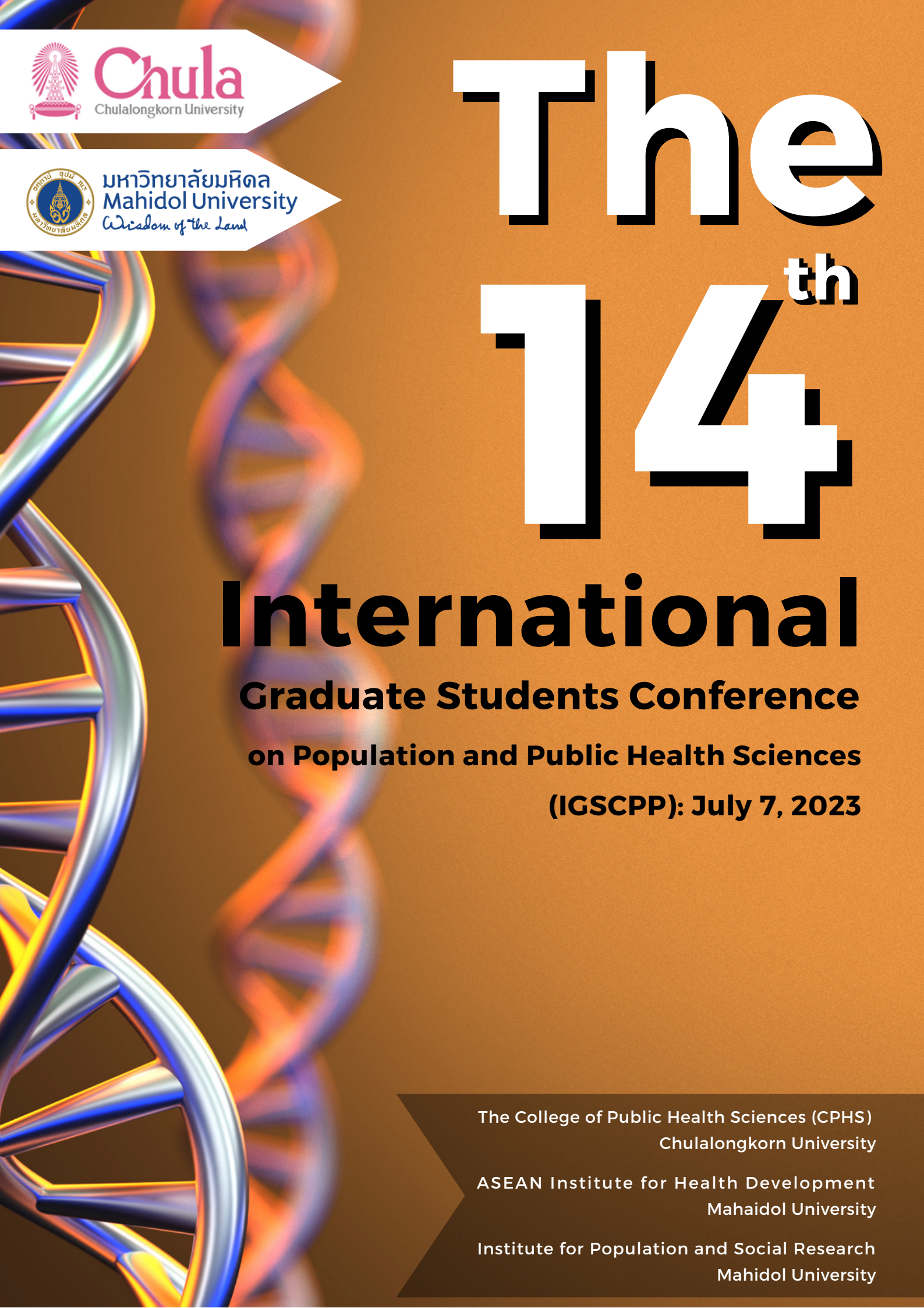

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Wisdom of the Land

The 14th International

Graduate Students Conference

on Population and Public Health Sciences

(IGSCPP): July 7, 2023

The College of Public Health Sciences (CPHS)
Chulalongkorn University

ASEAN Institute for Health Development
Mahaidol University

Institute for Population and Social Research
Mahidol University

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Welcome Message

Prof. Chitlada Areesantichai, Ph.D.

Chairperson, Executive Committee, 14th IGSCPP

Dean

The College of Public Health Sciences, Chulalongkorn University, Thailand

www.cphs.chula.ac.th

Dear Colleagues,

On behalf of all the academic staff and students at the College of Public Health Sciences (CPHS) Chulalongkorn University, I would like to extend our warmest welcome to all the participants at this; the 14th International Graduate tudent Conference on Population and Public Health Sciences (IGSCPP) July 7 th , 2023. 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 14 years. Together, we have made such an incredible and exciting international conference. This year, CPHS, as the host, is pleased to learn that the Conference has brought together both membersand non-members, local friends, and colleagues from abroad who share a common goal; a view of global healthand public advocacy. Naturally, this conference provides an excellent forum for the discussion of 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 the 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 the technical contents of this conference, and wish you a very productive conference and an enjoyable stay in Bangkok, Thailand.

