inform government policies on family planning programs, aiding in their development and enhancement to better address contraceptive utilization concerns.

Keywords: Hormonal contraceptives, menstrual problems, irregular menstruation, absent of menstruation, Demographic and Health Survey, Indonesia.

INTRODUCTION

Menstrual problems are one of the side effects caused by hormonal contraceptive consumption. In the counseling section, the health providers and counselors explain these side effects before the acceptors make a decision about which contraceptive methods they want to use. Regarding the side effects of

hormonal contraceptives, menstrual problems are one of the side effects that acceptors highly experience during contraceptive utilization¹. The Indonesian women who took hormonal contraceptives as their favorite methods, experience the absence of menstruation and irregular menstruation. The high number of acceptors who experience menstrual problems



among hormonal contraceptive use could be a new problem for the Indonesian fertility issue in the future. Evidence shows that hormonal contraceptives are closely linked to infertility in women by disruption of the menstrual cycle. The ovulatory disruption, and menstrual disorders caused female infertility by reaching 15-25% with menstrual abnormalities strongly correlate with anovulation².

Based on the contraceptive methods trends in Indonesia, hormonal contraceptive users were still the majority in Indonesia from 1991 to 2012 with more than 60% utilization³. Regarding the linking of the infertility issue and long-term side effects of hormonal contraceptives, this condition is expected to affect women's sexual reproductive and well-being in Indonesia in the future.

This study aims to provide new perspectives and literature on the association between hormonal contraceptive use and menstrual problems by using a representative national dataset. Moreover, this study also wants to identify the most hormonal contraceptive types that affect menstrual problems among married reproductive-age Indonesian women. This study result may provide strong evidence for policymakers and stakeholders in Indonesia to enact a new policy and programs to encourage participation in male contraceptives and non-hormonal contraceptive users.

METHODOLOGY

A cross-sectional design was used to analyze the secondary data from the Indonesia Demographic and Health Survey (IDHS) 2017. The survey was conducted on married Indonesian women aged 15-49 years old provided by Statistics Indonesia (BPS) in collaboration with the National Population and Family Planning Board Indonesia (BKKBN), and the Indonesia Ministry of Health which was funded by the U.S. Agency for International Development (USAID). The IDHS survey is a nationally representative survey for reproductive-age married couples in Indonesia with separated households, men, and women's questionnaire. The IDHS provides a comprehensive overview of population issues in Indonesia by exploring fertility, maternal and child health, sexual reproductive health, and the health service sector. Respondents reported

their condition by data collecting from the trained data collectors' interviews.

The survey dataset can be freely accessed on the DHS Program's website. Respondents were selected in this research based on eligible women completing interviews with a total of 49,627 respondents. A total of 4,686 respondents were available on the dataset, after data screening by dropping the missing data in respondent's variables, only 2,053 respondents with complete data were selected for further analysis.

Two steps were conducted for data collection on respondents in this study. The first step was choosing respondents who use hormonal contraceptive methods. The second step was choosing respondents with experience of side effects during their hormonal contraceptive utilization. The dependent variables in this research are the absence of menstruation and irregular periods as respondents' menstrual problems. The independent variable is hormonal contraceptive use which are injectables, pills, and implants. To examine the factors related to hormonal contraceptive use and menstrual problems, controlling variables such as age, education, place of resident, children ever born (CEB), household wealth index, occupation/employment, currently work, and region also analyze in this study.

The 6 models from 3 independent variables and 2 dependent variables of binary logistic regression were used for multivariate analysis, calculating a significantly adjusted odds ratio (AOR) of menstrual problems. Adjusted odds ratios were compared between 6 models of multivariate analysis to make the rank of probability menstrual problems experienced among hormonal contraceptive methods. The STATA program was used to analyze the dataset for this research with hypothesis testing significant at .05 (CI 95%).

Ethical Consideration

The IDHS 2017 was properly reviewed and approved by the United States Agency for International Development (USAID) and corporate with the Indonesian government. This research was approved by the Institutional Review Board (IRB) of the Institute for Population and Social Research, Mahidol University (COE. No. 2024/03-025).



RESULTS

The majority of the respondents in this study were used injectables (74.33%), with the age group 30-34 years old (26.50%), attend the secondary school (59.91%), lived in urban areas (51.10%), delivered 2 live births (39.36%) during their reproductive age (mean: 2.2474, SD: 1.1496, min: 0, max: 8), with middle-class household wealth index (22.55%), currently work (51.10%), working in the service/ sales as their occupation/ employment status (28.45%), and live in the region cluster 2 (55.43%).

The binary logistic regression analysis between pills and menstrual problems in Table 1 revealed that pills had a significant negative association with menstrual problems including the absence of menstruation and irregular periods ($p < .05$). Women who did not use pills as their hormonal contraceptives decreased the probability of having the absence of menstruation by 79.5% (AOR=0.205, 95% CI= 0.128-0.329) and irregular periods 75.5% (AOR=0.245, 95% CI= 0.154-0.390). Moreover, other factors that are related to irregular periods is education besides region related to the absence of menstruation ($p < .05$).

Table 2 revealed the multivariate binary logistic regression analysis between injectables and menstrual problems. Based on the analysis results found that injectables had a significant association with menstrual problems including the absence of menstruation and irregular periods ($p < .05$). Women who use injectables as their hormonal contraceptive were 2.5 times more likely to have the absence of menstruation (AOR= 2.592, 95% CI= 1.952-3.442) and 1.5 times more likely to have irregular periods (AOR= 1.548, 95% CI= 1.183-2.026). However, other factors related to the absence of menstruation are age, and region besides education related to irregular periods.

Table 3 reveals the multivariate binary logistic regression analysis between implant and menstrual problems. Based on the analysis result, implants had a significant association with irregular periods ($p < .05$) but not with the absence of menstruation ($p > .05$). Women who use implants were 1.5 times more likely to have irregular periods (AOR= 1.526, 95% CI= 1.105-2.108) compared to women who did not use implants as their hormonal contraceptives.

Furthermore, other factors related to the irregular periods are education, and occupation/employment.

DISCUSSION

The main finding of this study is injectables in the first rank that had a higher probability more likely to have menstrual problems including the absence of menstruation and irregular period. The second rank is implants that had a probability more likely to have irregular periods without any significant association with the absence of menstruation. Third, pills had a lower probability of having both the absence of menstruation and irregular periods. Other factors that influenced the absence of menstruation are age and region besides education and occupation/ employment related to the irregular periods experience.

Age plays an important role related to menstrual problems. Women at early reproductive age mostly took combined oral contraceptives to prevent unplanned pregnancies as a birth control compared to middle and end-reproductive-age women⁴. Regarding the relationship between age and menstrual problems, previous studies mention that women in early and middle reproductive ages who use hormonal contraceptives are more likely to have menstrual problems^{5,6}. Related to the Indonesian context, the government issued the family planning program to the target population of reproductive-age married couples (15-49 years). Regarding support to decrease the fertility rate and postpone marriage, marriage laws in Indonesia have changed since 2019 to apply a minimum age for women who want to marry at 19 years old.

Education is one of the important roles in the determinants of contraception. Women who attended higher education levels such as a university degree, sought contraceptive information from gynecologists and the internet before they made a decision for contraceptive utilization⁷. Furthermore, students who achieved sexual education in their home and school, 52.3% had adequate knowledge and 80.1% had attitudes in terms of contraceptives⁸ whether to select methods that have more effectiveness, and contraceptives behavior related to contraceptive continuation⁹. This explanation is matched with Indonesian conditions that have a contraceptive prevalence



rate of more than 60% with the majority utilizing hormonal contraceptives.

The region is related to contraceptive availability and access. A superior sector of education in a region related to knowledge of people. In terms of sexual reproductive health education, people who attended higher education level had better knowledge of sexual reproductive health^{7,10}. Regarding to infant mortality rate (IMR), the community that had a low infant mortality rate (IMR) is equal to a low total fertility rate (TFR) which means achieving a high contraceptive prevalence rate (CPR) in that area¹¹. The high contraceptive prevalence rate (CPR) is related to the availability and better access to contraceptives in those areas. Access to electricity is related to the household wealth index¹ which is related to the open unemployment rate.

Occupation/ employment is also one of the key determinants for contraceptive utilization. Women with ages 15-49 years who are employed have a 0.0391 lower probability of not using any contraceptive methods than unemployed women. Regarding contraceptive methods, employed women have a 0.0344 higher probability of using modern contraceptive methods¹². Reproductive age women 18-45 years found that women who have current employment status not full or part-time employed are more likely to discontinue their contraceptive methods related to the price of contraceptives¹³. Women who have a professional occupation can earn money to pay for their needs, especially for access the healthcare services and insurance.

Reproductive-age Indonesian women who use hormonal contraceptives are at a potential risk of having menstrual problems. The majority of Indonesian women who utilize hormonal contraceptives as their favorite method should be informed about the potential risks of consuming hormonal contraceptives. Switching methods to non-hormonal contraceptives and to another hormonal contraceptive that had less probability of causing menstrual problems could be the solution for Indonesian women to avoid menstrual problems as the side effects of hormonal contraceptives.

CONCLUSIONS

Three types of hormonal contraceptives are found to have an association with the menstrual cycle among reproductive-age Indonesian women. Indonesian women who use hormonal contraceptives, such as injectables and implants, are at risk of having menstrual problems, and they should be aware of their sexual reproductive health and well-being. In contrast, pill use is positively associated with the menstrual cycle, including regular menstruation and reduces the risk of menstruation absence.

RECOMMENDATIONS

Researchers recommend the Indonesian government improve the family planning program and sexual reproductive health education among Indonesian women. The health providers and counselors in family planning programs should explain clearly the potential risks of hormonal contraceptive consumption to the acceptors to help acceptors make the best decision to choose their contraceptive methods. The Indonesian government must develop a family planning program to decrease the utilization of hormonal contraceptives. Sexual reproductive health is one of the important keys to increasing the health and well-being of Indonesian women in the future.

**Table 1** Multivariate Analysis of Pills and Menstrual Problems

Variables		Menstrual Problems							
		Adjusted Odds Ratio	No Menstruation		P value	Adjusted Odds Ratio	Irregular Period		P value
			95% CI				95% CI		
		Lower	Upper		Lower	Upper			
Hormonal Contraceptive Use									
Pill	No	Ref.							
	Yes	0.205	0.128	0.329	0.000***	0.245	0.154	0.390	0.000***
Controlling Variables									
Age	15-19	Ref.							
	20-24	0.489	0.235	1.015	0.055	0.791	0.368	1.696	0.547
	25-29	0.556	0.271	1.139	0.109	0.710	0.333	1.511	0.375
	30-34	0.599	0.289	1.240	0.168	0.864	0.401	1.858	0.709
	35-39	0.509	0.239	1.086	0.081	0.840	0.379	1.860	0.669
	40-44	0.598	0.269	1.327	0.206	0.714	0.305	1.673	0.439
	45-49	0.429	0.145	1.263	0.125	0.954	0.328	2.772	0.932
Education	Less than primary school	Ref.							
	Secondary school	0.791	0.613	1.020	0.072	1.173	0.889	1.549	0.258
	Higher education	0.639	0.403	1.014	0.057	1.928	1.238	3.004	0.004**
Place of resident	Urban area (ref)								
	Rural area	1.018	0.801	1.293	0.884	1.242	0.970	1.590	0.085
Children Ever Born									
Household Wealth Index	Poorest	Ref.							
	Poorer	0.925	0.660	1.296	0.652	0.964	0.670	1.386	0.845
	Middle	1.028	0.728	1.451	0.872	1.240	0.863	1.782	0.243
	Richer	1.081	0.751	1.556	0.672	1.032	0.700	1.523	0.870
	Richest	0.792	0.508	1.235	0.305	1.255	0.805	1.955	0.315



Variables		Menstrual Problems							
		Adjusted Odds Ratio	No Menstruation		P value	Adjusted Odds Ratio	Irregular Period		P value
			95% CI				95% CI		
		Lower	Upper		Lower	Upper			
Occupation/ Employment	Not Work	Ref.							
	Professional/ Manager/ Administration	1.236	0.625	2.445	0.542	0.525	0.259	1.065	0.074
	Service/ Sales	1.039	0.641	1.682	0.876	0.814	0.487	1.359	0.432
	Agricultural worker	1.145	0.673	1.947	0.616	0.988	0.558	1.747	0.967
Currently work	Industrial worker	1.416	0.805	2.493	0.227	0.811	0.438	1.499	0.505
	No	Ref.							
Region	Yes	1.005	0.635	1.590	0.981	1.074	0.656	1.757	0.775
	Cluster 1	Ref.							
	Cluster 2	1.325	1.025	1.713	0.031*	0.925	0.717	1.194	0.554
	Cluster 3	1.623	1.128	2.334	0.009**	0.785	0.532	1.158	0.224

**Table 2** Multivariate Analysis of Injectables and Menstrual Problems

Variables		Menstrual Problems							
		No Menstruation			P value	Irregular Period			
		Adjusted Odds Ratio	95% CI			Adjusted Odds Ratio	95% CI		P value
Lower	Upper		Lower	Upper					
Hormonal Contraceptive Use									
Injectable	No (ref)								
	Yes	2.592	1.952	3.442	0.0***	1.548	1.183	2.026	0.001***
Controlling Variables									
Age group (Years)	15-19	Ref.							
	20-24	0.453	0.217	0.945	0.035*	0.770	0.360	1.649	0.502
	25-29	0.525	0.255	1.079	0.080	0.680	0.320	1.444	0.317
	30-34	0.553	0.266	1.149	0.113	0.813	0.379	1.745	0.597
	35-39	0.455	0.213	0.973	0.042*	0.752	0.341	1.657	0.480
	40-44	0.546	0.245	1.214	0.138	0.637	0.273	1.484	0.296
Education	45-49	0.356	0.121	1.045	0.060	0.755	0.264	2.160	0.601
	Less than primary school	Ref.							
	Secondary school	0.800	0.620	1.032	0.086	1.178	0.895	1.551	0.241
	Higher education	0.644	0.408	1.018	0.060	1.896	1.225	2.935	0.004**
Place of resident	Urban area	Ref.							
	Rural area	1.038	0.817	1.318	0.756	1.256	0.983	1.603	0.068
Children Ever Born									
Household Wealth Index	Poorest	Ref.							
	Poorer	0.880	0.628	1.232	0.457	0.918	0.640	1.318	0.646
	Middle	0.974	0.690	1.376	0.884	1.177	0.821	1.689	0.374
	Richer	1.035	0.719	1.490	0.851	1.011	0.686	1.488	0.955
	Richest	0.734	0.471	1.143	0.172	1.176	0.758	1.824	0.469



Variables		Menstrual Problems							
		No Menstruation				Irregular Period			
		Adjusted Odds Ratio	95% CI		P value	Adjusted Odds Ratio	95% CI		P value
Lower	Upper		Lower	Upper					
Occupation/ Employment	Not Work	Ref.							
	Professional/ Manager/ Administration	1.378	0.700	2.712	0.352	0.548	0.272	1.103	0.092
	Service/ Sales	1.112	0.686	1.802	0.665	0.823	0.493	1.372	0.455
	Agricultural worker	1.273	0.749	2.162	0.371	1.018	0.578	1.795	0.948
Currently work	Industrial worker	1.500	0.852	2.642	0.160	0.817	0.443	1.506	0.519
	No	Ref.							
Region	Yes	0.925	0.585	1.462	0.740	1.028	0.630	1.678	0.910
	Cluster 1	Ref.							
	Cluster 2	1.395	1.080	1.801	0.011*	0.972	0.756	1.251	0.830
	Cluster 3	1.767	1.227	2.543	0.002**	0.816	0.554	1.201	0.303

**Table 3** Multivariate Analysis of Implants and Menstrual Problems

Variables		Menstrual Problems							
		No Menstruation				Irregular Period			
		Adjusted Odds Ratio	95% CI		P value	Adjusted Odds Ratio	95% CI		P value
Lower	Upper		Lower	Upper					
Independent Variable									
Hormonal Contraceptive Use									
Implant	No	Ref.							
	Yes	0.777	0.552	1.093	0.148	1.526	1.105	2.108	0.010**
Controlling Variables									
Age	15-19	Ref.							
	20-24	0.485	0.235	0.999	0.050	0.825	0.386	1.760	0.619
	25-29	0.519	0.256	1.055	0.070	0.688	0.325	1.456	0.329
	30-34	0.549	0.267	1.129	0.103	0.833	0.389	1.783	0.638
	35-39	0.433	0.205	0.914	0.028*	0.759	0.345	1.670	0.494
	40-44	0.496	0.226	1.088	0.080	0.620	0.267	1.442	0.268
	45-49	0.299	0.103	0.864	0.026*	0.727	0.255	2.073	0.552
Education	Less than primary school	Ref.							
	Secondary school	0.805	0.627	1.035	0.091	1.169	0.888	1.538	0.264
	Higher education	0.663	0.422	1.040	0.074	1.905	1.231	2.949	0.004**
Place of resident	Urban area	Ref.							
	Rural area	1.030	0.813	1.305	0.804	1.236	0.967	1.579	0.090
Children Ever Born									
Household Wealth Index	Poorest	Ref.							
	Poorer	0.863	0.618	1.204	0.387	0.932	0.649	1.338	0.704
	Middle	0.966	0.687	1.359	0.844	1.202	0.838	1.725	0.316
	Richer	1.058	0.738	1.517	0.757	1.057	0.718	1.558	0.776
	Richest	0.734	0.473	1.138	0.168	1.228	0.791	1.905	0.359



Variables		Menstrual Problems							
		No Menstruation				Irregular Period			
		Adjusted Odds Ratio	95% CI		P value	Adjusted Odds Ratio	95% CI		P value
Lower	Upper		Lower	Upper					
Independent Variable									
Occupation/	Not Work	Ref.							
Employment	Professional/ Manager/ Administration	1.189	0.609	2.319	0.611	0.475	0.235	0.960	0.038*
	Service/ Sales	1.029	0.638	1.659	0.906	0.756	0.453	1.262	0.286
	Agricultural worker	1.170	0.692	1.975	0.557	0.922	0.522	1.629	0.781
	Industrial worker	1.398	0.800	2.442	0.239	0.763	0.414	1.403	0.385
Currently work	No	Ref.							
	Yes	0.957	0.608	1.507	0.852	1.091	0.668	1.784	0.726
Region	Cluster 1	Ref.							
	Cluster 2	1.397	1.084	1.800	0.010**	0.949	0.737	1.221	0.687
	Cluster 3	1.615	1.127	2.315	0.009**	0.748	0.507	1.102	0.142



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CLINICAL MANIFESTATIONS OF FATAL DENGUE HEMORRHAGIC FEVER, UPPER SOUTHERN THAILAND, 2023

Thanapol Chaiprateep^{1*}, Thammarat Chuaychain¹, Kalita Wareewanit¹, Lamoon Saengsuwan¹

¹Office of Disease Prevention and Control, Region 11 Nakhon Si Thammarat

*Corresponding Author: Thanapol Chaiprateep, Office of Disease Prevention and Control, Region 11 Nakhon Si Thammarat, Thailand. E-mail: thanapol.tkd@gmail.com

ABSTRACT

Introduction: Dengue infection is a substantial public health challenge with a spectrum of clinical manifestations mild fever to severe disease, which can be life-threatening. Upper Southern Thailand, dengue is endemic and it is an important public health problem.

Objectives: A descriptive study aimed to study the clinical manifestations of fatal dengue hemorrhagic fever and give recommendations about diagnosis, surveillance, and prevention and disease control.

Methodology: Secondary data were used by collecting data including 7 provinces of upper southern Thailand from R506, R507, and event-based surveillance in 2023, reviewing medical records, epidemiological investigation reports, laboratory results, and dead case conference reports.

Results: There were 9,108 cases and 31 deaths with dengue diseases. Case fatality rate was 0.34%, which was the highest in Thailand. Female mortality was higher than male mortality (54.84% in females). The highest proportion by age group was 15-59 years of age (61.29%). The majority (38.71%) were found to be employees/laborers. The proportion of underlying disease was 83.87%. Surat Thani had the most reported deaths (35.48%). Clinical manifestations found acute fever (93.55%) the most, followed by muscle pain (61.29%). The results of complete blood count (CBC) indicated 83.87% of platelet < 100,000 cell/mm³, 16.13% of Hematocrit > 50%, 25.81% of WBC < 5,000 cell/mm³. The DENV-3 serotype had a slightly higher proportion than the DENV-2 serotype (32.3% and 29.0%, respectively). The factors of death were obesity/overweight (70.97%) and self-medication (41.94%). The causes of death were prolonged shock (41.94%) and multi organ failure (32.26%).

Conclusion: This study is beneficial for public health and mortality prevention. Especially, the population at risk, who have underlying disease and are 15 to 59 years of age, with acute fever, muscle pain, and headache. They should be followed with platelet and WBC. Furthermore, risk communication is necessary to receive treatment early for reducing their mortality.

Keywords: Dengue hemorrhagic fever, Clinical manifestations, Death, Upper Southern Thailand

INTRODUCTION

Dengue is a mosquito-borne viral disease, which is a substantial public health challenge with a spectrum of clinical manifestations from mild fever to severe disease both dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS). DHF is severe form of dengue fever (DF), which can be life-threatening. In the past 30 years, dengue disease has become endemic in over 100 countries/territories and it affected to population's health around 40 percent (2,500 million people), especially in tropical regions including Southeast Asia, Western Pacific, Central America, and South America. 70 percent of all the reported cases were from Asia. The

disease occurs from dengue virus (DENV) which is a small single-stranded RNA virus comprising four distinct serotypes including DENV1, DENV2, DENV3, and DENV4. These closely related serotypes of the dengue virus belong to the genus *Flavivirus*, family *Flaviviridae*. Primary infection is thought to induce lifelong protective immunity to the infecting serotype. People with dengue infection are protected from clinical illness with a different serotype within 3-12 months of the primary infection but with no long-term cross-protective immunity (1). In addition, DHF and DSS are severe diseases and it is public health emergency according to International Health Regulation (IHR 2005). It affects to population's health and can be rapidly transmitted worldwide. WHO estimate



approximately 100-400 million cases are reported every year. This is basically an estimate and the American region alone has report about 2.8 million cases and 101,280 deaths. (2, 3)

For Thailand, dengue disease is endemic and it is also important public health. Thailand had the first reported cases in 1949 and there was the first epidemic in 1958. In 1987, there were 170,000 reported cases and 1,000 deaths approximately and it was the broadest epidemic. There were reported cases increasingly and dengue is seasonal variation. The data indicated there were the highest reported case in June to August which was the rainy season and the reported cases slightly decrease in September. However, if the number of reported cases does not decrease at the end of the year, there will be an outbreak next year (1).

In the past 11 years of Upper Southern Thailand, the pattern of outbreak was not uncertain but the mortality rate decreased in 2020-2021 due to the COVID-19 pandemic. In 2022, it was the post-pandemic of COVID-19, and reported cases were increasing continuously (4). Furthermore, Division of Vector Borne Diseases sets key indicators of Vector-borne Disease Management Strategy 2023-2032 including the mortality rate is less than the 5 year-median and the case fatality rate (CFR) in the upper 15 years of age being less than 0.1 percent (5). For upper southern Thailand, there were 31 reported deaths in 2023, which was higher than the target of the key indicator. When the researchers classified the age group, there were 24 reported deaths among people in the upper 15 years of age (CFR = 0.44%). Many parts of information were related to clinical manifestations and epidemiology characteristics including person, time, place, and others e.g. laboratory results, complications, and dengue genetic material. Those were really important for mortality prevention. The researchers have expected to take the results for appropriately giving some recommendations about diagnosis, surveillance, and disease and prevention control.

METHODOLOGY

Study design

A descriptive study was conducted in this study for studying the clinical manifestations of fatal dengue hemorrhagic fever, upper southern Thailand. The researchers used data from R506, and event-based surveillance from Division of Epidemiology, Department of Disease Control, Ministry of Public Health.

R506 is the passive surveillance which was collaborated from network partners in provincial level included Provincial Public Health Office, Hospitals, and Subdistrict Health Promoting Hospitals. R506 was created for disease and disaster surveillance for outbreak prevention. R507 is created to revise incorrect data after getting the confirmed laboratory, autopsy result, or correct information. For event-based surveillance is the organized and rapid capture of information about events which are a potential risk to public health. The information can be rumors and other ad-hoc reports transmitted through formal channel (i.e. established routine reporting systems) and informal channels (i.e. media, health workers and nongovernmental organizations reports). These sources of data included R506 and event-based surveillance are used for prevention and disease control (6, 7). For the number of populations, the researchers used data from The Bureau of Registration Administration, Department of Provincial Administration, Ministry of Interior. The data were collected from 1 January to 31 December 2023.

Study area

This study was implemented in upper southern Thailand which is under the Office of Disease Prevention and Control, Region 11 Nakhon Si Thammarat includes Nakhon Si Thammarat, Krabi, Phangnga, Phuket, Surat Thani, Ranong, and Chumphon.

Sample size and study population

The study population, who was diagnosed with confirmed laboratory by physicians, consisted of deaths with three types of dengue diseases: DF, DHF, and DSS. 31 reported deaths were recorded to Epidemiological surveillance including R506, and Event-based surveillance from 1 January to 31 December 2023.

The sample size was deaths with three types of dengue diseases: DF, DHF, and DSS. They were diagnosed with confirmed laboratory by physicians and reported to Epidemiological surveillance including R506, and Event-based surveillance from 1 January to 31 December 2023. The sample size was selected based on inclusion and exclusion criteria. For sample size calculation, the researchers used table sample size (8), and 31 deaths were recruited as a sample size because all deaths were less than 100 populations according to the table sample size.



Inclusion criteria

1. Deaths with dengue diseases included DF, DHF, and DSS from 1 January to 31 December 2023.
2. Received treatment in the public health service center in upper southern Thailand.
3. There were confirmed laboratories with commercial test kits e.g. Positive NS-1 antigen or Positive PCR.
4. Be reported to Epidemiological surveillance including R506, and Event-based surveillance.

Exclusion criteria

1. Data in the Epidemiological surveillance including R506, and Event-based surveillance were not completed.

Measurement tools

Secondary data was conducted in this study by using data in the Epidemiological surveillance including R506, and Event-based surveillance. In addition, the researchers reviewed medical records and recorded data in the case report form which had 6 parts including

demographic characteristics, health service information, clinical manifestation, laboratory results, risk factors, and the cause of death information.

Statistical analysis

Data were analyzed using SPSS version 16.0 (9). A descriptive study design was conducted in this study. Therefore, all data were presented as descriptive statistics. Data were reported quantitatively using mean ± SD for normal distribution, median (IQR) for non-normal distribution and qualitatively as percentage and frequency.

RESULTS

There were 9,108 reported cases and 31 reported deaths. The morbidity rate was 202.85 cases per 100,000 population, the mortality rate was 0.69 deaths per 100,000 population, and the case fatality rate (CFR) was 0.34%, which was the highest when compared to the health region level of Thailand. Phuket had the highest CFR (0.91%), followed by Chumphon and Nakhon Si Thammarat (0.41% and 0.27, respectively). Demographic data were presented in Table 1.

Table 1 Demographic characteristics of deaths with dengue (Total n=31)

Characteristics	Participants	
	Number	Percent (%)
Gender		
Male	14	45.2
Female	17	54.8
Age (Years)		
< 15	7	22.6
15-59	19	61.3
≥ 60	5	16.1
Mean ± SD	30.29 ± 19.74	
Nationality		
Thai	29	93.5
Foreigner	2	6.5
Occupation		
Agriculturist	2	6.5
Government officer	1	3.2
Employee/Laborer	12	38.7
Housekeeper	5	16.1
Student	8	25.8
Soldier /Police officer	1	3.2
Teacher	1	3.2
Others	1	3.2
Body Mass Index (kg/m ²)		
< 18.5 (Underweight)	6	19.4
18.5-22.9 (Normal)	5	16.1



Characteristics	Participants	
	Number	Percent (%)
23.0-24.9 (Obese class I)	1	3.2
25-29.9 (Obese class II)	10	32.3
≥ 30.0 (Obese class III)	9	29.0
Mean ± SD	27.32 ± 8.99	
Underlying disease* (n=25)		
No	12	48.0
Yes	13	52.0

*Variable with missing data

Health service information

31 reported deaths were mostly in the inpatient department (IPD). Most of them went to see the doctor for treatment within 4 days after date of illness. However, approximately 58% of deaths were diagnosed as dengue disease longer than 4 days. Duration of delay treatment was the

date of illness until the date of getting treatment in the hospital by 4 days. For duration of delay diagnosis, it was the date of illness until the date of getting treatment in the hospital but the physician diagnosed longer than 4 days after the date of illness. Then the physician diagnosed next day.

Table 2 Health service information (Total n=31)

Health service information	Participants	
	Number	Percent (%)
Tourniquet test* (n=29)		
No	28	96.6
Yes	1	3.4
Type of Patient		
Outpatient department (OPD)	2	6.5
Inpatient department (IPD)	29	93.5
Duration of delay treatment (Days)		
< 4 days after date of illness	20	64.5
≥ 4 days after date of illness	11	35.5
Mean ± SD	2.77 ± 1.88	
Duration of delay diagnosis (Days)		
< 4 days after date of illness	13	41.9
≥ 4 days after date of illness	18	58.1
Mean ± SD	3.81 ± 1.99	

*Variable with missing data

Clinical manifestation

Clinical manifestation of deaths in this study included acute fever/high temperature the

most (93.5%), followed by others (87.1), muscle pain (67.9%) and headache (56.7%). (Figure 1).

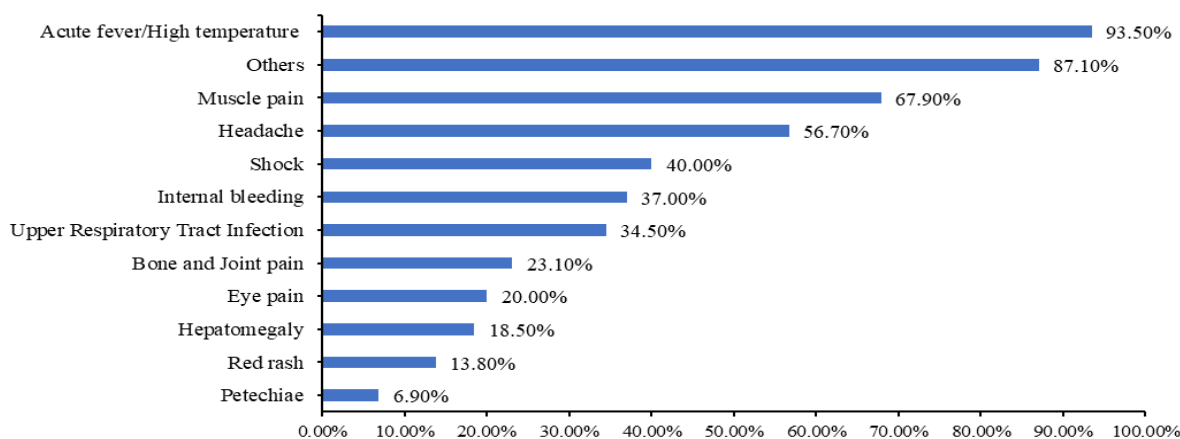


Figure 1 Clinical manifestation of fatal dengue hemorrhagic fever

For others of the clinical manifestations of deaths in Figure 1, they included others, and then vomiting was found the most (32.3%),

followed by fatigue (25.8%) and cough (22.6%). They were presented in Figure 2.

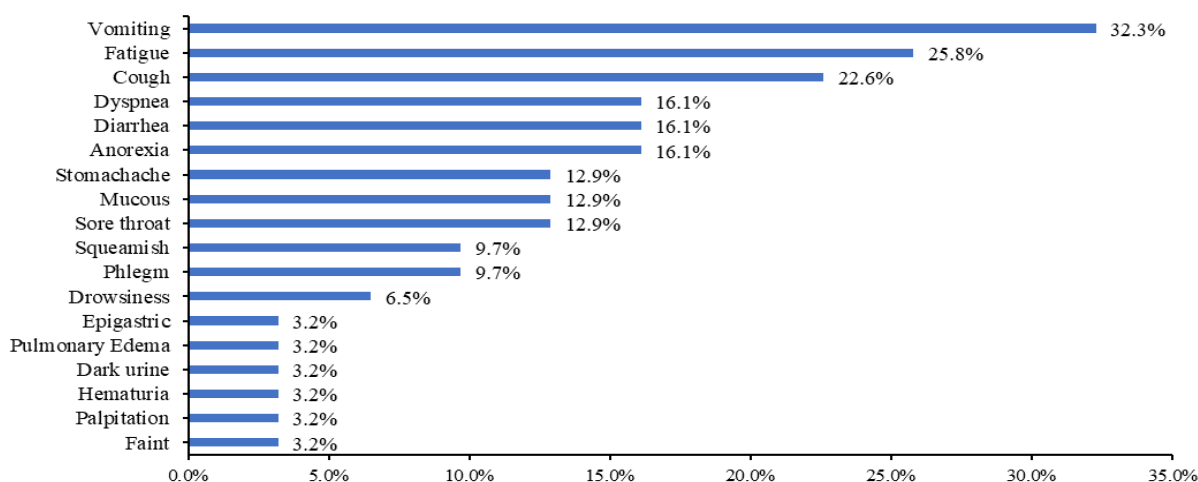


Figure 2 Clinical manifestation of fatal dengue hemorrhagic fever (Others)

Laboratory results

Laboratory results included general laboratory and specific laboratory. For general laboratory, the results of complete blood count (CBC) indicated that 25.8% of WBC < 5,000 cell/mm³ (Mean 11,211.75 ± 9,826.27 cell/mm³), 83.9% of platelet < 100,000 cell/mm³ (Mean

57,656.26 ± 68,973.98 cell/mm³), 16.1% of Hematocrit > 50% (Mean 40.05 ± 10.29). For specific laboratory, NS-1 antigen, Dengue IgM and IgG results were generally positive. The DENV-3 serotype had a slightly higher proportion than the DENV-2 serotype (32.3% and 29.0%, respectively) (Table 3).

Table 3 Laboratory result (Total n=31)

Laboratory result	Participants	
	Number	Percent (%)
General laboratory		
White Blood Cell (WBC)		
< 5,000 cell/mm ³	8	25.8
≥ 5,000 cell/mm ³	23	74.2



Laboratory result	Participants	
	Number	Percent (%)
Mean \pm SD	11,211.75 \pm 9,826.27	
Platelet		
< 100,000 cell/mm ³	26	83.9
\geq 100,000 cell/mm ³	5	16.1
Mean \pm SD	57,656.26 \pm 68,973.98	
Hematocrit (Hct)		
\leq 50 %	26	83.9
> 50 %	5	16.1
Mean \pm SD	40.05 \pm 10.29	
Lymphocyte (Lym)		
Median (IQR)	40.00 (12, 99)	
<u>Specific laboratory</u>		
NS-1 Antigen		
Negative	2	6.5
Positive	28	90.3
Not tested	1	3.2
Dengue IgM* (n=22)		
Negative	9	40.9
Positive	11	50.0
Not tested	2	9.1
Dengue IgG* (n=24)		
Negative	4	16.7
Positive	18	75.0
Not tested	2	8.3
PCR		
Negative	2	6.5
Positive	30	93.5
o DENV-1	5	16.1
o DENV-2	9	29.0
o DENV-3	10	32.3
o DENV-4	5	16.1

*Variable with missing data

Factors and the causes of death

The factors of death were presented in Figure 4. However, they could be classified as related factors to the patients themselves and their treatment-seeking behaviors. The related factors of the patient themselves included overweight/obesity (71.0%), followed by underlying diseases (52.0%), pregnancy (4.0%), and menstruation (3.2%). For the related factors

of their treatment-seeking behaviors, they were included self-medication (50.0%), followed by getting NSAIDs (42.9%), delay treatment (35.5%), and treatment at clinic (30.4%). For the causes of death, Prolonged shock was the highest proportion (41.9%) and followed by multi-organ failure (32.3%). The cause of death was presented in figure 4

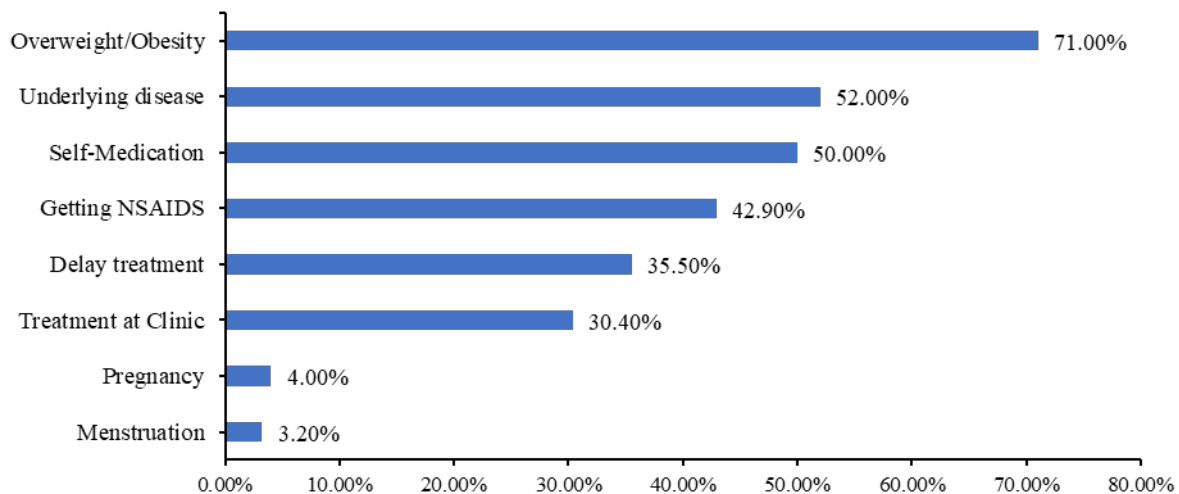


Figure 3 The factors of death

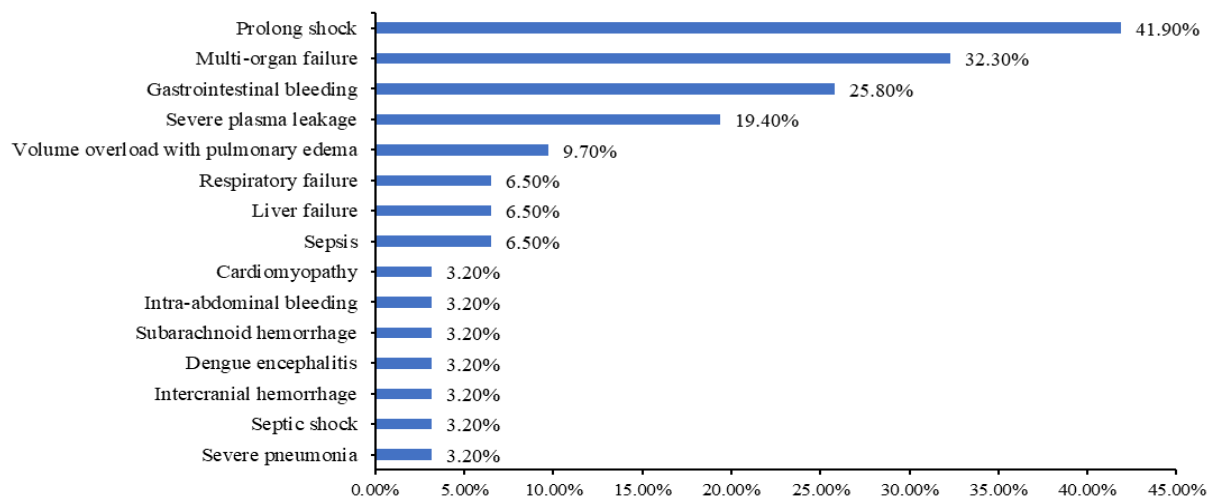


Figure 4 The cause of death information

DISCUSSION

31 reported deaths in 2023. The proportion of females was 54.8%, which was slightly higher than that of males, because some females were at high risk, e.g., pregnancy, menstruation. Thus, they could be bleeding, and treatment among females was more difficult than for males. It was consistent with some studies. The mortality rate in females was higher than males because of physiological factors and different immune responses. Females were at higher risk than males, e.g., pregnancy and menstruation. Therefore, treatment among females was more difficult and they had more opportunity for fatalities (10, 11). Furthermore, the highest proportion of deaths was 15-59 years of age (61.3%) and 46.7% of them had underlying diseases., followed by age group < 15 years of age (22.6%) and 40.0% of them had underlying diseases. The last age group was > 60

years of age and 80.0 of them had underlying diseases. Therefore, the age group 15-59 and > 60 years of age were at higher risk. It was consistent with the study in Taiwan. Elderly people probably had chronic diseases or underlying diseases which affects more severity of dengue disease. Thus, they would have more opportunity for fatality. The changing of dengue patients from children to elderly people reflected this trend. It would more severity among people who were more than 50 years of age (12). For occupation in this study, most deaths were employee/laborer (38.7%), followed by student (25.8%). This result indicated most of them were in a working age and an education age. It was similar to the study in Vietnam. Deaths in an education age had the most mortality rate (13).