Welcome Message

Assoc. Prof. Chuthamanee Suthisisang, Ph.D.

Vice President of Mahidol University, Thailand

Acting for Director of ASEAN Institute for Health Development

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

Ladies and Gentlemen,

It is with great pleasure that I extend a warm welcome to all participants of the 14th 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 14th 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 our mission and vision. 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. Aree Jampaklay, Ph.D.

Co-Chairperson, Executive Committee, 14th IGSCPP

Director

Institute for Population and Social Research, Mahidol University

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

Greetings, my dear colleagues,

With profound gratitude, I warmly welcome all distinguished participants of the 14th International Graduate Students Conference on Population and Public Health Sciences (IGSCPP) 2023. For the past 13 years, this annual conference has demonstrated a steadfast commitment to advancing academic pursuits, facilitated networking opportunities, and fostered rewarding partnerships. As we gather here today, I would like to take a moment to celebrate the resounding success of the ongoing collaborative efforts of the following esteemed institutions:

- *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*

On behalf of the Institute for Population and Social Research (IPSR), Mahidol University, it is an honor and a privilege to extend my heartfelt welcome to participants from diverse backgrounds and nations. By sharing your research, I am confident that we will collectively acquire a deeper understanding and knowledge of various facets encompassing population and public health, including critical domains such as healthcare and reproductive health.

I wish to express my sincere congratulations and most profound appreciation to the two esteemed co-chairs, Prof. Dr.Chitlada Areesantichai from the College of Public Health Sciences (CPHS), Chulalongkorn University, and Assoc. Prof. Dr.Chuthamanee Suthisisang from the ASEAN Institute for Health Development (AIHD), Mahidol University. Their unwavering dedication and relentless efforts in organizing this annual conference are commendable. I am also grateful to the entire IPSR staff, whose active contributions have been instrumental in materializing this conference. Your untiring support has been paramount to the success of our collective endeavors.

Furthermore, I sincerely appreciate all the graduate students, researchers, and presenters who have graciously chosen to share their research at this conference. Your invaluable contributions are the lifeblood of this annual collaborative and networking event.

In conclusion, I wholeheartedly welcome you to the 14 International Graduate Students Conference on Population and Public Health Sciences (IGSCPP). I am confident that you will continue to cherish this experience for a long time to come as a meaningful part of your academic journey.

Thank you.

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Time	Program
8.30-8.45	VDO Presentation &Welcome
8.45-9.00	Conference Welcome Report Welcome keynote: 1. *Professor Chitlada Areesantichai, Ph.D.* *Dean, College of Public Health Sciences,* *Chulalongkorn University* 2. *Associate Professor Chuthamanee Suthisisang, Ph.D.* *Director, ASEAN Institute of Health Development, Mahidol University* 3. *Associate Professor Aree Jampaklay, Ph.D.* *Director, Institute for Population and Social Research, Mahidol University* Conference Opening Keynote 1. *Professor Bundhit Eua-arporn, Ph.D.* *President of Chulalongkorn University* ***MC: Asst. Prof. Anchalee Prasansuklab, Ph.D.***
9.00-9.30	Special Lecture: • *Translating science to implementation towards ending HIV in Thailand* 1. *Nittaya Phanuphak, MD, PhD.* *Executive Director of the Institute of HIV and Research Innovation (IHRI)* *Chairperson & Co-Chairperson* *Assoc. Prof.Wattasit Siriwong, Ph.D. / Asst. Prof.Montakarn Chuemchit, Ph.D.*
9.30-9.40	Photo Group / Short Break
9.40-12.00	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 Behaviors
	Chairperson & Co-Chairperson *Asst. Prof. Wandee Sirichokchatchawan, Ph.D. / Assoc. Prof. Piyapong Janmaimool, Ph.D.* ***Committee:*** *Asst. Prof. Dusita Phuenqsamran, Ph.D.*
	1) Associated Factors with Treatment-Seeking Delay of Malaria Patients at Private General Practitioners in Kachin State, Myanmar: A Secondary Data Analysis of Routine Surveillance Data (#01) *by Pyi Thein Khine*
	2) Strategies for Coping with Discrimination and Sexual Violence at Work and in the Community of LGBT Myanmar Migrant Workers in Thailand (#02) *by Khin Hsu Hlaing*
	3) Examining the Influence of Sociodemographic Factors and Immediate Risk Factors on the Occurrence of Tuberculosis among Individuals with Diabetes in Bangladesh (#03) *by Nadim Reza*