93.5% of deaths were treated as an inpatient department (IPD). They had many symptoms included vomiting, fatigue,



stomachache, faint, bleeding, shock, hematocrit > 50% in males or > 40% in females, platelet \leq 100,000 cell/mm³, plasma leakage, kidney disfunction, patients at high risk e.g. infant, pregnant women, elderly people, obesity, chronic disease. Therefore, they were a suspected dengue case and were able to be admitted as an IPD (14). It was consistent with this guideline because 52.2% of deaths had underlying diseases and 72.4% of deaths had overweight/obesity. However, 96.6% of deaths were not tested a tourniquet and it was consistent with the current situation. Physicians did not order a tourniquet test because they did not suspect dengue disease (15). In addition, it was consistent with this study because 58.1% of deaths were diagnosed after 4 days of illness. Physicians did not suspect dengue disease at the first treatment.

The result of clinical manifestations, 93.5% had fever, followed by other symptoms (87.1%) and muscle pain (67.9%). Other symptoms included vomiting (32.3%), fatigue (25.8%), and cough (22.6%). This result was consistent with the epidemiological investigation in community of Aung Thong, Nakhon Phanom, Surin (16-18).

25.8% of deaths had WBC \leq 5,000 cell/mm³, 83.9% of deaths had platelet \leq 100,000 cell/mm³. For WBC in this study was not consistent with the laboratory criteria according to the definition and guideline of Dangerous communicable disease and Communicable disease under surveillance Report in Thailand. Cases with dengue disease must have WBC \leq 5,000 cell/mm³ and platelet \leq 100,000 cell/mm³ (19). However, platelet in this study was consistent with the laboratory criteria. This is the limitation of using the epidemiological surveillance data which is secondary data. Office of Disease Prevention and Control, Region 11 Nakhon Si Thammarat would get the reported data from Provincial Public Health Officer in the upper southern Thailand for epidemiological surveillance. It was not probably the latest laboratory results before cases would die. For dengue serotype, DENV-3 serotype had a slightly higher proportion than the DENV-2 serotype (32.3% and 29.0%, respectively). It was not consistent with other studies which indicated DENV-2 was severer, than other serotypes (20, 21).

For the factors of death, many deaths had overweight/obesity (71.0%), followed by underlying diseases (52.0%). For underlying

disease, the highest proportion was hypertension (30.8%) which was consistent with other studies. Dengue cases with underlying diseases would have a greater severity of clinical manifestations, and they would have more opportunity for fatality (22). For the study of overweight/obesity, it was associated with severe respiratory failure but it was not associated with acute liver failure. Furthermore, overweight/obesity could be dangerous to endothelial cell and it made plasma leakage (23, 24). For hypertension, studies indicated that cases with dengue disease who also had hypertension were at higher risk of developing severe dengue, which could lead to death. In addition, studies found a correlation between hypertension and the progression of dengue from mild fever to severe dengue. Hypertension often involves inflammation, which exacerbates the immune response during a dengue infection. This leads to increased vascular permeability and fluid leakage, resulting in shock, a critical condition characterized by low blood pressure and organ dysfunction, which can ultimately lead to death (22, 25).

The causes of death indicated that the most common cause of death for patients with dengue fever was prolonged shock (41.9%). This was followed by multi-organ failure at 32.3%. This finding was consistent with other studies that indicated patients with dengue fever who experienced prolonged shock were approximately 2-3 times more probably to die (26-28). Furthermore, studies indicated that prolonged shock could lead to multi-organ failure, including liver and kidney failure, significantly increasing the risk of fatality (29).

LIMITATION

Data in Event-based surveillance had some limitations because some data were not completed, e.g. self-medication, the number of hospitals getting treatment, underlying diseases, laboratory results, and co-morbidity. Those were the limitations of this study.

CONCLUSIONS AND RECOMMENDATIONS

This study is beneficial for public health and mortality prevention. Especially, the population at risk, who have underlying disease and are 15 to 59 years of age, with acute fever or high temperature, muscle pain, and headache. Risk communication is necessary to observe their symptoms and receive treatment initially



for reducing mortality. Additionally, suspected case screening is also necessary for initial treatment to prevent severe dengue and mortality. Dengue cases should be followed up with platelet and WBC. Furthermore, risk communication is necessary to receive treatment early for reducing their mortality.

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DISTRIBUTION OF THE FACTORS RELATED TO NEEDLE STICKS AND SHARP INJURIES AMONG HEALTHCARE WORKERS IN A TEACHING HOSPITAL

Perawat Wattanasombat^{1*}, Wichai Aekplakorn¹, Chathaya Wongrathanandha¹

¹Department of Community Medicine, Faculty of Medicine, Ramathibodi Hospital, Mahidol University, Bangkok 10400, Thailand

***Corresponding Author:** Perawat Wattanasombat, Department of Community Medicine, Faculty of Medicine, Ramathibodi Hospital, Mahidol University, Bangkok 10400, Thailand, E-mail: perawat.wat@student.mahidol.ac.th

ABSTRACT

Introduction: Needle sticks and sharp injuries (NSSIs) are common occupational hazards for healthcare workers (HCWs) leading to many consequences, such as blood-borne infection, stress, and poor healthcare services. Identifying HCWs at high risk of NSSIs exposure and associated factors is important for developing appropriate prevention guidelines. However, the incidence of NSSIs varies depending on the region of study, healthcare setting, and other factors. Ramathibodi hospital have > 6,000 staffs with > 100 NSSIs/year and trustworthy database about HCWs and NSSI events; thus, it can be an appropriate study place for NSSIs.

Objectives: This study aimed to determine the characteristics of factors associated with NSSIs among all groups of HCWs in a teaching hospital.

Methodology: A retrospective cohort study was conducted in the Faculty of Medicine, Ramathibodi Hospital, Mahidol University. The data sheets recording NSSI events from 1 July 2020 to 31 December 2022 were reviewed and extracted for variables on work-related factors, such as unit of affiliation, workplace and work shift of incidence, step and emergency level of procedures, and injured body site. In addition, data on demographic factors of HCWs, such as age, gender, occupation, education level, and year of work experience, were obtained from the Division of Human Capital Management. The cumulative incidence and distribution of factors were calculated as percentages and compared using Chi-square test. P-value < 0.05 was considered statistically significant.

Results: Among 6,778 HCWs, there were 319 NSSI events. Among the events, most of injured HCWs were female (84%), nurses (49.2%), 30-44 years old (49.8%), having ≤ 5 years of experience (78.4%), holding bachelor's or higher degree (91.8%), working in academic department (51.7%). Most events affected the hand (96.9%) and occurred at inpatient department (39.2%), in the morning shift (64.6%), while performing (53.9%), and during the emergent procedures (59.9%). The overall cumulative incidence was 4.7%. The incidence was high among HCWs who were female (4.8%), physicians (7.6%), working in labor room (LR) or operation room (OR) (9.5%), having ≤ 5 years of work experience (8.4%), < 30 years old (6.4%), and holding bachelor's or higher degree (6%). All these variables except gender were significantly associated with NSSIs.

Conclusion: As NSSIs are common among younger HCWs having up to 5 years of work experience, and those working in LR or OR, the hospitals should actively promote NSSI prevention programs for them. Additionally, these HCWs should be particularly vigilant during procedures to protect themselves from the injuries.

Keywords: Needle sticks and sharp injuries, Healthcare workers, occupational hazard, associated factors

INTRODUCTION

Needle sticks and sharp injuries (NSSIs) are defined as “punctured or lacerated wounds on the skin produced by sharp medical devices while performing medical tasks”. Many

healthcare workers (HCWs) usually come into contact with various sharp devices while working, making NSSIs a potential occurrence. According to the information from WHO, worldwide HCWs are annually exposed to more



than two million NSSIs (1). While a recent systematic review among 525,798 HCWs in 2022 revealed the global prevalence of NSSIs at 43% (2). Importantly, NSSIs bring many undesirable consequences to HCWs and healthcare system. In terms of physical issues, NSSIs lead to blood and body fluid exposure and a higher risk of blood-borne infection. According to estimates from the Ontario Hospital Association and the Ontario Medical Association, there is a 6–30% probability that an exposed vulnerable person may become infected following an injury caused by an HBV-contaminated needle. In a comparable scenario involving hepatitis C, an individual's risk of infection is 1.8%, whereas the risk of HIV infection is 0.3% (3). The risk of infection for HCWs is contingent upon the implicated blood-borne pathogen, the severity of NSSIs, the immune condition of exposed HCWs, and the use of appropriate prophylaxis after injury (4). In terms of psychological issues, exposed HCWs might go through intense emotional discomfort, worry, and anxiety, which causes the alterations in their behaviors and work abilities (5, 6). This means NSSIs can affect both HCWs and the quality of healthcare services provided to the patients. Therefore, exploring the incidence of NSSIs reflecting the risk in the region of interest and identifying HCWs with high risk of NSSIs exposure are very crucial for settling the effective NSSIs prevention guidelines.

However, the incidence and prevalence of NSSIs vary depending on the region of study and healthcare setting. A global systematic review in 2020 revealed the pooled prevalence of NSSIs from 18 studies at 56.2%. The prevalence of NSSIs in the year prior was 12.4% in developed countries and 37.8% in

developing countries, indicating disparities in standard procedure implementation and working conditions of different healthcare settings (7). Conversely, a systematic study in 2014 revealed a greatly varying incidence of NSSIs with the highest incidence in developed countries like Australia, France, and United states. It was believed that the different information sources were the main reason for this disparity as surveillance systems may show lower numbers due to underreporting (8). These different study approaches consequently made it impossible to conduct a thorough comparison between the investigations. In Thailand, a study in a teaching hospital revealed the highest annual incidence of NSSIs among residents (11%), followed by medical students (10.5%). Whereas the lowest annual incidence belonged to nursing students (2.3%) (9). Nevertheless, since this study was performed over ten years ago, an updated analysis is strongly required. Moreover, the other studies were usually conducted among specific group of HCWs, such as nurses and medical students (10, 11). Whereas the studies among the other groups of HCWs were rarely published despite their high risk of NSSIs exposure. The study on associated factors of NSSIs among all groups of HCWs would potentially help us figure out the preventable causes and develop more effective safety guidelines for all occupations in healthcare facilities. Thus, this study aims to determine the characteristics of factors associated with NSSIs among all groups of HCWs in Ramathibodi hospital as it is a teaching hospital having a great number and a variety of HCWs with trustworthy database on HCWs' information and NSSI event records. As a result, it can serve as an appropriate place for study on NSSIs.

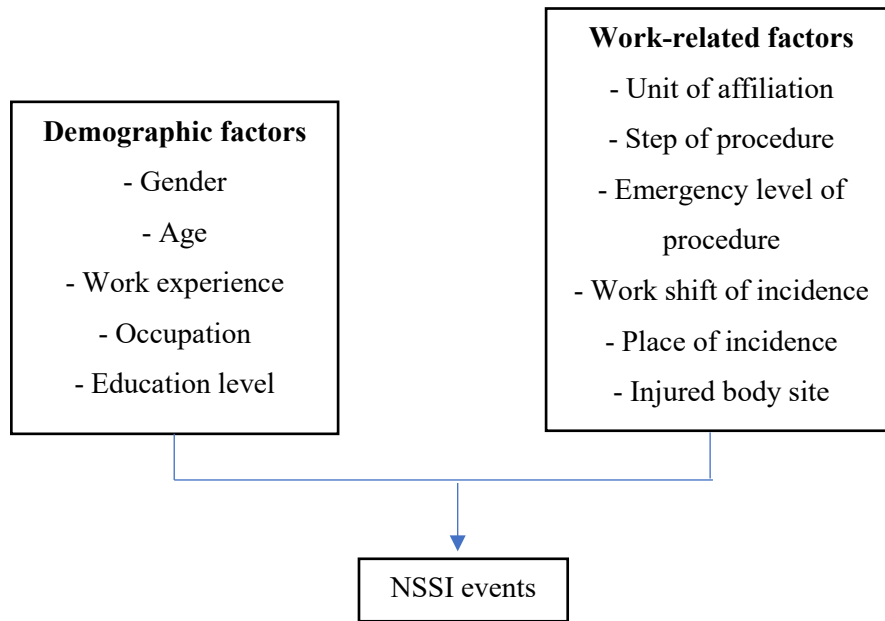


Figure 1 Conceptual Framework of the study

This framework showed the concept of categorizing possible associated factors into 2 groups; work-related factors and demographic factors, which could eventually result in NSSIs exposure and need to be explored more.

HYPOTHESIS

1.4.1 There could be associations between NSSIs and demographic factors

A retrospective cohort study using secondary data sources was conducted in the Faculty of Medicine, Ramathibodi Hospital, Mahidol University. The independent variables of exposed HCWs and outcome of interest (dependent variable) were extracted from NSSI event data sheets stored in the Department of Occupational Health, Safety and Environment during 1 July 2020 to 31 December 2022. Meanwhile, the independent variables of all HCWs were obtained from the Division of Human Capital Management database.

Ethical consideration

The study protocol was approved by Human Research Ethics Committee, Faculty of Medicine, Ramathibodi Hospital, Mahidol University (COA. No. MURA2023/732).

Sampling method and eligible criteria for the participants

A purposive sampling method was applied to this study. Eligible participants for this study were HCWs who had active status

including gender, age, occupation, education level, and work experience

1.4.2 There could be associations between NSSI and work-related factors, including unit of affiliation, place and work shift of incidence, step and emergency level of procedure, and injured body site.

METHODOLOGY

Research design and study period

during the study period with the occupations and units of affiliation that provided a chance of direct contact with the sharp medical devices while performing medical tasks.

Variables

Dependent variable was NSSI event. Independent variables were classified into 2 groups; work-related factors (unit of affiliation, workplace and work shift of incidence, step and emergency level of procedure, and injured body site) and demographic factors (age, gender, occupation, education level, and year of work experience).

Statistical analysis

The demographic data of HCWs and the distribution of NSSI events classified by demographic and work-related factors were shown as numbers and percentages. Then, the cumulative incidence and the incidence related to each factor were calculated. Pearson's chi-square test was used to assess the association



between NSSIs and factors of HCWs. P-value < 0.05 was considered statistically significant.

RESULTS

Demographic data and distribution of NSSIs

Table 1 demonstrates the demographic data and distribution of NSSIs among HCWs. During the study period, there were 6,778 eligible HCWs with 319 NSSI events. HCWs were mainly female (83.2%), nurses (59.4%), between 30-44 years old (50.1%), having up to 5 years of work experience (43.7%), working in an academic department (38.8%), and

holding Bachelor's or higher degree (72.2%). Most of NSSIs occurred to female HCWs (84%). The highest distribution of injuries belonged to nurses (49.2%), followed by physicians (44.2%). More than half of exposed HCWs worked in the academic department (51.7%), followed by the inpatient department (17.6%) and labor room/operation room (12.2%). Most of them hold a bachelor's or higher degree (91.8%) and had up to 5 years of work experience (78.4%). HCWs with more than 10 years of experience accounted for only 10.3% of injuries.

Table 1 Demographic data and distribution of NSSIs among HCWs

Characteristic	Injury (n = 319), n (%)	non-injury (n = 6,459), n (%)	Total n (%)	P-value
Gender				
Male	51 (16.0)	1,088 (16.8)	1,139 (16.8)	0.689
Female	268 (84.0)	5,371 (83.2)	5,639 (83.2)	
Age (years old)				
<30	146 (45.8)	2,120 (32.8)	2,266 (33.4)	<0.001
30-44	159 (49.8)	3,235 (50.1)	3,394 (50.1)	
45-59	14 (4.4)	1,104 (17.1)	1,118 (16.5)	
Occupation				
Physician	141 (44.2)	1,791 (25.6)	1,857 (26.5)	<0.001
Nurse	157 (49.2)	3,871 (59.9)	4,028 (59.4)	
Nurse assistant	16 (5.0)	617 (9.5)	633 (9.3)	
Technician and scientist	5 (1.6)	321 (5.0)	326 (4.8)	
Education level				
Diploma or lower	26 (8.2)	1,857 (28.8)	1,883 (27.8)	<0.001
Bachelor's or higher degree	293 (91.8)	4,602 (71.2)	4,895 (72.2)	
Unit of affiliation				
Academic department	165 (51.7)	2,466 (38.2)	2,631(38.8)	<0.001
OPD and ER	28 (8.8)	943 (14.6)	971(14.3)	
LR and OR	39 (12.2)	410 (6.4)	449 (6.6)	
IPD	56 (17.6)	1,479 (22.9)	1,535 (22.6)	
ICU	22 (6.9)	750 (11.6)	772 (11.4)	
Supporting division	9 (2.8)	411 (6.4)	420 (6.2)	
Work experience (years)				
≤ 5	250 (78.4)	2,711 (42.0)	2,961 (43.7)	<0.001
6-10	36 (11.3)	1,422 (22.0)	1,458 (21.5)	
11-15	17 (5.3)	948 (14.7)	965 (14.2)	
>15	16 (5.0)	1,378 (21.3)	1,394 (20.6)	

**Cumulative incidence and incidence associated with each factor**

The overall cumulative incidence of NSSIs in Ramathibodi hospital was 4.7%. In terms of gender, the incidences were nearly equal in male (4.5%) and female HCWs (4.8%). Regarding occupation, the incidence was highest among physicians (7.6%), followed by nurses (3.9%). In terms of age, HCWs who were younger than 30 years old (6.4%) had the highest incidence of NSSIs, and the incidence was lowest in HCWs who were 45-59 years old. In terms of work experience, the incidence among HCWs with up to 5 years of work experience (8.4%) was 7 times higher than the incidence among HCWs with > 15 years of work experience (1.2%). Regarding education level, the incidence of NSSIs among HCWs holding a bachelor's or higher degree was 6.0%, which was 4.3 times as much as the incidence among HCWs holding a diploma or lower degree. In

terms of unit of affiliation, HCWs working in labor room/operation room had the highest incidence of 9.5%, followed by those working in the academic department (6.3%) and the inpatient department (3.7%). There was a significant association between NSSIs occurrence and almost all factors except gender.

Details of NSSI events

Among 319 events, NSSIs most frequently occurred in the inpatient department (39.2%), followed by emergency room and the outpatient department (24.5%), and supporting unit including laboratory (18.5%). 64.6% of events occurred in the morning shift, whereas only 14.4% occurred in the night shift. Half of them (53.9%) happened while performing the procedures and 59.9% were related to the emergent procedures. Hand was the most common body site affected by NSSIs (96.9%).

Table 2 Distribution of NSSI events

Variables	Number (%) (N = 319)
Shift of incidence	
Morning shift	206 (64.6)
Evening shift	67 (21.0)
Night shift	46 (14.4)
Emergency level of procedure	
Emergent	191 (59.9)
Urgent	108 (33.8)
Non urgent	20 (6.3)
Step of performing procedure	
During the preparation	18 (5.7)
During the performance	172 (53.9)
During the disposal	129 (40.4)
Place of incidence	
Intensive or critical care unit	35 (11.0)
ER and OPD	78 (24.4)
IPD and observation unit	125 (39.2)
LR OR and intervention room	22 (6.9)
Laboratory and supporting unit	59 (18.5)
Injured body site	
Hand	309 (96.9)
Arm	5 (1.6)
Foot	3 (0.9)
Leg	2 (0.6)

DISCUSSION

NSSIs have been an important occupational hazard for HCWs for a long time. Even after guidelines for minimizing NSSIs in healthcare settings have been developed and

implemented, these hazards continue to happen in daily practice (1, 4). Prior research conducted in Thailand revealed the greater frequency of NSSIs among HCWs compared with those reported in the studies conducted abroad (9, 12),



suggesting that more researches on potential predictors of NSSIs are necessary to develop more effective preventive guidelines for all medical settings in the future.

To explore the incidence reflecting the risk of NSSIs exposure among all groups of HCWs, this study was conducted in a teaching hospital with many HCWs using secondary data from a trustworthy database to prevent the recall bias of participants. The study revealed the cumulative incidence over the 2.5-year period at 4.7% with the highest incidence among the physicians, which is similar to the findings of a global systematic review in 2020 (13) and a previous study in Thailand (9). The authors of the latter study explained that it could be the results of increased risk associated with treatments performed by physicians or the physicians' negligence during performing the procedures. On the contrary, some studies from the other countries identified nurses as the riskiest occupation for NSSIs exposure (2, 14). This could be due to the different scope of work for nurses and doctors in each country, leading to the disparity in the risk of experiencing NSSIs. Younger HCWs with fewer years of work experience were also at higher risk of experiencing NSSIs. This result agrees with the previous studies (15, 16), including a study in Thailand (11). It may suggest that experienced HCWs are more likely to obtain adequate safety training, grow competent in using sharp objects, and manage waste disposal over time, all of which are essential for preventing NSSIs exposure.

Interestingly, although the distribution of NSSIs was highest among HCWs working in academic department, the incidence of NSSIs was highest among HCWs working in the labor room/operation room. The result is consistent with the results of studies from the other countries (14, 15) and a study in Thailand (12) demonstrating that HCWs in surgical-related departments were at a higher risk of NSSIs exposure. Because of the nature of their jobs, these HCWs are daily assigned to handle a larger number and type of sharp objects under the time-limited settings for more extended periods compared with HCWs in the other departments, leading to an increase in the risk of injury (17). In addition, HCWs holding bachelor's or higher degrees were more prone to experience NSSIs than HCWs holding diplomas or lower degrees. This finding was in accordance with the studies of Girmaye et al. in Ethiopia stating that HCWs

with higher degree were more susceptible to NSSIs exposure (18). The probable explanation was that most of HCWs who perform medical procedures involving sharp objects are physicians and nurses. Since they must have a bachelor's degree at the very least, exposed HCWs thus primarily hold bachelor's or higher degrees.

According to the analysis of work-related factors among exposed HCWs, the inpatient department was the most frequent place of NSSIs. This finding is similar to the finding in a systematic review identifying inpatient department or general ward as the most common place for NSSIs occurrence (13). The probable explanation is that the number of HCWs working in the inpatient department in our study was much higher than those working in the other units of affiliation except the academic department and they usually carried out many procedures involving sharp devices, such as intravenous fluid administration and blood sampling, in this unit, resulting in the higher chance of exposure to NSSIs.

Most of NSSIs happened in the morning shift. This was similar to the studies in Iran (19) and Saudi Arabia (20) identifying the highest frequency of NSSIs in the morning shift. It could be the result of the fact that during the morning shift, more procedures were accomplished compared with the evening shift and the night shift. It is possible that the increased workload during the morning shift and a quicker workday or haste can contribute to the accidents (20). Furthermore, NSSIs usually occurred while performing the procedures and mostly affected the hand. This is probably because during this step, HCWs often come into the closest contact with sharp devices, and hands are almost always used to perform the procedures.

Overall, this study revealed the distribution of NSSIs and the incidence of NSSIs associated with each factor that help identify HCWs with higher risk of NSSIs exposure. Strength of the present study is the utilization of the secondary data from the reliable database to prevent recall bias that might be found in some previous studies using questionnaires. Besides, it comprised a very large number of participants from all groups of HCWs which could improve the validity of the results. However, the generalizability of this study to other healthcare settings, such as primary care centers or community hospitals, may be constrained



because it was performed in one teaching hospital which is tertiary-care medical facility. We recommend that the hospital administrators should prioritize personal safety to help all HCWs understand the significance of preventing NSSIs. Besides, they ought to establish a safety culture, provide the most current practice standards, schedule frequent educational training sessions for NSSIs prevention, and encourage HCWs in implementing these procedures, especially those who are susceptible to NSSIs exposure. In addition to providing safety-focused training, lowering the frequency of NSSIs also requires the availability of basic devices, e.g., disposal containers and personal protective equipment. After applying the solutions to the workplace, the incidence of NSSIs should also be regularly monitored to evaluate the effectiveness of these interventions and adjust them as proper.

CONCLUSIONS

As NSSIs are more common among physicians, nurses, and younger HCWs having up to 5 years of work experience and those working in labor rooms or operation rooms, hospitals should actively promote NSSI prevention programs to reduce the incidence and consequences of NSSIs. Additionally, these HCWs should be particularly vigilant during procedures to protect themselves from injuries.

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FACTORS ASSOCIATED WITH HUMAN PAPILLOMAVIRUS (HPV) VACCINE UPTAKE AMONG FEMALE ADULTS IN CHINA: A PRELIMINARY RESULT FROM CROSS-SECTIONAL STUDY

Cong Liu¹, Narumol Bhummaphan^{1*}

¹College of Public Health Sciences, Chulalongkorn University, Bangkok 10330, Thailand

*Corresponding Author: Narumol Bhummaphan, College of Public Health Sciences, Chulalongkorn University, Bangkok 10300, Thailand, E-mail: narumol.b@chula.ac.th

ABSTRACT

Introduction: Cervical cancer ranks fourth globally in cancer-related deaths in women, and China has occupied over one-fifth of the frequency of cervical cancer worldwide. There is evidence linking the incidence and risk of cervical cancer to the prevalence of human papillomavirus (HPV). HPV vaccination has the potential to prevent more than 90% of HPV-attributable le cancers. However, the HPV vaccination rate in China is still low. Therefore, it is necessary to know the factors associated with HPV vaccination among those who never received the vaccine.

Objectives: Shandong has a higher HPV infection rate, and there are no data on the HPV vaccination rate in Heze City now, and demographic factors are likely to contribute to vaccination rates. The preliminary study objective aims at identifying factors associated with female adults' uptake of the HPV vaccine in Shandong City and to provide a basis for subsequent HPV vaccination education.

Methodology: A cross-sectional research design studied the factors associated with HPV vaccine uptake among females aged 18–45 who lived in Shandong City from April to June 2024. An online questionnaire was collected via a mobile phone application (WeChat). The reliability was tested with Cronbach's alpha, which was more than 0.7, and the association was analyzed by SPSS.

Results: The findings revealed that 55.3% of participants were aged 18 to 36, and only 24.7% were single. The majority of the participants were highly educated (74.9%) with a high monthly family income (13.2%). The results showed HPV vaccination uptake conditions, 50.9% of women never received vaccination; only 3.7% and 4.6% of women received at least one and two doses, respectively. Interestingly, the results found that 40.8% had completed three doses of vaccination. In addition, HPV vaccination was significantly associated with education level ($p = 0.019$) and monthly household income ($P < 0.05$).

Conclusion: The finding revealed that the uptake of HPV vaccination was not very high in Shandong City. Improving knowledge about HPV and the association between the identified factors and HPV vaccination among female adults in Shandong City might help promote HPV vaccine uptake.

Keywords: Human Papillomavirus (HPV), HPV vaccine uptake, Cervical cancer, Associating factor HPV vaccination



INTRODUCTION

Cervical cancer ranks fourth globally in terms of cancer-related diseases among women and is the third most common kind of age-standardized rate (ASR) incidence rate in women (1). Most importantly, over 95% of cervical cancer cases are due to the human papillomavirus (HPV), and HPV-16 and HPV-18 are associated with 70% of all cases (2).

About 662301 females were diagnosed with HPV-related cancers in the world in 2022, and 348874 deaths in that year (1). Asia currently plays a significant part in all global cervical cancer deaths, which account for 58% of the deaths (3). There were about 109,741 new cases of cervical cancer in 2020 in China, which occupied over 20% of the worldwide cervical cancer burden (4).

A previously retrospectively reviewed study reported that there was a 28.4% incidence rate of HPV infection among 94489 females in Shandong Province, China (5), which is higher than the national level (6). The positive rate of high-risk HPV was higher in West Shandong (22.8%) among a total of 63349 HPV- testing females, but lower in East Shandong (15.4%) and Middle Shandong (15.0%). The west of Shandong includes Liaocheng City and Heze City (7) because they have low education level in the whole province (Statistics, 2021).

HPV vaccination is the most valid measure against HPV infection, cervical cancer, and other related cancers. Regular screening plays a crucial and significant role in identifying cervical precancers, enabling timely intervention before they progress to cancer. It's important and considerable to note that, as of now, there is no specific treatment for HPV infection (8).

The WHO fact sheet on HPV and cancer prevention mentions that HPV vaccines should be given to all girls aged 9–14 years before they become sexually active (8). According to relevant epidemiological surveys, cervical cancer mainly occurs in young and middle-aged people, mainly in underdeveloped countries or low-income and middle-income people. China has a large number of new cases of cervical cancer every year (9). The infection rate of HPV is highly expressed in women aged 25–45 years with 19.9% in China. Since the prevalence of HPV infection is relatively high between the ages of 17 and 45 years, the purpose of this thesis is to study the HPV vaccination uptake reason of adult women aged 18 to 45 years. Shandong has a higher prevalence of HPV infection rate, and

there are no data on the HPV vaccine uptake rate in Heze City until now. Therefore, addressing this research gap is critical to developing targeted interventions that address the unique needs and conditions of HPV vaccination in Heze City.

A previous study found that global coverage with the first dose of HPV vaccine among women in 2022 was 21% and coverage with the last dose was 15% (10). HPV vaccination rates are very low in China as well, a report pointed out that the coverage rate of complete HPV vaccine for youths was less than 3% in 2021, and that for the population who are allowed to receive HPV vaccine was lower than 6% (11). The reason which related to the low vaccination rate is the payment of HPV vaccination. Currently, HPV vaccines are administered in China voluntarily (12), and for the vaccines currently approved for entry into China, the recommended vaccination age is 9–45 years old (13). 2-valent, 4-valent, and 9-valent vaccines are about 600, 800, and 1,300 CNY per dose in China, respectively. The price of two 2-valent vaccines developed by China is about half of the price of imported 2-valent vaccines (14). China has proposed national policies like "Healthy China Action (2019–2030)," which includes provisions for intensifying public education and publicity on the HPV vaccine, in response to the WHO's "Accelerated Eradication of Cervical Cancer" initiative and to increase HPV vaccine coverage.

Thus, it is crucial to find out what is the factor that people are willing to carry out HPV vaccination. According to this situation make plans to improve the incidence rate of cervical cancer in Shandong Province, China.

METHODOLOGY

Study conceptual framework

The research questions included the prevalence of the HPV vaccine uptake among female adults in Heze, Shandong, China, and the association between demographic factors and HPV vaccine uptake among female adults in this area.

For the Statistical Hypothesis, the Null hypothesis(H₀) was there were no significant associations between demographic factors with the female adults' HPV vaccine uptake in Heze City, and there were no significant associations between behavioral factors with the female adults' HPV vaccine uptake in Heze City. And the Alternative hypothesis(H₁) was there were



significant associations between demographic factors with the female adults' HPV vaccine uptake in Heze City, and there were significant associations between behavioral factors with the female adults' HPV vaccine uptake in Heze City. For the Conceptual framework, the independent variables of this research had demographic factors which include Age, Marital status, Education level, Occupation, and Monthly household income, and behavioral factors including cervical cancer screening. The dependent variable was HPV Vaccination uptake conditions.

Study design

This was a quantitative study with a cross-sectional study design.

Study Area

The area of this research is centered in Heze City, Shandong Province, China.

Study population

This study targeted 18-45 years old female adults in Heze City, Shandong Province, China. The exclusion criteria were as follows: (1) Participants who lived in City, Shandong Province, China, for over 6 months. (2) Participants' age was not between 18-45. (3) Participants who were unwilling to join the study. (4) Participants who have already had cervical cancer. (5) Participants who are not able to understand how to fill out the questionnaire online.

Sampling Technique

The sampling technique used in this study was Convenience Sampling which is a non-probability sampling method.

Data collection

Study data was collected via online applications like WeChat, and the questionnaires were distributed to female adults in Heze City, Shandong Province, China by link or QR code. Researchers were also spread to community

public health stations (vaccination sites) by the social media platforms mentioned. And the questionnaire includes the consent form, screening questions, demographic factors, behavioral factors and HPV Vaccination uptake conditions in this study.

Validity and reliability

The Item Objective Consistency (IOC) was used to determine the content validity and reliability of the questionnaire; the average IOC was 0.88. Predictions were made in a sample size of 10% of women aged 18 to 45 years who are not living in Heze City, therefore, there are 44 eligible females who are living in Hangzhou City to complete this prediction in this research.

Statistical analysis

All the data used SPSS 29.0.0.0 version software analysis in this study. P-value < 0.05 was recognized as statistical significance, under a 95% confidence interval.

Descriptive statistics for each variable in this study include all independent and dependent variables, with frequencies and percentages provided for categorical variables (e.g., marital status, education), and mean and SD (standard deviations) for continuous variables (e.g., age). Inferential statistics used Chi-square tests in this research. Chi-square tests were utilized to explore associations between categorical independent variables (e.g., marital status and education level) and the categorical dependent variable (HPV vaccination conditions). If the P-value < 0.05, it means the independent variable and dependent variable have an association with each other, by contrast, there are no associations.

Ethical Consideration

This study was submitted to the Research Ethics Review Committee for Research Involving Human Research Participants, Group 1 of Chulalongkorn University, and approved on 26 May 2024 (No. 115/67).



RESULTS

Table 1. Characteristics of study participants (n=409)

Demographic characteristics	Number (%)
Age (years)	
18-36	176 (55.3)
37-45	233 (44.7)
Median (IQR)	36.00 (13.0)
Marital status	
Married	308 (75.3)
Single	101 (24.7)
Education level	
Middle school or below	48 (11.7)
High school	55 (13.4)
Bachelor's degree	268 (65.5)
Master's degree or above	38 (9.3)
Occupation	
Worker or farmer	20 (4.9)
Service industry staff	52 (12.7)
Employee in the company	43 (10.5)
Government staff	17 (4.2)
Healthcare industry	151 (36.9)
Student	46 (11.2)
Unemployed	23 (5.6)
Other	57 (13.9)
Monthly household income	
< 5700 CNY (< 17100 THB)	152 (37.2)
5700 – 10200 CNY (20000 – 51000 THB)	203 (49.6)
≥ 10200 CNY (≥ 51000 THB)	54 (13.2)
Behavioral characteristics	
Cervical cancer screening	
Yes	244 (59.7)
No	165 (40.3)



Table 2 HPV Vaccination uptake conditions	Number (%)
HPV vaccination uptake conditions	
Never received	208 (50.9)
Received one dose	15 (3.7)
Received two doses	19 (4.6)
Received three doses	167 (40.8)
Types of HPV vaccination received	
Bivalent	30 (14.9)
Quadrivalent	87 (43.3)
Nine-valent	77 (38.3)
I don't know	7 (3.5)

The result demonstrated the demographic characteristics of the participants in Table 1. 409 female adults aged 18 to 45 participated in this research; 55.3% of participants were 18-36 years old; however, the Median (IQR) was 36.00 (13). There were 75.3% of participants had married, and 74.8% of participants had a bachelor's or above educational level of all 409 participants. Most of the participants worked in the healthcare industry (36.9%), however, only 13.2% of all participants had higher monthly household income which had more than 10200 CNY (\geq

51000 THB) per month. In addition, 59.7% of 409 participants got cervical cancer screening before.

Table 2 shows the investigation of the HPV vaccination rate in Heze City, thus further exploring the type of HPV vaccination. In this study, 50.9% of all 409 participants never received the HPV vaccine, and 40.8% of participants received three doses of the HPV vaccine. The data interpreted that most participants who received at least one dose of HPV vaccine preferred receiving quadrivalent (43.3%) and nine-valent (38.3%).