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Time	Program
Room 1	4) Prevalence and Associated Factors of Minimum Acceptable Diet among the Internally Displaced Population in Kayin State, Myanmar (#04) *by Htet Zaw Shein*
	5) Association of Knowledge Level and Discriminatory Attitudes toward People Living with HIV/AIDS among Adult Citizens in Myanmar: An Analysis of 2015-2016 Myanmar Demographic and Health Survey (#05) *by Pyae Phyo Thar*
	6) Effect of Health education on contraceptives use for family Planning among university students of Pakistan (#06) *by Ramesh Kumar*
Room 2	**Track 1:** Population, Demography, Aging and Migration, Active Aging and Innovation **Track 3:** Primary Health Care, Global Health, Health Care Management, Health Promotion, Health Behaviors, Substance abuse, Addiction studies, Mental Health, District Health System, Health System Research, Universal Health Care Coverage, Social Health Protection and Health Security Management, Health Economic, Behavioral Economic, Health Policy and Administration **Track 6:** One Health, Zoonoses and Antimicrobial Resistance
	Chairperson & Co-Chairperson: *Asst. Prof. Wakako Takeda, Ph.D. / Asst. Prof. Tepanata Pumpaibool, Ph.D.* ***Committee:*** *Asst. Prof. Seo Ah Hong, Ph.D.*
	1) The Association between Social Support and Biopsychosocial Factors on Psychological Distress among Undergraduates Students (#07) *by Shimpei Echigo*
	2) Factors Contributing to Suicide Ideation among Thai Recipients of Government Financial Support Program in 2022 (#08) *by Boonyawee Yeeluk*
	3) Factors Associated with Stunting among Non-Cash Food Assistance Program Receiver and Non-Receiver Program (#09) *by Ni Made Laksmi Gita Hapsari*
	4) Time-Trend Analysis of Different Causes of Elderly Deaths from 1960 to 2020 in The Philippines (#10) *by Ralf Benjo G. Morilla*
	5) Factors Associated with Health Insurance Premium Compliance among Small and Medium Enterprises in South Jakarta, Indonesia (#11) *by Rita Oktafitria*
	6) Accessibility to Health Services among National Health Insurance Program users in Champasak Province of Lao People's Democratic Republic (#12) *by Souphaphone Xayphavongsa*

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Time	Program
Room 3	**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
	Chairperson & Co-Chairperson: *Assoc.Prof. Thunwadee Suksaroj, Ph.D. / Assoc. Prof. Nutta Taneepanichskul, Ph.D.* ***Committee:*** *Asst. Prof. Marc Voelker, Ph.D.*
	1) Intimate partner violence among LGBT community in Yangon, Myanmar (#13) *by Kyaw Si Thu*
	2) Human Health Risk Assessment Related to Heavy Metals in Roadside Dust Near Hydropower Dams Construction Areas: A Case Study in Wangduephodrang District of Bhutan (#14) by Kinley Dorjee
	3) Phytochemical and Antioxidant Properties of Nam Wah (Musa paradisiaca L.) Banana By-Products in Thailand (#15) *by Ansella Amanda Epifani Widoyanti*
	4) Factors Associated with Menstrual Hygiene Practices among Buddhist Nuns in Bhutan (#16) *by Tshewang Yeden*
	5) Health Risk Assessment Related to Consumption of Heavy Metals Contaminated Foxtail Millet (Setaria Italica): A Case study in Anyang, China (#17) *by Xinfei Guo*
	6) Transcriptomic Analyses of Knockdown Cell Lines Reveal the Possible Association of ITPR3 and Olfactory Sensing Genes in Head and Neck Squamous Cell Carcinoma (#18) *by Tai-Sheng Chiu*
12.00-13.30	**Poster Presentation (room 1)**
	Poster committees: *Narumol Bhummapha, Ph.D,* *Prof. Ratana Somrongthong, Ph.D. / Nipunporn Voramongkol, M.D. MPH./* *Nuchanad Hounnaklang, Ph.D. / Onuma Zongram, Ph.D.* *Assoc. Prof. Kanchana Rungsihirunrat, Ph.D.*
	1) Dental Health Expenditure and Associated Factors among Elderly Patients in Faculty of Dentistry, Chulalongkorn University *by Rawitsara Suwannimit*
	2) Breaking the Silence: Exploring Perceived Social Norms and Knowledge Regarding Sexual and Reproductive Health among Adolescent Students in Monastic Schools, Myanmar *by Theingi Oo*
	3) The Development of Telemedicine in Rural Primary Healthcare Center for Hypertensive Patients, Muang-Phetchabun District, Phetchabun Province, Thailand; From Policy to Practice *by Tassana Thammaros*

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Time	Program
12.00-13.30	4) Characterization of N-Terminal Extension Domain of the Ubiquitin-Relative Hub1 in *Cryptococcus Neoformans* *by Chanakan Techawisutthinan*
	5) Association between FOMO and mental health among Pakistani crypto traders during crypto bear market: Preliminary survey *by Muhammad Umar Iftikhar*
	6) Factors Associated with the Utilization of Preventive Dental Treatments among Elderly Patients in Faculty of Dentistry, Chulalongkorn University *by Weerachon Panthueng*
	7) Factors associated with obtaining lung cancer screening in lung cancer high-risk group at Guangming Road Community, Golmud City, Qinghai Province, China: A preliminary result from a cross-sectional study *by Jinghe Li*
	8) The Assessment of Mobility in Community-Dwelling Older Adults in Nakhon Ratchasima Province, Thailand *by Pimpitcha Kangyang*
	9) Development and Validation of Questionnaire to assess Quality of Life in Nepali infertile patients *by Shital Shakya*
	10) Factors Associated with the Dental Attendance among Elderly Patients in Faculty of Dentistry, Chulalongkorn University: A Study Based on Anderson's Model *by Narongrit Nampikul*
	Poster Presentation (room 2) *Poster committees: Kriangkrai Lerdthusnee, Ph.D. / Napaphan Viriyautsahakul, Ph.D. M.D.* *Assoc. Prof. Chaweewon Boonshuyar/ Asst. Prof. Pokkate Wongsasuluk, Ph.D./* *Nanta Auamkul, M.D, M.P.H/*
	11) Association between Breastfeeding and Peripheral Neuropathy in Postmenopausal Obese Women Aged 40-70 Years: Results from the 1999-2004 National Health and Nutrition Examination Survey *by Jiayu Li*
	12) Association between Medical Services of Choice and Length of Stays in Grey Cambodian Medical Tourists in Thailand *by Apassara Tuegdee*
	13) Prevalence and Associated Factors of Stress among Adolescents in a Public School, Nakhon Ratchasima Province, Thailand *by Panchanok Thongmanogoon*
	14) International Retirement Migration: A Case Study of Long Stay Tourism in Hua Hin, Thailand *by Wanida Sukkun*

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Time	Program
12.00-13.30	15) Association Study of polymorphisms in Drug Metabolizing Enzyme and DNA Repair Genes with Cisplatin-Induced Nephrotoxicity in Thai Cancer Patients *by Saad Ahmed*
	16) Caregiver Burden among Community Caregivers of Dependent Elderly in Long-Term Care System: A Cross-Sectional Study in Thailand *by Songpol Kamnungkiattiwong*
	17) Immunizable Diseases among Children: Mortality Trends in the Philippines *by Chin-chin J. Demayo*
	18) Socio-Demographic Factors Influencing Men's Fertility Desires in Northern Nigeria *by Abbani, Abubakar Yakubu*
	19) Medical Service Utilization among International Tourists in Bangkok, Thailand *by Ken Lin*
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	7) Factors Affecting the Implementation of Integrated Community Case Management Program among Key Players at Community Level in Central River Region North, The Gambia *(#19)* *by Ebrima Bah*
	8) Dengue and Malaria: Mortality Trends in the Philippines, 1979 - 2020 *(#20)* *by Meliza Parba*
	9) Adopting Hormone Therapy for Transgender People within the Healthcare Systems in Thailand: Perspectives of Health Service Providers *(#21)* *by Sirirath Ratlerdkarn*
	10) Associated Factors among Confirmed COVID-19 Cases and Telemedicine Treatment Outcome During the Third Wave of COVID-19 in Myanmar: A Secondary Data Analysis *(#22)* *by Hein Thu*
	11) Ability to Pay for Rotavirus Vaccination among Guardians of Children Under 5 Years of Age in Vientiane Capital, Lao PDR *(#23)* *by Soutthasone Taichanthone*
	12) Factors Associated with Asymptomatic Malaria Infection among Residents in Nga Pyin Inn Rural Health Center, Myanmar *(#24)* *by Zaw Win Thein*

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Time	Program
	13) Burnout and Associated Factors Among Nurses in Central Division, Fiji During COVID-19 Pandemic *(#25)* *by Vijeta Mani*
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	7) Performance of the Village Health Volunteers in Prevention and Control of Liver Fluke in Nan Province, Thailand (#26) *by Prasit Piriyapaiboon*
	8) Assessing Progress in Women and Girls' Health: Profile and Trends of Disease Mortality among Females in the Philippines from 1960 to 2020 (#27) *by Kathleen L. Cabanlit*
	9) Barriers of Willingness to Enroll into National Health Insurance Program among Household of Parsa district, Madhesh Province of Nepal (#28) *by Adhikari Saroj*
	10) Associating Social Factors of Women's Desire to Have Additional Children in the Two Largest Cities in Vietnam (#29) *by Diep The Hoang Tram*
	11) Six-Decade Mortality Trends among Filipino Adolescents from Different Causes (#30) *by Jamerah B. Sidic*
	12) Determinants of Compliance with National Health Insurance Contribution Payment Among Informal Workers in Indonesia (#31) *by Trisnasari*
	13) The Determinants of Continuity of Care and Its Effect on Type 2 Diabetes Mellitus (T2DM) Patients' Health Outcomes in Indonesia: Analysis Using the National Health Insurance (NHI) Database (#32) *by Herly Dwi Putra*
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	7) The impact of mothers' characteristics on the disposal methods of children's stools in Myanmar (#33) *by Naw Lah Say Wah*
	8) Assessment of stress among healthcare professionals in Yangon, Myanmar (#34) *by Nyein Chan Aung*
	9) Evaluation of groundwater pollution in Hossein Abad region in Hamedan province due to industrial activities (#35) *by Mahdi Reyahi-Khoram*
	10) Socioeconomic Status and Mental health among Myanmar Migrant workers in Samut Sakhon province Thailand (#36) *by Myo Myint Kyaw*
	11) Profile and Trends of Mortality from Infectious Diseases in the Philippines (#37) *by Angel Mae F. Luga*
	Wrap Up & Evaluation ***MC:*** *Asst. Prof. Anuchit Phanumartwiwath, Ph.D.*
15.30.- *16.00.*	**Outstanding Award and Closing** *Prof. Chitlada Areesantichai, Ph.D.* ***MC:*** *Asst. Prof. Anchalee Prasansuklab, Ph.D. / Asst. Prof. Anuchit Phanumartwiwath, Ph.D.*