Table 3 Chi-Square test results and association of factors between demographic characteristics and HPV vaccine uptake conditions

Characteristic	HPV vaccine uptake conditions				Chi-square	P-value
	Never received (N=208)	Received one dose (N=15)	Received two doses (N=19)	Received three doses (N=167)		
Education level					20.990	0.019*
Middle school or below	35 (72.9)	3 (6.3)	1 (2.1)	9 (18.8)		
High school	28 (50.8)	2 (3.6)	1 (1.8)	24 (43.6)		
Bachelor's degree	133 (49.6)	9 (3.4)	14 (5.2)	111 (42.8)		
Master's degree or above	12 (31.6)	1 (2.6)	3 (7.9)	22 (57.9)		
Monthly household income					18.767	0.005*
< 5700 CNY (< 17100 THB)	91 (59.9)	8 (5.3)	7 (4.6)	46 (30.2)		
5700 – 10200 CNY (20000 – 51000 THB)	100 (49.3)	6 (3.0)	6 (3.9)	89 (43.8)		
\geq 10200 CNY (\geq 51000 THB)	17 (31.4)	1 (1.9)	4 (7.4)	32 (59.3)		



Table 3 shows the chi-square test of independence was performed to examine the association between sociodemographic characteristic independent variables and the HPV vaccine uptake conditions. The results showed that education level and monthly household income were associated with HPV vaccine uptake conditions, and the association between these variables was significant (p -value < 0.05). However, age, marital status, and occupation didn't have a significant association (p -value > 0.05) with HPV vaccination conditions (data not tabled).

DISCUSSION

Since the rate of HPV infection is very high in Shandong City (7), this study attempted to identify the related factors associated with HPV vaccination. The preliminary result of this study used a cross-sectional study via an online questionnaire. A total of 409 participants, aged 18–45, living in Heze City, Shandong Province, China, were recruited. This research considered various independent demographic factors and HPV vaccination uptake conditions. The results showed significant associations between HPV vaccine uptake and education level ($p = 0.019$) and monthly household income (p -value < 0.05). The HPV vaccine uptake rate was not high in Heze City, even though 59.7% of participants got cervical cancer screening. The reason for the low vaccination in this city because there is no policy of free vaccination like in other areas in China (15), people need to pay by themselves and the cost of vaccination is not covered by any insurance (16).

This study did not find any association between age and HPV vaccine uptake conditions, which is similar to the prior research that found that age was not associated with the initiation of HPV vaccination (Hennebery et al., 2020). The results showed that there was an association between HPV vaccination and educational level. Participants who have higher levels of education had higher rates of HPV vaccine uptake than those who never did, which is consistent with prior research showing that people with higher levels of education, such as women who have completed college, are more likely to be vaccinated (Sims et al., 2018) or people who have a better education level will have a stronger intention to receive HPV vaccination (Shuya et al., 2022). There was no association between HPV vaccination and different occupations, even

though government staff and healthcare employees had higher vaccination rates and were more likely to have received the three dosages of the HPV vaccine than other occupations. It is consistent with previous studies that employment status did not have an association with the start of the HPV vaccine (Hennebery et al., 2020). What's more, there is an association with monthly household income with HPV vaccination. This study also showed that high household income participants account for a large part of this research associated with HPV vaccine uptake, especially in three doses of vaccination, with a total of 40.8% of participants. Since the HPV vaccine cost needs to be paid by the participants themselves in this study. This study suggests that these demographic factors are the main factors influencing people to get vaccinated.

Here are some limitations and strengths of this research. Due to the self-reported of this study, participants may have given false information about their HPV vaccination history or other behaviors out of memory loss or a desire to project a positive image of themselves. Convenience sampling was used in this study so that the results may lack generalizability. and this study's cross-sectional methodology, which only collects data at one point, makes it more difficult to establish causality. However, this study evaluated the HPV vaccination rate among female adults in Heze City, Shandong Province, China, with significant potential benefits and applications. Through studying the local conditions, provides a significant perception of the current state of social democratic practices, guiding targeted public health interventions.

CONCLUSIONS

The complete HPV vaccine coverage in Shandong was only 40.8%, 3.7% of the participants received one dose of the HPV vaccine, and 4.6 % of those received two doses of the HPV vaccine. Most interestingly, for the participants who received at least one dose of the HPV vaccine, the Quadrivalent HPV vaccine (43.3%) was the most popular of the other types of HPV vaccine. These findings can inform targeted interventions and policies to increase HPV vaccine coverage and reduce the incidence of HPV-related diseases.

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BARRIERS IN ACCESSIBILITY OF HEALTH CARE SERVICE UTILIZATION AMONG MYANMAR MIGRANT WORKERS IN SAMUT SAKHON, THAILAND

Nyan Phone Myint^{1*}, Wichai Aekplakorn¹, Chathaya Wongrathanandha¹

¹Department of Community Medicine, Faculty of Medicine, Ramathibodi Hospital, Mahidol University, Bangkok 10400, Thailand

***Corresponding Author:** Nyan Phone Myint, Department of Community Medicine, Faculty of Medicine, Ramathibodi Hospital, Mahidol University, Bangkok 10400, Thailand, E-mail: nyanphone23@gmail.com

ABSTRACT

Introduction: The migrant workers play a crucial role not only in economic development of host country but also in flow of economics, particularly in Thailand. Seventy-second Health Assembly by WHO, declared that several barriers such as language differences, costs of services, discrimination, occupation factors and limited health-related information were substantial barriers in health care services utilization among migrant population. Regarding health status and utilization of health services, there was limited information about the barriers affecting access to health care services among Myanmar migrant workers in Samut Sakhon.

Objectives: This study aimed to examine the behaviours of health care utilization and also to identify the barriers which affecting the accessibility of healthcare services among Myanmar migrant workers in Samut Sakhon, Thailand.

Methodology: A cross-sectional study design was conducted. Structured questionnaires were administered to 433 Myanmar migrant workers in Samut Sakhon province covering demographic characters, health service utilization behaviours, and barriers to health care accessibility. The perception of barriers with socio-demographic characters, including occupational groups, income, education and ethnicity were analysed-by using Chi-square test.

Results: Regarding behaviours on utilization of health service, 58.7% of respondents sometimes prefer self- medication rather than going to health service. 80% Myanmar migrant workers sometimes too often utilized of traditional medication. Migrant workers agreed that limited hour (53.3%), long waiting time (59.6%), informal costs being expensive (55.4%) and also language difficulties (65.6%). Socio-demographic factors, such as occupational group, ethnicity, were associated with barriers points. Because of the language difficulties and financial difficulties, it made them to prefer self-medication and these barriers were significant barriers which lower the health care service utilization among Myanmar migrant workers in Samut Sakhon.

Conclusion: This study revealed that language barriers, long distances, long waiting time, and high indirect cost are common barriers to accessing healthcare services utilization and associated with occupational type, ethnicity and income among Myanmar migrant workers in Samut Sakhon. The result of this study might help policy reviewers and other sectors to rethink about the language aids service system, review of service available time and language friendly program in health service utilization.

Keywords: Migrant health system, accessibility of health services, barriers in accessibility.

INTRODUCTION

Intraregional migration is very prominent with 7.2 million of intra ASEAN migrant in 2020 and according to United Nations department of economic and social affairs (DESA) data in 2020, Thailand is one of the destination countries for international migration (3). Access to health care services by migrant workers remained one of the biggest migrant

health issues all over the world. Workers' health can impact country economic development as well as image of national policies on migrant's healthcare. Migrants' workers have to work in unsafe environment, risky works, dirty and have to work for a long time in dangerous working environment and work place (1).

In seventy-second Health Assembly by WHO, it was declared that language and



cultural differences, costs of services, discrimination, administration gaps, inability to adapt and adjust with health financing system of host country, unsafe and poor living conditions, occupation factors and blockage of work environment, and limited health-related information were substantial barriers in health care services utilization in migrant population which lead to emergence of diseases (2).

Many studies revealed potential health service barriers in health service utilization where these barriers were mainly social barriers, living conditions, financial status, location of services, lack of supportive environment etc (4). A cross-sectional analysis in deep south of Thailand among Myanmar migrant workers explored that some of the jobs were characterized by overcrowding, congestion, poor-sanitation, and also socially, economically and educationally deprivation (5). This study is the one of the pilot studies for migrant workers after the political changes in Myanmar. The huge impact of political changes rose sharply in influx of migrants from Myanmar into Thailand. Therefore, health care policy and care services of Thailand shall be changes in accordance with socio-demographic spectrum.

The knowledge gap between previous studies and this study is that there are very few numbers of study done in Samut Sakhon province after the political changes and impact. After political crisis, huge influx of Myanmar were prevalent and the health care system of migrant population would be one of the major problems in Thailand. Transition of epidemiology, emergence of diseases would be expected and so the comprehensive health services were definitely required to prevent and control the diseases. Barriers of health service utilization made them not to go to the services and this study revealed the barriers in association with their health care services.

This study aimed to state the attitude and behaviors of health care utilization such as preferences of self-medication and also to explore the information on barriers which affecting the accessibility of healthcare services among Myanmar migrant workers in Samut Sakhon, Thailand. By providing the information regarding barrier points and its associations, it was aimed to arise the quality health care system for migrant workers

especially Myanmar migrant workers in Thailand.

METHODOLOGY

This study was done in three different language schools which accepted migrant workers of various occupation with regardless of geographical areas. A cross section was done in 433 Myanmar migrant workers in Samut Sakhon between age of 18 to 59 who can speak and response Myanmar language. Systematic sampling method was used in each purposive collection site. In each class of language school, a random case was picked up from the first cases of a sample and was selected every two cases after that one.

Data collection was done from December 2023 to February 2024. Before data collection, the structured guided self-administered question set was first developed in English language and translated into Myanmar language which has checked by registered notarial public for translation validity. After translation validity, the pilot test was done in Bangkok to check whether pilot participants are easily understandable and responsible or not. The sample size was calculated by following equation.

$$n = \frac{Z\alpha^2 * p(1-p)}{e^2}$$

n is the desired sample size in this study. The prevalence were provided by the Samut Sakhon hospital with prevalence of using health insurance of 73.05% with , e = error, 0.03 and 95% CI ($Z\alpha^2 = 1.96$) . Study proposal was approved by Ramathibodi ethical committee, Mahidol university.

The outcome variable used in this study was barriers in accessing of health care service utilization among Myanmar migrant workers. The independent socio-demographic variables in this study were the occupational group, educational level, average income, experiences of health care service utilization. Chi-square test was used to report the analysis for percentages of perception of barriers points and socio-demographic determinants such as educational background, occupational group

**RESULT**

Of the 433 Myanmar migrant workers, about 82.9 % of total participants were between 20 to 35 years of age. Regards occupational sectors, 78.3% employed in blue collar jobs. Most of the participants in this study were Burmese with 44.1%. 69.3% of participants resided in

Thailand for about 1 to 5 years. 50.8 % of total respondents were basic educational level. 75.5% of average income were 6000 to 12000 baht. The full detail of demographic characteristics of the participants is shown in table 1.

Table 1 Socio-demographic characters of study population (Number=433).

Demographic Characters	Number (%)
Gender	
Male	199 (45.9)
female	234 (54.1)
Age	
<20 yrs	41 (9.5)
20-35 yrs	359 (82.9)
35> years old	33 (7.6)
Current occupation group	
White Collar Jobs	94 (21.7)
Blue Collar Jobs	339 (78.3)
Current field of Occupation	
Service providing sectors	112 (25.9)
Non-service providing sectors	321 (74.1)
Ethnicity	
Non-Burmese	242 (55.9)
Myanmar (Burmese)	191 (44.1)
Years in Thailand	
1-5 years	300 (69.3)
5-10 years	80 (18.5)
>10 years	53 (12.2)
Educational Background	
Can read and write	60 (13.9)
Basic educational level	220 (50.8)
Higher educational level (University education)	125 (28.9)
Bachelor degree and above	28 (6.5)
Average income (per month)	
< 6000 bahts	53 (12.2)
6000 – 12000 bahts	327 (75.5)
>12000 bahts	53 (12.2)

Table 2 shows behaviors on utilization of health service utilization among Myanmar migrant workers in Samut Sakhon. 58.7 % of total respondents answered that sometime they preferred self-medication rather than health service. 57.3 % of total respondents responded that they never take a rest less than 3 days and never tell to others when they got illness. 46 % of participants answered they used the traditional medicine and methods. Moreover, 64.2 % of respondents never pray religious holy mantra. Nearly 42% of participant answered

that they never took self-medication by using information from sources other than health personal such as friends, co-workers, online and internet when they got illness. In addition, 56.5 % responded that they never went to the health services when their symptoms were getting worse and interfere with daily routine functions. Moreover, 55.2 % of participated workers never went to the health services when the symptoms of illness make discomfort and unable to go to the work

**Table 2** Behaviors of health care service utilization among Myanmar migrant workers in Samut Sakhon, Thailand.

	Always	Often	Sometime	Never
Preferred self-medication rather than health care services	29(6.7%)	95(21.9%)	254(58.7%)	55(12.7%)
Took a rest less than 3 days and never tell to others about the illness	10(2.3%)	26(6.0%)	149(34.4%)	248(57.8%)
Used traditional medicine and methods	32(7.4%)	116(26.8%)	199(46%)	86(19.9%)
Prayed religious holy mantra	15(3.5%)	28(6.5%)	112(25.9%)	278(64.2%)
Took self-medication by using information from sources other than health personal	22(5.1%)	84(19.4%)	146(33.7%)	181(41.8%)
Went to the health services when symptoms were getting worse and interfere with daily routine functions	11(2.5%)	25(5.8%)	152(35.1%)	245(56.6%)
Went to the health services when the symptoms of illness make discomfort and unable to go to the work	12(2.8%)	25(5.8%)	157(36.3%)	239(55.2%)

Table 3 reports barriers in the accessibility of health service facilities available in Thailand by Myanmar migrant workers in Samut Sakhon. 38.3 % of total respondents thought that the distance between home and facilities are far. Furthermore, more than three quarters of respondents agreed that transportation facilities between home and facilities is good. 53.4 % of total respondents agreed that there was limited hour in accessing the health care facilities while nearly 60% of respondents reported that the waiting time in accessing services is long. 44.8% of respondents answered that the services fees are very expensive compared with self-medication from drug store where 55.4 % of respondents agreed that informal costs like car purchasing or accommodation costs are very expensive. 65.6 % of total respondents agreed that they cannot speak or communicate with health care providers with Thai language. In addition, about 50% of respondents agreed that health service settings have discriminations between migrants and locals. 73.7 % of the participants disagreed that their employers and work do not like to go to the services when there is illness.

Table 3 Descriptive information of barriers points in accessibility of health care services among Myanmar migrant workers in Samut Sakhon, Thailand.

Barriers Point	Agree Number (%)	Disagree Number (%)
Far distance between home and facilities	166 (38.3)	267 (61.7)
Good transportation facilities between home and facilities.	336 (77.6)	97 (22.4)
Limited hour in accessing the service.	231 (53.3)	202 (46.7)
Waiting time are too long. (>30min)	258 (59.6)	175 (40.4)
The services fees are very expensive compared with self-medication.	194 (44.8)	239 (55.2)
Informal costs are very expensive.	240 (55.4)	193 (44.6)
Can't speak or communicate with health care providers with Thai language.	284 (65.6)	149 (24.4)
Discriminations between migrants and locals.	218 (50.3)	215 (49.7)
Employers and work do not like going to the services when there is illness.	114 (26.4%)	319 (73.7)

**Table 4** Association of socio-demographic characters with distance, transportation and service time availability

Socio-demographic characters	Far distance between health service and living spots		Good transportation between health service and living spots		Limited hour in accessing services	
	Number (%)	<i>P</i> -value	Number (%)	<i>P</i> -value	Number (%)	<i>P</i> -value
Current occupation group						
White collar job	28 (29.8)	0.05*	71 (75.5)	0.59	46 (48.9)	0.33
Blue collar job	138 (40.7)		265 (78.2)		185 (54.6)	
Current field of occupation						
Non-service providers	127 (39.6)	0.37	242 (75.4)	0.06	175 (54.5)	0.41
Service providers	39 (34.8)		94 (83.9)		56 (50.0)	
Ethnicity						
Non-Burmese	77 (31.8)	0.002*	193 (79.7)	0.23	113 (46.7)	0.002*
Myanmar (Burmese)	89 (46.6)		143 (74.9)		118 (61.8)	
Years in Thailand						
1-5 years	114 (38.0)	0.29	242 (80.7)	0.02*	158 (52.7)	0.53
5-10 years	27 (33.7)		60 (75.0)		41 (51.3)	
>10 years	25 (47.2)		34 (64.2)		32 (60.4)	
Educational Background						
Can read and write	25 (41.7)	0.36	43 (71.7)	0.02*	28 (46.7)	0.01*
Basic educational level	91 (41.4)		161 (73.2)		133 (60.5)	
Higher educational level (University education)	41 (32.8)		107 (85.6)		60 (48.0)	
Bachelor degree and above	9 (32.1)		25 (89.3)		10 (35.7)	
Average income (per month)						
< 6000 bahts	24 (45.3)	0.06	38 (71.7)	0.24	29 (54.7)	0.94
6000 – 12000 bahts	129 (39.)		260 (79.5)		173 (52.9)	
>12000 bahts	13 (24.5)		38 (71.7)		29 (54.7)	

**Table 5** Association of socio-demographic characters with fees on service utilization, and service time availability

Socio-demographic character	Long waiting time in accessing services		Service fees are said to be expensive		Indirect cost are said to be expensive	
	Number (%)	<i>P</i> -value	Number (%)	<i>P</i> -value	Number (%)	<i>P</i> -value
Current occupation group						
White collar job	45 (47.9)	0.009*	33 (35.1)	0.03*	47 (50.0)	0.23
Blue collar job	213 (62.8)		161 (47.5)		193 (56.9)	
Current field of occupation						
Non-service providers	196 (61.1)	0.29	136 (42.4)	0.08	178 (55.5)	0.98
Service providers	62 (55.4)		58 (51.8)		62 (55.4)	
Ethnicity						
Non-Burmese	134 (55.4)	0.04*	106 (43.8)	0.64	118 (48.8)	0.002*
Myanmar (Burmese)	124 (64.9)		88 (46.1)		122 (63.9)	
Years in Thailand						
1-5 years	185 (61.7)	0.32	138 (46.0)	0.37	167 (55.7)	0.57
5-10 years	42 (52.5)		37 (46.3)		41 (51.3)	
>10 years	31 (58.5)		19 (35.8)		32 (60.4)	
Educational Background						
Can read and write	34 (56.7)	0.02*	28 (46.7)	0.12	34 (56.7)	0.16
Basic educational level	139 (63.2)		109 (49.5)		128 (58.2)	
Higher educational level (University education)	76 (60.8)		46 (36.8)		68 (54.4)	
Bachelor degree and above	9 (32.1)		11 (39.3)		10 (35.7)	
Average income (per month)						
< 6000 bahts	30 (56.6)	0.15	32 (60.4)	0.008*	29 (54.7)	0.89
6000 – 12000 bahts	190 (58.1)		133 (40.7)		180 (55.0)	
>12000 bahts	38 (71.7)		29 (54.7)		31 (58.5)	

**Table 6** Association of socio-demographic characters with language difficulties, discrimination and employers' will

Socio-demographic character	Can't speak Thai and cannot communicate with health care providers		Discriminations between migrant workers and host community		Employer did not like go health services	
	Number (%)	<i>P</i> -value	Number (%)	<i>P</i> -value	Number (%)	<i>P</i> -value
Current occupation group						
White collar job	49 (52.1)	0.002*	38 (40.4)	0.03*	22 (23.4)	0.47
Blue collar job	235 (69.3)		180 (53.1)		92 (27.1)	
Current field of occupation						
Non-service providers	214 (66.7)	0.42	166 (51.7)	0.34	90 (28.0)	0.17
Service providers	70 (62.5)		52 (46.4)		24 (21.4)	
Ethnicity						
Non-Burmese	139 (57.4)	<0.001*	108 (44.6)	0.007*	63 (26.0)	0.87
Myanmar (Burmese)	145 (75.9)		110 (57.6)		51 (26.7)	
Years in Thailand						
1-5 years	201 (67.0)	0.50	152 (50.7)	0.06	71 (23.7)	0.09
5-10 years	48 (60.0)		33 (41.3)		23 (28.7)	
>10 years	35 (66.0)		33 (62.3)		20 (37.7)	
Educational Background						
Can read and write	36 (60.0)	0.07	26 (43.3)	0.06	13 (21.7)	<0.001*
Basic educational level	153 (69.5)		124 (56.4)		78 (35.5)	
Higher educational level (University education)	82 (65.6)		58 (46.4)		22 (17.6)	
Bachelor degree and above	13 (46.4)		10 (35.7)		1 (3.6)	
Average income (per month)						
< 6000 bahts	36 (67.9)	0.84	21 (39.6)	0.20	12 (22.6)	0.81
6000 – 12000 bahts	212 (64.8)		167 (51.1)		88 (26.9)	
>12000 bahts	36 (67.9)		30 (56.6)		14 (26.4)	



Table (4 to 6) describes the association of socio-demographic characters with barriers in accessibility of health care service utilization among Myanmar migrant workers in Samut Sakhon.

Regard agreement on far distance, occupational type and ethnicity showed association with agreement on far distance. Regards agreement of good transportation, history of living in Thailand as well as education level showed association with transportation in the health care service utilization. The ethnicity and education level associated with agreement that the available hours are limited in accessing the health facilities. In addition, occupation type as well as ethnicity also show association on agreement that the long waiting time in accessing the health facilities. Moreover, types of occupation, average monthly income, ethnicity had significant association with expensive the health care service fees as well as informal fees.

Moreover, current occupation group and ethnicity show association with language barriers as well as agreement on discrimination. For the employer factors, education level show association with agreement on attitude of employers as a barrier. (All the detail are on the table).

DISCUSSION

In this study, the descriptive information on behaviours on health service utilization, barriers in accessing the health care service utilizations were reported. Not only Burmese workers but also non-Burmese workers were involved in this study. Myanmar has several ethnicities and these diversified ethnicities were spread throughout Thailand. For instance, Mon, Karen, Rakhine were non-Burmese ethnicities.

This study also revealed the behaviors and attitude of health care service facilities utilization among Myanmar migrant workers. In consistent with a previous study (46), this study found that most of the participants preferred self-medication rather than health care service facilities in sometimes. But this study did not reveal type of the illness that they preferred self-medication. This study also reported that use of traditional medicine. In contrast with previous studies (7), there was use of traditional medicines with or without western prescriptions or drugs.

Certain workers utilized health care service in certain conditions such as symptoms getting worse, unable to do daily function and

unable to work. A study on Myanmar migrant workers reported that workers do not seek health services because they thought that their condition was not worse enough to go to services and only seek when their health status deteriorated (6).

Most of the participants in this study disagreed that distance between their living spots and health service facilities were far. They also responded that the transportation facilities were good. Several previous studies stated that location, lack of quality transportation were the major barriers in accessing the health care service utilization. (11) (8) (9) (13)

Most of the participants agreed that long waiting hour as well as available hours were limited to access the health care service utilization. If they go out, their supervisors has cut off their wages. They want to go to the services but they cannot go in reality because of the working hour availability. Another important issue stated in this study was work assignment, schedule and work shift. Several previous studies also pointed out that limited hour, availability of appointment, long waiting time, were the negative factors in accessing the health care service facilities among migrant workers. (11) (10) (9)

Moreover, nearly 45% the participants agreed that the service fees were very expensive compared with self-medication while more than half of the participants agreed that informal costs were very expensive. Previous studies in Thailand revealed that there was association of health care service facilities of workers with low income, additional costs and financial hardship (12) (13) (11). This financial unaffordability resulted in self-medication among migrant workers because the price is much lower than utilization in certain health center (9).

In this study, it was reported that language barrier as an important role in accessing health care service facilities utilization among Myanmar migrant workers in Samut Sakhon. Majority of the respondents agreed with difficulties in communication with Thai language. Previous studies (10) (5) (8) (13) revealed that the language as a barrier and can lead to negative outcome with mis-understanding, mis-interpretation of health and services related information (10).

According to the results, slightly more than half of the respondents answered that there was discrimination between migrants and host population. The result of a previous study in



Bangkok explored discrimination in accessing health care service of migrants (10).

However, 26.4% of the respondents agreed that the employers and work did not like going to the services when there is illness. One of the previous studies (9) reported that employers had cut off the wages if they went out for the health care service. Moreover, certain studies showed that some of the Thai employers usually kept the employees' health insurance card so that seafarers went to the private clinic or got care from home visit health personal rather than going to public hospital (5).

This study was involved in one of the studies which focused and pointed out the association of barriers in accessibility of health care service utilization with socio-demographic characters.

Based on the result of this study, agreement on far distance and good transportation facilities, service time availability as a barrier, language difficulties and agreement on discrimination was associated with occupational type, ethnicity, living year in Thailand, education level. For the employer factors, education level show association with agreement on attitude of employers as a barrier.

Myanmar has different types of ethnicities, these ethnicities have their own way of language, expression, cultural value and literature systems and some of the languages have similarities with Thai languages. Therefore, ethnicity play a role in determination of health care service utilizations.

The health care service utilization and barriers in accessibility can be reported as a sector in most of the studies, this study reported in divided sectors however, this study compared with the results of previous studies based on health care service utilization. Previous studies described the association between occupational type and accessibility of health care services utilization. (14) (15). One of the studies which was conducted in transnational people between northern Thailand and Myanmar border pointed out the relationship of ethnicity with barriers point especially for fear of capturing them by local authorities (16).

The previous studies in China among migrant workers revealed that socio-economic inequalities among rural migrant populations, education system, average income and current occupation, economic status were the main contributing factors in equalities of health care service utilization (17).

After changes in Myanmar, thousands of Myanmar has migrated to Thailand for their safety, their survival as well as various concern. This study revealed the descriptive information on barriers in accessibility of health care service and association of socio-demographic characters with barriers. With these information, further research on health service policy, and wellbeing of Myanmar migrant workers such as psychosocial areas, health risks behaviours, and others research study should be conducted. To surmount the barriers to health care service utilization, language barriers, social stigma, collaboration with various sectors such as business, education, health, legislation and administration is recommended.

Limitation of the study

This is a cross-sectional study; the information was self-reported. Therefore, it was subject to recall bias. This study reflects the information of health service utilization on documented or legal layer. Therefore, it might not represent the illegal workers. The participants were recruited from language schools and so, selection bias shall be considered.

CONCLUSIONS

This study revealed that language barriers, long distances, long waiting time, and high indirect cost are common barriers to accessing healthcare services utilization and associated with occupational type, ethnicity and income among Myanmar migrant workers in Samut Sakhon. Moreover, exploration of barrier points can help reviewers to rethink about the language aids service system, review of clinic available time as well as language friendly program in health service utilization.

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ACHIEVEMENT OF MALARIA ACCELERATION IN SOUTHWEST SUMBA DISTRICT IN INDONESIA: A REVIEW OF ELECTRONIC- MALARIA SURVEILLANCE INFORMATION SYSTEM (E-SISMAL)

Orpa Diana Suek^{1,2*}, Yuni Sufyanti Arief¹, Ilya Krisnana¹, Rensat Bastian Tino³

¹ Faculty of Nursing, Universitas Airlangga, Surabaya, Indonesia

² Department of Nursing, Health Polytechnic, Ministry of Health, Kupang

³ UNICEF Region East Nusa Tenggara

***Corresponding Author:** Orpa Diana Suek, Doctoral Student, Faculty of Nursing, Universitas Airlangga, Surabaya, Indonesia. Campus C Mulyorejo Surabaya, Indonesia, 60115, E-mail: orpa.diana.suek-2021@fkn.unair.ac.id

ABSTRACT

Introduction: The Southwest Sumba district in East Nusa Tenggara Province is identified as a high malaria endemic area by the Indonesian Ministry of Health.

Objectives: This paper aims to describe malaria endemicity, evaluate the elimination targets, describe malaria cases and the situation among at-risk groups, and assess the quality of malaria programs at-risk groups in the Southwest Sumba District.

Methodology: This research uses a descriptive method, utilizing data from the 2021 electronic Malaria Surveillance Information System (e-SISMAL).

Results: Southwest Sumba District is a highly endemic area with an Annual Parasite Index (API) of 11.265%, making it the second-highest district after West Sumba in East Nusa Tenggara Province. The Annual Blood Examination Rate (ABER) was 17.85% in 2021, surpassing the minimum target of 10% increasing from 2020. Malaria cases are predominantly among men, accounting for 57.03% (2,706 cases). The highest incidence is in the productive age group (15-64 years), while the lowest is in infants aged 0-11 months. There are to 2 – 3 children under 5 who are suffered from malaria every day, with a total of 760 children under 5, of which 8.9% are infants. Additionally, 39% of malaria cases occur in school-age children (5-14 years), with 5-6 new cases daily, totally 1,867 cases. Integrated malaria services are provided alongside maternal and child health programs and immunization initiatives. These include routine antenatal services, screening all sick children under 5 with IMCI approach, and comprehensive basic immunization services.

Conclusion: Nationally, the goal for malaria elimination in East Nusa Tenggara is set for 2027, with the last indigenous case expected by 2024. As of 2021, Southwest Sumba district remains highly endemic. With only two years left, achieving the elimination target in East Nusa Tenggara requires strategic and progressive actions.

Keywords: Malaria, Acceleration, Southwest Sumba District

INTRODUCTION

Malaria is a disease transmitted by Anopheles sp mosquitoes which is greatly influenced by climatic conditions in the form of temperature, rainfall and humidity [1]. Malaria is still a big problem in countries with tropical and sub-tropical climates, including Indonesia. Even though the Annual Parasite Incidence (API) in the last decade in Indonesia has decreased, this figure shows a stagnant condition since 2014. The Ministry of Health of the Republic of Indonesia is targeting the

elimination of malaria in Indonesia by 2030, so that several provinces which are high endemic areas for malaria have become a national priority. to accelerate the decline in cases before 2030[2].

According to data from the Ministry of Health, the total number of malaria cases in Indonesia reached 94,610 cases in 2021. Malaria cases in 2021 decreased by 58.2% compared to the previous year reaching 226,364 cases. If you look at the trend, since 2018 malaria cases in Indonesia have tended to decrease. However,



malaria cases increased in 2019, reaching 250,628 cases [3]. Then, cases decreased in 2020 and decreased again in 2021. The highest malaria cases are still concentrated in eastern Indonesia. Papua is the province with the highest malaria cases in the country, reaching 86,022 cases to date. The proportion of malaria cases that occurred in this province reached 90,9% of the total. Then, it was followed by East Nusa Tenggara with malaria cases reaching 2,393 cases (2.5%). After that there is West Papua with 1,841 malaria cases (1.94%)[4].

Nationally, in 2020, East Nusa Tenggara Province was the second highest province contributing to malaria cases in Indonesia after Papua Province, East Nusa

Tenggara (NTT) Province has a malaria elimination target, namely by 2023. The elimination stages are eradication, pre-elimination, elimination and maintenance at the village, sub-district, district and provincial levels. There are three districts/cities, namely Kupang City, Manggarai district, and East Manggarai district which have been assessed by the Indonesian Ministry of Health's Malaria Elimination Assessment Commission that their areas are free of local transmission (indigenous cases). The achievement of malaria elimination in East Nusa Tenggara Province can be seen in the following picture:

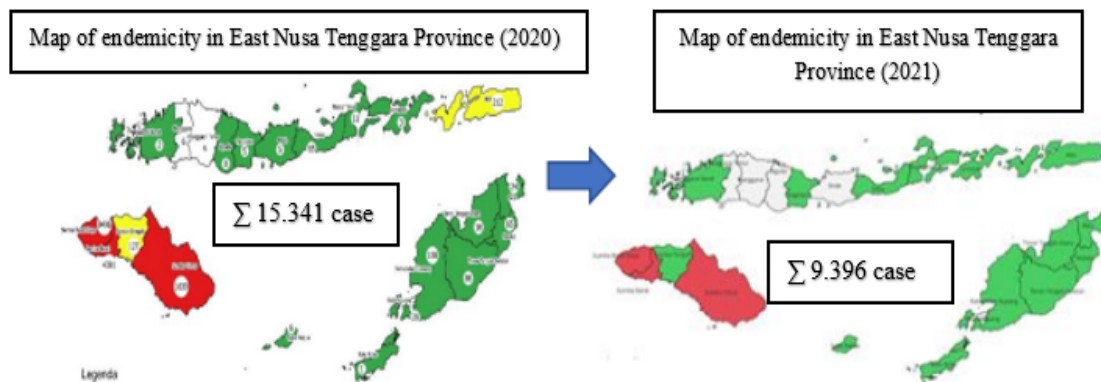


Figure 1 Map of Malaria Elimination Achievements in East Nusa Tenggara Province (2020-2021).

The map shows that until 2021, the highest cases in East Nusa Tenggara came from Sumba Island (94%), with three districts being highly endemic and only one district with low endemicity.

To achieve malaria elimination on Sumba Island requires progressive methods through data-based problem interventions with appropriate strategies according to the facts faced in the district, so it is necessary to analyze the malaria situation as a basis for determining short-term and long-term problem intervention strategies. The purpose of this paper aims to describe malaria endemicity, evaluate the elimination targets, describe malaria cases and the situation among at-risk groups, and assess the quality of malaria programs in the Southwest Sumba District

METHODOLOGY

This study used data from the 2021 electronic Malaria Surveillance Information System (e-SISMAL). The 2021 e-sismal

sampling design was designed to present national and provincial level estimates. The variable of this study are malaria endemicity, evaluate the elimination targets, describe malaria cases and the situation among at-risk groups, and assess the quality of malaria programs at-risk groups in the Southwest Sumba District. The data were analyzed descriptively and presented in the form of tables and graphs.

RESULTS

Malaria endemicity and evaluate the elimination targets in The Southwest Sumba District

Trends in positive malaria cases and the number of malaria sufferers (Annual Parasite Incidence/API) show a concentration of high malaria endemic districts or cities in Eastern Indonesia. The results of the study show that Southwest Sumba district is a highly endemic area with an API of 11.26%, as well as being the 2nd highest district after West Sumba in East Nusa Tenggara Province. The annual case



finding or annual blood examination rate (ABER) in 2021 was 17.85% above the minimum target (>10%), there was an increase in ABER compared to 2020. There were 2 Public Health Centers (PHC) with ABER < 10, namely PHC Werilolo and PHC Elopada, while the trend in the positivity rate (PR) and annual Parasite Incidence (API) has decreased. Achievements ABER, API and PR in Southwest Sumba District in 2021 can be seen in the table below:

Tabel 1 Achievements PR, ABER, and API based on PHC in Southwest Sumba District (2021)

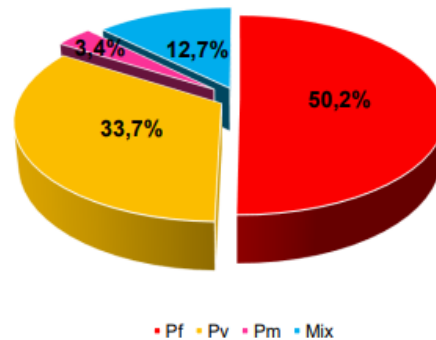
Name of PHC	2021		
	PR	ABER	API
Walandimu	6.86	17.97	12.32
Panenggo Ede	4.40	20.26	8.91
Bondokodi	4.73	26.96	12.74
Kori	7.20	26.79	19.28
Tena Teke	8.51	11.05	9.4
Waimangura	0.05	16.06	0.08
Watu Kawula	0.96	10.84	1.04
Tenggaba	0.09	13.63	0.12
Palla	0.10	20.75	0.21
Rada Mata	1.57	26.49	4.15
Delu Depa	13.18	12.05	15.88
Kawango Hari	6.47	21.17	13.7
Billa Cenge	1.44	32.26	4.67
Weri Lolo	3.33	5.44	1.81
Weekombak	0.16	14.06	0.23
Elopada	5.91	1.45	0.85

and the lowest is the 0-11 month age group. There are to 2 – 3 children under 5 who are suffered from malaria every day, with a total of 760 children under 5, of which 8.9% are infants. Apart from that, 39% of malaria cases occur in school age children (5-14 years), every day 5-6 school age children are suffered malaria. The total number of malaria cases in school-aged children is 1,867.

The types of plasmodium in positive malaria cases in Southwest Sumba District can be seen in Figure 3 below.

The picture above shows that there are 3 types of plasmodium in malaria cases in Southwest Sumba, including Plasmodium Falciparum, Plasmodium vivax and Plasmodium malariae. The most plasmodium is Plasmodium Falciparum, reaching 50.2% compared to other types of plasmodium. This is a sign that local transmission is still very high among the population.

Quality of malaria programs in children under five and pregnant women.



Malaria cases and the situation among at-risk groups

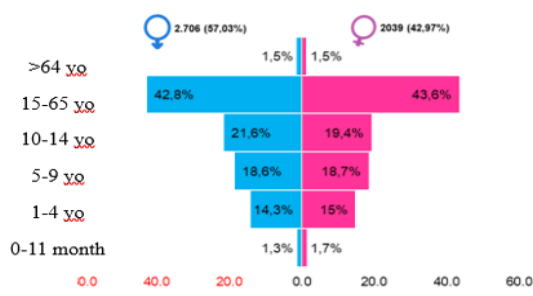


Figure 2 Overview of Cases According to Gender and Age Group in 2021

Malaria cases in the Southwest Sumba District based on gender were mostly men, reaching 57.03% (2,706 cases). The highest age group is the productive age group or 15-64 years

Integrated services for malaria programs with maternal and child health programs as well as immunization programs are implemented through routine antenatal services, services for sick children under five, complete basic immunization services. One of the strategies implemented in high and medium endemic areas is malaria screening for pregnant women at polyclinics and all sick children under five with IMCI approach, as well as providing insecticide-treated bed nets (anti-mosquito nets) for pregnant women at first visit (K1) of antenatal care. Those who are positive for malaria are given treatment according to the guidelines for managing malaria cases.



Table 2 Achievements of Integrated services for malaria programs for pregnant women in Southwest Sumba District (2021)

Data	Amount or percent
– target pregnant women	10,684
– Pregnant mother makes first visit (K1)	5,983
– findings through screening of pregnant women	2,675
– screening coverage of pregnant women (%)	44,71
– distribution of mosquito nets to pregnant women	8,804
– coverage of distribution of mosquito nets to pregnant women (%)	82,4
– number of positive malaria cases	4,745
– number of pregnant women positive for malaria	58
– percentage of malaria cases in pregnant women (%)	1,22

Table 2 shows that the coverage of pregnant women being screened for malaria is very low, only reaching 44.71% (2,675 pregnant women), less than the coverage of pregnant women who receive mosquito nets, which is 82.4% (8,804 pregnant women). There should be more or the same number of pregnant women who receive mosquito nets as pregnant women who are screened for malaria. 58 pregnant women tested positive for malaria (1.22%).

Table 3 Achievements of Integrated services for children under five in Southwest Sumba District (2021)

Data	Amount or percent
– target children under five	41,374
– Screening of sick children under five/ IMCI	1,306
– number of positive malaria cases	4745
– number of positive malaria cases in children under five	760
– Procentage of positive malaria cases	16.02

– Children under five with serious complications of malaria 3

The results of malaria screening were 1,306 children under five, with positive cases reaching 16.02% (760 cases), 3 cases of which had serious complications. This data does not yet describe the actual coverage of under-five/IMCI screening because real data on sick children under five at the district level (in the LB1 report) is not yet known.

DISCUSSION

Malaria elimination is an effort to stop local malaria transmission in a certain geographic area. Achieving elimination does not mean that there are no cases of imported malaria or that there is no longer a vector in the area, so precautionary activities are still needed to prevent re-infection. The Ministry of Health sets the elimination standards as no local transmission for three consecutive years, positivity rate < 5%, and API < 1 per 1000 population. The national target for eliminating malaria in East Nusa Tenggara is 2028 with the final indigenous target being 2024. This means that in 2027 Southwest Sumba will receive a malaria-free certificate, in 2023 it will reach low endemicity, and in 2022 it will reach moderate endemicity. Southwest Sumba must escape from high endemicity within a maximum of 2 years. Considering that there are many high and medium endemic villages with ABER targets that are not evenly distributed across all public health centers, a massive movement of malaria-free villages is needed, led by regional heads.

Malaria is the cause immediate anemia and heavy babies Low Birth, is a factor which contributes to stunting [12]. Pregnant women and children under five are a group at risk if they are infected with Malaria, so integrated malaria control activities are carried out with health services for pregnant women/antenatal services and sick children which aim to protect pregnant women and babies/children from malaria transmission and encourage increased coverage of routine services [9]. Even though the malaria screening policy for pregnant women and children has changed, namely only being implemented in high endemic districts/cities, almost all provinces report that they are still implementing this activity [6]. Children under five are vulnerable to malaria because they have low body resistance [5]. They can have severe



anemia, hypoglycaemia, and cerebral malaria if proper and timely treatment is not taken. The implementation of Integrated Management of childhood Illness (IMCI) has to run comprehensively and simultaneously, especially for a developing country like Indonesia. This strategy is significant in achieving children's health status [13]. Multiple research found that IMCI is an effective approach to improving the quality of child health services.

Mass Mosquito Net Provision Focuses on the output of the number of households that have at least one mosquito net to protect their residents from mosquito bites. The use of insecticide-treated mosquito nets is very effective in preventing malaria infection. If the use of mass mosquito nets is not effective, Indoor Residual Spraying (IRS) can be used [7]. Village Malaria Specialists play a role in identifying and finding malaria cases, especially in moderate and high endemic areas. Community health centers that are located in low endemic areas because there are few malaria cases can strengthen early diagnosis, carry out malaria screening on all pregnant women when carrying out pregnancy checks and apply IMCI approach to all sick children who come to the public health center [11]. IMCI is an evidence-based approach that is widely adopted to prove testing and treatment for children with malaria. The aim is to improve access and quality of services, especially for the diagnosis and treatment of malaria in children [8,10].

CONCLUSIONS

According to the Malaria Elimination Road Map, the target for malaria elimination in 2023 aligns with the governor's regulations, aiming for elimination in East Nusa Tenggara by 2024. Nationally, the goal for malaria elimination in East Nusa Tenggara is set for 2027, with the last indigenous case expected by 2024. As of 2021, Southwest Sumba district remains highly endemic. With only two years left, achieving the elimination target in East Nusa Tenggara requires strategic and progressive actions.

Study Limitation

This study used datasets from electronic Malaria Surveillance Information System from Indonesia, which was conducted in 2021, so the availability of existing data determined the selection of variables.

RECOMMENDATIONS

Requires commitment from the government in following up on regulations, the Plamodium Sweep Movement through 5 actions that were agreed and other existing commitments by carrying out regular monitoring and evaluation. Existing Village Malaria Specialists can help increase search and discovery efforts for active cases in reducing the rate of transmission in the future. There is a need to improve the quality of integration services at public health centers for pregnant women and children. There is a need to be a government commitment to regulating IMCI approach as a standard service for sick children under five at health centers.

Conflict of Interest

The authors declare that there is no conflict of interest in the publication of this paper.

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CHALLENGES AND INNOVATIONS TO INCREASE THE SUCCESS OF TB MANAGEMENT IN CHILDREN: A LITERATURE REVIEW

Era Dorihi Kale^{1*}, Nursalam², Makhfudli³, Uly Agustine⁴

¹Doctoral Nursing Program, Airlangga University, Surabaya, Indonesia

^{2,3}Faculty of Nursing, Airlangga University, Surabaya, Indonesia

^{1,4}Poltekkes Kemenkes Kupang

*Corresponding Author: Era Dorihi Kale, Doctoral Nursing Program, Airlangga University, Jalan C. Kotadia No 12 Fontein, Kupang-NTT, Indonesia, 85112, E-mail: eradorihikale@gmail.com

ABSTRACT

Introduction: Children are significantly at risk of being infected with Tuberculosis (TB) because they have close contact with infected parents, have difficulties in diagnosis and treatment, and require a unique approach to pediatric patients. Innovation must be made to improve the TB infection care cascade, particularly in children, is crucial.

Objectives: This article aims to research results related to diagnosing and treating tuberculosis in children and the innovations made to overcome these problems. This paper is a literature review where the literature search is focused on the problems encountered in managing tuberculosis in children and the innovations that have been made to overcome these problems.

Methodology: The articles obtained were 582 (Scopus 71, PubMed 56, and Science Direct 455). Articles that experienced duplication of titles were removed. The researcher then screened the title and abstract of the article according to the predetermined inclusion and exclusion criteria. Articles that meet the inclusion criteria according to the purpose of the literature review are 31 articles.

Result: Innovative interventions have shown promise in improving case detection and treatment outcomes, including intensified case-finding approaches, capacity building, and improved diagnostic methods. Several innovations have been developed, including renewable TB diagnosis (Fujifilm SILVAM TB, WRDT), GeneXpert as a primary tool for TB diagnosis in children, and community-based, integrated, and decentralized TB treatment models. Evaluation can be done using immunological evaluation.

Conclusion: Childhood TB management faces challenges such as under-detection, drug-resistant cases, and difficulties in diagnosis, especially in resource-limited settings. Innovations like decentralized services, improved diagnostics, and symptom-based screening aim to improve case detection. Parental trust and motivation are crucial for treatment success. The lack of specific pediatric TB treatment formulas worsens the problem. Multisectoral partnerships and addressing country-specific challenges are essential for improving TB management in children. Several innovations have been developed, including renewable TB diagnosis (Fujifilm SILVAM TB, WRDT) and community-based, integrated, and decentralized TB treatment models. Evaluation can be done using immunological evaluation.

Keywords: Tuberculosis, children, challenges, innovation.

INTRODUCTION

Tuberculosis (TB) is a common infection in adults, whereas children in close contact at home, especially with parents, are at high risk for contracting TB. Children under five are at high risk of infection (1). The disease starts within one year after the previous infection. Epidemic control and the success of TB control programs depend on this (2).

There are about 1 million Mycobacterium tuberculosis infections in children under 15 years globally, with a

mortality rate of 200,000 every year (WHO, 2020). Tuberculosis in children (TB) is an essential cause of child morbidity and mortality in prevalent areas and contributes significantly to global mortality in children under five. WHO estimates that in 2015, around 10% of children developed new TB (3).

Currently entering the multidrug-resistant TB (MDR-TB) era, resistance to isoniazid and rifampin drugs occurs. Cases of multidrug-resistant TB (MDR) in children have now been identified in every country, with an



estimate that approximately 30,000 children develop MDR TB each year (2). This condition can be avoided if effective screening, case-finding strategies, and appropriate therapy with high adherence are implemented. However, it faces obstacles from low resource settings, limited diagnostic tools, and limited community responses to contain disease transmission (2). Children who start TB therapy experience a lack of pediatric drug formulations because the drug preparations do not follow the dose, and there is a gap in the socialization of the national TB program.

WHO's End TB Strategy and Sustainable Development Goals (SDGs) aim to end the global TB epidemic. Specific targets have been set in the WHO's End TB Strategy for 2016-2035, which include a 90% reduction in TB deaths and an 80% reduction in TB incidence (new cases per year) by 2030, compared to 2015 (4). In order to achieve this, it is necessary to treat TB in children with a unique approach to diagnosis, treatment, and evaluation. Therefore, it is essential to have innovations in related fields to improve the quality of TB services in children. There is a need for developing and implementing more sensitive, non-invasive diagnostic tools that can be easily used in low-resource settings, developing models that provide holistic and efficient care for children with TB, safer and more effective treatments for MDR-TB in children, psychosocial support for the children and accurate assessment of treatment efficacy. This article explores the research results related to the problems encountered in diagnosing and treating tuberculosis in children and the innovations made to overcome these problems. The specific purpose of this article is to Identify the problems faced in the diagnosis and treatment of tuberculosis in children, identify innovations related to the TB treatment model in children, identify innovations related to TB diagnosis in children, and identify innovations

related to TB treatment in children and TB evaluation in children. This article also contains new, innovative findings that can be used in practice settings to increase the success of treating TB in children from latest years.

METHODOLOGY

This paper is a systematic literature review. The literature search is focused on the problems encountered in managing tuberculosis in children and the innovations that have been made to overcome these problems. The journals taken are journals of international repute with the appropriate theme. Search articles using keywords: children OR pediatric, tuberculosis, management, and prevention with publication deadlines from 2019-2024 and articles written in English. The databases used in this literature search are Scopus, Pubmed, and Science Direct. Article screening was carried out using inclusion and exclusion criteria. The inclusion criteria are children and innovation in treatment, diagnosis, and evaluation. At the same time, the exclusion criteria are teenage and adult, and they are standard in treatment, diagnosis, and evaluation. The articles obtained were 582 (Scopus 71, PubMed 56, and Science Direct 455). Articles that experienced duplication of titles were removed. The researcher then screened the title and abstract of the article according to the predetermined inclusion and exclusion criteria. Articles that meet the inclusion criteria according to the purpose of the literature review are 31 articles. The results of article selection can be illustrated in the following diagram:

RESULT

31 articles meet the inclusion criteria according to the purpose of the literature review. The results of the search for articles can be formulated according to the objectives that have been set.

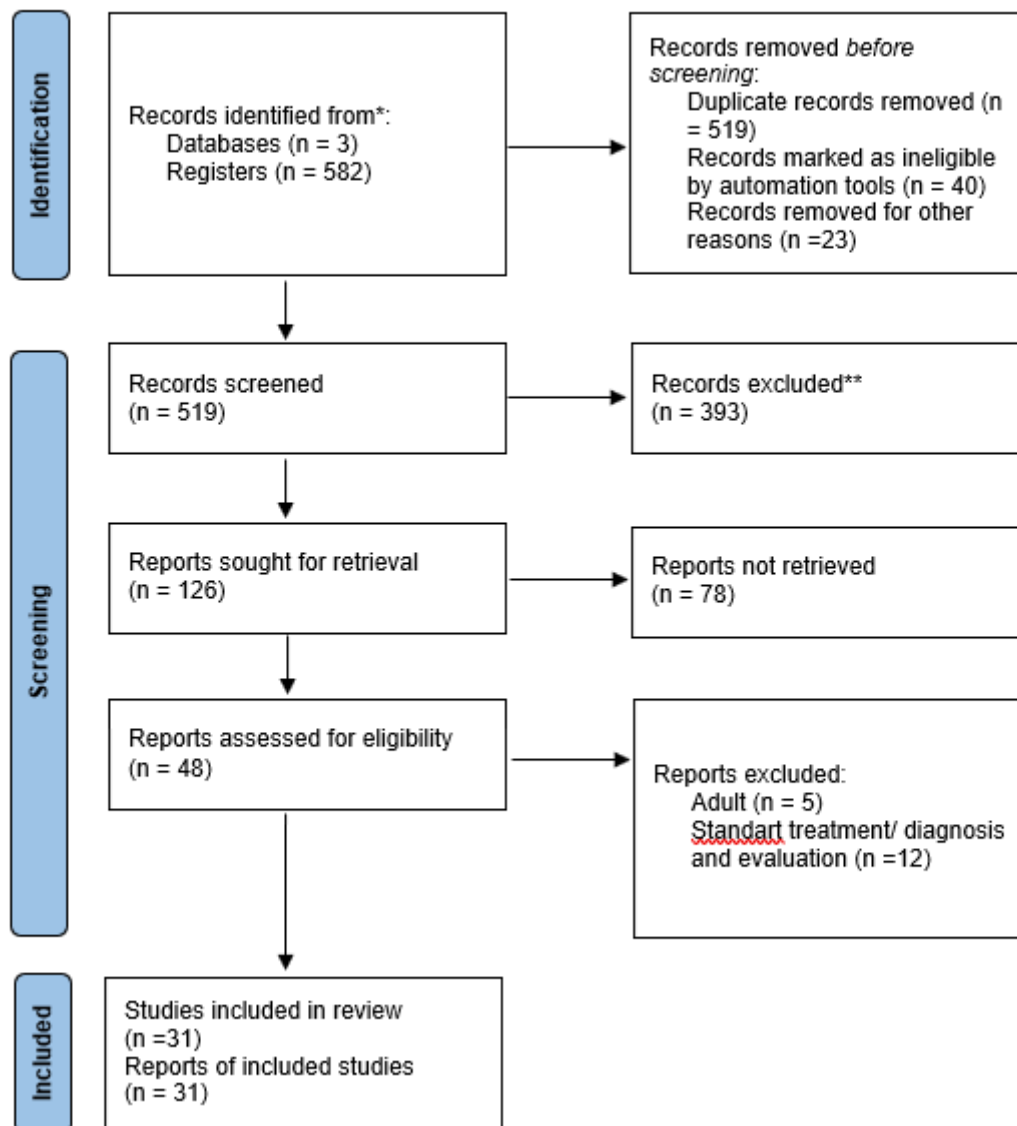


Figure 1 Flow of Systematic Review (PRISMA, 2020)

Table 1 The Main Findings of All Articles

No	Authors	Main Findings
1	(5)	The TB REACH improvement in tuberculosis case notifications in children, focusing efforts and funding on childhood TB can produce marked improvements in case detection.
2	(6)	Despite developing new tools and approaches for managing child and adolescent TB, there are still significant barriers to implementing these innovations in routine practice: funding, care approaches, and guidelines.
3	(7)	The fundamental limitations to the successful management of pediatric TB are prevention, diagnosis, and therapeutic management. The complexity of administering anti-TB drugs to children, often through off-label use, leads to various issues that compromise treatment outcomes and contribute to drug resistance.
4	(8)	Significant progress has been made in advancing child and adolescent TB care. However, significant challenges remain, including under-detection and under-reporting of cases, poor implementation of contact investigation and preventive treatment, the need for health system strengthening and integration of TB and child health services, and the negative impact of the COVID-19 pandemic.



No	Authors	Main Findings
5	(9)	Diagnosing TB and drug-resistant TB in children is challenging due to the limitations of current diagnostic tools. Treating multi-drug resistant TB in children is difficult due to limitations of current treatment options, adverse drug effects, prolonged regimens, and challenges in management and monitoring.
6	(10)	Trust in healthcare services and strong motivation to continue treatment were the key factors contributing to tuberculosis treatment success in children.
7	(11)	Symptom-based screening can identify children less likely to have TB disease who can benefit from preventive treatment and those more likely to have TB disease who need further investigation. In resource-limited settings, clinical approaches are essential to guide TB treatment decisions when information is limited. Recent WHO guidance has provided standardized algorithms to support rapid and uniform TB treatment decision-making for children with presumptive TB.
8	(12)	The DETECT Child TB project decentralized child TB services from tertiary to primary healthcare facilities, resulting in improved case findings, treatment outcomes, and uptake of TB preventive treatment. Ongoing mentorship and support for health workers were critical to the intervention's success.
9	(13)	Decentralizing TB diagnosis, treatment, and prevention services for children and adolescents is critical to improving access and outcomes.
10	(14)	Factors influencing TB treatment adherence operate at multiple levels (structural/community, health system, household, individual) and vary by developmental stage.
11	(15)	the treatment journey is challenging due to physical trauma, emotional trauma, lack of social support, and non-adapted healthcare services, and concluding that a tailored socio-psychological approach is needed along with medical care, with the TB program considering the patient and family as a unit when designing the care package.
12	(16)	Diagnosing TB in children, especially those with severe acute malnutrition (SAM), is challenging, but targeted case-finding strategies for children with SAM may be high-yield. The pharmacokinetics and pharmacodynamics of anti-tuberculosis drugs may be different in children with SAM compared to well-nourished children, and understanding these differences is crucial for optimizing TB treatment in this population.
13	(17)	Bedaquiline and delamanid have demonstrated efficacy and safety in treating multidrug-resistant tuberculosis (MDR-TB) in children. Delamanid is an effective anti-TB drug that can improve culture conversion rates and lead to successful therapeutic outcomes. It is also safe for long-term use.
14	(18)	The performance of available TB diagnostic tests remains below WHO targets for childhood TB diagnosis. Combining different sample types, such as NPA and stool, can improve the microbiological yield, with 28% of children with severe pneumonia confirmed by this approach.
15	(19)	Children with TB were previously neglected, but there has been a recent increase in attention, effort, and investment in pediatric TB research and development over the last decade. Significant gaps remain in developing sensitive, non-sputum-based diagnostics and effective TB vaccines for children.
16	(20)	The findings support integrated HIV/TB services and demonstrate that increasing ART coverage can help reduce TB incidence in high HIV/TB burden settings.
17	(21)	Progress has yet to be made in closing the pediatric TB detection gap and improving TB preventive treatment (TPT) coverage among child and adolescent contacts. Contact case management (CCM) interventions are effective for finding TB cases and identifying those needing TPT and should be prioritized by national TB programs. To close the gap, CCM implementation and mobilizing resources from ministries of health, donors, and implementing agencies must be prioritized.
18	(22)	Bedaquiline and delamanid have shown efficacy and safety in treating MDR-TB and XDR-TB in adolescent children, based on the available evidence.
19	(23)	There is an ongoing need for effective and widespread implementation of TB preventive treatment (TPT) in children and adolescents living with HIV (CALHIV). - New diagnostic approaches, such as the SILVAMP-LAM urine test and a clinical decision score, promise to improve TB detection in CALHIV.
20	(24)	Tuberculous meningitis in children is challenging to diagnose and treat, with high mortality rates and substantial long-term morbidity in survivors. Current diagnostic tests are expensive and inaccessible, and the WHO-recommended treatment, while extended to 12 months, still has high mortality rates.



No	Authors	Main Findings
21	(25)	New molecular technologies could substitute for current culture-based methods to improve tuberculosis therapy monitoring and accelerate drug development.
22	(26)	Greater integration between meningitis and TB programs is needed to address TB Meningitis in children effectively.
23	(27)	The TOP TB assay demonstrated high analytical specificity, with no cross-reactivity against 20 species of non-tuberculous mycobacteria.
24	(28)	Improving diagnostics is crucial to the WHO's END TB Strategy to end the global TB epidemic. Several priorities for improving TB laboratory diagnostics include identifying patients with subclinical TB, accurately detecting all forms of TB, rapidly identifying drug-resistant cases, and improving treatment monitoring.
25	(29)	Preventive therapy was highly effective. However, most tuberculosis cases were diagnosed within the first 90 days, suggesting that many cases may not be preventable with preventive therapy alone.
26	(30)	- The B-C-M vaccination regimen provided superior protection compared to BCG alone at eight weeks post-vaccination, but this protection was only partially maintained at 20 weeks post-vaccination.
27	(31)	The FujiLAM test had a sensitivity of 60% and a high specificity of 95% among children with bacteriologically confirmed TB. Its urine-based format makes it non-invasive and easy to use, and it could help diagnose TB in children, including those who do not excrete bacilli.
28	(32)	The screening and management of TB in this immunocompromised population was challenging due to discrepancies in diagnostic test results and potential mimicry of TB by underlying diseases or other respiratory infections.
29	(33)	Addressing drug-resistant TB is crucial for eliminating TB by 2035, and prevention through preventive therapy and vaccination, in addition to early diagnosis and treatment, is a key priority. Treatment for MDR-TB is becoming more individualized due to advances in diagnostics and understanding of drug resistance and pharmacology.
30	(34)	Children have been neglected in the fight against tuberculosis (TB) for decades. The traditional model of TB care and treatment, which relies on referral-based TB disease case finding and treatment at centralized clinical settings, lacks child-specific services and is not sufficient to achieve good outcomes and reach the WHO's End TB Strategy targets.
31	(35)	The global burden of tuberculous meningitis (TBM) is unclear, as many cases are undiagnosed and unreported. Current diagnostic tools for TBM are inadequate, and treatment is often started only after substantial neurological damage has occurred.

Table 2 General conditions challenges

No	Findings	References
1	Low case detection rate, detection under-reporting, poor contact investigation	(5,8,12,21,36)
2	Lack of funding	(5,6,19)
3	Inappropriate approach to tuberculosis care for children, non-adapted healthcare services.	(5,6,12–14,21,24,36)
4	Lack of family or parental involvement/ lack of social support	(8,14,37)
5	BCG is the oldest and only used vaccine for TB in children	
6	TB is common in children with severe acute malnutrition (SAM), and vice versa, and mortality increases when these two conditions co-occur.	(16)
7	HIV infection in children will prolong the time in care, increase mortality and morbidity	(20,22)

Managing tuberculosis (TB) in children is challenging due to low detection rates, underreporting, and poor contact investigation. Funding shortages and inappropriate treatment methods further hinder TB care. The BCG

vaccine is the primary prevention strategy for children. TB is prevalent in children with severe acute malnutrition and HIV infection, leading to increased care duration, mortality, and morbidity.

**Table 3** Challenges in Diagnosis

No	Findings	References
1	Difficulties collecting sputum children. Current TB diagnostics only confirm a small proportion of children with TB, and it is challenging to obtain respiratory samples	(31,38,39)
2	Diagnosing TB and drug-resistant TB in children is challenging due to the limitations of current diagnostic tools.	(9,18)
3	Low sensitivity and limited accessibility of microbiological testing.	(11,19)
4	Diagnosing TB in children, especially those with SAM, is challenging	(16)
5	Tuberculous meningitis in children is challenging to diagnose and treat, with high mortality rates and substantial long-term morbidity in survivors.	(24,40)
6	Current diagnostic tests are expensive and inaccessible	(24)

The main challenges in diagnosing tuberculosis (TB) in children include difficulties in collecting sputum samples, limitations of current diagnostic tools, low sensitivity and accessibility of microbiological testing, and the complexity of diagnosing TB in children with severe acute malnutrition (SAM). Additionally, diagnosing tuberculous meningitis in children is

particularly difficult, with high mortality rates and long-term morbidity in survivors. The cost and lack of accessibility of current diagnostic tests further exacerbate these challenges, emphasizing the need for improved, more accessible, and cost-effective diagnostic methods for TB in children.

Table 4 Challenges in Treatment

No	Findings	References
1	Tuberculosis drugs are the child-friendless and long duration of treatment	(7,12,16,21,22,36,38,41)
2	Poor preventive treatment	(8,22)
3	Treating multi-drug resistant TB in children is difficult due to limitations of current treatment options, adverse drug effects, prolonged regimens, and challenges in management and monitoring.	(9,17,22,38,42)
4	Low of tuberculosis treatment adherence	(14,40)
5	The pharmacokinetics and pharmacodynamics of anti-tuberculosis drugs may be different in children with SAM compared to well-nourished children	(16)
6	The continued use of drugs with limited efficacy or high resistance	(9,42,43)
7	Treatment journey is challenging due to physical trauma, emotional trauma, lack of social support, and non-adapted healthcare services	(15)

Challenges in tuberculosis (TB) treatment for children include the lack of child-friendly medications, limited access to preventive treatment, difficulties in treating multi-drug resistant TB, low treatment adherence, pharmacokinetic differences in malnourished children, and the continued use of drugs with limited efficacy or high resistance. These challenges highlight the need for tailored, child-friendly TB treatments and improved adherence strategies. Diagnosing TB in children

is challenging due to difficulties in collecting samples and limitations of diagnostic tools, particularly for tuberculous meningitis. Funding shortages and inappropriate treatment methods further complicate TB care. The BCG vaccine remains the primary prevention strategy for children. TB is prevalent in children with severe acute malnutrition and HIV infection, leading to increased care duration, mortality, and morbidity.



Table 5 Challenges in Evaluation

No	Findings	References
1	Lack of biomarkers to monitor treatment response and difficulties in collecting sputum from children	(38,39,42)

Evaluating pediatric tuberculosis is challenging due to the lack of reliable biomarkers for tracking treatment response and

the difficulty in obtaining sputum samples from young children. This has been highlighted in several studies.

Table 6 Innovations for General management

No	Findings	References
1	Decentralized child TB services from tertiary to primary healthcare facilities	(12,13)
2	Integration of TB and child health services, including the private sectors	(8,13,16)
3	Integrate TB screening into routine evaluations	(5)
4	Increase support and funding for TB children and integrate them into the national strategic plan.	(5,6,44)
5	Develop a holistic and multilevel approach (structural/community, health system, household/parents, individual), and vary it by developmental stage.	(10,14,15)
6	Age-appropriate counseling and support,	(15)

Table 7 Innovations for Diagnostic

No	Findings	References
1	Symptom-based screening can identify children less likely to have TB disease.	(11)
2	A non-invasive biomarker-based test can substitute for a mucus test	(31)
3	WHO Approved Rapid Diagnostic Tests	(45)
4	Xpert MTB/RIF Ultra and culture assays	(46)
5	The FujiLAM test had a sensitivity of 60% and a high specificity of 95% among children with bacteriologically confirmed TB.	(31)

Table 8 Innovations for Treatment

No	Findings	References
1	Intervention to increase the trust of parents to improve treatment adherence	(15)
2	Non-injectable, palatable medications pediatric formulations	(15)

Table 9 Innovations for Evaluation

No	Findings	References
1	Immunological screening in regular laboratories in pediatric TB clinics	(38)

Recent research highlights significant challenges and innovations in managing childhood tuberculosis (TB). Key issues include under-detection, with 56% of cases unnotified (47), and gaps in translating evidence to practice at the primary care level (48). Innovations to improve case detection include intensified case-finding, capacity building, and improved diagnostics (5). Decentralization of services has

shown promise in increasing case detection and treatment outcomes (12). Challenges persist in diagnosing and treating drug-resistant TB in children, necessitating improved diagnostic tools and treatment options (9). Parental trust in healthcare services and motivation are crucial for treatment success (37). Optimizing clinical approaches, such as symptom screening and algorithmic decision-making, can help overcome



diagnostic limitations in resource-constrained settings (11). Multisectoral partnerships and addressing country-specific challenges are essential to close policy-practice gaps (44).

Diagnosis of TB in children is more difficult due to difficulties collecting sputum children. Current TB diagnostics only confirm a small proportion of children with TB, and it is challenging to obtain respiratory samples (31). The high mortality rate and TB drug dropout rate in children is above 10% (40). Discontinuation of TB drugs in children significantly affects the increase in MDR-TB (multidrug-resistant) cases, where it is estimated that as many as 25,000 children have MDR-TB (38). Management of children with MDR-TB is often a presumptive diagnosis because of the difficulty of microbiological confirmation in children (34).

Many children have difficulty with TB treatment because of the unavailability of unique TB treatment formulas. MDR-TB treatment in children will give better results than in adults (12,38). Treatment of TB in children has challenges, especially in providing new drugs. Testing of new drugs in phase 3 rarely involves children under the age of 17. New drugs for children are usually after knowing their effectiveness in adults. This condition causes children to experience delays in using new drugs. The new drug formulation as a shorter treatment regimen contains rifapentine (3HP or 1HP) and the main DRTB drugs (bedaquiline and delamanid). In addition, many drug preparations are not explicitly formulated for pediatrics and must be pulverized from adult formula (34).

The pediatric TB program is observed and assessed to recognize gaps in benefit conveyance, recognize quality change procedures, and advocate for better well-being administrations for children with TB. Problems that occur in children's TB are in terms of reporting, such as disaggregation of age under 19 years has not become a standard indicator of TB programs, diagnostic approaches, microbiological determination, and TB outcomes are not routinely accessible (39).

Innovations related to the TB treatment model in children

Treating TB in children requires a slightly different approach from treating TB in adults. Here are two approaches proven to increase treatment success in children. The DSD (Differentiated service delivery) model is a client-centered approach that streamlines and

adjusts administrations across services to receive services and reduce the burden on the health system. This DSD model has been used in HIV programs to demonstrate increased HIV care, increased outcomes for clients, increased effectiveness in cost, increased number of new cases identified, and designed a follow-up care model program for HIV treatment. DSD model framework to scale up context-tailored solutions for pediatric TB. This model is composed of “what” is necessary to succeed, “how” TB treatment is provided in unique conditions, “who (who)” gives the services, and “when” the services are given (39).

The second model is an integrated and decentralized community-based model. The community-based model is an "active" approach to screening and managing client contacts. The client diagnosed with pulmonary TB is confirmed bacteriologically, then the officer asks if there is contact with the child at home, and screening is done to find out the contact. Family members who are in contact and show indications of TB are guided for TB screening. Follow-up was carried out at home by officers after seven days, two weeks, and then every month to detect children with TB signs in the family. The officer gathers tuberculosis preventive treatment (TPT) at the healthcare facility before visiting the client at home and returns the residual medications and documents to the facility afterward. Throughout follow-up visits, staff examine TB symptoms, assess the child's TPT tolerance and compliance, and assess for critical signs. If a child shows severe warning signs, tolerance problems, or TB indications, he or she is immediately sent to a healthcare facility for consultation with a doctor. The use of this model has been proven to increase the discovery of new TB cases in children and increase treatment success rates (21), (2), (12), (3), (12).

Innovations related to TB diagnosis in children

Several types of TB diagnostic tests have been developed in children with good sensitivity to overcome the difficulties of pediatric TB diagnostics and the struggle of collecting respiratory samples. First, a non-invasive biomarker-based test can be substituted for a mucus test. Fujifilm SILVAMP TB lipoarabinomannan (FujiLAM), a test for detecting lipoarabinomannan in urine, has increased sensitivity for the TB diagnostic. The results showed it could be a good TB diagnostic in children (31). Second: WHO Approved Rapid



Diagnostic Tests (WRDT). This test has higher sensitivity and specificity and requires a shorter time when compared to conventional microscopic smears and solid cultures (45). Third: Xpert MTB/RIF Ultra and culture assays. These diagnostics are the most sensitive and specific and can determine drug resistance cases(46).

Innovations related to TB treatment in children

TB treatment can be carried out appropriately and effectively if TB laboratory diagnostics for case detection can be carried out correctly. Some of the innovations that can be used in treating TB in children are: first, combined tablets. A combination tablet of three fixed-dose combination drugs (FDCs) with a fruit flavor containing rifampin, isoniazid, and pyrazinamide (Sharma, 2019). Second: Bedaquilin for MDR-TB. These medicines, Bedaquiline (BDQ) and delamanid (DLM) can also treat DR-TB in children, with substantial benefits in treatment achievement rates and reducing impermanence (45) (49). Third: TB Preventive Treatment. The use of isoniazid (for 30 days) and daily rifapentine (1HP) in children has been proven safe and feasible to use to prevent TB.

Innovation related to the evaluation of TB in children

Immunological evaluation is one of the innovations in evaluating TB treatment in children. Although not regularly executed in children, its usefulness is urgent for implementing strategies that can also be helpful in some issues, such as optimal therapy choice, predictive valuation, immunotherapy interferences, genetic counseling, and identifying individual protective aspects. Evaluation of the current immune response is intended to assist in deciding on therapeutic interventions. The elements in this evaluation are critical to rid the mycobacterial infection and can be measured in the immunology laboratory using whole blood counts. This procedure is also fast and more efficient.

Studies on the immune status of children with TB may help address some pediatric TB problems. Practically, it can aid in deciding on immunomodulatory therapy to inhibit the inflammatory response for an exacerbated innate response, using immunostimulants where inflammation can be detrimental or providing antioxidants to prevent cell damage if necessary.

It can be used as a consideration to do a genetic evaluation if necessary. The potential use is broad and supports the idea of using immunological screening in regular laboratories in pediatric TB clinics.

DISCUSSION

The TB treatment model in children has been proven to provide good treatment outcomes, and it is community-based, integrated, and decentralized. The approach taken can be in various ways, for example, DETECT TB (12), DSD (34), and integrated packages (3). This community-based management model is a treatment where children remain in the community by utilizing existing resources in the community. Integrated means covering all sectors related to pediatric TB care and decentralized, meaning that it is not only centered on special TB care units at the central level, but child TB services should also be accessible in primary care units. This model includes screening, diagnostics, and monitoring during the treatment and evaluation.

Diagnostics of TB in children have made significant progress. These findings are beneficial in diagnosing children infected with TB but cannot be diagnosed by conventional microscopy examination. This diagnostic innovation helps label suspected TB in children, either microbiologically confirmed or clinically diagnosed with TB, in various ways that can be applied to children. Clinically diagnosed TB includes “probable” and “possible” TB cases in which bacteriological confirmation failed. Therefore, although this test is new, it has good sensitivity in children. This diagnostic is necessary because TB treatment should only be started if the doctor is sure that it is TB. If the diagnostic fails, the TB morbidity and mortality rates will continue to increase significantly (45). Treatment of TB in children does require innovation, especially those related to the availability of drugs with formulas and doses for children and the handling of side effects of drugs in children. There have been many discoveries of new types of treatment, such as the use of Bedaquin, which has been proven effective in treating TB in children. In addition, it is developing drugs in smaller sizes and flavors that children like has been shown to increase the success of TB treatment in children.



KEY FINDINGS

1. Low case detection and under-reporting
2. Inadequate diagnostic tools
3. Challenges in treatment adherence
4. Management of multi-drugs resistant TB
5. Integration of TB and Child Health Services
6. Preventive treatment and vaccination
7. Psychosocial support
8. Evaluation and monitoring of treatment

CONCLUSIONS

Childhood TB management faces challenges such as under-detection, drug-resistant cases, and difficulties in diagnosis, especially in resource-limited settings. Innovations like decentralized services, improved diagnostics, and symptom-based screening aim to improve case detection. Parental trust and motivation are crucial for treatment success. Challenges in diagnosing TB in children due to difficulties in collecting sputum samples lead to high mortality and drug dropout rates. The high prevalence of multidrug-resistant TB in children highlights the need for better diagnostic tools and treatment options. The lack of specific pediatric TB treatment formulas worsens the problem. Multisectoral partnerships and addressing country-specific challenges are essential for improving TB management in children. Several innovations have been developed, including renewable TB diagnosis (Fujifilm SILVAM TB, WRDT) and community-based, integrated, and decentralized TB treatment models. Evaluation can be done using immunological evaluation.

Future research

Future research should focus on developing innovative, child-friendly diagnostic and treatment approaches, integrating TB care with general child health services, and providing comprehensive psychosocial support to affected children and their families. These efforts will contribute significantly to achieving the goals set by the WHO's End TB Strategy and the Sustainable Development Goals.

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CANCER RISK RELATED TO CONSUMPTION OF CR-CONTAMINATED POTATO IN JINING, CHINA

Siyuan Ma¹, Pokkate Wongsasuluk^{1,2*}

¹College of Public Health Sciences, Chulalongkorn University, Bangkok, 10330 Thailand

²Excellent Center for Health and Social Sciences and Addiction Research (CEHSSR), Thailand

*Corresponding Author: Pokkate Wongsasuluk, College of Public Health Sciences, Chulalongkorn University, Bangkok, 10330, Thailand, E-mail: pokkate.w@chula.ac.th

ABSTRACT

Introduction: Heavy metals are concerned problem according to contamination in soil also growing underground crops in many countries. They can cause human health risks such as cancer through oral exposure by crops consumption. Many studies found heavy metals contamination in potato due to soil contamination. In China, potato is one of the most popular staple foods, especially in northern regions like Shandong. Therefore, they may have adverse health risk from contaminated potato consumption.

Objectives: To find the concentration of chromium in potato and the cancer risk related to potato consumption among residents in Jining, Shandong, China.

Methodology: Online questionnaires were used to collect personal information and potato consumption rate from 405 participants in Jining, China. Potatoes (*Solanum Tuberosum*) were sampled from Da Runfa, the biggest local market where most of the residents buy potatoes from, then the Cr concentrations were investigated using ICP-MS. The cancer risk was assessed through 4 steps: 1) Hazard Identification, 2) Dose-Response Assessment, 4) Exposure Assessment, and 4) Risk Characterization.

Results: Potato consumption rate of these participants was found 0.063 ± 0.045 (0.007-0.357) kg/day, and their mean age was 40.44 ± 11.94 years. The ICP-MS results exhibited the average concentration of Cr on potato was $48.49 \times 10^{-3} \pm 8.37 \times 10^{-3}$ mg/kg (41.23×10^{-3} - 57.64×10^{-3} mg/kg). The health risk assessment showed average cancer risk was $1.13 \times 10^{-5} \pm 0.95 \times 10^{-5}$ ranged from 0.02×10^{-5} to 6.66×10^{-5} , which is about 10 times higher than the acceptable level (1×10^{-6}). The average cancer risk results mean 12 people in a million who consume potato may have cancer by Cr contamination.

Conclusion: There was cancer risk related to potato consumption in Jining especially the middle-aged group showed highest cancer risk due to their higher ingestion rate. Therefore, this study recommends them to reduce their daily consumption of potatoes, to limit the potato consumption to be lower than 43.2g/week. The local government should be more concerned about controlling heavy metals contaminated in agricultural area to reduce cancer risk and prevent adverse health effects among Jining residents.

Keyword: Chromium, Health risk, Cancer, Potato, China

INTRODUCTION

The definition of Heavy metal is the metallic elements with a relatively high density compared to water. (1) Heavy metal contamination refers to the presence of excessive amounts of heavy metal elements in soil, air, water, or within living organisms. These components can cause environmental and human health risks when their concentrations exceed certain limits.

Cause of heavy metal contamination

Although heavy metals are the components that are naturally existed in the

world, most environmental contamination and human exposure are caused by industrial activities such as mining and smelting operations, artificial production such as battery, and agricultural practices of metals and metallic compounds (2)

Environmental pollution can also arise from atmospheric deposition, metal corrosion, soil erosion releasing metal ions, leaching of heavy metals, sediment re-suspension, and metal evaporation. Through these processes, heavy metals transition from water resources to groundwater and soil. (3)



Production and Consumption of potatoes

China stands as the global leader in potato production, boasting over 4.81 million hectares dedicated to potato cultivation and yielding a substantial output of 90.32 million metric tons in 2018. This represents 27.36% of the world's planting area and contributes significantly, accounting for 24.53% of the world's total potato production. (Wang et al., 2023)

China has emerged as the leading potato-producing nation, followed by India, Russia, the USA, and Ukraine. Collectively, China and India contribute approximately one-third of the world's potato output. (4).