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ASSOCIATED FACTORS WITH TREATMENT-SEEKING DELAY OF MALARIA PATIENTS AT PRIVATE GENERAL PRACTITIONERS IN KACHIN STATE, MYANMAR: A SECONDARY DATA ANALYSIS OF ROUTINE SURVEILLANCE DATA

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ABSTRACT

Malaria is a substantial global health burden, with timely treatment critical for effective outcomes. Because of convenience and inclination, high-risk populations of malaria frequently seek treatment in the private health sector. This study aims to explore the factors associated with delayed malaria treatment-seeking in the private sector of Kachin State, Myanmar.

The routine malaria surveillance data of 2,609 patients with malaria under the Myanmar Medical Association Malaria Project, encompassing patient characteristics, diagnostic results, and treatment details from 2018 to 2022 were gathered to find the associated factors with treatment-seeking delay. Bivariate and multivariate statistical analysis was performed to evaluate the associations, using Person's Chi-square and binary logistic regression. The statistically significant was set at *p-value* <0.05.

According to the findings of the bivariate analysis, several factors are associated with delayed treatment-seeking. Age and occupation exhibited a substantial association, with individuals in the working age group and those who work in the forest being prone to delay seeking treatment. Furthermore, patients who resided in rural areas were observed to have higher rates of delayed treatment-seeking than their urban counterparts. In addition, the species composition of malaria infections, recent traveling characteristics, the distance between patients' residences and clinics, and the experience of quality general practitioners also showed significant associations with delayed treatment-seeking. In multivariate analysis, the occupation of the patients (AOR=3.584, 95%CI=2.872-4.473), the malaria species composition (AOR=2.600, 95%CI=1.558-4.338), patients' location (AOR=1.354, 95%CI=1.056-1.737), and location differences between patients' residences and clinics (AOR=2.165, 95%CI=1.721-2.724) maintained their association.

This study offers insight into the intricate relationship of variables that affect delayed malaria treatment-seeking by revealing the significant association of treatment-seeking delay with specific occupation as forest-related workers, *Plasmodium vivax* infection, patients' residential areas, and location differences between patients' residences and clinics.

Keywords: Malaria, Treatment-seeking, Private sector, Kachin State, Myanmar

INTRODUCTION

Malaria is a substantial health burden in many parts of the world, with high transmission rates and accompanying morbidity and mortality. According to the most recent World Malaria Report, there were 247 million new cases of malaria in 2021, an increase from 245 million in 2020 (1). Myanmar reported 79,046 cases of malaria in 2021. Of these, 14,614 cases were caused by *Plasmodium falciparum*, 523 by mixed cases, and 63,909 by *Plasmodium vivax* (2).

Treatment-seeking behavior is crucial in decreasing the impact of malaria in the context of malaria control and elimination efforts. In Myanmar, private general practitioners are crucial to the healthcare delivery system, especially in remote and rural areas where there may be limited access to public healthcare facilities (3). Kachin State, which is located in northern Myanmar, is one of the high-burden regions of malaria. Despite the availability of private general practitioners in the region, the extent of treatment-seeking delay and the factors that contribute to it remain poorly understood. This study aims to address this knowledge gap by evaluating the factors associated with delayed treatment seeking among patients with malaria at private quality general practitioners (QGPs) under Myanmar Medical Association, Malaria Project (MMA Malaria Project) in Kachin State.

The study employed the Precede phase of the Precede-Proceed model as a framework to investigate the factors associated with delayed treatment-seeking among patients with malaria in Kachin State, Myanmar. The Precede-Proceed model provided a systematic approach to comprehending health behaviors and the influencing factors (4). The Precede phase focuses on identifying the predisposing, enabling, and reinforcing factors that impact certain behavior related to health (4). Predisposing factors are intellectual and emotional "givens" that tend to either raise or decrease an individual's propensity to participate in risky or healthy behaviors. Enabling factors are those aspects of an issue that facilitate the initiation and maintenance of good or unhealthy behaviors. Reinforcing factors are attitudes and social norms that encourage or prevent the practice of healthy behaviors (5).