In general, potatoes are staple food in China, especially in northern regions like Shandong. They are affordable, starchy, and nutritious and widely used in various culinary preparations. People may consume potatoes as a primary food source or incorporate them into dishes alongside other ingredients. Potato farming is a traditional advantageous industry in Tengzhou, Shandong where it was first cultivated in the late 19th century with a history of more than 100 years. Due to the unique local soil, water quality and climatic conditions, potatoes are known for their beautiful shape, smooth color, thin skin, crispy flesh, and delicious taste, and are very popular among consumers.

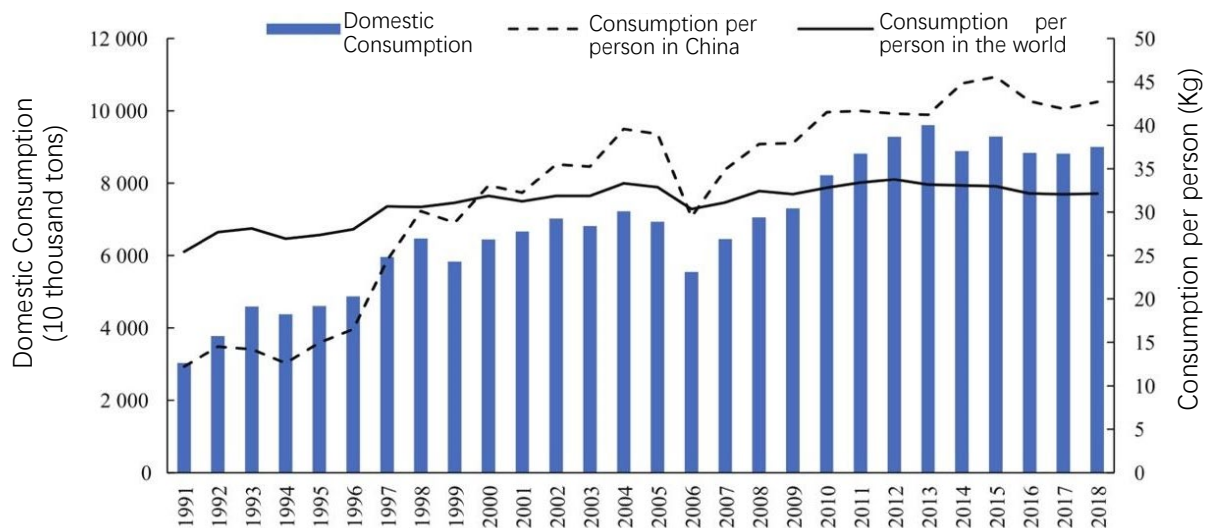


Figure 1 Potato consumption

From 1991 to 1996, China's per capita potato consumption remained relatively stable at approximately 15 kilograms (kg) per year. Subsequently, there was a gradual and consistent increase in consumption, reaching 40 kg in 2004. The consumption peaked at a record of 45 kg in 2014 (5).

Jining, one of the biggest cities in Shandong province, is only 90 kilometres away from Tengzhou. Owing to its location, potatoes are the major source of food for people in Jining. Almost all the local people, from toddler to 60-year-old elders, are fond of potatoes which cause the long exposure. Hence, testing for the safety of local potatoes is of great importance.

There is limited data about the consumption rate of potatoes and limited paper published about risk assessment in terms of potato consumption in Shandong, China. Hence, the

objective of this study is to assess the human health risks of heavy metals (Cr) contamination in potatoes among residents in Jining, Shandong, China

METHODOLOGY

Study area

The study was a cross-sectional study and was conducted in Jining, situated in the southwestern part of Shandong province, China.

Participants

The participants in this study were residents who are living in Jining City for more than 6 months. The Citizens aged between 18-60 years old, eat potato at least once a month for at least 5 years and capable of answering the online survey were included. Then, those who are on diet or need to control their carbohydrate intake



were excluded out, since they only consume a tiny portion of potato products, which mean the exposure will be relatively low comparing with the general public.

The data were collected using snowball sampling. Taro Yamane formula was used to calculate the sample size. According to the data from the People's Government of Jining Municipality, the total population is 1,569,560 people in Jining City. (6)

$$n = \frac{N}{1 + N(e)^2} = 399.89$$

n= the estimated sample size

N= size of population= 1,569,560

E= allowable error (%) =0.05

The calculated sample size was rounded up to 400 people by the researcher. Besides, an additional 10% sample will be included to offset the incomplete or missing data from the questionnaire. There will be 440 people in the overall sample. Descriptive statistics were used to present the characteristics of the participants. The questionnaire was submitted to 3 experts for their comments on questionnaires. The validity of the questionnaire was obtained based on score to assess content validity and language applicability using the Item Objective Consistency. The mean value for score of the IOC form is 0.86 which is greater than 0.5. So, the questionnaire is considered to be valid.

Data Collection and Analysis

The exposure data were collected through an online questionnaire through WeChat application. As for potato samples, there are 6 supermarkets in Jining city, and this study collected 3 potato samples in the biggest supermarket called DaRunfa. DaRunfa is the most popular one in Jining city and all the potatoes selling in this supermarket are come from Tengzhou city, so this supermarket was chosen to collect the potato samples. For potato samples, each one should be 150 grams to 200g. As for the size, those extremely large or small one and those in irregular shapes were excluded, and then those middle ones (around fist size) were randomly selected which usually takes 3-4 month for the potato to grow into this size. (7)

The potato samples were analyzed by Fuda Analytical Testing Group according to the standard process GB 5009.268. Determination of Multiple Elements in Food, National Standard of Food Safety released by the National Health Commission of the People's Republic of China in 2017 (8).

The potato samples were washed and digested with microwave. Then, the ICP-MS instrument was configured to analyze targeted heavy metal (Cr). This involves selecting the appropriate mass-to-charge (m/z) ratios for the metals, optimizing the plasma conditions, and setting up the instrument's detection system. The limit of detection for heavy metals was 1×10^{-5} . After analyzed the concentration of Cadmium, the risk was assessed under 4 steps:

1) Hazard identification:

Hazard identification is the method of evaluating whether exposure to Cadmium will lead to adverse effects on the human body.

2) Dose-response assessment:

Dose-response assessment elucidates the measurable correlation between exposure levels and the occurrence of adverse health effects. In this study, Oral Reference Dose (RfD) and Slope Factor values for Cadmium will be employed to analyze risk attributes. (Bidone et al., 2001)

3) Exposure Assessment

Lifetime Average Daily Doses (LADDs) was employed for assessing cancer effects.

$$LADD_{POT} = \frac{CxIR \times ED \times EF}{BW \times AT}$$

4) Risk Characteristics

Cancer risk will be calculated as the following formula:

Cancer Risk = Exposure \times Slope Factor

If the result of cancer risk is less than 10^{-6} , it will be considered acceptable.

The data (such as frequency and amount of potato consumption) collected from the questionnaire was taken into above equations to calculate the ADD for the average Jining residence and then used it to calculate the cancer risk (CR).

RESULTS

Characteristic of the participants

The online questionnaires were conducted in Jining to collect the basic information and eating habits of participants who lived in Jining for more than 6 months. Total number of 440 questionnaires were collected using snowball sampling, then the questionnaires with errors (extremely high or low values) or missing data were screened out from this study. So, this study finally calculated data of 405 participants.

**Table 1. Characteristic of Participants**

Characterization (n=405)		n (%)	
Gender	Male	200 (49.4%)	
	Female (Mode)	205 (50.6%)	
Income level (monthly)	Low	73 (18%)	
	Middle (Mode)	280 (69.1%)	
	High	52 (12.8%)	
Education level	Elementary	9 (2.2%)	
	Secondary	156 (38.5%)	
	Postsecondary (Mode)	240 (59.2%)	
Occupation	Agriculturalist	21 (5.2%)	
	Businessman	48 (11.9%)	
	Civil Servant	57 (14.1%)	
	Doctor	34 (8.4%)	
	Financial Staff	27 (6.7%)	
	Labor (Mode)	81 (20.0%)	
	Lawyer	13 (3.2%)	
	Student	53 (13.1%)	
	Teacher	55 (13.6%)	
	Smoking status	Yes	77 (19.0%)
		No (Mode)	328 (81.0%)
Cleaning process	Tap-water only (Mode)	320 (79%)	
	Baking Soda	10 (2.5%)	
	Fruit and Vegetable Wash	28 (6.9%)	
Cooking Method	Brushing	47 (11.6)	
	Boiling	20 (4.9%)	
	Braising	122 (30.1%)	
	Deep-frying	34 (8.4%)	
	Roasting	10 (2.5%)	
	Steaming	23 (5.7%)	
Amount of potato consumption (per meal)	Stir-frying (Mode)	196 (48.4)	
	<100 g	99 (24.4%)	
	100-200g (Mode)	207 (51.1%)	
Convenience of buying potatoes	>200g	99 (24.4%)	
	Convenient (Mode)	310 (76.6%)	
	Inconvenient	95 (23.5%)	

Continuous variables	Mean±SD	Median	Min-Max
Age (years)	40.44±11.94	41	18-60
Weight (kg)	66.45±12.08	65	38-120
Frequency of potato consumption (per week)	2.91±1.26	3	1-10
Duration of potato consumption (years)	32.71±11.89	31	2-58



As is shown above, the questionnaire was collected from 405 individuals, with slightly higher number of female (50.6%) than male. For the income levels, majority (69.1%) of the participants fall into the category of Middle-income level and High-income group and Low-income group account for 12.8% and 18% respectively.

For potato consumption, about half of the respondents eat 100-200g potatoes per meal, while 24.4% respondents eat less than 100g and above 200g. As for cleaning process, most respondents washing the potatoes with tap-water only, which pose a potential threat to our body due to remaining dust and soils on the potato peel and around 11.6% of the respondents brush the potatoes before cooking. Fruit and Vegetable Wash (6.9%) and baking soda (2.5%) are not widely used options with less than 10% of participants using them.

Stir-frying is the most popular cooking method for potatoes, accounting for 48.4% of the total participants, followed by braising with 122 (30.1%) respondents choosing it. Deep-frying, steaming, and boiling are relatively less popular, preferred by 34 (8.4%), 23 (5.7%) and 20 (4.9%) respondents respectively and roasting is the least favorable option with only 2.5% participants.

Concentration of Heavy Metals

This study only focuses on Chromium and ICP-MS was used to assess the concentration of it within potato samples. The table below shows the concentration of Cr in potato samples

and the Chinese national standards for maximum permissible levels of heavy metal contamination in potatoes.

Table.2 Concentration of Heavy Metals
Concentration of Chromium

	Cr (mg/kg)
Sample 1	41.23×10^{-3}
Sample 2	46.59×10^{-3}
Sample 3	57.64×10^{-3}
Mean	48.49×10^{-3}
SD	8.37×10^{-3}
LOD	1×10^{-5}
National Standard	0.1

According to the above table, the concentration of Chromium is ranged from 41.23×10^{-3} to 57.64×10^{-3} with the mean value of 48.49×10^{-3} . Hence, the concentration is lower than the national standard.

Health Risk Assessment

The health risk of residents was assessed using the collected data from questionnaire. Since the numerical data such as Age, Weight etc. are not normally distributed, median value was used instead of the mean. The table 3 below presents the symbol, unit and values which were used to assess the health risk.

Table 3 The Parameter of Health Risk Assessment

Parameter	Symbol	Unit	Value	Reference
Concentration	C	mg/kg	Cr: 48.49×10^{-3}	Laboratory Analysis
Ingestion Rate	IR	kg/day	All subject: 0.0633 Male:0.0711 Female:0.0556 Young adult:0.0471 Adult:0.0623 Middle age:0.069.7	Questionnaire
Exposure Duration	ED	years	All subject:32.7 Male:33.3 Female:32.2 Young adult:16.9 Adult:28.0 Middle age:42.9	Questionnaire



Parameter	Symbol	Unit	Value	Reference
Exposure Frequency	EF	Days/year	All subject:365	Questionnaire
Weight	BW	kg	All subject:66.45 Male:74.2 Female:58.9 Young adult:59.8 Adult:66.1 Middle age:69.1	Questionnaire
Average Time	AT	days	Non-Cancer: All subjects:11940 Male:12140 Female:11744 Young adult:6149 Adult:10203 Middle age:15650 Cancer:25550	Questionnaire
Slope Factor	SF	mg/kg*day	Cr: 5×10^{-1}	(9)

Table 4 summarized the cancer risk for all 405 by using mean, standard deviation, median, maximum, and minimum values. The cancer risk (CR) is $11.3 \times 10^{-6} \pm 9.5 \times 10^{-6}$ (0.2×10^{-6} - 66.6×10^{-6}) which is almost 10 times higher than the acceptable level. In other word, 12 people will be expected to develop cancer among a million Jining residents under the same level of exposure.

Table 4 Cancer Risk of all participants

Chromium	
Mean±SD	$1.13 \times 10^{-5} \pm 0.95 \times 10^{-5}$
Median	0.90×10^{-5}
Max	6.66×10^{-5}
Min	0.02×10^{-5}

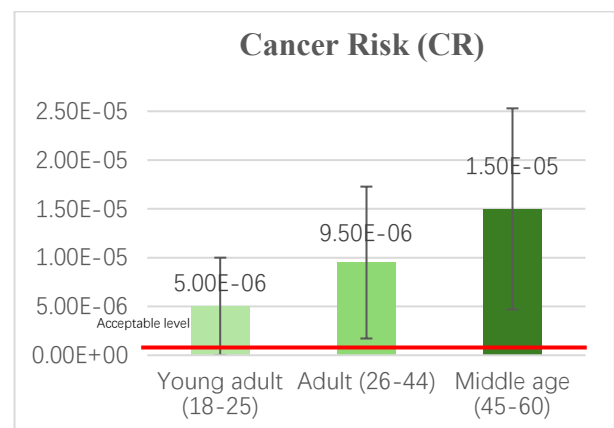
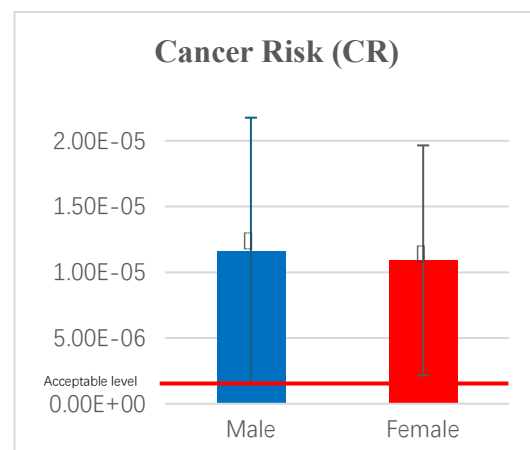


Figure 2 Comparison of Cancer Risk between groups



As is shown above, there is no much difference between Male and Female although the risk for woman is a slightly lower comparing with men. An increasing trend in cancer risk can be seen as the age rising. The average cancer risk of young adult is about $5.0E-6$, whereas the CR almost doubled to $9.5E-6$ for the Adult Group and even reached $15.0E-6$ for the Middle age group. Hence, the risk of middle-aged people are very high, since 15 people will be expected to develop cancer among one million residents.

DISCUSSION

Characteristic of the participants

The questionnaire was answered by 405 residents who lived in Jining more than 6 month. Among the participants, the number of male and female are almost the same, which is correspond with the gender proportion in Jining city (10). Although the data collection started with university students, they shared with their parents and relatives who's about 50 years old to cover all age groups. Besides, the average age of all participants is about 40 which is the same as the average age of all the residents in Shandong. The average weight for all participants is 66.45 ± 12.08 which is much lower than the average weight (75kg) of all residents in China (11). So, the risk might be higher than the general public.

The annual potatoes consumption is around 23.1 kg while the average consumption for all Chinese is 42.7kg (5). This might because the weight of the participants is lower than the average level of all Chinese and heavier people tends to consume much more food. Also, the pictures of cooked potatoes were place in the questionnaires to help them estimate the weight of the potatoes they eat per meal. So the consumption data in the questionnaire is about cooked potatoes (already peeled). However, the consumption per person in China (as shown in the bar chart above) is using the weight of the whole potato (including peel and soil on the surface), which might be higher than the real value.

Since the consumption rate in this study is only around half of the mean values in China, cancer risk might be almost doubled for all Chinese who incorporate potatoes in their diets.

Health Risk Assessment

The cancer risk of Chromium is much higher than the acceptable level which indicate there is high likelihood of developing cancer for

the local residents in Jining city. One study conducted in India indicates very high concentration of heavy metals and possibility of developing cancer since Sutlej river was contaminated by domestic and industrial wastes, and agricultural runoff (12). Other 2 studies conducted in China got similar findings. (13) (14)

CONCLUSIONS

Based on the results of the questionnaires, more than half of the respondents are female (50.6%). The average age, weight of the participants are 40.44 ± 11.94 years, and 66.45 ± 12.08 kg respectively.

The ingestion rate for the middle age group is 69.7 g/day. This increasing trend might explain why the older group has higher cancer risk than the younger one.

According to the results of risk assessment, the cancer risk is far belonged the safety standard. The mean value of the CR is 11.3×10^{-6} ($< 1 \times 10^{-6}$ are deemed as relatively safe) with slightly higher risk for male (11.6×10^{-6}) than female (10.9×10^{-6}). As the age increasing, a deeply increasing trend can be seen. The CR for young adults is 5×10^{-6} , whereas it tripled to 15×10^{-6} when it come to the middle age group. To sum up, the residents in Jining city are under risk of getting cancer due to the long-term exposure of potato products.

RECOMMENDATIONS

The local residents (especially the middle age group) should reduce the daily consumption of potato products. Limiting the consumption of potatoes might reduce the exposure to heavy metal and consequently decrease the cancer and non-cancer risk.

Besides, individuals should deeply clean the potatoes before cooking. According to the questionnaire, around 80% of the participants only use tap-water to clean. Brushing or using fruit and vegetable wash might be more effective in removing the foreign substances from the surface of potatoes.

Moreover, residents should reduce the exposure to heavy metals from other routes (dermal, inhale) as well. For example, stay away from smoke or secondhand smoke might be helpful.

The government can make some adjustment of the local policy to help residents reduce the exposure to heavy metals. For example, increasing taxes for cigarette might



reduce the number of smokers. A better monitoring system might be needed to control the concentration of contaminants do not exceed the safety standard.

Future studies might be needed to assess the carcinogenic and non-carcinogenic effects of potatoes growing in the different areas and in different seasons. Also, increase the sample size of the potatoes and choose potatoes with different size or age will also help to increase the representativeness of the samples. Longitudinal study might also be helpful to double check the findings of this study.

LIMITATIONS

The snowball sampling technique might cause Selection Bias, since initial subjects are likely to recruit others who are similar to themselves, the sample may not be representative of the entire population in China.

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SELF-EFFICACY AND SELF-CARE AGAINST HYPERTENSION RISKS AMONG MYANMAR MIGRANTS LIVING IN THAILAND

Khin Nyein Myat¹, Thunwadee Suksaroj^{1*}, Cheerawit Rattanapan¹, Orapin Laosee¹

¹ASEAN Institute for Health Development, Mahidol University, Salaya, Nakhon Pathom 73170, Thailand

*Corresponding Author: Thunwadee Suksaroj, ASEAN Institute for Health Development, Mahidol University, Salaya, Nakhon Pathom 73170 Thailand, Email: thunwadee.suk@mahidol.ac.th

ABSTRACT

Introduction: Globally, non-communicable diseases (NCDs) impact individuals, families and communities by causing debilitating illness and substantial financial burdens. Migrants are often mobile and vulnerable to both communicable diseases and NCDs. For NCDs such as hypertension, in addition to genetic factors, migrants are at high risk due to various determinants, including psychological stress, socioeconomic challengers and limited access to healthcare. Among Myanmar migrants in Thailand, approximately 27.8% reported having hypertension, and more than three-fifths (68.3%) had pre-hypertension. Consequently, there is an urgent need to promote hypertension prevention within this population. Self-efficacy, a widely applied psychosocial concept, is commonly associated with the management of chronic diseases, including hypertension. Effective chronic disease management requires individuals to engage in various self-care behaviors. These behaviors are often linked to managing hypertension and include adherence to therapeutic regimes, active participation in weight control, diet management, physical exercise and avoiding risky behaviors such as alcohol consumption and smoking.

Objectives: The aim of this study was to assess the hypertension risks among Myanmar migrants living in Thailand and to find the association with their self-efficacy and self-care practices in managing the disease.

Methodology: A cross-sectional study was conducted among Myanmar migrant communities in Samut Sakhon Province, Thailand. A total of 123 participants was selected from migrant clusters using voluntary response sampling method. Data collection was conducted through face-to-face interview using a standardized structured questionnaire along with the physical measurement of blood pressure according to standard guidelines. To assess self-efficacy, a 5-item scale of self-efficacy for managing hypertension was applied. To measure levels of self-care, a series of questionnaires with predefined responses assess preventive measures such as diet control, weight management, physical activities, and adherence to therapeutics and risky behaviors including alcohol and smoking practices. IBM SPSS version 25 was used to analyze the data. Descriptive statistics and chi-square test were used to investigate the potential associations between hypertension risks.

Results: Nearly half (46.3%) of participants had high blood pressure. Over half of the participants had good scores for self-efficacy and health literacy. However, they engaged in risky behaviors like tobacco use (34.1%) and alcohol consumption (16.3%). Chi square analysis revealed several factors significantly associated with hypertension risk with the p-value < 0.05: these are older age, lower education level, working in seafood processing, increased BMI, history of hypertension and poor management to healthy diet.

Conclusion: The findings of the high-risk group identified in our study who are in immediate need for healthcare could help the healthcare providers and community organizations to focus on prevention and management of hypertension. Early screening, regular monitoring of blood pressure, education on medication adherence and to manage healthy diet with implementation of culturally appropriate health promotion programs are recommended according to this study outcomes.

Keywords: hypertension, non-communicable diseases, self-efficacy, self-care practice

INTRODUCTION

Globally, NCDs frequently significantly impact individuals, families, and communities by causing debilitating illness and catastrophic overheads, accounting for an alarming 74% of all global deaths (1). Non-communicable diseases are prevalent in middle-class and low-income nations

with over 86% of premature NCD deaths (before age 70) occurring within their populations. Cardiovascular diseases are the leading cause among the four major NCDs, claiming 17.9 million lives each year. (2). In the South East Asian region, about one in three adults has high blood pressure (3). Hypertension, prehypertension and other



dangerously high blood pressure causes 8.5 million deaths worldwide from stroke, coronary heart disease, other vascular diseases and kidney disease (4,5).

For the last four decades, Thailand has been a major shelter for millions of migrant labors from neighboring countries in South East Asia with estimated 2.5 million as of April 2023, the latest report, comprising 75% of whom are from Myanmar (6). Hypertension, often called the silent killer, is a significant metabolic risk factor for NCDs, migrants are at high risk due to various determinants, including psychological stress, socioeconomic challengers and limited access to healthcare (7). According to a study conducted in Chiang Mai Province, Thailand, migrant workers from Myanmar had hypertension (27.8%) (8). The study of prehypertension risk for Myanmar migrants living in Surat Tharni Province was 68.3% (9). Numerous thorough studies demonstrate the critical connection between unhealthy behaviors and the formation of lifestyle disorders, highlighting the necessity for proactive lifestyle treatments (10). Self-efficacy is a person's degree of self-assurance in their ability to carry out an action successfully. Previous studies have identified self-efficacy as a key predictor of engaging in disease prevention actions as part of anticipated health benefits (11). Self-care is the ability of individuals, families, and communities to support one another in maintaining and promoting health, as well as to deal with illness and disability, with or without the assistance of a health provider, is known as self-care. This concept of self-care encompasses promoting one's own health, preventing and controlling disease and taking medication on oneself (12). In addition, because migrants may face educational, cultural, and institutional barriers that impede their ability to access health information, services, and support, it is essential to consider their health literacy when working with them (13).

Previous comparative studies described that self-care practice and management are imperative strategies for prevention, controlling disease progression, and treatment. Health literacy, self-efficacy, and social support are found to directly affect chronic disease self-management as well as for hypertension (14). Therefore, it is needed to find out preventive self-care behaviors and self-efficacy of Myanmar migrant populations for prevention and treatment of hypertension. Therefore, the aim of this study was to assess the hypertension risks among Myanmar migrants living in Thailand and to find the association with

their self-efficacy and self-care practices in managing the disease.

METHODOLOGY

Study design and sampling procedure

The study design was cross-sectional and Mueang Samut Sakhon district was purposively selected for its dense population of Myanmar migrants. With a provincial GDP ranking among the top five in Thailand, Samut Sakhon is well-known for having one of the biggest seafood industries (15) and there is a large aquatic animal trading market, including the Thai Sea Market, the Central Shrimp Market, and the Leela Market (16). Then, three Myanmar migrants' communities are selected by simple random sampling among total 31, these are Talaat Kung, Thai Union and Talay Thai which were informal names of migrant clusters with almost 100 per cent of Myanmar migrants. We contacted to the community leaders of these communities and participants were gathered by voluntary with the inclusion criteria of age 18 to 50 years, both healthy and known hypertensive individuals, who are willing to participate and living in Samut Sakhon province regardless of duration. People who were not available at the time of interview day were excluded. The age range 18 to 50 years was selected to best represent the working-age population, physical and cognitive function at their highest productivity and to recognize the early onset of hypertension.

The sample size of this study was calculated by using the Cochran's formula with infinite population and the required sample size was 418. According to a study conducted in Chiang Mai Province, Thailand, the prevalence of hypertension of migrant workers from Myanmar is 27.8% (8) with $P = \text{Population proportion}$ assumed to be 0.28. However, only 29% of the data collection was completed on 27th and 28th of June 2024 with 123 samples.

Study outcomes of field blood pressure measurement

Blood pressure of the participants was measured by using properly validated, maintained and regularly calibrated automated BP measuring device which is included in the list of British and Irish Hypertension Society's website (17). Blood pressure measurement procedure was prepared by using instructions of 2018 ESC/ESH Guidelines for the management of arterial hypertension. Three measurements were taken with 1 min apart to avoid white coat hypertension. The average of the last 2 measurements was calculated. If BP of first reading



is $< 130/85$ mmHg no further measurement was required (18, 19). Hypertension risks with blood pressure levels (BP) were categorized into four groups: 1. Normal BP; Systolic blood pressure (SBP) < 130 mmHg and diastolic blood pressure (DBP) < 85 mmHg, 2. High normal BP; SBP $130/139$ mmHg and/ or DBP $85/89$ mmHg, 3. Grade 1 Hypertension; SBP $140/159$ mmHg and/or DBP $90/99$ mmHg and 4. Grade 2 Hypertension; SBP ≥ 160 mmHg and/or ≥ 100 mmHg (14). Then, Hypertension risk were dichotomous scale as Yes (high risk with SBP ≥ 130 mmHg and/or DBP ≥ 85 mmHg) and No (low risk with SBP < 135 mmHg and/or DBP < 85 mmHg).

Data collection tools and techniques

A structured questionnaire was developed according to research objectives, literature review, previous out-of-pocket theoretical framework of Social Cognitive theory to measure the variables containing nine parts including blood pressure measurement: (1) Socio demographic factors such as age, sex, marital status, ethnicity, place of residence, comorbidity and self-reported body weight and height to calculate Body Mass Index since 88% equivalent in BMI classification with self-reported and direct measurement found in Australian study (20), (2) Socio economic factors such as education level, occupation and monthly income, (3) Present health status such as having diagnosed of hypertension, duration of the disease, comorbidity of other diseases and self-rated health status of the respondents, (4) Preventive self-care behaviors for Hypertension, (5) Health literacy for Hypertension, (6) Self-efficacy to prevent and manage Hypertension, (7) Social support and (8) Accessibility to health care services such as the distance of available health care facility from the place of residence, availability of health care personnel, having health insurance or can handle the out of pocket expenditure, how the respondents get hypertension information from, then, along with (9) the physical measurement of the blood pressure.

For assessing hypertension self-care behaviors, Hypertension Self-Care Activity Level Effect (H-SCALE) scale questionnaire developed by Warren-Findlow was adapted and assesses all aspects of self-care for hypertension. The six subscales were: medication adherence only for the known hypertensive individuals as therapeutic self-care and weight management, exercise, exposure to smoking, alcohol intake, healthy eating plan as preventive self-care (21). The Self-efficacy to manage Hypertension Scale, created in 2012 by Warren-Fidlow and associates, was used to gauge

self-efficacy to prevent and manage hypertension (22). Health literacy for hypertension among Myanmar migrants was measured by The Health Literacy Questionnaire (HLQ) adapted with hypertension information, originally created by Osborne et al. in Australia. It has nine domains that are intended to gauge an individual's experiences in comprehending, obtaining, and utilizing health services and information (23). Social support was measured by Social Support Scale (SSS) questionnaire which Peeters et al. originally developed (24). For the classification of Body Mass Index, Asia-Pacific body mass index was used (25).

Content validity was checked by expertise from ASEAN Institute for Health Development and the questionnaire was revised accordingly. The questionnaire was translated to Myanmar language and was certified by expertise in the related field. Pre-test was done to 30 Myanmar migrant workers who were not the participants of this study but with the same characteristics. Then, the questionnaire was adjusted accordingly. Cronbach's alpha coefficient was 0.84 for health literacy, 0.79 for self-efficacy, 0.69 for diet, 0.70 for weight management and 0.89 for social support scale. Two data collectors (graduated from Medical university) from the public health field were trained via zoom for one day for both questionnaire practice and blood pressure measurement to be standardized.

Data analysis

Data was collected by paper-based face to face interview and entered to epi data software then transported to SPSS software. Data was analyzed by using SPSS version 25, to run descriptive statistics; the median, range, and quartile were used to present continuous variables (age and income). Frequencies and percentages were used to present categorical variables (other independent variables). Then for inferential statistics, Pearson's Chi-squared test was analyzed to assess the association between categorical variables.

A statistical significance level (alpha) of 0.05 and a 95% confidence interval (CI) were used for data analyses. The Kolmogorov–Smirnov test was used to test the normality of the distribution of continuous variables (age and household monthly income), which were found to be non-normally distributed.

Ethical Consideration

This study was approved by Mahidol University Central Institutional Review Board (MU-CIRB) with the reference number COA 2024-209.1405. All the participants were ensured to be



volunteers and informed written consent was obtained from every participant before participation. The confidentiality of the participants was taken as the priority, and the identity was not revealed by name or in other ways. Only identification numbers were used.

RESULTS

Socio-Demographic Characteristics of the Study Participants

The distribution of sociodemographic

characteristics of Myanmar migrants living in Samut Sakhon Province, Thailand was shown in Table 1. The highest proportion (39.0%) of the 123 Myanmar migrants were under the age of 30, with an average age of 34.11 years. More than half of the participants were female (68.3%), most of them were married (60.2%). About one third of participants (30.1%) attained secondary school level of education and 23.6% of them reached the bachelor and above level. Their average monthly income was around 10,000 Thai Baht.

Table 1 Sociodemographic characteristics of Myanmar migrants living in Samut Sakhon Province, Thailand (n=123)

Characteristics	Number	Percent (%)
Age (completed years)		
18-30	48	39.0
31-40	40	32.5
41-50	35	28.5
Mean (±SD)	34.11 ±8.21	
Median (Min:Max)	33 (18:50)	
Sex		
Male	39	31.7
Female	84	68.3
Marital status		
Single	40	32.5
Married/ living with a partner	74	60.2
Separated/divorced/Widowed	9	7.3
Widowed	3	2.4
Highest education level		
Never went to school	7	5.7
Primary school	28	22.8
Secondary or Middle school	37	30.1
High school	22	17.9
University level or above	29	23.6
Types of occupation		
Seafood processing	57	46.3
Factory worker	21	17.1
General worker	10	8.1
Unemployed/ Dependent	10	8.1
Self-employed	5	4.1
Others	20	16.3
Household family income		
Low income	50	40.7
High income	73	59.3
Mean (± SD)	10302.44 ±412.065	
Median (Min:Max)	10000 (0:30000)	



Characteristics	Number	Percent (%)
Ethnic groups		
Burmese	77	62.6
Karen	10	8.1
Mon	27	22.0
Others	9	7.3
History of Hypertension		
Yes	33	26.8
No	90	73.2
Family history of hypertension		
Yes	56	45.5
No	59	48.0
Do not know	8	6.5
Other comorbid diseases		
Hypercholesterolemia	1	0.8
Renal disease	2	1.6
Heart disease	3	2.4
Diabetes	6	4.9
Others	14	11.4
Self-rated health status		
Excellent	13	10.6
Good	54	43.9
Fair	47	38.2
Poor	8	6.5
Very poor	1	0.8

Accessibility to healthcare characteristics of Myanmar migrants in Samut Sakhon

Table 2 showed healthcare accessibility condition of the participants. Two thirds (65.0%) of

the participants did not have health insurance. Most of the participants had never attended the health event especially for hypertension and they tended to get information from healthcare providers

Table 2 Healthcare accessibility characteristics of Myanmar migrants in Samut Sakhon (n=123)

Health insurance	Number	Percent (%)
Yes	43	35.0
No	80	65.0
Source of hypertension information		
Healthcare provider	47	38.2
Internet/ websites	36	29.3
Social medias	14	11.4
family members	26	21.1
Ever attended a hypertension information sharing event		
Yes	23	18.7
No	100	81.3
Social support		
Poor social support	13	10.6
Good social support	110	89.4



Blood pressure measurement of Myanmar migrants in Samut Sakhon

The results of blood pressure of participants were described in Table 3. The participants who had high blood pressure $\geq 130/85$

mmHg was 46.3%. 11.4% of the respondents had risk for grade 2 hypertension because their blood pressure was $SBP \geq 160$ mmHg and/or ≥ 100 mmHg.

Table 3 Blood pressure measurement of Myanmar migrants in Samut Sakhon (n=123)

Hypertension risk ($\geq 130/85$ means high risk)	Number	Percent (%)
Low HT risk	66	53.7
High HT risk	57	46.3
Blood pressure levels by category		
G1Hypertension	18	14.6
G2Hypertension	14	11.4
Normal	66	53.7
Upper normal	25	20.3

Table 4 Personal factors of Myanmar migrants in Samut Sakhon (n=123)

Self-efficacy to prevent and manage hypertension scores	Number	Percent (%)
Respondents with poor Self-efficacy	60	48.8
Respondents with good Self-efficacy	63	51.2
Health literacy for Hypertension scores		
Respondents who gets poor HL scores	58	47.2
Respondents who gets good HL scores	65	52.8
HSCALE self-care activity scores		
Diet management		
Poor diet	65	52.8
Good diet	58	47.2
Engaging to physical activity		
Inactive	28	22.8
Active	95	77.2
Smoking behavior		
No tobacco exposure	81	65.9
Tobacco exposure	42	34.1
Behavior for Alcohol		
Abstinence	103	83.7
Drinker	20	16.3
Engaging to weight management		
Poor Weight management	55	44.7
Good Weight management	68	55.3



Association of personal factors, self-efficacy, self-care behaviors and health literacy and risk of hypertension

Table 5 shows the factors associated with high risk of hypertension and the personal factor scores among our study participants (n=123) using Pearson’s Chi-squared test. There were statistically significant associations

between age (p=0.003), education level (p=0.001), occupation (p<0.001), BMI (p<0.001), history of hypertension (p<0.001) and healthy diet (p=0.002) and risk of hypertension. On the other hand, no significant association was found between other factors and risk of hypertension.

Table 5 Factors associated with Hypertension risks among Myanmar migrants in Samut Sakhon

Factors	Number	Low risk for HT	High risk for HT	p-value	COR	95% CI	P-value
Age				0.003*			
18-30	48	35 (72.9%)	13 (27.1%)		Ref		
31-40	40	17 (40 %)	23 (60 %)		3.643	1.491-8.901	0.005
41-50	35	14 (53.7%)	21 (46.3%)		4.038	1.595-10.223	0.003
Sex				1.000			
Male	39	21 (53.8 %)	18 (46.2 %)				
Female	84	45 (53.6 %)	39 (46.4 %)				
Marital status				0.120			
Living alone	49	31 (63.3 %)	18 (36.7 %)				
Married	74	35 (47.3 %)	39 (34.3 %)				
Education level				0.001*			
Lower than High school	72	29 (40.3 %)	43 (59.7 %)		3.919	1.806-8.503	0.001
Higher education	51	37 (72.5 %)	14 (27.5 %)		Ref		
Occupation				<0.001*			
Seafood processing	57	19 (33.3 %)	38 (66.7 %)		4.947	2.299-10.646	<0.001
Factory workers and other jobs	66	47 (35.4 %)	19 (28.8 %)		Ref		
BMI				<0.001*			
Not overweight under 22.9	55	37 (67.3 %)	18 (32.7 %)		Ref		
Overweight	26	17 (65.4 %)	9 (34.6 %)		1.088	0.406-2.914	0.866
Obese	42	12 (28.6 %)	30 (71.4%)		5.139	2.142-12.326	<0.001
Past history of hypertension				<0.001*			
Yes	33	8 (24.2 %)	25 (75.8 %)		5.664	2.290-14.010	<0.001
No	90	58 (64.4 %)	32 (35.6 %)		Ref		
Household family income				0.625			
<10000	50	25 (50 %)	25 (50 %)				
>10000	73	41 (56.2 %)	32 (43.8 %)				
Healthy diet				0.002*			
Poor diet	65	26 (40 %)	39 (60 %)		3.333	1.582-7.025	0.002
Good diet	58	40 (69 %)	18 (31 %)		Ref		



Factors	Number	Low risk for HT	High risk for HT	p-value	COR	95% CI	P-value
Engaging to physical activity				0.525			
Inactive	28	17 (60.7 %)	11 (39.3 %)				
Active	95	49 (51.6 %)	46 (48.4 %)				
Doing weight management				0.145			
Poor wt mx	55	25 (45.5 %)	30 (54.5 %)				
Good wt mx	68	41 (60.3 %)	27 (39.7 %)				
Self-efficacy to prevent and manage hypertension				0.540			
Poor SE score	60	30 (50 %)	30 (50 %)				
Good SE score	63	36 (57.1 %)	27 (42.9)				
Health Literacy				0.190			
Poor HL	58	27 (46.6 %)	31 (53.4 %)				
Good HL	65	39 (60 %)	26 (40 %)				

***p-value by Pearson chisquare test**

DISCUSSION

In this study, the prevalence of hypertension risk or high blood pressure is 46.3% for the participants age 18-50 years, female and male has almost the same prevalence. The percentage of high BP is lower than the previous Northeastern migrant study (63.3%) with participant age of 18-59 years (26), likely due to differences in blood pressure cutoff points. According to the chi-square analysis, age, education level, types of occupation, body mass index, history of hypertension and poor management to healthy diet were significantly associated with the increased blood pressure. For the age factor, older age > 30 years and above is high risk for increased BP which is similar to the previous migrant study in Surat Thani Province (8). Respondents who aged 31 to 40 years had found to be high risk for hypertension than other age groups in this study, since this age group had been mostly affected by unhealthy diet and stress due to migration, family and financial responsibility, demanding jobs and physical inactivity.

Overweight and obese migrants had high blood pressure in this study. A household base cross-sectional study in Yangon, Myanmar also reported that overweight was significantly associated with hypertension risks (27). More than half of the increased BP cases answered that they had no history of hypertension or experienced high blood pressure. However, in the Sri Lanka study, majority of respondents with high blood pressure had no previous history (28). People who were working in seafood processing were found to have high blood

pressure because there were more older adults, who had to work tiresome jobs with usual work hour shifts. Respondents who were obese and with poor engagement to healthy diet had found to be high risk for hypertension, which matched the risk factors for hypertension (18).

Contrary to expectations, health literacy and self-efficacy are not significantly associated with increased BP in this study. This is similar to the study conducted with the atherosclerotic patients with no association to self-efficacy (29). However, health literacy is associated with hypertension in North Iran study (30).

Despite decent self-efficacy and some aspects of self-care behaviors, such as diet management, the high prevalence of increased blood pressure there is a potential gap between their knowledge, attitude and their practice. Because they still engaged in risky behaviors such as tobacco exposure and alcohol consumption. Therefore, health promotion about hypertension prevention as well as for management is indicated.

Strengths and Limitations of the Study

This preliminary survey included only 123 participants of the migrant communities and could not represent the migrant population living in Samut Sakhon. Although the results from Chi-square test can show the possible association of independent variables with the high blood pressure, However, the findings of the high-risk group who are in immediate need for healthcare especially for prevention and management of hypertension would be the strength of this study.



CONCLUSIONS AND RECOMMENDATIONS

Based on data resulted, the recommendations for these Myanmar migrant communities could be made to reduce the high burden of hypertension, the health consequences and other metabolic risk factors for NCDs. Culturally appropriate health promotion strategies and sharing sessions that prioritize prevention and management of hypertension should be implemented. Healthy life style behaviors such as balanced diet (reduce sodium intake, increase fruits and vegetables, limit unhealthy fats and portion control), weight management, smoking cessation and avoiding alcohol use should be promoted. High risk groups for targeted intervention are older participants especially who are 30 years and above, those with lower than high school education and who are working in sea food processing area with past history of hypertension. Early screening, regular monitoring of blood pressure and education on adherence to medication should be done as immediate measure by collaboration with health care providers and community organizations residing around these communities. By addressing these issues, we can empower Myanmar migrants to better manage their health and reduce the burden of hypertension in this population.

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EXPLORING PREVENTIVE BEHAVIOR RELATED TO TUBERCULOSIS AMONG MYANMAR MIGRANTS IN SAMUT SAKHON PROVINCE OF THAILAND

Htet Arkar¹, Cheerawit Rattanapan^{1*}, Thunwadee Suksaroj¹, Orapin Laosee¹

¹ASEAN Institute for Health Development, Mahidol University, Salaya, Nakhon Pathom, 73170 Thailand

*Corresponding Author: Cheerawit Rattanapan, ASEAN Institute for Health Development, Mahidol University, Salaya, Nakhon Pathom, 73170 Thailand, Email: cheerawit.rat@mahidol.edu

ABSTRACT

Introduction: Tuberculosis (TB), second leading cause of death following COVID-19, remains a significant global health concern. These concerns are more significant among migrant populations with crowded living conditions, exacerbating TB case rates surpassing over fourfold compared to the national average in Thailand. Notable research gap and scarcity remain regarding direct investigation of TB preventive behaviors, which is of significance in TB research among at-risk migrant communities.

Objectives: The current study aims to explore the preventive behaviors related to reducing the spread of TB and its associating factors among Myanmar migrants in Samut Sakhon Province of Thailand.

Methodology: A cross-sectional study was conducted in June 2024 among Myanmar migrants aligning with the selection criteria. Data was collected through a volunteer response sampling approach in three randomly selected Myanmar communities in Samut Sakhon Province using paper-based self-administered questionnaire with the help of trained research assistants.

Results: A total of 149 completed responses from Myanmar migrants were included in the preliminary analysis. The median age of the respondents was 35, ranging from 18 to 59 years old, 66% were female respondents, and 58.4% had secondary school or lower education level. More than three-quarters (81.9%) of the respondents were currently employed. 55.7% of Myanmar migrants were found to have good TB preventive behaviors. Pearson's Chi-squared test revealed statistically significant associations between individual average monthly income, having health insurance, and previous TB contact history and TB preventive behaviors with p-value of 0.027, 0.025 and 0.007 respectively.

Conclusion: Although TB preventive behaviors among migrants are found to be at high levels, active promotion of culturally tailored TB awareness campaigns with focused interventions to maintain good TB preventive behaviors are recommended to be continually implemented by healthcare institutions and relevant agencies, together with the efforts made by the Myanmar migrant communities.

Keywords: Tuberculosis, Myanmar Migrants, TB Preventive Behavior, Thailand

INTRODUCTION

TB has long since been an ongoing major public health threat being addressed by many countries across the world, especially in developing countries, facing with multitude of challenges. In the recent years, TB has been the second leading cause of death from infectious diseases following coronavirus disease (Covid-19) (1). Despite TB being preventable and treatable with appropriate anti-TB medications, over 10 million people has been falling ill with TB disease every year. In 2022, there has been 1.3 million TB-related mortality worldwide (1). Although progress is being made in reducing cases and deaths, global efforts are crucial to ultimately conquer this ancient yet persistent disease. In 2021, the TB incidence in Thailand

was reported as 155 cases per 100,000 population. While Thailand has transitioned out of the list of high Multi-Drug Resistant MDR-TB countries, it is still included in the list of high-burden countries for TB, and HIV-associated TB, according to the new World Health Organization (WHO) global list of high burden countries for 2021-2025, release in June 2021 (2).

Thailand's rapid economic development in the recent decades has resulted in increased demand for labor, drawing in substantial number of migrant workers, from nearby regions and bordering countries (3). As of February 2024, about 3.6 million documented non-Thai migrants are currently living in Thailand, as well as a significant number of undocumented migrants



residing as well (4,5). Myanmar migrants represent the largest migrant group within the country, largely employed in low-wage sectors like construction, seafood processing. They often face challenges in accessing quality healthcare (sometimes including timely diagnosis and treatment for TB), such as knowledge gaps resulting from language barriers, pre-existing legal and social barriers in access to health insurance, discriminatory policies related to nationality or documentation status. These factors play a role in contributing towards under-diagnosis and delayed treatment of TB, resulting in further transmission within the community and posing a public health risk (6).

The increasing number of migrants who came into Thailand for employment opportunities has also resulted in crowded living conditions and workspaces. These conditions are known to be facilitators to the spread of infectious diseases, particularly TB with more than four-fold increase in TB incidence rates compared to the national average of Thailand, posing a significant public health concern (7). Massive influx of migrants, particularly refugees from countries with weak infrastructure afflicted by political instability, is likely to result in the rise in TB incidence, placing workers in at-risk environments, posing a threat to TB elimination in achieving the goal of ending global TB epidemics by 2030 according to target 3 of global Sustainable Development Goals (SDG) (8, 9).

The disproportionate burden of TB among Myanmar migrants is particularly evident in Samut Sakhon Province, a major industrial hub in the central region of Thailand with highest density of migrant workforce, which was also previous epicenter of the COVID-19 respiratory pandemic disease outbreak in Thailand among migrant populations (10). Studies reveal a prevalence of TB two to five times higher among Myanmar migrants compared to local Thai people (11). This alarming disparity underscores the urgent need to understand the specific preventive behaviors related to TB within migrant populations, which serves as the root cause that serves to indicate and strongly influence the number of TB cases and impact within these communities. This focused approach is vital for reducing TB transmission and ensuring proper TB prevention and control within both migrant communities and the wider population they interact with. The current study aims to explore the preventive behaviors related

to reducing the spread of TB and its associating factors among Myanmar migrants in Samut Sakhon Province of Thailand.

METHODOLOGY

Study design and population

This study applied cross-sectional survey to explore the preventive behaviors related to reducing the spread of TB infection among Myanmar migrants working in Thailand in June 2024. Three Myanmar communities out of a thirty-two total within Samut Sakhon Province was randomly selected and voluntary response sampling of the participants was done to achieve the required sample size of 149 for preliminary analysis of the study. The participants were chosen based on the following criteria: Myanmar migrants aged 18 years and above, living and working within the region for more than six months. Those who met the selection criteria and willing to participate were recruited into the study. For filtering out ineligible candidates, people who migrated temporarily for reasons other than work, such as study, tourism, medical care, or training, those unavailable at the time of study or incapable of participating were excluded.

Research instrument

The research instrument applied featured a structured self-administered questionnaire adopted from previous studies as well as standard questionnaire set from WHO (12-14). The revised questionnaire was then reviewed by two experts from the faculty and a senior research scientist working at Research Institute of Tuberculosis. The validated questionnaire was then backward translated into Myanmar language and then rechecked by TB expert proficient in local language for consistency of the items. Pilot testing for reliability assessment of the questionnaire was then conducted with 30 Myanmar migrants working in Bang Len District of Nakhon Pathom Province. Cronbach's alpha coefficient yielded an acceptable value of 0.71 for the included items for TB preventive behaviors during pilot testing.

Data collection

Data collection was done after getting approval from Central Institutional Review Board of Mahidol University and obtaining permission from relevant local authorities and community leaders at the data collection sites.



Structured self-administered questionnaire was distributed among eligible participants to collect data for the study and participants were able to answer independently.

Data analysis

Data collected through the survey questionnaires were then checked for data cleaning and then coded in EpiData before importing into IBM SPSS Statistics Version 29 for further analysis. Descriptive statistics was used to represent the distribution of findings for sociodemographic characteristics (age, sex, marital status, highest education level, current employment status, monthly income, presence of health insurance), previous TB history, TB contact history, TB-related knowledge level, and exploring the preventive behaviors related to TB among the Myanmar migrants.

For inferential statistics, Chi-square test (or Fisher’s exact test where applicable) was used to identify the potential associations between each independent variables and preventive behaviors related to TB according to the research objectives. A p-value of less than 0.05 was considered statistically significant for the association. Cut-off points for the level of knowledge related to TB and behaviors related to preventing the spread of TB were identified with the median values and the variables were categorized into two groups.

Ethical Consideration

Ethical approval was obtained from Mahidol University Central Institutional Review Board (MU-CIRB) with approval number MU-CIRB 2024/200.1305. The participant information sheets regarding the research were distributed to the participants and explained in detail before obtaining consent for the

participation. All the information collected were anonymized, coded, analyzed, and archived for data confidentiality considerations and protecting the rights of the participants.

RESULTS

General characteristics of the respondents

A total of 149 completed responses were recorded for preliminary data analysis after completing the data cleaning process. Table 1 shows the distribution of the outcome (overall preventive behavior related to TB) and the independent variables included in the study. Findings indicated that 66% of the respondents among the group were female migrants. Kolmogorov–Smirnov normality test displayed non-normal distributions of age ($p = 0.013$) and average monthly income ($p < 0.001$). Thus, grouping for age and average monthly income was categorized into two: (18-34 years and 35 and above) and ($< 8,500$ Thai Baht, and $\geq 8,500$ Thai Baht) respectively, based on the median values.

The majority of the respondents 78 (52.3%) were aged 35 and above, and 58.4% of the respondents had highest education level of secondary school level or lower. More than three-quarters (81.9%) of the respondents were currently employed in various working categories such as seafood processing work, general laborers, factory workers, and other working categories. Close to half (49.7%) of the respondents had an average monthly income of less than 8,500 Thai Baht. 112 (75.2%) of the respondents reported not having any form of health insurance. Regarding previous TB history and TB contact history, about 7.4% reported to have had TB previously and 41.6% reported that they had someone close to them who had contracted TB previously.

Table 1. General characteristics of the respondents (Number = 149)

Variables	Number	Percent (%)
Overall TB Preventive Behavior		
Poor Practice	66	44.3
Good Practice	83	55.7
(mean = 16.59 ± 3.466, median = 17, min – max = 7 – 20)		
Sex of respondents		
Male	50	33.6
Female	99	66.4
Age group		
18 – 34 years	71	47.7
35 and above	78	52.3
(mean = 35.53 ± 9.82, median = 35, min – max = 18 – 59)		
Highest Education Level		
Secondary School level or lower	87	58.4



Variables	Number	Percent (%)
High School level and above	65	41.6
Current Employment Status		
Unemployed / Dependent	27	18.1
Employed	122	81.9
Average Monthly Income		
< 8,500 Thai Baht	74	49.7
≥ 8,500 Thai Baht	75	50.3
(median = 8,500, min – max = 0 –25,000THB)		
Health Insurance		
No health insurance	112	75.2
Have health insurance	37	24.8
TB History		
No	138	92.6
Yes	11	7.4
Previous TB Contact		
No	87	58.4
Yes	62	41.6
Level of overall TB Knowledge		
Poor	69	46.3
Good	80	53.7

Table 2 describes the factors associated with preventive behavior related to reducing the spread of TB among the respondents using Pearson’s Chi-squared test. There were statistically significant associations between average monthly income ($p = 0.027$), presence of

health insurance ($p = 0.025$) and previous TB contact history ($p = 0.007$) with TB preventive behaviors. On the contrary, no significant association was found between TB preventive behavior and other independent variables according to the study findings.

Table 2 Comparison of TB preventive behavior and associating factors

Variables	Number of respondents	TB Preventive Behavior N (%)		χ^2	P-value
		Poor	Good		
Sex of respondents				3.495	0.062
Male	50	28 (56.0)	22 (44.0)		
Female	99	38 (28.4)	61 (61.6)		
Age group				0.949	0.330
18 – 34 years	71	28 (39.4)	43 (60.6)		
35 and above	78	38 (48.7)	40 (51.3)		
Highest Education Level				0.000	0.990
Secondary School or lower	87	38 (43.7)	49 (56.3)		
High School and above	62	28 (45.2)	34 (54.8)		
Current Employment Status				0.435	0.510
Unemployed / Dependent	27	14 (51.9)	13 (48.1)		
Employed	122	52 (42.6)	70 (57.4)		
Average Monthly Income				4.916	0.027
< 8,500 Thai Baht	74	40 (54.1)	34 (45.9)		
≥ 8,500 Thai Baht	75	26 (34.7)	49 (65.3)		
Health Insurance				5.054	0.025
No health insurance	112	56 (50.0)	56 (50.0)		
Have health insurance	37	10 (27.0)	27 (73.0)		
TB History					0.412*
No	138	62 (44.9)	76 (55.1)		
Yes	11	4 (36.4)	7 (63.6)		
Previous TB Contact				7.231	0.007
No	87	30 (34.5)	57 (65.5)		
Yes	62	36 (58.1)	26 (41.9)		
Level of Overall TB Knowledge				0.096	0.757



Variables	Number of respondents	TB Preventive Behavior N (%)		χ^2	p-value
		Poor	Good		
Poor	69	32 (46.4)	37 (53.6)		
Good	80	34 (42.5)	46 (57.5)		

*Fisher's exact test

DISCUSSION

Findings from the current study indicated that most of the respondents were female (66.4%), of working age group ranging from 18 to 59 with the highest education level of secondary school or lower (58.4%). Previous study regarding health risk behaviors in Samut Sakhon Province among Myanmar migrant workers of similar characteristics also found that the majority of the participants were female, aged between 18 and 29 years, and had low level of education (15).

Total score for overall TB preventive behavior was high among the migrants with the average value of 16.59 ± 0.28 . Findings coincide with previous studies conducted among Myanmar migrant workers within Bangkok metropolitan regions (16).

Average monthly income, presence of health insurance and previous TB contact history are found to have association with preventive behaviors related to reducing the spread of TB disease. People with higher income level ($\geq 8,500$ Thai Baht) were more likely to have good TB preventive behaviors. This could be explained by having sufficient capacity to practice such behaviors. Our findings support previous research related to TB prevention conducted in Myanmar (17). Similar to that study, it was found that higher income was associated with better practices, emphasizing the need for targeted interventions for low-income migrants, potentially through subsidized healthcare or targeted education related to TB.

Secondly, having any form of health insurance among the migrants was strongly associated with better TB preventive behaviors, potentially owing to increased access to healthcare and information. Those with health insurance reported that they are more likely to get medical checkups or visit health facility when they see themselves as having risk of TB. This aligns with studies in other populations related to TB prevention (17). This underscores the importance of advocating for policies that improve health insurance coverage and affordability for these vulnerable populations.

Additionally, migrants with previous TB contact were more likely to report good preventive behaviors. The finding that previous TB contact increases preventive behavior is consistent with the concept of 'lived experience' as a motivator for health action (20).

While preceding studies indicated that previous TB History and good TB-related knowledge levels are positively associated with good TB preventive behaviors, there were no statistically significant associations in the current study (21). However, data suggests a possible trend these people might have better preventive practices. This could potentially be explored further in future studies with larger sample sizes.

CONCLUSIONS

Over half of Myanmar migrants were found to have good TB preventive behaviors. Significant associations between TB preventive behaviors and individual average monthly income, having health insurance, and previous TB contact history were identified.

RECOMMENDATIONS

Exploring behaviors that Myanmar migrants engage in to related to preventing TB can help get a better understanding of the progress of TB control currently being implemented as well as identifying knowledge gaps. Although TB preventive behaviors among migrants are found to have high levels, active promotion of culturally tailored TB awareness campaigns structured in local Burmese dialects will be essential, as well as targeting specific groups like low-income migrants, those without health insurance and people having previous TB contact history by healthcare institutions and relevant agencies focusing on migrant health and TB elimination activities. These will contribute towards increased TB-related knowledge, addressing key areas, and improving the belief on the benefits of practicing preventive behavior among the Myanmar migrant communities with the end result of protecting the health of these



migrants and reducing the overall burden of TB in Thailand.

LIMITATIONS

Limitations in causal inference can be noted as this study is a cross-sectional study. Due to the nature of representative study sample, findings can only reflect other Myanmar migrant communities of similar characteristics working and living in Thailand and may not be extrapolated to populations with different context.

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ASSOCIATIONS OF CONTRACEPTIVE USE WITH SEXUAL AND REPRODUCTIVE HEALTH LITERACY AND SOCIO-PSYCHOLOGICAL FACTORS AMONG MYANMAR MIGRANT WOMEN IN SAMUT SAKHON PROVINCE, THAILAND

Aung Myint Myat¹, Cheerawit Rattanapan¹, Orapin Laosee¹, Piyapong Janmaimool^{1*}

¹ASEAN Institute for Health Development, Mahidol University, Salaya, Nakhon Pathom, 73170, Thailand

*Corresponding Author: Piyapong Janmaimool, ASEAN Institute for Health Development, Mahidol University, Salaya, Nakhon Pathom, 73170, Thailand E-mail: piyapong.jan@mahidol.ac.th

ABSTRACT

Introduction: Contraceptive use is essential to the sexual and reproductive health and rights of women. Using types of modern contraceptives consistently and correctly has many benefits in reducing the risk of unintended pregnancy. In Myanmar, the unintended pregnancy prevalence rate was still high between 2015-19 (35% of all pregnancies). Additionally, migrant women were less likely to utilize modern contraceptives than their non-migrant counterparts. Therefore, it is important to address Sexual and Reproductive Health Literacy (SRHL) and socio-psychological factors (socio-demographics, intention, knowledge, and attitude) regarding modern contraceptive use among Myanmar migrant women.

Objectives: This study aimed to examine the associations of modern contraceptive use with SRHL and socio-psychological factors among Myanmar migrant women in Samut Sakhon Province, Thailand.

Methodology: A cross-sectional study was conducted among Myanmar migrant women in Samut Sakhon Province, Thailand. 150 respondents aged 18-35 years were selected from two migrant communities using voluntary response sampling. Data collection was performed in June 2024 using a self-administered questionnaire developed from the Theory of Planned Behavior (TPB), Sorensen's health literacy concept, and other relevant studies. The collected data was inspected and analyzed using descriptive and Chi-square tests at a 5% level of significance.

Conclusion: The result showed that higher intention and good SRHL-accessibility to SRH knowledge and information were significantly associated with modern contraceptive use. Moreover, education level, positive attitude, and high social norms were significantly associated with intention to use contraceptives. Tailored migrant SRHR programs should be prioritized to increase modern contraceptive use and to promote SRHL and intention among Myanmar migrant women in Samut Sakhon Province, Thailand.

Keywords: Modern Contraceptive Use, Sexual and Reproductive Health Literacy, Myanmar Migrant Women, Unintended Pregnancy, Thailand.

INTRODUCTION

Contraceptive information, services, and use are important for all individuals (1). Contraceptives, especially modern methods, are known to have many benefits to individuals and are associated with reducing the risks of unintended pregnancy (1). Worldwide, only 65% of reproductive-aged women use any contraceptive method and among them, only 58.7% use modern methods in 2022 (2). In Myanmar, 31.6% of reproductive-aged women used any contraceptive and only 31.1% used modern methods while 51.3 % of women who were married or in union used modern methods according to DHS Myanmar (3). Regarding the unintended pregnancy prevalence in Myanmar between 2015-19, an estimated 35% of all

pregnancies were unintended and 74% of them ended in abortion (4).

The impact of migrations has significantly occurred on migrants' sexual health practices with different sexual practices and beliefs in each country (5). Regarding the impact of migration on contraceptive use, a study found that migrants have unequal access to modern contraceptives (6). A systematic review showed that undocumented migrant women and female refugees are at increased risk of unintended pregnancies (7).

Sexual and Reproductive Health Literacy (SRHL) is important for all woman considering postponing their sexual debut, making informed choices regarding their partners, and enhancing their ability to protect



themselves during sexual activity (8). Some studies showed that lower levels of SRHL led to higher rates of unplanned pregnancies, and sexually transmitted infections (STIs) among migrants compared to non-migrant counterparts (9, 10).

According to the Theory of Planned Behavior (TPB), not only what people approve of, but also whether they practice a behavior, can have an impact on an individual's intention and practice of such behavior (11). Moreover, a study in Ghana showed that a positive attitude toward contraceptives was associated with using contraceptives (12). Besides, the level of knowledge regarding modern contraceptives was also associated with intention and contraceptive use (13,6-8).

Recent studies showed the unmet needs of family planning methods barriers to accessing contraceptive use, and available sources of family planning information among Myanmar migrant and refugee women (14,15). It is important to promote modern contraceptive use among Myanmar migrant women in Thailand to prevent unintended pregnancy. Therefore, this study evaluated the associations of modern contraceptive use with SRHL and socio-psychological factors such as socio-demographics, knowledge, attitude, social norms, and intention among Myanmar migrant women in Samut Sakhon Province, Thailand.

METHODOLOGY

A cross-sectional study was conducted using a self-administered questionnaire among Myanmar migrant women aged 18-35 living in selected subdistricts of Samut Sakhon Province, Thailand.

Participants

Myanmar migrant women were included regardless of their marital status, aged 18-35 years currently residing in the province regardless of their registration status. The study excluded those women who were currently pregnant or had poor maternal conditions and could not fully communicate to answer the questionnaire during the study period.

Sample size and sampling method

The sample size was calculated based on Cochran's formula using the following parameters: the expected proportion of Myanmar migrant women of reproductive age who use modern contraceptives = 0.5 (based on DHS

Myanmar during 2015-2016) (3) and the confidence level at 95%, and the margin of error at 5%. Accordingly, the result showed the appropriate sample size of 385 participants. However, this study is a preliminary study that aims to examine the possible association of modern contraceptive use with SRHL and socio-psychological factors. Thus, the sample size of 150 Myanmar migrant women aged 18-35 years was determined.

As Samut Sakhon Province is a highly dense area of Myanmar migrant population, Mueang Samut Sakhon District is proposedly selected at the district level. At the sub-subdistrict level, two communities were randomly selected. Since migrant women are either undocumented or documented, it was not possible to obtain all the necessary information about the population of migrants in those areas, the participants were recruited voluntarily. Female research assistants were trained. Upon identification of the eligible participants, the informed consent was administered to the respondents.

Research instrument

The conceptual framework was based on TPB which explained an individual's engagement with a specific health behavior through an individual's intention to perform such behavior (11). Regarding SRHL, the concept was based on Sorensen's general health literacy which explains an individual's health literacy with four dimensions: Access, Understand, Appraise, and Apply (16).

Eighteen SRHL questionnaire items were developed from the SHL-PPA questionnaire set with a 5-point Likert scale which was based on Sorensen's general health literacy (17) and Cronbach's alpha value was 0.93. Nine contraceptive knowledge items asking "Yes, No or Don't know" were developed from previous studies (14) and Cronbach's alpha value was 0.79. There were six items regarding attitude towards contraceptives which used the 5-point Likert scale (18) and Cronbach's alpha value stated 0.72. For social norms, there were five items with the 5-point Likert scale (19, 20) showing Cronbach's alpha value at 0.77.

In this study, the intention variable was defined as both a dependent variable and one of the independent variables that might be associated with modern contraceptive use. For this study, the focus was directed towards not only intention but also consistent and correct use



to identify the level of intention to use. The intention contained 2 items that used the 5-point Likert scale, '1 (highly impossible) to 5 (highly possible)' based on relevant literature (21-23). For the first item, options 1 and 2 were categorized as 'No' and options 3, 4, and 5 as 'Yes'. Those who answered 'Yes' proceeded to the next item to assess consistent and correct use.

The final responses were then converted into a binary form: 'No' from the first item and options 1 and 2 from the second item were coded as 'low intention,' while options 3, 4, and 5 from the second item were coded as 'high intention'. Regarding contraceptive use, items were developed from the previous studies as shown in Figure 1 (14, 24).

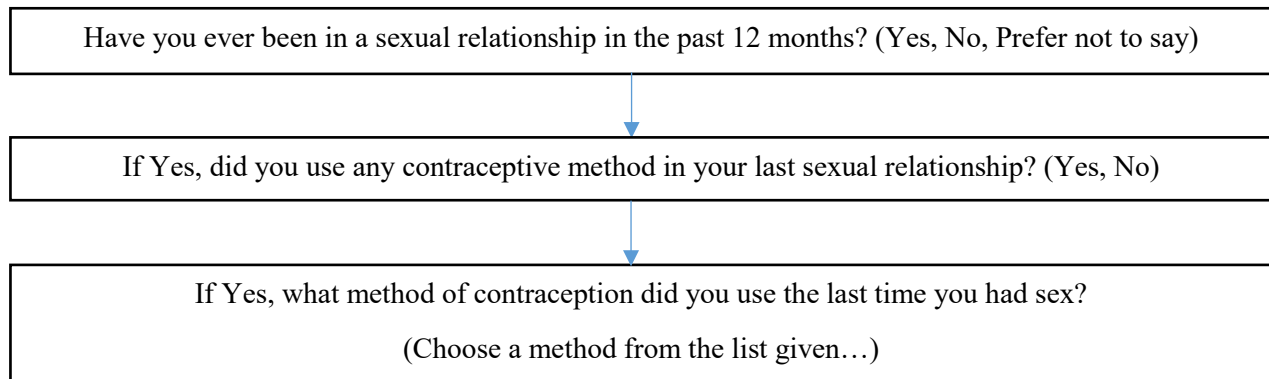


Figure 1 Contraceptive use questionnaire item

After the questionnaire was developed from relevant literature, it was validated for IOC with three experts and overall results were within 0.67-1.00. The informed consent form was also created, and pretesting was done with 30 participants.

Data collection procedure

Data was collected after approval by the Mahidol Central Institutional Review Board, Mahidol University (Code: MU-CIRB 2024/208.1405, No.78.0130/1537) in June 2024. The research asked for permission to collect data from community leaders. Then, the questionnaire was distributed to the respondents by the research assistants and recorded on paper.

Data analysis

The completed questionnaire was analyzed using IBM SPSS version 25. Regarding SRHL, the scores in each domain and overall score were categorized into high and low according to previous study (17). In analyzing the other variables that used the 5-point Likert scale such as intention, attitude, and social norms, they were calculated using the median cut-off points based on the previous study (23). Knowledge score was categorized into two groups, high and low according to the median value (14). This study used a chi-square test to identify the associations between the

independent variables and modern contraceptive use and intention to use. The variables with a p-value of $< .05$ were considered statistically significant.

Ethical Consideration

The Ethical Committee of the Mahidol University Central Institutional Review Board (MU-CIRB) has approved the study (COA No. 2024/208.1405). Participation in this study was voluntary, solely with confidentiality for the respondents with an informed consent form.

RESULTS

Table 1 shows the respondents' socio-demographic characteristics. Among 150 respondents, there was nearly even distribution between two age groups, 18-29 years (49.3%) and 30-35 years (50.7%), the median age was 30 years. 63.3% of the respondents completed middle school and lower education levels. Regarding their marital status, more than 60% of them were married. Nearly all respondents were currently employed (92.0%) and half of them earned a monthly income of more than or equal to 10,000 THB (52.0%).

The levels of each variable (knowledge, attitude, and social norms towards contraceptive use and SRHL) were recategorized subsequently in Chi-square test (Table 2). According to Table



2, more than half of respondents had good knowledge about contraceptive methods (56.0%), with positive attitudes (52.0%) and high social norms (52%) regarding contraceptives. The overall SRHL level was

maintained equally among respondents. Two-thirds of the respondents showed high intention to use any contraceptive method with moderately to high consistency and correctness during sexual relationships in the future (71.3%).

Table 1 Socio-demographic characteristics of respondents (n= 150)

Variables	Categories	Number	Percent (%)
Age	18-29	74	49.3
	30-35	76	50.7
<i>(Median= 30, Min= 18, Max= 35)</i>			
Education status	Middle school and lower education	95	63.3
	High school education and above	55	36.7
Marital status	Single or non-union	57	38.0
	Married or in-union	93	62.0
Employment status	Unemployed	12	8.0
	Employed	138	92.0
Monthly Income	<10,000 THB	72	48.0
	≥10,000 THB	78	52.0
<i>(Median= 9,428, Min= 0, Max= 20,000)</i>			

Table 2 Number and percentage distribution of knowledge, attitude, social norms, intention, and SRHL level among respondents (n=150)

Variables	Number	Percent (%)	
Knowledge	Poor (<11)	66	44.0
	Good (≥11)	84	56.0
<i>(Median= 11, Min= 0, Max=18)</i>			
Attitude	Negative (<23)	72	48.0
	Positive (≥23)	78	52.0
Social Norms	Low (<17)	72	48.0
	High (≥17)	78	52.0
<i>(Median=17, Min=5, Max=25)</i>			
Intention to use contraceptives	Low	43	28.7
	High	107	71.3
SRHL_access	Poor (<19)	67	44.7
	Good (≥19)	83	55.3



Variables	Number	Percent (%)
<i>(Median=19, Min= 5, Max=25)</i>		
SRHL_understand		
Poor (<14)	56	37.3
Good (≥14)	94	62.7
<i>(Median=14, Min=4, Max=20)</i>		
SRHL_appraise		
Poor (<15)	75	50.0
Good (≥15)	75	50.0
<i>(Median=15, Min= 5, Max=25)</i>		
SRHL_apply		
Poor (<14)	68	45.3
Good (≥14)	82	54.7
<i>(Median= 14, Min=4, Max= 20)</i>		
SRHL Overall		
Poor (<63)	75	50.0
Good (≥63)	75	50.0
<i>(Median= 63.5, Min=18, Max= 90)</i>		

The Chi-square test was first performed to examine factors associated with the intention to use contraceptives according to the theory applied. The results indicated that education, attitude, social norms, overall SRHL, and three dimensions were identified as significant factors associated with the intention to use contraceptives (< .05) while no associations were found between age, income, knowledge, and intention to use (Table 3).

77 out of 93 participants who were married or in union reported their sexual experiences in the last 12 months and 16 participants were not living with their partners despite their marital status in the last 12 months. Subsequently, the Chi-square test was employed

to identify significant factors associated with modern contraceptive use. The results showed that SRHL- the ability to access SRH knowledge and information and intention to use contraceptives were significantly associated with modern contraceptive use (< .05) (Table 4). 80% of respondents with higher intentions practiced modern contraceptives while only 35.3% of those with low intentions used modern contraceptives (p= .001). Moreover, 80.9% of respondents with good accessibility to SRH knowledge and information utilized modern contraceptives while only 53.3% of those with poor accessibility used modern contraceptives (p= .020).

Table 3 Associations between independent variables and intention to use contraceptives

Variable	Number of respondents (n)	Intention to use contraceptives		P-value*
		Low intention n (%)	High intention n (%)	
Total	150	43 (28.7)	107 (71.3)	
Age				0.089
18-29 years	74	16 (21.6)	58 (78.4)	
30-35 years	76	27 (35.5)	49 (64.5)	
Education status				0.019
Middle school and lower	95	34 (35.8)	61 (64.2)	
High school and above	55	9 (16.4)	46 (83.6)	



Variable	Number of respondents (n)	Intention to use contraceptives		P-value*
		Low intention n (%)	High intention n (%)	
Monthly Income				0.054
Low (<10,000 THB)	72	26 (36.1)	46 (63.9)	
High (≥ 10,000 THB)	78	17 (21.8)	61 (78.2)	
Knowledge				0.139
Low (<11)	66	23 (34.8)	43 (65.2)	
High (≥ 11)	84	20 (23.8)	64 (76.2)	
Attitude				0.003
Negative (<23)	72	29 (40.3)	43 (59.7)	
Positive (≥ 23)	78	14 (17.9)	64 (82.1)	
Social Norms				0.003
Low (<17)	72	29 (40.3)	43 (59.7)	
High (≥ 17)	78	14 (17.9)	64 (82.1)	
SRHL-Access				<0.001
Poor (<19)	67	30 (44.8)	37 (55.2)	
Good (≥ 19)	83	13 (15.7)	70 (84.3)	
SRHL-Understand				.066
Poor (<14)	56	21 (37.5)	35 (62.5)	
Good (≥ 14)	94	22 (23.4)	72 (76.6)	
SRHL-Appraise				0.048
Poor (<15)	75	27 (36.0)	48 (64.0)	
Good (≥ 15)	75	16 (21.3)	59 (78.7)	
SRHL-Apply				0.002
Poor (<14)	68	28 (41.2)	40 (58.8)	
Good (≥ 14)	82	15 (18.3)	67 (81.7)	
SRHL-Overall				0.004
Poor (<63.5)	75	30 (40.0)	45 (60.0)	
Good (≥ 63.5)	75	13 (17.3)	62 (82.7)	

* p-value by Chi-square Test

Table 4 Associations between independent variables and contraceptive use (n= 77)

Variable	Number of respondents (n)	Contraceptive Use		P-value*
		Not use n (%)	Use n (%)	
Total	77	23 (29.9)	54(70.1)	
Age				0.298
18-29 years	32	7 (21.9%)	25 (78.1)	
30-35years	45	16 (35.6%)	29 (64.4)	
Education status				1.000
Middle school and lower	53	16 (30.2%)	37 (69.8)	
High school and above	24	7 (29.2%)	17 (70.8)	
Monthly Income				0.117



Variable	Number of respondents (n)	Contraceptive Use		P-value*
		Not use n (%)	Use n (%)	
Low (<10,000 THB)	38	15 (39.5%)	23 (60.5)	0.732
High (≥ 10,000 THB)	39	8 (20.5%)	31 (79.5)	
Knowledge				0.709
Low (<11)	23	8 (34.8%)	15 (65.2)	
High (≥ 11)	54	15 (27.8%)	39 (72.2)	0.195
Attitude				
Negative (<23)	36	12 (33.3%)	24 (66.7)	0.001
Positive (≥ 23)	41	11 (26.8%)	30 (73.2)	
Social Norms				0.020
Low (<17)	30	12 (40.0%)	18 (60.0)	
High (≥ 17)	47	11 (23.4%)	36 (76.6)	0.986
Intention				
Low	17	11 (64.7%)	6 (35.3)	0.094
High	60	12 (20.0%)	48 (80.0)	
SRHL-Access				0.820
Poor (<19)	30	14 (46.7%)	16 (53.3)	
Good (≥ 19)	47	9 (19.1%)	38 (80.9)	0.137
SRHL-Understand				
Poor (<14)	25	8 (32.0%)	17 (68.0)	0.094
Good (≥ 14)	52	15 (28.8%)	37 (36.5)	
SRHL-Appraise				0.820
Poor (<15)	34	14 (41.2%)	20 (58.8)	
Good (≥ 15)	43	9 (20.9%)	34 (79.1)	0.820
SRHL-Apply				
Poor (<14)	27	9 (33.3%)	18 (66.7)	0.820
Good (≥ 14)	50	14 (28.0%)	36 (72.0)	
SRHL-Overall				0.137
Poor (<14)	32	13 (40.6%)	19 (59.4)	
Good (≥ 14)	45	10 (22.2%)	35 (77.8)	

* P-value by Chi-square Test

DISCUSSION

The study is an attempt to explore the associations of modern contraceptive use with other factors among Myanmar migrant women aged 18-35 years in Samut Sakhon Province, Thailand. The initial results showed that two-thirds of those women who had sexual experiences in the last 12 months reported modern contraceptives. This finding was consistent with the previous study among migrant and non-migrant women in Kenya (25).

The higher intention was significantly associated with modern contraceptive use among Myanmar migrant women and this finding aligns with the theory (TPB) applied to the study and

literature (26). However, this finding was inconsistent with the survey results among fecund sexually active women in developing countries, especially in Asia region (27). The study also explained that educational attainment was positively associated with women's intention to use contraceptives which was consistent with the previous studies in developing countries (27, 28).

The study findings also showed that positive attitudes towards contraceptives and high social norms were more likely to be higher intention to use contraceptives. The study in Ghana explained that positive attitudes and social influences from peers and family members



could enhance women's intention and subsequent use of contraceptives (29, 30).