According to a cross-sectional study conducted in Indonesia, age group, gender, educational attainment, occupation, ethnicity, and distance from healthcare facilities to health facilities were associated with care-seeking for malaria treatment (6). Travel history was revealed to be a factor in malaria treatment delay in a study conducted in Northern Ethiopia (7). A study conducted in Equatorial Guinea discovered that households waited more than 24 hours before seeking treatment outside, with the largest delays in rural areas (8). A study conducted on the Thailand-Myanmar border indicated that the prevalence of treatment delay of more than one day was 79.6% (9). A study conducted in Shan State, Myanmar, discovered that factors associated with delayed malaria treatment-seeking included low malaria literacy, self-treatment, and distance to health facilities and 84.2% of those surveyed delayed getting treatment for malaria (10).

The focus of existing research may be primarily on public healthcare systems or community-based initiatives, with little emphasis placed on the role of private general practitioners in malaria treatment-seeking and the identification of associated factors related to treatment-seeking time in Myanmar's private sector. The primary objectives of the study are to estimate the prevalence of delayed treatment-seeking among patients with malaria reported by QGPs and to evaluate the relationship between delayed treatment-seeking and the socio-demographic factors, malaria species composition, patients' residence location, location difference between patients' residences and QGPs' clinics, recent traveling characteristics, and the experience of QGPs in Kachin State, Myanmar from 2018 to 2022.

METHODOLOGY

Study Design, Population, and Sample Size

This study employed existing routine surveillance data of the private sector under the MMA Malaria Project from 2018 to 2022 to evaluate the factors associated with treatment-seeking delay among patients with malaria in Kachin State, Myanmar. The longitudinal data were gathered from 51 QGPs in 9 townships of Kachin State. All the patients infected with *Plasmodium falciparum* and *Plasmodium vivax* of all ethnicities including all ages and both genders who were diagnosed and received treatment according to the national malaria treatment guideline at QGPs under the MMA Malaria Project within the study period were included in an analysis except the patients whose data in the dataset were incomplete. After applying the exclusion criteria, 2,609 patients with malaria make up the overall sample size of the study.

Data Analysis

Descriptive statistics were employed to summarize the general characteristics of the study population, including frequencies and percentages for independent variables and treatment-seeking delay. The independent variables of the study are the predisposing factors which include socio-demographic factors and malaria species composition, enabling factors such as patients' residence location, location difference between patients' residences and QGPs' clinics, and recent traveling characteristics, and reinforcing factors including the experience of QGPs. The treatment-seeking time can be classified into two categories: not delayed, which is within 24 hours following the onset of the fever, and delayed, which is defined as seeking treatment after 24 hours from the first sign and symptom of malaria, especially fever (11). To evaluate the relationships between all those factors and treatment-seeking delay, a bivariate analysis using Pearson's Chi-square test was performed. To control for potential confounders, binary logistic regression analysis was employed to determine the adjusted associations. The findings were presented as adjusted odds ratios and 95% confidence intervals. Statistical significance is interpreted as a *p-value* less than 0.05. All of the analysis was done using the SPSS (version 28.0.0.0) software.

Ethical Approval and Consent

The MMA Malaria Project authorized the utilization of secondary data for analysis. The study scrupulously upheld the confidentiality and privacy of the personal information of patients, and all data would be erased once the study has been published. The Research Ethics Review Committee for Research Involving Human Research Participants, Chulalongkorn University reviewed and approved this study (COA No. 097/66).

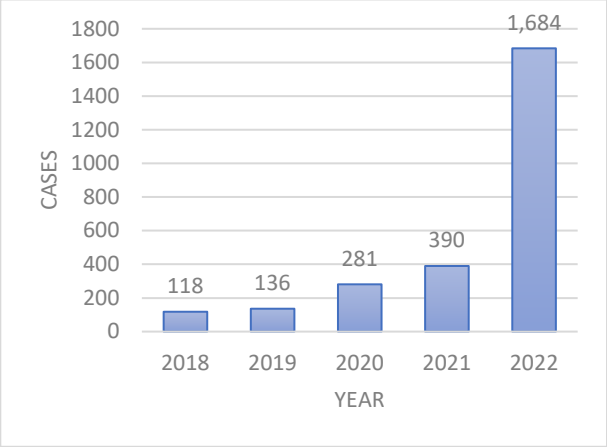

Figure 1: Trends of Malaria Cases in Kachin State from 2018 to 2022

RESULTS

The study comprised 2,609 patients with malaria attending QGPs in the private sector under MMA Malaria Project in Kachin State. As shown in Figure 1, there were 118 overall cases in 2018, 136 cases in 2019, 281 cases in 2020, and 390 cases in 2021. Notably, 2022 had the highest number of cases of malaria out of the five years, totaling 1,684 cases. The global outbreak of the COVID-19 pandemic, which influences healthcare services, surveillance, and control efforts, coincided with the surge in malaria cases in 2020. The military coup that resulted in political instability in Myanmar worsened the situation in 2021 and 2022.

As indicated in Table 1, there was a delay in seeking treatment in the vast majority of patients (80.2%), and the most prevalent species of malaria discovered was *Plasmodium vivax* (96.4%). The majority of patients were male (76.2%) and between the ages of 16 to 30 (47.9%). Forest-related workers made up a sizable share of the sample (58.2%). The majority of patients (80.5%) resided in rural areas, and a sizable percentage (57.3%) of patients have location differences from the clinics. Approximately 29.1% of patients had a recent history of travel and 61.1% of QGPs caring for the patients were experienced to the level of five years or more.

Table 1: Description of predisposing, enabling, reinforcing factors and treatment-seeking time (n=2,609)

Variables	Number	Percentage (%)
Predisposing factors		
Age		
Under 16	401	15.4
16-30	1,249	47.9
31-65	946	36.3
Over 65	13	0.5
Gender		
Female	621	23.8
Male	1,988	76.2
Occupation		
Forest-related worker	1,519	58.2
Non-forest-related worker	1,032	39.6
Nil*	58	2.2
Malaria species composition		
Plasmodium falciparum	95	3.6
Plasmodium vivax	2,514	96.4
Enabling factors		
Location of the patients		
Urban	510	19.5
Rural	2,099	80.5
Location difference between patients' residences and QGPs' clinics		
Same township	1,113	42.7
Different township	1,496	57.3
Recent traveling history		
No traveling	1,850	70.9
Traveling	759	29.1
Reinforcing factor		
Experience of quality general practitioners		
Under 5 years	1,014	38.9
5 years and above	1,595	61.1
Treatment-seeking time		
Not delayed	517	19.8
Delayed	2,092	80.2

*Nil=No occupation data

The relationships between independent variables and delayed treatment-seeking in bivariate analysis were shown in Table 2. Particularly, there was a significant relationship between delayed treatment-seeking and age (χ^2=13.804, df=3, *p-value*=0.003). The working age groups (16-30 and 31-65 age groups) had a larger proportion of people who delayed seeking treatment when compared to the under-16 and over-65 age groups. The relationship with occupation was also observed (χ^2=144.386, df=1, *p-value*<0.001). Compared to non-forest-related workers, forest-related workers also had a higher percentage of delayed treatment-seeking. However, gender did not demonstrate any significant associations with treatment-seeking delay. Additionally, there was a significant relationship between the delay in seeking treatment and the species composition of malaria (χ^2=17.987, df=1, *p-value*<0.001). Patients with *Plasmodium vivax* infection displayed a higher incidence of delayed treatment-seeking compared to those with *Plasmodium falciparum* infection. The patients' location and delayed treatment-seeking showed substantial association (χ^2=6.098, df=1, *p-value*=0.014). Patients who lived in rural areas were more likely to delay seeking treatment than those who lived in urban areas. A significant relationship was also found between the location difference between patients' residences and QGPs' clinics and delayed seeking of treatment (χ^2=56.135, df=1, *p-value*<0.001). Patients who resided in a different township from QGPs' clinics were more likely to delay seeking treatment than those who lived in the same township. A substantial relationship between recent traveling history and delayed treatment-seeking was also identified (χ^2=15.497, df=1, *p-value*<0.001).

Compared to patients who had no history of travel outside of the township, patients with travel histories had a higher proportion of delayed treatment-seeking. Concerning delayed treatment-seeking, the experience of QGPs had a significant difference (χ^2=6.312, df=1, *p-value*=0.012). QGPs with 5 years or more of experience had a lower proportion of delayed treatment-seeking of the patients.

Table 2: Factors associated with treatment-seeking delay by bivariate analysis (n=2,609)

Variables	Treatment-seeking time				Chi-square	*p-value*
	Not delayed		Delayed			
	n	%	n	%		
Age					13.804	**0.003***
Under 16	93	23.2	308	76.8		
16-30	244	19.5	1,005	80.5		
31-65	173	18.3	773	81.7		
Over 65	7	53.8	6	46.2		
Gender					0.207	0.649
Female	127	20.5	494	79.5		
Male	390	19.6	1,598	80.4		
Occupation (n=2551)					144.386	**<0.001***
Forest-related worker	181	11.9	1,338	88.1		
Non-forest-related worker	322	31.2	710	68.8		
Malaria species composition					17.987	**<0.001***
Plasmodium falciparum	35	36.8	60	63.2		
Plasmodium vivax	482	19.2	2,032	80.8		
Location of the patients					6.098	**0.014***
Urban	121	23.7	389	76.3		
Rural	396	18.9	1,703	81.1		
Location difference between patients' residences and QGPs' clinics					56.135	**<0.001***
Same township	296	26.6	817	73.4		
Different township	221	14.8	1,275	85.2		
Recent traveling history					15.497	**<0.001***
No traveling	403	21.8	1,447	78.2		
Traveling	114	15.0	645	85.0		
Experience of quality general practitioners					6.312	**0.012***
Under 5 years	176	17.4	838	82.6		
5 years and above	341	21.4	1,254	78.6		