Several dimensions of SRHL were significantly associated with contraceptive use intention and subsequent modern contraceptive use. This is relevant to other literature reviews and studies (16, 31, 32). Better SRHL access significantly increased contraceptive use among Myanmar migrant women. Better access to sexual and reproductive health information and services was associated with increased contraceptive use and this finding was consistent with previous studies (33, 34).

CONCLUSIONS

The study findings highlight the importance of individuals' intention to use modern contraceptives. Education attainment and positive attitudes towards modern contraceptive use can enhance their intention. Influences from family and friends play a crucial role in their intention to use. Moreover, this study explores the fact that enhancing SRHL can empower women to make informed decisions about their reproductive health, ultimately reducing the risk of unintended pregnancies among Myanmar migrant women.

RECOMMENDATIONS

Intention and SRHL are associated factors for appropriate behavioral change toward modern contraceptive use. To enhance the intention level, strategies to increase educational opportunities, and promote positive attitudes and high social norms should be implemented through community programs for migrant women. SRHL should be promoted to increase their intention and practice of modern contraceptives. Nevertheless, tailored SRHR programs for migrant women should be promoted to increase modern contraceptive usage among Myanmar migrant women in Samut Sakhon Province, Thailand.

STUDY LIMITATIONS

Concerning the diversity of the migrant population in Thailand, results could partly provide evidence for Myanmar migrant women regarding modern contraceptive use but were less able to be generalized for all migrant women in Thailand. Sampling bias could be involved when social desirability occurs with hesitancy to answer sexual experiences among respondents. Moreover, it needs further research from various

residing places with a large sample size to cover Myanmar migrant women's situation.

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ORAL HEALTH CARE SERVICE UTILIZATION AMONG PREGNANT WOMEN ATTENDING ANTENATAL CARE CLINICS IN PUBLIC HOSPITALS OF THAILAND

Pachareeyaphat Nakwaree¹, Anchalee Prasansuklab^{1*}

¹College of Public Health Sciences, Chulalongkorn University, Bangkok 10330, Thailand

*Corresponding Author: Anchalee Prasansuklab, College of Public Health Sciences, Chulalongkorn University, Bangkok 10330, Thailand, E-mail: anchalee.pr@chula.ac.th

ABSTRACT

Introduction: Maintaining good oral health during pregnancy is essential not only for the mother but also for the child. Studies have shown that poor maternal oral health is associated with early childhood caries and adverse pregnancy outcomes. Since 2020, Thailand has launched policy for Thai pregnant women with quality Antenatal Care (ANC) to provide essential services that pregnant women should receive during pregnancy including oral health care. Although no analysis study for this policy has been officially conducted, the rate of using oral health service during pregnancy is still not achieved as expected.

Objectives: This study aimed to examine the utilization rate of oral health care services among pregnant women who received ANC service in Thai public hospitals and explore its associated factors

Methodology: A cross-sectional study was conducted at 11 public hospitals under the Office of the Permanent Secretary, Ministry of Public Health in Lopburi province during April to May 2024. Using a proportional stratified random sampling, total 224 Thai pregnant women who received ANC in those hospitals were selected and interviewed with a constructed questionnaire. The data were analyzed by descriptive statistics and logistic regression. The level of statistical significance was set at 0.05.

Results: The majority of respondents were < 25 years old (57.1%), graduated from secondary school or vocational certificate (78.6%), lived in urban area (51.8%), had personal income ≤ 12,650 THB/month, and not in the first-time pregnancy (51.8%). The results showed that only 59.4% of pregnant women utilized oral health care service, indicating low utilization rate. Pregnant women who received oral examination with or without teeth cleaning and polishing represent 58.5% and 27.7% of all respondents, respectively. In the analysis of associated factors, we found that having education level on secondary school and vocational certificate (AOR = 3.445) and bachelor's degrees or higher (AOR = 4.549), completing all quality ANC services (AOR = 21.452), and knowing the right to receive maternal oral health service during accessing ANC (AOR = 2.648) were significantly associated with oral health care service utilization.

Conclusion: The study revealed that utilization of oral health care service in Thai public hospitals remains below the government's target level (40 % for oral examination plus teeth cleaning and polishing and 70% for oral examination), highlighting the importance of promoting and improving this service in Thailand. The study also identified associated factors (e.g., higher education level, complete ANC service, and knowing the right to receive during ANC) which may further help in achieving appropriate utilization of oral health service as well as the development of maternal oral health care policy for pregnant women.

Keywords: Maternal Oral Health, Quality Antenatal Care, Service Utilization, Public Hospital, Thailand

INTRODUCTION

During pregnancy, research findings indicate that maternal periodontal disease is linked to preterm delivery, low birth weight, and the transmission of cavity-causing bacteria to their newborns at birth (1, 2) compared to pregnant women who have no periodontitis. (3,

4) Additionally, the study of pregnant women with periodontitis is associated with preterm labor and low birth weight. (5).

Therefore, pregnant women should be able to receive oral health services safely in every trimester of pregnancy (6). However, the most appropriate period is during the second



trimester, specifically around gestational age 4 - 6 months. In Thailand, all pregnant women are covered by public health insurance that has been made to offer oral health promotion services for pregnant women, which include oral examination and teeth cleaning and polishing, aiming to improve their overall quality of life during pregnancy (7).

However, the data from the Health Data Center (HDC) of the Ministry of Public Health (MOPH) showed a low utilization rate for ANC oral health services. It was found that access to services remained below the MOPH, Thailand target. It was found that access to services remained below the Ministry of Public Health (MOPH), Thailand target at 70% of oral examination and 40% of oral health examination, and teeth cleaning and polishing. Specifically, pregnant women received oral examination from the fiscal year 2020 to 2023 at 58.97%, 54.33%, 53.36%, and 58.31% respectively and oral health examination, and teeth cleaning and polishing from the fiscal year 2020 to 2023 at 17.83, 15.52, 16.96%, and 25.50% respectively. In the Public Health Region 4th, consisting of Nonthaburi, Pathum Thani, Ayutthaya, Nakhon Nayok, Saraburi, Lopburi, Singburi, and Ang Thong, the rate of oral health service use by pregnant women according to the antenatal care benefit package is the lowest of the 12 public health regions. In 2020 - 2023, there was oral health examination, and teeth cleaning and polishing services utilization: 6.48%, 7.30, 17.40%, respectively. From that information, public health region 4th is therefore an area that should be studied and in the HDC, MOPH, Thailand it was found that Lopburi Province is the province with the highest rate of antenatal care utilization among the 8 provinces of Public Health Region 4th. Therefore, it can be a representative for finding factors in the utilization of oral health services by pregnant women. According to the guidelines for quality ANC, it is recommended to receive dental care during the second trimester of pregnancy. Pregnancy in the third trimester is a period where it is anticipated to receive oral health care, to be informed about what necessary oral health services throughout pregnancy or have already received advice on oral health care. Therefore, this target group has been selected for research studies.

From Jean-Frederic Levesque's study, 2013 on patient-centered access to health care:

conceptualizing access at the interface of health systems and populations, it was found that several factors are associated with patient access to healthcare. These factors include the patients demand and health care provider supply, which refer to knowledge, literacy, beliefs, and the oral health care system within the ANC unit of hospitals (8). As a result, this concept has been applied to study association of oral health care utilization for pregnant women. This study aimed to examine the factors influencing pregnant women's utilization of antenatal oral health services of public hospitals under the Office of the permanent secretary at Lopburi province. The findings will serve as valuable information for both hospital and national-level policy development, with the goal of enhancing access to quality oral health care services for pregnant women.

METHODOLOGY

Target population and setting

The study was conducted from April to June 2024, using a cross-sectional design. The study focused on public hospitals under the Office of the Permanent Secretary, MOPH at Lopburi province, Thailand. There are 11 hospitals, namely King Narai, Baan Mi hospital, Khok Samrong, Chai Badan, Phatthana Nikhom, Khok Charoen, Tha Wung, Tha Luang, Lamsonthi, Nong Muang, and Srabot. The selected participants including Thai nationality who pregnant in the third trimester (7-9 months of pregnancy or 27 - 40 weeks of pregnancy), had ANC data at the hospital where the data is collected, and can understand Thai language.

Sample size estimate and Sample Technique

The sample size was calculated, based on the number of women who receive antenatal care, accumulated within the fiscal year 2023 from 43 data file, HDC, MOPH Thailand in their respective areas of Lopburi province is 3,184 people, using a Danial formula (9). As a result, the study required approximately 194 participants, with an additional 15% (30 people) who refused to participate in this research. Therefore, the total sample size was determined to be 224 participants. A multistage proportionated stratified random sampling was used to obtain and then compare the proportions of pregnant women of all hospitals list for selection proportional to the size of pregnant



women in each hospital and selected the participants by convenience sampling until complete.

Measurement Tools and Data Collection method

The questionnaire conducted by the researcher in Thai language and reviewed and checked for appropriateness from five Thai specialists with an acceptable IOC score. After passing validity from specialists, the questionnaires were utilized in a sample group with characteristics like the study group of 30 individuals to assess the internal consistency of the questions for calculating Cronbach's Alpha Coefficient to determine internal consistency, the results were 0.7.

The questionnaire utilized in this study include 2 parts as following: socio-demographic characteristics included age, education level, marital status, main occupation, side job, monthly income, living status, oral health problem, dental services history, congenital disease, and health insurance, and ANC history (current pregnancy) included the number of current pregnancies, timing of first ANC attendance, gestational age, ANC appointment, receiving complete services according to the criteria for quality antenatal care, number of ANC visit, and oral health care utilization.

Ethical Consideration

This study was approved from The Research Ethics Review Committee for Research Involving Human Research Subjects, Health Science Group1, Chulalongkorn University, Thailand. (COA No. 099/67). The data were collected by the researcher and assistants with permission from the chief of Lopburi Provincial Public Health Office and

the directors of the hospitals for permission to collect data in the hospitals.

Data analysis

The analysis was performed using SPSS software version 28. Descriptive statistics were used to analyze socio-demographic information and ANC history which included frequency, percentage, mean, and standard deviation. For bivariate analysis of independent categorical variables, both simple and multiple logistic regression were performed to determine the factors influencing oral health care services utilization. A p-value < 0.05 were considered statistically significant for all tests.

RESULTS

Socio-demographic characteristics

All of 224 respondents responded to the questionnaire have been analyzed in table 1. The age of pregnant women are in the age less than or equal to 25 years old comprises the largest proportion at 57.1 %, the mean of age is 25.3, the lowest age is 14 years, and the highest is 44 years old. The majority of respondents graduated secondary school or higher 87.1 % and have lived with husband or spouse or partner 91.5 %. Most of occupations of the respondents are the housewife/ unemployed, 31.3 %, monthly income of pregnant women, 41.5 %, were less than or equal to 12,650 baht. Most of respondents are living in an urban area 51.8 %. More than half of the respondents, 68.3 %, did not have oral health problems before pregnancy and were receiving dental services before pregnancy at 68.3 %. In terms of the health problem or congenital diseases of participants, 87.9% had no congenital diseases. Among the respondents who were known to have rights in terms of medical care, accounted for 63.5 % of Universal Coverage scheme (USC) or 30-baht card.

Table 1 Percentage of pregnant women by Socio-demographic characteristics (n = 224)

Characteristics	Number	Percent (%)
Age (years)		
Less than or equal to 25	128	57.1
More than 25	96	42.9
Mean = 25.3, SD = 6.2, Min = 14, Max = 44		
Education level		
Uneducated and primary School	29	12.9
Secondary school or higher	195	87.1



Characteristics	Number	Percent (%)
<i>Marital status</i>		
No husband/Living alone	19	8.5
Living with husband/spouse/partner	205	91.5
<i>Occupation</i>		
Housewife/Unemployed	70	31.3
Freelance/Farmer/Gardener	50	22.2
Company employee/Government officer/State enterprise	66	29.5
Personal business/Merchant	38	17.0
<i>Monthly income</i>		
No income	92	41.1
≤12,650 THB	93	41.5
>12,650 THB	39	17.4
Mean = 6,999.7, Min = 0, Max = 50,000		
<i>Residential area</i>		
Living in an urban area	116	51.8
Living in the countryside	108	48.2
<i>Oral health problem before pregnant</i>		
No	153	68.3
Yes	71	31.7
<i>Receiving dental services before pregnant</i>		
No	143	63.8
Yes	81	36.2
<i>Health Problem or congenital diseases</i>		
No	197	87.9
Yes	27	12.1
<i>Health insurance in term of medical care</i>		
Universal Coverage scheme (USC) or 30 THB Card	142	63.5
Social Security Scheme (SSS)	76	33.9
Rights of government or state enterprise officer (OFC)	5	2.2
Welfare of the company or employer	1	0.4

Antenatal Care history

According to the table below found that half of respondents, specifically 51.8%, the current number of pregnancies were more than the first pregnancy. For the first antenatal care, most of the respondents reported receiving antenatal care before or equal to 24 weeks accounting for 93.8 %. Additionally, 96.9 % of

the participants attended ANC clinics appointment. Regarding received quality ANC services, 92.9 % of respondents completed ANC services. When analyzing the perception of the right to receive oral health services during pregnancy, the results found that 42.4 % of respondents have known before receiving antenatal care service.

Table 2 Percentage of pregnant women by ANC history (n=224)

Characteristics	Number	Percent (%)
<i>The current number of pregnancies</i>		
First pregnancy	108	48.2
More than the first pregnancy	116	51.8



Characteristics	Number	Percent (%)
<i>Time of receiving first ANC in current pregnancy</i>		
Before or equal to 24 weeks of pregnancy	210	93.8
After 24 weeks of pregnancy	14	6.2
<i>Attended every ANC clinic appointment</i>		
No	7	3.1
Yes	217	96.9
<i>Received complete quality ANC services</i>		
Not Complete	16	7.1
Complete	208	92.9
<i>Perception of the health insurance to receive oral health services during pregnancy</i>		
Never known before	45	20.1
Know before receiving antenatal care service	95	42.4
Know during receiving antenatal care service	84	37.5

Oral health care utilization

In terms of oral health care utilization in table 3, 59.4 % of the respondents used the oral health care services. According to the study found, 58.8% received oral health examinations, oral health examination and other services, 12.9 % received only oral

examination while 27.7 % received both oral health examinations and teeth cleaning and polishing. These figures are still below the target values. The reason for not utilizing oral health care service during pregnancy was that 37.4% of the respondents were in the process of waiting in queue for an appointment.

Table 3 Percentage of oral health service utilization

Characteristics	Number	Percent (%)
<i>Oral health care services utilization (n =224)</i>		
No	91	40.6
Yes	133	59.4
<i>Receiving oral examination service (n=224)</i>		
Received an oral health examination or oral health examination and other services	131	58.5
Received other services, not received an oral health examination	2	0.9
Not received any services	91	40.6
<i>Receiving oral health examination, and teeth cleaning and polishing (n=224)</i>		
Received an oral health examination, teeth cleaning and polishing or received oral health examination, teeth cleaning and polishing with other services	62	27.7
Received other services	71	31.7
Not received any services	91	40.6
<i>The reason for not utilization of oral health care service during pregnant (n=91)</i>		
Never known the right to receive dental service	19	20.8
In the process of waiting in queue for an appointment	34	37.4
Afraid of dental services/ feel not safety and had no oral health problem	7	7.7
Not convenient to receive the service	10	11.0
Receiving the oral health service in private clinic	10	11.0
Receiving ANC services in the third trimester	11	12.1



Simple Logistic Regression Analysis

Simple logistic regression of the following variables was applied to determine the association between socio-demographic characteristics, ANC history, ability to access to oral health care with oral health care utilization. All variables were considered for inclusion in the multivariable analysis model with p-value of less than 0.2.

The socio-demographic characteristics were statistically significant in simple logistic regression: education level, marital status, oral health problem before pregnancy, and have received dental services before pregnancy. Regarding education level, participants graduated secondary school or higher [OR 4.678, 95% CI (1.973 - 11.136), p < 0.001] were 4.678 times more likely to oral health care utilization during pregnancy. The marital status has found that the pregnant women who were living with husband/spouse or partner [OR 2.734, 95% CI (1.033 – 7.239), p = 0.043] were

2.734 times more likely to oral health care utilization during pregnancy.

Additionally, for the ANC history, the time of first utilized ANC services before or equal to 24 weeks of pregnancy [OR 3.981, 95% CI (1.208 - 13.118), p = 0.023] were 3.981 times more likely to oral health care utilization during pregnancy. Receiving complete quality ANC services was also found the pregnant women who were received complete ANC services follow by the ANC guideline [OR 26.053, 95% CI (3.375 - 201.128), p = 0.002] were 3.981 times more likely to oral health care utilization during pregnancy. And perception of the right to receive oral health services during pregnancy found that the participants who knew the insurance before receiving ANC services [OR 3.758, 95% CI (1.775 - 7.955), p < 0.001] and the participants who knew the right during receiving ANC services [OR 4.000, 95% CI (1.856 - 8.622), p < 0.001] were more likely to oral health care utilization during pregnancy.

Table 4 Simple logistic regression of factors associated with oral health care utilization (n=224)

Characteristics	Oral health care utilization (n=224)		Crude OR	95% CI		P-value
	No N (%)	Yes N (%)		Lower	Upper	
<i>Socio-demographic characteristics</i>						
<i>Age</i>						
More than 25	40(41.7)	56(58.3)	(ref)			
Less than 25	51(39.8)	77(60.2)	1.078	0.629	1.848	0.783
<i>Education Level</i>						
Uneducated or primary school	21(72.4)	8(27.6)	(ref)			
Secondary school or higher	70(35.9)	125(64.1)	4.687	1.973	11.136	<0.001*
<i>Marital Status</i>						
No husband/living alone	12(63.2)	7(36.8)	(ref)			
Living with husband/ spouse/ partner	79(38.5)	126(61.5)	2.734	1.033	7.239	0.043*
<i>Occupation</i>						
Housewife/ Unemployed	28(40.0)	42(60.0)	(ref)			
Freelance/ Farmer/Gardener	20(40.0)	30(60.0)	1.000	0.477	2.098	1.000
Company employee /government officer/ state enterprise	30(45.5)	36(54.5)	0.800	0.405	1.580	0.521



Characteristics	Oral health care utilization (n=224)		Crude OR	95% CI		P-value
	No N (%)	Yes N (%)		Lower	Upper	
Personal business/ Merchant	13(34.2)	25(65.8)	1.282	0.563	2.921	0.554
<i>Monthly income</i>						
No income	42(45.7)	50(54.3)	(ref)			
≤12,650 THB	34(36.6)	59(63.4)	1.458	0.809	2.626	0.210
>12,650 THB	15(38.5)	24(61.5)	1.344	0.626	2.887	0.448
<i>Residential area</i>						
Living in the countryside	44(40.7)	64 (59.3)	(ref)			
Living in an urban area	47(40.5)	69 (59.5)	1.009	0.592	1.721	0.973
<i>Oral health problem before pregnancy</i>						
No	67(43.8)	86(56.2)	(ref)			
Yes	24(33.8)	47(66.2)	1.526	0.849	2.742	0.158
<i>Have received dental services before pregnancy</i>						
No	64(44.8)	79(55.2)	(ref)			
Yes	27(33.3)	54(66.7)	1.620	0.919	2.858	0.096
<i>ANC history</i>						
<i>The current number of pregnancies</i>						
First pregnancy	46(39.7)	70(60.3)	(ref)			
More than the first pregnancy	45(41.7)	63(58.3)	0.920	0.540	1.569	0.759
<i>Time of receiving first ANC in current pregnancy</i>						
After 24 weeks	10(71.4)	4(28.6)	(ref)			
Before or equal to 24 weeks	81(38.6)	129(61.4)	3.981	1.208	13.118	0.023*
<i>Attended every ANC clinic appointment</i>						
No	4(57.1)	3(42.9)	(ref)			
Yes	87(40.1)	130(59.9)	1.992	0.435	9.122	0.375
<i>Received complete quality ANC services</i>						
Not Complete	15(93.8)	1(6.2)	(ref)			
Complete	76(36.5)	132(63.5)	26.053	3.375	201.128	0.002*
<i>Perception of the health insurance to receive oral health services during pregnancy</i>						
Never known	30(66.7)	15(33.3)	(ref)			
Know before receiving ANC service	33(34.7)	62(65.3)	3.758	1.775	7.955	<0.001*
Know during receiving ANC service	28(33.3)	56(66.7)	4.000	1.856	8.622	<0.001*

* Statistically significant p-value < 0.05

**Multiple Logistic Regression Analysis**

The variables with a p-value of less than or equal to 0.2 were selected to consider for inclusion in multiple logistic regression model. For education level, secondary school or higher education [AOR 2.952, 95% CI (1.104 – 7.895), $p = 0.031$] where 3 times had a significant association with oral health care utilization, compared to the respondents who uneducated or graduated primary school. According to the analysis, after controlling for other variables in the model with a significant at $p - \text{value} < 0.05$, the association was found that the participants who were received complete quality ANC services [AOR 16.694,

95% CI (1.991 - 139.981), $p = 0.009$] are about 17 times more likely to oral health care utilization during pregnancy than the participants who were not received complete quality ANC services, with a 95% confidence level. In terms of the perception of the right to receive oral health services during pregnancy found that the respondents have known the insurance during receiving ANC services [AOR 2.978, 95% CI (1.197 - 7.409), $p = 0.019$] were 3 times more likely to oral health care utilization during pregnancy compared to the respondents who have not known the right, with a 95% confidence level.

Table 5 Multiple Logistic Regression of factors associated with oral health care utilization

Characteristics	Oral health care utilization (n=224)		AOR	95 % CI		P-value
	No	Yes		Lower	Upper	
	n (%)	n (%)				
<i>Socio-demographic characteristics</i>						
<i>Education Level</i>						
Uneducated and primary School	21(72.4)	8(27.6)	Ref			
Secondary school or higher	70(35.9)	125(64.1)	3.737	1.391	10.037	0.009*
<i>Marital Status</i>						
No husband/living alone	12(63.2)	7(36.8)	ref			
Living with husband/ spouse/ partner	79(38.5)	126(61.5)	1.928	0.618	6.021	0.258
<i>Oral health problem before pregnancy</i>						
No	67(43.8)	86(56.2)	ref			
Yes	24(33.8)	47(66.2)	1.230	0.604	2.504	0.569
<i>Have received dental services before pregnancy</i>						
No	64(44.8)	79(55.2)	ref			
Yes	27(33.3)	54(66.7)	1.400	0.705	2.781	0.336
<i>ANC history</i>						
<i>Time of receiving first ANC in current pregnancy</i>						
After 24 weeks	10(71.4)	4(28.6)	ref			
Before or equal to 24 weeks	81(38.6)	129(61.4)	2.540	0.633	10.192	0.188
<i>Received complete quality ANC services</i>						
Not Complete	15(93.8)	1(6.2)	ref			
Complete	76(36.5)	132(63.5)	22.174	2.566	191.597	0.005*
<i>Perception of the right to receive oral health services during pregnancy</i>						
Never known	30(66.7)	15(33.3)	ref			
Know before receiving ANC services	33(34.7)	62(65.3)	1.955	0.804	4.755	0.139
Know during receiving ANC services	28(33.3)	56(66.7)	2.694	1.092	6.645	0.031*



DISCUSSION

This study aimed to explore oral health care services utilization rate among pregnant women who receive ANC service at public hospitals and factors that related to oral health care utilization. Therefore, it is important to highlight education level was important influencing predictors of oral health care services utilization. The study found that mother who graduated higher education had higher chance to access to ANC utilization, so education is the main factor of utilization of ANC services (10-12). For receiving complete quality ANC services, if pregnant women received complete ANC services according to the “Thailand, Quality ANC, 2022” policy followed by Mother and Child Health standard, they will receive oral health care services during pregnancy. The aim is for health care providers have to deliver quality ANC services consistently across all health services units (13). This is consistent with Geoge's study, which found that the main barriers for ANC providers in this area were the lack of practice guidelines on oral health care during pregnancy in Australia, showed that having clear operational guidelines or policy will help health care providers prepare the oral health services and increase the utilization rate of oral health (14). In terms of perception of the right to receive oral health services during pregnancy, the results found that pregnant women who had known the insurance before and during receiving ANC services have more chance to utilize the oral health care service than the pregnant women who have never know the insurance. Similarly two study found that pregnant women who had health insurance coverage was strongly related to dental utilization during pregnancy and women who had health insurance before pregnant were more likely to utilize dental service than women who were not insured (12, 15).

CONCLUSIONS

In conclusion, the multivariable analysis presented that three variables were significant associated with oral health care services utilization during pregnancy while attending antenatal care clinics in public hospitals. There were variables including education level, complete quality ANC services, and perception of the right to receive oral health services during pregnancy that were

found to be significant with a p-value of less than 0.05.

RECOMMENDATIONS

The results of this study have important implications for public health practice and policy. Improving educational outreach to enhance pregnant women's perception of the importance of oral health could lead to increased utilization of dental services. The finding of this research provides new evidence in this field and information for the government sector, policymakers and health care providers in preparing the oral health services system for pregnant women. Additionally, efforts to make oral health care more accessible, such as enhancing of integrating dental services with antenatal care or providing mobile dental clinics, could overcome barriers related to the ability to reach care. Policymakers should consider these strategies to improve oral health outcomes among pregnant women.

LIMITATION

The study included only pregnant women in the third trimester, it is unknown whether women's awareness of their rights or others across different trimesters of pregnancy.

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KNOWLEDGE AND ATTITUDE ABOUT HYPERTENSION AND ASSOCIATED FACTORS AMONG PEOPLE AGED 30-64 YEARS IN TONGLU COUNTY, CHINA

Yuanyuan Wu¹, Narumol Bhummaphan^{1*}

¹College of Public Health Sciences, Chulalongkorn University, Bangkok, 10330 Thailand

*Corresponding Author: Narumol Bhummaphan, College of Public Health Sciences, Chulalongkorn University, Bangkok, 10330 Thailand, E-mail: narumol.b@chula.ac.th

ABSTRACT

Introduction: The Global Burden of Disease study shows that poor blood pressure control remains one of the leading risk factors for global burden and death. Most of the general population does not have enough knowledge and attitude about the prevention of hypertension, which can increase the number of people who die from early diseases. In China, about 270 million people have hypertension, and in Zhejiang, the prevalence of hypertension is higher than the national average. Therefore, knowledge and attitude toward hypertension play a crucial role in the behavioral changes required to prevent it.

Objectives: This study aims to assess the level of knowledge and attitude about the prevention of hypertension and determine the associated factors in Tonglu County, Zhejiang.

Methodology: This cross-sectional online survey study used convenient sampling techniques, involving 100 participants aged 30-64. Descriptive statistics and chi-square were used to analyze the data. The validity of the questionnaire was assessed by three experts. The reliability was tested with Cronbach's alpha, which was more than 0.7, and the association was analyzed by SPSS. Hypertension knowledge was assessed using scale measurements at good, moderate, and poor levels and the attitude about hypertension was classified as negative or positive.

Results: The results showed that 43% of the participants had good knowledge, 43% had moderate knowledge, and only 14% had poor knowledge. The average knowledge score was 10 ± 2 , the highest was 13, and the lowest was 6. 77% of participants knew that hypertension is a disease related to high blood pressure, and 84% of respondents correctly answered the normal value of human blood pressure. Most of the participants knew that obesity increases the risk of hypertension (90%). Most participants were also knowledgeable about how hypertension can be prevented by reducing the amount of alcohol (88%), quitting smoking (82%), and reducing stress (68%). In addition, the knowledge level towards the prevention of hypertension was significantly associated with age (p -value = 0.002), education level (p = 0.014), and occupation (p = 0.018). For the attitude of hypertension, the results showed that 64% of the participants had a negative attitude, and only 36% had a positive attitude, which was significantly associated with age (p < 0.001), educational level (p = 0.006), and occupation (p = 0.003).

Conclusion: The finding revealed that even though most of the participants had good and moderate knowledge of hypertension, most of them still had a negative attitude. The reason might be associated with age, education, and occupation. Therefore, the assessment of knowledge and attitude towards the prevention of hypertension in the public is important, and knowledge-raising programs are needed to educate people about the prevention of hypertension.

Keywords: Hypertension, Knowledge and attitude towards hypertension, high blood pressure



INTRODUCTION

Hypertension is a common, chronic, and often silent health condition. Most patients can develop the disease without any symptoms, and long-term higher than normal pressure on the vascular walls can lead to serious diseases such as coronary heart disease and stroke (1). The Global Burden of Disease study shows that poor blood pressure control remains one of the leading risk factors for global burden and death (2). From 1990 to 2019, the number of adults increased from 650 million to 1.28 billion (WHO). In 2019, more than 1 billion people with high blood pressure (82% of the world's total) lived in low- and middle-income countries (3).

People who know less about high blood pressure have negative attitudes toward the prevention of hypertension. If individuals have insufficient knowledge and attitude about the disease, it can increase the number of people who die from early disease (4). Studies from around the world report that people with hypertension do not know enough about high blood pressure; they often lack sufficient awareness of their condition (5).

According to the National Health Commission of the People's Republic of China, there are 270 million people in China who suffer from hypertension. In terms of age groups, middle-aged people have a higher incidence of hypertension. Although the level of diagnosis has improved compared to previous years, treatment and control rates are still low.

In Zhejiang, the prevalence of hypertension is higher than the national average. The prevalence of hypertension in Zhejiang Province was 29.3% in 2021 (Zhejiang Provincial Health Commission). Zhejiang mainly develops manufacturing and e-commerce industry, the demands of these industries often prompt workers to adopt unhealthy lifestyles. The nature of their work can cause their schedules to be reversed day and night. These irregular working hours and diets, combined with the pressure to meet deadlines and deliver quotas, have resulted in more young people developing high blood pressure in this region. Compared with 2019, the prevalence of hypertension aged 18–79 in Tonglu County increased by 4.4% in 2020 (Tonglu County Health Commission). Tonglu County mainly develops pen-making, knitting, and other

factories, accounting for more than 60% of the county's economic output. This county mainly develops pen-making, knitting, and other factories, accounting for more than 60% of the county's economic output. However, there is a few investigations or research on knowledge, attitude about hypertension in Tonglu County.

Despite advances in medical treatment, there are still large gaps in knowledge and attitudes about hypertension around the world. Participants with more knowledge about hypertension are willing to make lifestyle changes than those with a low level of knowledge and attitude about hypertension, which assisted them in achieving better control of their blood pressure (6). Therefore, knowledge and attitude toward hypertension play a crucial role in the behavioral changes required to prevent it.

The purpose of this preliminary study was to assess the level of knowledge and attitude about hypertension of people aged 30-64 years and identify the social-demographically associated factors in Tonglu County. Recognizing these factors can help provide useful information for intervention measures to improve knowledge and attitude levels in the public.

METHODOLOGY

Study design and setting

A cross-sectional study was conducted in Tonglu County, China, from March 2024 to June 2024.

Population

People aged 30-64 years old live in Tonglu County, China. People who could complete online questionnaires and lived in Tonglu County for more than 6 months were included in the study. People who were unable to provide informed consent or were diagnosed by a doctor as having mental health problems were excluded from the study.

Sample size and sampling methods

The sample size was 100. According to the preliminary results, the study participants were selected using a convenient sampling technique.



Variables of the study

The dependent variables of this study were knowledge and attitude about hypertension. Knowledge level was classified into three categories: poor, moderate, and good knowledge. Whereas, attitude level was classified into two categories: negative and positive by mean. The independent variables in this study were associated with socio-demographic factors (age, sex, educational level, marital status, occupation)

Data collection

The online questionnaires were produced through WeChat, which then contacted local organizations and community staff to post the questionnaire link in each public account to help spread information.

Knowledge about hypertension was assessed with 13 items. Each question was closed in a true/false format to assess participants' knowledge about hypertension. Each correct answer was assigned one point. Participants' overall knowledge scores were categorized as follows: using Bloom's cut-off point (7), as good if the respondent answered more than 80% correctly (score 10), moderate if the score was between 60 and 79% (score 8–10), and poor if the score was less than 60% (score 8). Attitude about hypertension was assessed with 10 items; each question was scored using a five-point Likert scale. Attitude level was classified as two levels: negative and positive, by mean (8).

Validity and reliability

Item Objective Consistency (IOC) was used to determine the validity and reliability of the questionnaire; the average IOC was 0.93. Cronbach's alpha was used to test the reliability of the SPSS software. The Cronbach's alpha was 0.763, so the questionnaire was considered reliable.

Data processing and analysis

All statistical analysis was performed using SPSS 28 software. A 95% confidence level was used, and a p-value less than 0.05 was considered statistically significant. Descriptive statistics, the chi-square test, and binary logistic regression were used to analyze the data.

Ethical Consideration

This study was submitted to the Research Ethics Review Committee for Research Involving Human Research Participants, Group 1 to ensure that the research complied with established ethical guidelines and principles.

RESULTS

Descriptive data of social-demographic factor

A total of 100 participants, 55% of the participants were female. 39% of the participants aged between 44-54 years old. 43% of the participants got a bachelor's degree or above. The majority (93%) were married. 30% of the participants mentioned civil servants as a profession (Table 1).

Table 1 Frequency and percentage of social-demographic factor of participants (N=100)

Characteristic	Number	Percent (%)
Sex		
Male	45	45.0
Female	55	55.0
Age (years)		
(Mean±SD: 48±8.96)		
30-44	35	35.0
45-54	39	39.0
55-64	26	26.0
Educational level		
Junior high school or below	25	25.0
High school	32	32.0
Bachelor's degree or above	43	43.0
Marital status		
Married	93	93.0
Unmarried	7	7.0
Occupation		
Civil servant	30	30.0



Characteristic	Number	Percent (%)
Farmer	13	13.0
Employed	42	42.0
No-working	15	15.0

Knowledge about Hypertension

More than 70% of the participants answered correctly about the value of diastolic or systolic blood pressure for hypertension. More than 80% of the participants answered correctly about diseases associated with hypertension. Most participants answered correctly that hypertension can be prevented by physical activities (76%), reducing the amount

of alcohol they drink (88%), quitting smoking (82%), and reducing stress (68%). 96% of participants answered correctly that hypertension can cause heart disease. But more than half of the participants answered incorrectly that hypertension can cause premature death (54%), and hypertension can cause stroke (56%), if left untreated (Table 2).

Table 2 Frequency and percentage of knowledge score about hypertension of participants (N=100)

No	Statement	Number (%)	
		Incorrect answer	Correct answer
1	Hypertension is defined as systolic higher than 140 mm Hg and diastolic higher than 90 mm Hg.	16 (16.0)	84 (84.0)
2	High diastolic or systolic blood pressure indicates increased blood pressure.	23 (23.0)	77 (77.0)
3*	Individuals with diabetes are not at risk of hypertension.	17 (17.0)	83 (83.0)
4	Individuals with cardiovascular diseases are at risk of hypertension.	13 (13.0)	87 (87.0)
5*	Individuals with kidney diseases are not at risk of hypertension.	20 (20.0)	80 (80.0)
6	Overweight individuals are at risk of hypertension.	10 (10.0)	90 (90.0)
7*	Hypertension cannot be prevented through physical activities.	24 (24.0)	76 (76.0)
8	Drinking alcohol is one of the risk of Hypertension.	12 (12.0)	88 (88.0)
9	Smoking is one of the risk of Hypertension.	18 (18.0)	82 (82.0)
10*	Stress is not the risk of Hypertension.	32 (32.0)	68 (68.0)
11*	Increased blood pressure does not cause premature death if left untreated.	54 (54.0)	46 (46.0)
12	Hypertension can cause heart diseases, such as heart attack, if left untreated.	4 (4.0)	96 (96.0)
13*	Hypertension does not cause stroke, if left untreated.	56 (56.0)	44 (44.0)

*Negative Statement

Table 3 showed knowledge scores are categorized into poor, moderate and good levels by bloom cut-off point. The respondent answered correctly more than 10 score is good; the score between 8 and 10 is moderate; less

than 8 is poor. The mean is 10.01. Among total 100 participants, 43% scored good knowledge level, and followed by moderate knowledge level (43%).

**Table 3** Distribution of knowledge level about hypertension of participants (N=100)

Knowledge level	Number (%)
Poor level	14 (14.0)
Moderate level	43 (43.0)
Good level	43 (43.0)
Mean	10.01
Minimum, Maximum	6, 13

Table 4 showed age ($p=0.002$), educational level ($p=0.014$), and occupation ($p=0.018$), are the significant factors of knowledge level about hypertension.

Table 4 Chi-square analysis of association of knowledge with social-demographic factor (N=100)

Variable	Level of knowledge			Chi-square	P-value
	Poor (n, %)	Moderate (n, %)	Good (n, %)		
Sex					
Male	7(15.6)	22(48.8)	16(35.6)	1.856	0.395
Female	7(12.7)	21(38.2)	27(49.1)		
Age (years)					
30-44	2(5.7)	10(28.6)	23(65.7)	17.208	*0.002
45-54	4(10.3)	21(53.8)	14(35.9)		
55-64	8(30.7)	12(46.2)	6(23.1)		
Educational level					
Junior high school or below	7(28.0)	13(52.0)	5(20.0)	12.465	*0.014
High school	5(15.6)	14(43.8)	13(40.6)		
Bachelor's degree or above	2(4.7)	16(37.2)	25(58.1)		
Marital status					
Married	12(12.9)	41(44.1)	40(43.0)	1.506	0.471
Unmarried	2(28.6)	2(28.6)	3(42.8)		
Occupation				15.353	*0.018
Civil servant	1(3.3)	9(30.0)	20(66.7)		
Farmer	4(30.8)	7(53.8)	2(15.4)		
Employed	8(19.1)	20(47.6)	14(33.3)		
No-working	1(6.6)	7(46.7)	7(46.7)		

Attitude about Hypertension

38.0% of respondents strongly disagreed that checking blood pressure regularly is a waste of time. 68% of the respondents agreed that hypertension is a chronic disease. 86% of respondents disagreed that the prevention of hypertension is not very important. 78% of respondents agreed that quitting smoking can help prevent hypertension. 55% of respondents

agreed that reducing alcohol intake can help prevent hypertension, but 34% of respondents disagreed that reducing alcohol intake can help prevent hypertension. 81% of respondents agreed that physical activity and reducing stress (80%) can help prevent hypertension. 80% of respondents disagreed that hypertension does not lead to fatal or serious complications (Table 5).

**Table 5** Frequency and percentage of attitude score about hypertension. (SA - Strongly agree, A-Agree, N-Neutral, D-Disagree, SD-Strongly disagree) (N=100)

No	Statement	Number (%)				
		SA	A	N	D	SD
1*	Check blood pressure regularly is a waste of time.	2(2.0)	11(11.0)	14(14.0)	35(35.0)	38(38.0)
2	Hypertension is a chronic disease, and it has to be treated throughout life.	19(19.0)	49(49.0)	18(18.0)	12(12.0)	2(2.0)
3*	Prevention of hypertension is not much important.	1(1.0)	6(6.0)	7(7.0)	45(45.0)	41(41.0)
4*	Increasing salt and sugar intake can help prevent hypertension.	3(3.0)	12(12.0)	6(6.0)	30(30.0)	49(49.0)
5	It is better to have a normal body weight to be protected from hypertension.	41(41.0)	42(42.0)	12(12.0)	5(5.0)	0(0.0)
6	Quitting smoking can help prevent hypertension.	40(40.0)	38(38.0)	15(15.0)	5(5.0)	2(2.0)
7*	Reducing alcohol intake cannot help prevent hypertension.	14(14.0)	20(20.0)	14(14.0)	30(30.0)	22(22.0)
8	Physical activity can help prevent hypertension.	38(38.0)	43(43.0)	9(9.0)	7(7.0)	3(3.0)
9	Reducing stress can help prevent hypertension.	32(32.0)	48(48.0)	10(10.0)	9(9.0)	1(1.0)
10*	Hypertension does not lead to fatal serious complications.	3(3.0)	10(10.0)	7(7.0)	40(40.0)	40(40.0)

*Negative statement

Attitude scores are categorized into negative and positive levels by mean. The mean is 39.6. A score of more than 40 is a positive attitude, and less than 40 is a negative attitude.

64% of the respondents had a negative attitude level, followed by 36% of them who scored with a positive attitude level (Table 6).

Table 6 Distribution of attitude level about hypertension of participants (Number=100)

Attitude level	Number (%)
Negative level (score \leq 40)	64 (64.0)
Positive level (score $>$ 40)	36 (36.0)
Mean	39.6
Minimum, Maximum	29, 50



Table 7 shows age ($p < 0.001$), educational level ($p = 0.006$), occupation ($p = 0.003$) are the

significant factors of attitude about hypertension.

Table 7 Chi-square analysis of association of attitude with social-demographic factor

Variable	Level of Attitude		Chi-square	P-value
	Negative N (%)	Positive N (%)		
Sex				
Male	28(62.2)	17(37.8)	0.112	0.738
Female	36(65.5)	19(34.5)		
Age (years)				
30-44	14(40.0)	21(60.0)	20.417	<0.001
45-54	25(64.1)	14(35.9)		
55-64	25(96.2)	1(3.8)		
Educational level				
Junior high school or below	20(80.0)	5(20.0)	10.166	0.006
High school	24(75.0)	8(25.0)		
Bachelor's degree or above	20(46.5)	23(53.5)		
Marital status				
Married	60(64.5)	33(35.5)	0.154	0.695
Unmarried	4(57.1)	3(42.9)		
Occupation				
Civil servant	12(40.0)	18(60.0)	13.880	0.003
Farmer	12(92.3)	1(7.7)		
Employed	31(73.8)	11(26.2)		
No-working	9(60.0)	6(40.0)		

DISCUSSION

The current study aimed to assess knowledge and attitudes about hypertension and identify associated factors among people aged 30-64 years old in Tonglu County, China. Out of 100 participants, 43% had good knowledge. This rate is lower than that found in southern India (52.4%) (9), but higher than that found in Nepal (14%) (10) Ethiopia (43.6%) (11), and Canada (18.2%) (12). The reason for the difference may be the differences in the research environment, sample size, and inclusion criteria they used to include participants between this study and previous studies. 43% of the participants had moderate knowledge, and 14% had poor knowledge. This indicates that the population in this region has a good and moderate level of knowledge about the prevention of hypertension. People who have a good understanding of hypertension are more likely to adopt behaviors that reduce their risk of developing hypertension. The 43% statistic provides a baseline for future research. Researchers can use this data to measure the effectiveness of educational interventions over

time, assessing whether knowledge levels improve and are associated with better health outcomes. According to the responses of the participants in this study, most participants were able to correctly answer the definition of hypertension and the diseases associated with hypertension. More than 60% of participants knew the risk factors for hypertension, which was consistent with previous research (13). However, some participants lacked an understanding of the consequences of hypertension.

The results of the Chi-square test showed that age, educational level, and occupation were the significant factors associated with knowledge level about hypertension. The results showed that 64% of respondents had a negative attitude, consistent with the results of a previous study (14). This implies that even though most people have a better level of knowledge, their attitude about hypertension prevention is still negative. This fact points to the need to strengthen programmes to improve attitudes about hypertension prevention and to raise the population's awareness towards



hypertension. Most participants agreed that blood pressure must be checked regularly, and 80% agreed that preventing high blood pressure is very important. 81% of respondents agree hypertension can be prevented through physical activities; this rate is higher than previous research, which found that more than 62% of respondents thought exercising regularly was beneficial for hypertension (15).

The study is consistent with other previous research showing that younger participants had a better attitude as compared to older people, the older participants had less knowledge about hypertension, and the 30 to 39 age group had a higher level of knowledge and attitude about hypertension than other age groups, possibly because they have higher levels of education than other age groups (16).

The second significant factor is educational level. This is consistent with the results of research conducted in 2021 in Lebanon, where it was found that the level of knowledge and attitude about hypertension increased with the improvement of education level (17), which may be because educated people can read and understand more health education materials and are willing to adopt healthier lifestyles (18).

In addition, farmers and people who were employed had a less positive attitude as compared to civil servants. It is in contrast to the previous study, which showed that occupation was not significantly associated with hypertension knowledge or attitude level (4). The results suggest that occupation-related differences in lifestyle, access to healthcare, and workplace health promotion programs may contribute to varying levels of attitude towards the prevention of hypertension (19). That might be because people who work as civil servants have better access to information about hypertension in different ways, including by reading materials prepared for people with hypertension and participating in related activities, which increases their knowledge and attitude toward lifestyles to prevent hypertension.

CONCLUSIONS

Most participants scored high and moderate on knowledge but negative on attitude. It was found that age, educational level, and occupation were significantly associated with knowledge and attitude levels

about hypertension. In addition, young people are more likely to have positive attitudes. People with lower levels of education and people who were farmers are more likely to have negative attitudes about hypertension. Therefore, healthcare professionals should focus on the elderly, as well as people with low education, farmers, and other at-risk occupational groups. The public health sector can implement strategies to improve people's knowledge and attitude about hypertension, such as strengthening community engagement through health seminars, local events, health provider support groups, and social marketing campaigns to increase their awareness of hypertension.

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FACTORS ASSOCIATED WITH KNOWLEDGE ABOUT ANTIBIOTIC SELF MEDICATION BY GENDER AMONG THE GENERAL PUBLIC IN NORTHERN IRAN: A CROSS-SECTIONAL STUDY

Anahita Mogharabian¹, Vo Thi Hue Man^{1*}

¹College of Public Health Science, Chulalongkorn University, Bangkok 10330, Thailand

*Corresponding Author: Vo Thi Hue Man, College of Public Health Science, Chulalongkorn University, Bangkok 10330, Thailand, E-mail: Vothihue.M@chula.ac.th

ABSTRACT

Introduction: Antibiotics have been known as a powerful antimicrobial substance that plays a crucial role in treating bacterial infection. According to the Centers for Disease Control and many studies, antibiotic resistance is one of the major threats to global health in the 21st century. Self-medication is well-reported to be one of the most common reasons globally for antibiotic resistance. In Iran, high percentage of antibiotics self-medication and absence of a monitoring plan have resulted in increased of resistance level. Factors associated with antibiotic self-medication or knowledge about antibiotic use may vary by gender due to different socio-economic and health status, and this issue has been relatively unexplored in the context of Iran.

Objectives: To explore the relationship between knowledge regarding self-medication with antibiotics and socio-economic and health-related factors in northern Iran by male and female.

Methodology: A cross-sectional survey was conducted with 376 participants from Bandar-Gaz city, all over 18 years old, residents, and willing to provide informed consent. Participants were selected through a multi-stage sampling method and interviewed using a structured questionnaire developed and validated by experts. The questionnaire covered socio-demographic and health-related factors and included 10 questions assessing antibiotic knowledge. Data analysis was performed using SPSS descriptive and logistic regression, with a P value of less than 0.05 at a 95% confidence interval considered statistically significant.

Results: Findings showed that 51.1% of participants were female and 48.9% were male. More than three-quarters of respondents (76.3%) utilized antibiotics in the past 6 months. In logistic regression analysis by gender, results indicated that within both male and female groups, increasing age (age group ≥ 60) was associated with higher knowledge, with AOR of 15.02 (95% CI: 2.7-82.7) and 40.0 (95% CI: 3.3-484.3), respectively. For both gender monthly income was also a significant factor for higher knowledge, while among females, higher education (diploma degree) was associated with higher knowledge (AOR=5.8, 95% CI: 1.5-22.1). In both males and females, participants with an underlying disease were more likely to have higher knowledge compared to those without.

Conclusion: This study highlights the high prevalence of antibiotic self-medication in northern parts of Iran which accompanied with poor knowledge. The similarities and differences in factors linked with higher knowledge about antibiotic self-medication among males and females suggest the need for gender-targeted interventions. Educational campaigns to improve knowledge, particularly among younger age groups, are necessary.

Keywords: Self-medication, antibiotic resistance, knowledge, gender, Iran.

INTRODUCTION

Antibiotic is a powerful antimicrobial substance that targets bacteria and have a crucial role in fighting against bacterial infections (1,2). According to the Centers for Disease Control. Each year almost 2 million people suffer from infections, are treated by

antibiotics and at least 23,000 among them die because of antibiotic resistance (3). In recent years, the alarming rise in antibiotic resistance has posed a major threat to global health. This resistance increases healthcare costs, and even mortality rates (4,5). One of the most common and obvious reason for antibiotic resistance, is



self-medication (6). A study conducted among health professionals revealed that antibiotics are the most common type of medication that is used for self-medication (7).

Self-medication refers to the utilization of medications to address a self-diagnosed disease without seeking advice from a physician or without any medical supervision (8). Self-medication can happen with leftover drugs at home, simply buying antibiotics without prescription or using antibiotics based on previous experience or others experience. Studies from the Middle East of Asia showed that individuals can easily purchase antibiotics from pharmacies without prescription (9). Due to the lack of access to healthcare facilities, easy access to OTC drugs in the market, or because of the lack controlling plan, self-medication turned to a common practice globally (10).

In Iran antibiotic utilization is massive, according to the Iranian national pharmaceutical sales database, antibiotics consisted almost 12% of the total expenditure on medicine in the year of 2015. In a study conducted by Abbasian et al. 2019 on antibiotic utilization, results reported that antibiotic consumption in Iran jumped from 33.6 DID in 2000 to 60 DID in 2016 (11). Self-medication prevalence differs from 12% to 90% globally (12–16). In Iran it's been reported that the prevalence of self-medication in community setting is 53% (17). Globally many studies investigated the knowledge towards antibiotic use among the general population (18). results from a study from Hong Kong showed poor knowledge regarding antibiotic use (19). Antibiotic resistance has been reported to be a major issue in northern Iran. One study reported that the infection rate was so high in the northern part of Iran that it led to antibiotic resistance there (20). Although dispensing any type of antibiotic without prescription is prohibited according to Iran's pharmacy regulations, but results showing that dispensing antibiotic without prescription in pharmacy community in Iran is a routine practice (21).

Among different factors associated with drug prescription, gender is one of them. According to Loikas et al (22), antibiotic utilization was the most significant one with gender differ where women had more antibiotic utilization compared to men. This differences in gender can come from social and behavioral

factors, for example women tends to put their health on the healthcare professionals' hand more compared to men. A study in Dutch revealed that age groups 18-22- and 45–49-year-old showed significant gender differences in the number of times they visited their respective doctors (23). Although limited studies that have identified gender-related patterns in antibiotic consumption, highlights the importance of considering gender for developing strategies to reduce antibiotic use and resistance (24), there remains a noticeable research gap specific to the knowledge towards self-medication with antibiotics differ by gender in the context of Iran. This research aims to fill the gaps in the existing studies by providing a detailed exploration of knowledge toward self-medication with antibiotics by gender among the general public in Iran.

This study was conducted to explore the relationship between knowledge regarding self-medication with antibiotics and socio-economic and health-related factors in northern Iran by male and female.

Conceptual framework

Independent variables:

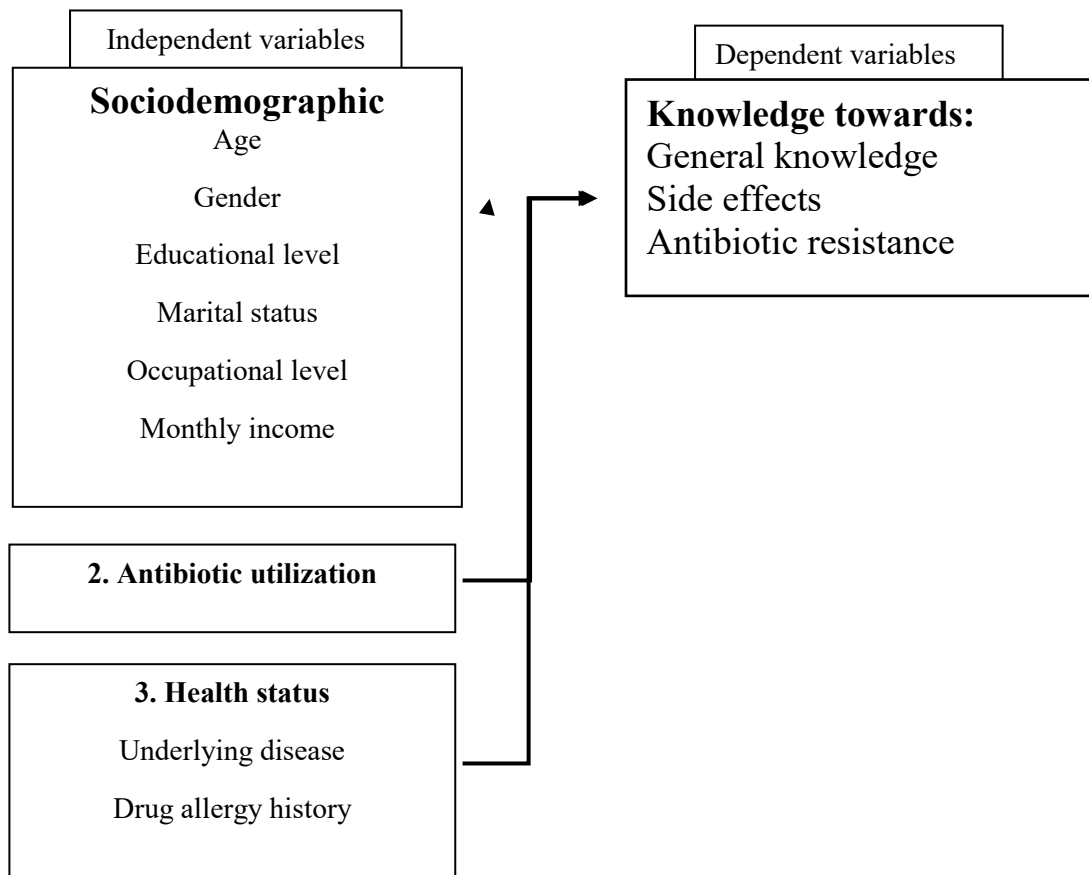
- Age of respondents (years): <20, 20–39, 40–59, ≥60 (25)
- Sex of respondents: male/female
- Educational status of respondents: no formal education/ a degree lower than diploma/ diploma degree/ university degree
- Marital status of respondents: married/ single/ separated/ widow
- Occupation of respondents: employed/ unemployed/ student/ housewife/ retired
- Monthly income (RIAL): low (less than 20000000) /adequate (20000000 to 50000000) /high (more than 50000000) (26)
- Antibiotic utilization: antibiotic utilization history, self-medication history, prescription, type of antibiotic usually taken, accumulation source, and common reason for self-medication



- Underlying disease and: history of underlying disease
- Drug allergy history: history of drug allergy history

Dependent variables:

Knowledge: the level of knowledge in public towards antibiotic self-medication in Bandar-Gaz



METHODOLOGY

A cross-sectional study carried out in May of 2024 in Bandar-Gaz northern city in Iran to evaluate the knowledge towards antibiotic self-medication by gender in the Bandar-Gaz public population.

Study Population

Participants who were 18 years and above and could give consent went through a face-to-face interview with trained data collectors. Residents who had disabilities or couldn't give consent have been left out.

Independent variables

Socio-demographic variables consist of age, gender, educational level, marital status, occupational status and monthly income. These variables provide insights into the diverse backgrounds and circumstances of the

respondents, which may influence health-related behaviors and outcomes.

Health status and antibiotic utilization, including antibiotic utilization in 6 months prior to the study, underlying diseases and drug allergy history. These variables provide insights into antibiotic consumption patterns, adherence to medical advice and adverse reactions.

Outcome variable

Knowledge level variable: Answers of respondents recorded in 3 categories: 1) Yes 2) No and 3) I don't know. A scoring system was used where correct answers were given a score of "1" and incorrect answers were given a score of "0". All responses with "I don't know" converted to "No" and got counted as "0". The score ranges from 0 to 10, blooms cut off point was used to classify participant knowledge into 3 categories as mentioned: Poor (under 60



percent), Moderate (between 60 to 80 percent) and Good (above 80 percent) (27). Good and moderate knowledge grouped together as 1 and poor knowledge as 2.

Research instruments

A structured questionnaire was used as the research instrument. It was developed based on published articles and validated by 3 committee experts, Chulalongkorn IRB ethical committees and at the end 1 healthcare professional from Iran to ensure its comprehensiveness for Iran's culture. The questionnaire consisted of 2 main sections. General characteristics that 9 questions regarding socio-economic factors (age, gender, educational level, marital status, occupational status and monthly income), health status and antibiotic utilization (antibiotic utilization in past 6 months, underlying disease, drug allergy history) and knowledge level that contains 10 questions. The questionnaire was first developed in Persian, translated into English, and then back-translated to ensure consistency. It underwent validation by English language expert and was pilot-tested among 30 participants to refine the instrument and ensure reliability.

Data Collection Procedure

Participants were recruited by multi stage sampling method. In first stage by random sampling method Four neighborhoods were chosen out of 18 neighborhoods in Bandar-Gaz. Then we proceeded to the second stage of sampling which is again a simple random sampling method that was used to select 101 households from each selected neighborhood (404 in total). In each selected household, only one individual could participate in the study to maintain fairness and reduce potential bias. Our total sample selection was 404 individuals. Information about the study aims and procedures was provided, and individuals meeting the eligibility criteria were invited to participate. Informed consent was obtained from all participants. Trained interviewers administered the questionnaires in person, asking questions and recording responses to ensure consistency and accuracy. The respondent's rate was 93.06% and the final participant were 376 individuals.

Data analysis

Data analysis was conducted using SPSS software and included several steps to examine the associations between independent variables and knowledge about antibiotic self-medication, as well as to explore gender differences. Descriptive statistics were used to summarize socio-demographic characteristics, health-related factors, and knowledge levels of participants. The data was then stratified by gender and separated multiple logistic regression models (binary logistic regression was performed to identify significant predictors of knowledge levels. Variables that were significant in the binary logistic regression were then included in multiple logistic regression models) were developed for males and females to identify significant predictors of knowledge about antibiotic self-medication. Data analysis was performed with a P value of less than 0.05 at a 95% confidence interval considered statistically significant.

Ethical Consideration

Ethical approval was obtained from the IRB Human Research of Chulalongkorn University with number COA 104/67.

RESULTS

Socio economic characteristics that are presented in Table 1 consist of age, gender, educational level, marital status, occupational status, monthly income. These characteristics describe the demographic profile of the 376 participants of Bandar-Gaz. The majority of the participants belong to the age group of 30 to 45 (45.2%), followed by 18 to 29 (25%) and 46 to 59 (21.5%), and the lowest percentage belongs ≥ 60 , comprising just 8.2% of the participants. The percentage of respondents by gender is almost equal, with 48.9% being male and 51.1% being female. The majority of participants had a university degree (40.7%) and only 15.4% of them didn't have any formal education. For marital status, the majority were married (57.2%) and in occupational status, 60.1 percent of participants were employed. For monthly income, the distribution of percentage between three categories (low, moderate, and high income) is almost balanced.

**Table 1** Socioeconomic characteristics of Respondents (n = 376).

Characteristic	Number	Percent (%)
Age range		
18-29	94	25.0
30-45	170	45.2
46-59	81	21.5
≥ 60	31	8.2
Gender		
Male	184	48.9
Female	192	51.1
Educational level		
No formal education lower than a diploma	58	15.4
Diploma degree	72	19.1
University degree	93	24.7
	153	40.6
Marital status		
Married	215	57.2
Single	123	32.7
Separated	29	7.7
Widow	9	2.4
Prefer not to say	0	0.0
Occupational status		
Employed	226	60.1
Unemployed	53	14.1
Student	27	7.2
Housewife	48	12.8
Retired	22	5.9
Income level		
Poor	117	31.1
Moderate	99	26.3
High	160	42.6

*n = total number of participants

Table 2 demonstrates the health status and antibiotic utilization frequency. In health status, questions underlying disease, and drug allergy history were asked. More than 76% of respondents consumed antibiotics during the

past 6 months to the start of the data collection. More than 60 percent of respondents don't have any underlying disease and more than 70 percent of them don't have any drug allergy history.

Table 2 Health status and antibiotic utilization of Respondents (N = 376)

Characteristic	Number	Percent (%)
Antibiotic utilization in past 6 months		
Yes	287	76.3
No	89	23.7
Underlying disease		
Yes	147	39.1
No	229	60.9
Drug allergy history		
Yes	109	29.0
No	267	71.0

*N = total number of participants



Table 3 shows multiple logistic regression of general characteristics regarding antibiotic self-medication with level of knowledge by gender. In this logistic regression analysis, several variables were found to be significant predictors of better knowledge. Age is a significant predictor for both males and females, particularly in the ≥ 60 age group, where males (AOR = 15.0, 95% CI: 2.7-82.7) and females (AOR = 40.0, 95% CI: 3.3-484.3) show higher likelihood of having a high level of knowledge. For females, having a diploma degree (AOR = 5.8, 95% CI: 1.5-22.1) are also significant predictors. Both separated marital

status and moderate-income level are significant predictors for both genders. For separated individuals, the odds of having a high level of knowledge are considerably higher for both males (AOR = 6.8, 95% CI: 1.3-34.9) and females (AOR = 25.4, 95% CI: 2.6-242.6). Moderate income level is also a significant predictor for both males (AOR = 2.9, 95% CI: 1.0-8.1) and females (AOR = 3.2, 95% CI: 1.1-8.7). Additionally, having an underlying disease significantly increases the odds of having a high level of knowledge for both males (AOR = 2.9, 95% CI: 1.2-6.9) and females (AOR = 2.2, 95% CI: 1.0-5.1).

Table 3 Associations between participants' characteristics and level of knowledge by gender

		High level of knowledge	
		Model 1 Male (n=184) AOR (95% CI) ¹	Model 2 Female (n=152) AOR (95% CI)
Age	18-29		
	30-45	3.5 (1.1-10.5)*	1.1 (0.4-2.9)
	46-59	4.5 (1.2-16.6)*	3.2 (1.0-10.1)*
	≥ 60	15.0 (2.7-82.7)*	40.0 (3.3-484.3)*
Educational level	Noformal education lower than a diploma	0.9 (0.2-3.1)	3.6 (0.9-13.8)
	Diploma degree	1.1 (0.3-3.5)	5.8 (1.5-22.1)*
	University degree	1.3 (0.5-3.7)	0.7 (0.2-2.7)
Marital status	Married		
	Single	2.0 (0.8-4.9)	1.5 (0.6-3.6)
	Separated	6.8 (1.3-34.9)*	25.4 (2.6-242.6)*
	Widow	1113732149.6	3.1 (0.4-22.6)
Occupational status	Employed		
	Unemployed	2.1 (0.6-7.2)	0.8 (0.2-2.5)
	Student	4186292051.9	0.4 (0.09-1.9)
	Housewife	1.5 (0.2-8.2)	0.2 (0.09-0.9)*
	Retired	0.7 (0.1-3.4)	0.8 (0.07-8.7)
Income level	Poor		
	Moderate	2.9 (1.0-8.1)*	3.2 (1.1-8.7)*
	High	1.4 (0.6-3.4)	1.2 (0.4-3.3)
Underlying disease	No		
	Yes	2.9 (1.2-6.9)*	2.2 (1.0-5.1)*
Drug allergy history	No		
	Yes	1.0 (0.4-2.7)	1.3 (0.5-3.0)
Antibiotic utilization in past 6 months	No		
	Yes	0.7 (0.3-1.8)	1.0 (0.4-2.5)

¹AOR Adjusted odd ratio; 95% CI = 95% Confidence interval

*p < 0.05

n= total number of participants

**Table 4** Crosstabulation of Socio-Demographic and Health-Related Factors by Knowledge Level and Gender

		Male (n=184)		Female (n=152)	
		Good and moderate	Poor	Good and moderate	Poor
		N (%)	N (%)	N (%)	N (%)
Age	18-29	23(65.7)	12(34.3)	44(74.6)	15(25.4)
	30-45	57(59.4)	39(40.6)	48(64.9)	26(35.1)
	46-59	17(51.5)	16(48.5)	17(35.4)	31(64.6)
	≥ 60	5(55.4)	15(75.0)	1(9.1)	10(90.9)
Educational level	No formal education lower than a diploma	21(65.6)	11(34.4)	17(65.4)	9(34.6)
	Diploma degree	21(61.8)	13(38.2)	16(42.1)	22(57.9)
	University degree	21(50.05)	21(51.0)	15(29.4)	36(70.6)
		39(51.3)	37(48.7)	62(80.5)	15(19.5)
Marital status	Married	72(61.0)	46(39.0)	62(63.9)	35(36.1)
	Single	27(50.9)	26(49.1)	44(62.9)	26(37.1)
	Separated	3(27.3)	8(72.7)	1(5.6)	17(94.4)
	Widow	0(0.0)	2(100.0)	3(42.9)	4(57.1)
Occupational status	Employed	82(62.6)	49(37.4)	57(60.0)	38(40.0)
	Unemployed	10(41.7)	14(58.3)	12(41.4)	17(58.6)
	Student	0(0.0)	5(100.0)	13(59.1)	9(40.9)
	Housewife	3(37.5)	5(62.5)	25(62.5)	15(37.5)
	Retired	7(43.8)	9(56.3)	3(50.0)	3(50.0)
Income level	Poor	33(61.1)	21(38.9)	45(71.4)	18(28.6)
	Moderate	14(35.0)	26(65.0)	22(37.3)	37(62.7)
	High	55(61.1)	35(38.9)	43(61.4)	27(38.6)
Underlying disease	Yes	23(35.9)	41(64.1)	35(42.2)	48(57.8)
	No	79(65.8)	41(34.2)	75(68.8)	34(31.2)
Drug allergy history	Yes	18(42.9)	24(57.1)	30(44.8)	37(55.2)
	No	84(59.2)	58(40.8)	80(64.0)	45(36.0)
Antibiotic utilization in past 6 months	Yes	82(56.9)	62(43.1)	86(60.1)	57(39.9)
	No	20(50.0)	20(50.0)	24(49.0)	25(51.0)

DISCUSSION

Study findings demonstrated that frequency of males and females in this study is almost equal which is almost in agreement with the country male and female ratio (103 male to 100 female) (28). Most populated age groups belong to 30-49 (28) again it's the same case in this study as the age group of 30-45 consists of the major proportion of the study population (45.2%).

This study findings revealed that higher age was correlate with higher knowledge in both male and females. One study in Spain revealed that younger age only in women was associated with self-medication (29). While other findings showed self-medication was associated with male and younger age groups (30). Other studies from Malaysia and Germany

revealed the same findings, individuals with higher age demonstrated better knowledge (31). In another study that was conducted in Norwegian in 2019, there was no associated between age and knowledge regarding antibiotics in general, but the results showed that higher age was associated with higher knowledge regarding antibiotic resistance and poor knowledge in young age groups again it's in agreement with outcomes of this study (32). Individuals in older age groups have more opportunities to be exposed to educational campaigns and interventions due to their more healthcare visits. It makes them a good target for a key change in antibiotic self-medication (33).

In other hand this study reported women with higher educational level have



better knowledge while there wasn't any significant association for men. One study in Thailand corresponds with this study stated that women with higher educational level and economic status 1.18 times have better knowledge in comparison to men (34). Another study that examined knowledge regarding medicine (including antibiotic) in primary school, revealed that girls showed better knowledge compared to boys (35). In general, a study in Portugal in the year 2021 revealed that knowledge level regarding self-medication is associated with educational level. People with higher levels of academic year showed better levels of knowledge. They suggested that there should be some curriculum about health-related information for undergraduate students to improve their knowledge level (36). A Thai study revealed that women are caregivers in their families and a decision maker about family health status. They are more exposed to having information about antibiotic use and have higher awareness about this matter than males (37).

For monthly income both male and female showed better knowledge in moderate economic level compared to poor economic level but a study in Spain demonstrated that only in men, income level was associated with self-medication (29). Multiple studies found that higher income is significantly associated with knowledge and education. It can be due to that higher education means higher income and both can increase the level of knowledge (38). On the other hand, individuals with more income have better access to healthcare facilities and more education opportunities (39).

Both male and female with underlying disease showed better knowledge. These findings correspond with other studies. In general people with underlying disease have to regularly getting checkups, so having better knowledge about antibiotics or other medications are logical (40).

STRENGTH AND LIMITATION

This study was conducted by face-to-face interview with trained data collectors. The respondent's rate was more than 93% with no missing data that shows a strong engagement rate. Multi stage sampling method allowed for better comprehensive results, ensuring the

sample are more generalizable to larger population.

Several limitations were shown in this study. First of all, it's a cross-sectional study design and limits the ability to create causal relationships between the general characteristic's factors and antibiotic knowledge. Second, the self-reported nature of the data could be subjected to recall bias and social desirability bias, where participants of the study might underreport or overreport for their behaviors and knowledge. Third, the study was conducted in a single city in northern Iran, which could limit the generalizability of the findings to other regions of Iran or other countries. Finally, the study relied on a structured questionnaire (41,42), which, despite being validated, may not capture all the details of participants' knowledge regarding antibiotic self-medication.

CONCLUSIONS

This study highlights the high prevalence of antibiotic self-medication in northern Iran. Knowledge about antibiotic self-medication was influenced by various socio-economic and health-related factors, which differed between males and females. This highlights the need for gender-specific educational interventions to improve knowledge and reduce self-medication practices. The findings underscore the urgent need for public health strategies, including educational campaigns targeting younger age groups and stricter regulations on antibiotic sales to mitigate the risk of antibiotic resistance.

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(The 15th International Graduate Students Conference on Population and Public Health Sciences)

ตามที่ สถาบันวิจัยประชากรและสังคม สถาบันพัฒนาสุขภาพอาเซียน มหาวิทยาลัยมหิดล และวิทยาลัยวิทยาศาสตร์สาธารณสุข จุฬาลงกรณ์มหาวิทยาลัย ได้มีบันทึกข้อตกลงความร่วมมือระหว่างสามสถาบัน เพื่อการพัฒนาวิชาการด้านการเรียนการสอน การวิจัย และกิจกรรมนิสิตนักศึกษา ระดับบัณฑิตศึกษา ทั้งนี้ได้กำหนดให้มีการนำเสนอผลงานวิจัยของนิสิต อาจารย์ และบุคลากรร่วมกัน ทั้งสามสถาบัน ในการประชุมวิชาการบัณฑิตศึกษานานาชาติด้านประชากรและวิทยาศาสตร์สาธารณสุข ครั้งที่ 15 “The 15th International Graduate Students Conference on Population and Public Health Sciences” (IGSCPP) ในวันที่ 12 กรกฎาคม 2567 ณ วิทยาลัยวิทยาศาสตร์สาธารณสุข จุฬาลงกรณ์มหาวิทยาลัย เพื่อให้การดำเนินการเป็นไปโดยเรียบร้อย มีประสิทธิภาพ และบรรลุวัตถุประสงค์ จึงขอแต่งตั้งคณะกรรมการในการดำเนินงานประชุมดังกล่าว ตามรายนามและตำแหน่งต่อไปนี้

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ภาระหน้าที่ความรับผิดชอบ

ให้คณะกรรมการปฏิบัติงานหน้าที่พิจารณากำหนดกรอบ แนวทาง หัวข้อของการประชุม และกำหนดกรอบแนวทางเนื้อหา/กิจกรรม วิทยากร และผู้เข้าร่วมประชุม

คณะกรรมการดำเนินการ

1. ศาสตราจารย์ ดร.จิตรลดา อารีย์สันติชัย	ที่ปรึกษา
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3. รองศาสตราจารย์ ดร.มธุรส ทิพยมงคลกุล	ประธานกรรมการร่วม
4. รองศาสตราจารย์ ดร.มนสิการ กาญจนะจิตรา	ประธานกรรมการร่วม
5. รองศาสตราจารย์ ดร.ธีระวิทย์ รัตนพันธ์	กรรมการ
6. รองศาสตราจารย์ ดร.อรพินท์ เล่าชัย	กรรมการ
7. ผู้ช่วยศาสตราจารย์ ดร.วันดี ศิริโชคชัชวาล	กรรมการ
8. ผู้ช่วยศาสตราจารย์ ดร.มนทกานต์ เชื่อมชิด	กรรมการ
9. รองศาสตราจารย์ ดร.ณัฐฐา ฐานีพานิชกุล	กรรมการ
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11. นายภูมิตน์ โกกิลกนิษฐ	กรรมการ
13. นายธงชัย จินดาสิทธิทางกูร	กรรมการ
14. นายเอกพิสิฐ ธนวัชรสมบัติ	กรรมการ
15. นางอโณทัย เกิดเจริญ	กรรมการ
16. นางสาวอหทัย จิระรัตนโพธิ์ชัย	กรรมการ
17. นางสาวมณีวรรณ สุวัฒน์ธกร	กรรมการ
18. นายวรวัชร วงษ์พันธ์	กรรมการ
19. นายธนาพงศ์ วงษ์งามมงคล	กรรมการ
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22. นางนฤมล ชอบสันเทียะ	กรรมการ
23. นางวรรณพา ชนะชัย	กรรมการ
24. นายสมลักษณ์ คลังเพชร	กรรมการ
25. นางสาวกุลญาฉินทร์ ศรีดาชาติ	กรรมการและเลขานุการ
26. นางสาวกาญจรัตน์ อินทุรัตน์	กรรมการและผู้ช่วยเลขานุการ

ภาระหน้าที่ความรับผิดชอบ

ให้คณะทำงานปฏิบัติงานหน้าที่การเตรียมการด้านการเชิญวิทยากร ประสานงานวิทยากร จัดทำระบบประชาสัมพันธ์ การรับสมัคร การลงทะเบียน และการเตรียมการด้านสถานที่จัดประชุม ด้านเอกสารประกอบการประชุม ด้านการเงินการบัญชีของการประชุม รวมทั้งกิจกรรมอื่นใดที่เกี่ยวข้อง และประสานงานกับหน่วยงานอื่นใดที่เกี่ยวข้อง

คณะทำงานวิชาการ

1. ศาสตราจารย์กิตติคุณ นายแพทย์ สุรศักดิ์ ฐานีพานิชสกุล	ที่ปรึกษา
2. Alessio Panza, M.D, M.Com.H, DTMH	ที่ปรึกษา
3. อาจารย์ ดร.เกรียง ไกรเลิศสนิย์	ที่ปรึกษา
4. ศาสตราจารย์ ดร.จิตรลดา อารีย์สันติชัย	ที่ปรึกษา
5. รองศาสตราจารย์ ดร.กาญจนา รังมีหิรัญรัตน์	ประธานกรรมการ
6. รองศาสตราจารย์ ดร.มธุรส ทิพยมงคลกุล	ประธานกรรมการร่วม
7. รองศาสตราจารย์ ดร.มนสิการ กาญจนจิตรรา	ประธานกรรมการร่วม
8. ผู้ช่วยศาสตราจารย์ ดร.มนทกานต์ เชื่อมจิต	รองประธานกรรมการร่วม
9. รองศาสตราจารย์ ดร.ธันวดี สุขสาโรจน์	กรรมการ
10. ผู้ช่วยศาสตราจารย์ ดร.ดวงใจ บรรทัด	กรรมการ
11. รองศาสตราจารย์ ดร.ธีระวิทย์ รัตนพันธุ์	กรรมการ
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14. รองศาสตราจารย์ ดร.อรพินท์ เล่าชัย	กรรมการ
15. ผู้ช่วยศาสตราจารย์ ดร.ดวงใจ บรรทัด	กรรมการ
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20. รองศาสตราจารย์ ดร. นพ.ตะวันชัย จิระประมุขพิทักษ์	กรรมการ
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42. Assistant Professor Dr.Wakako Takeda	กรรมการ
43. Assistant Professor Dr.Dyah Anantalia Widyastari	กรรมการ
44. Lecturer Dr.Sergey Ryazantsev	กรรมการ
45. Lecturer Dr.Truc Ngoc Hoang Dang	กรรมการ
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47. Dr.Vo Thi Hue Man	กรรมการ
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69. Dr. May Chan O	กรรมการ
70. นางสาวกุลญานินทร์ ศรีคาชาติ	กรรมการและเลขานุการ
71. นางสาวกาญจรัตน์ อินทุรัตน์	กรรมการและผู้ช่วยเลขานุการ

ภาระหน้าที่ความรับผิดชอบ

ให้คณะทำงานปฏิบัติงานหน้าที่พิจารณาบทความวิจัยเพื่อการนำเสนอในการประชุมของผู้สมัครพิจารณาให้รางวัลการนำเสนอดีเด่น (Outstanding Oral / Poster Presentation Award) รวมทั้งจัดทำบทความวิจัยตีพิมพ์เผยแพร่ลงใน Proceeding งานประชุม / Journal of Health Research และหน้าที่อื่นๆ ที่เกี่ยวข้อง

ทั้งนี้ ตั้งแต่บัดนี้เป็นต้นไป จนเสร็จสิ้นภารกิจ

ประกาศ ณ วันที่ 19 มิถุนายน พ.ศ. 2567



(ศาสตราจารย์ ดร.จิตรลดา อริย์สันติชัย)

คณบดีวิทยาลัยวิทยาศาสตร์สาธารณสุข



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