**p-value*<0.05

As in Table 3, a binary logistic regression analysis demonstrated that some factors maintain the association (p-value<0.05) with treatment-seeking delay. Specifically, compared to the reference group (non-forest-related workers), forest-related workers in Kachin State had 3.6 times higher chances (AOR=3.584**,** 95%CI=2.872-4.473) of delayed treatment-seeking. Individuals infected with Plasmodium vivax had 2.6 times the likelihood (AOR=2.600**,** 95%CI=1.558-4.338) of delayed treatment-seeking compared to individuals infected with Plasmodium falciparum (the reference group). When compared to patients who reside in urban areas (the reference group), those who lived in rural areas had about 1.4 times higher likelihood (AOR=1.354, 95%CI=1.056-1.737) of delaying treatment-seeking. Individuals who live in different townships from the location of clinics had 2.2 times greater chances (AOR=2.165**,** 95%CI=1.721-2.724) of delaying treatment-seeking compared to patients who reside in the same township (the reference group)

Table 3: Factors associated with treatment-seeking delay by multivariate analysis (n=2,609)

Variables	AOR (95%CI)	95%CI		*p-value*
		Lower	Upper	
Age				
Under 16	Ref.			
16-30	1.197	0.437	1.815	0.089
31-65	1.342	0.821	1.933	0.283
Over 65	0.478	0.125	0.819	0.147
Occupation (n=2,562)				
Non-forest-related worker	Ref.			
Forest-related worker	3.584	2.872	4.473	**<0.001***
Malaria species composition				
Plasmodium falciparum	Ref.			
Plasmodium vivax	2.600	1.558	4.338	**<0.001***
Location of the patients				
Urban	Ref.			
Location difference between patients' residences and QGPs' clinics				
Rural	1.354	1.056	1.737	**0.017***
Same township	Ref.			
Different township	2.165	1.721	2.724	**<0.001***
Traveling history				
No traveling	Ref.			
Traveling	1.031	0.823	1.252	0.779
Experience of quality general practitioners				
Under 5 years	Ref.			
5 years and above	0.972	0.764	1.098	0.457

**p-value*<0.05, Method=Enter method, Hosmer and Lemeshow Test χ^2=13.539 (*df*=7, *p-value*=0.095), Nagelkerke R Square=0.138, Overall percentage of correct classification=80.6%

DISCUSSION

The study revealed descriptive findings of 2,609 malaria patients attending QGPs in the private sector under the MMA Malaria Project in Kachin State and several associated factors with a delay in seeking treatment.

Young adults between the ages of 16 to 30 made up the majority (47.9%) of the cases, underscoring their vulnerability to malaria infection and a significant proportion of the sample was made up of males (76.2%), which indicates that males and females may behave differently while seeking healthcare. A study in Ethiopia showed that the age range of 25 to 54 (40.2%) had the highest rate of suspected and examined malaria cases and males had 1.41 times the likelihood of contracting malaria than females (12). A sizable percentage of the patients were forest-related workers (58.2%), indicating an elevated risk of malaria due to occupational exposure. A qualitative study conducted in Thailand discovered that people who visit forests increase the risk of contracting malaria since they are exposed to mosquitoes there, especially in hot and humid conditions (13). The most prevalent malaria species observed was *Plasmodium vivax* (96.4%), highlighting the need for tailored interventions to address its unique characteristics and medical requirements. *Plasmodium vivax* is predominant in the region of South-East Asia, comprising 51.7% of estimated malaria cases (2). *Plasmodium vivax* is known to cause recurrent malaria episodes and can be challenging to eliminate due to its capacity to remain latent in the liver (14). There was a delay in seeking treatment in the vast majority of patients (80.2%) indicating an issue regarding the timeliness of healthcare seeking among malaria patients attending QGPs in Kachin State, Myanmar. Targeted public health initiatives to increase awareness of early treatment-seeking, reduce geographic barriers, and improve access to healthcare facilities can play a crucial role in encouraging timely treatment-seeking behaviors.

In bivariate analysis, age appeared as a significant predictor of delayed treatment-seeking, but it lost significance in multivariate analysis. A study done in the Dera district of northwest Ethiopia showed that age was not associated with delay in seeking treatment for malaria among all age groups (15).

The patient's occupation and delayed treatment-seeking were positively associated in both bivariate and multivariate analyses. Forest-related workers had 3.6 times higher likelihood of delaying seeking treatment compared to non-forest-related workers. The results are in line with research done in Thailand that discovered forest goers tend to delay getting seeking treatment for malaria (13). This finding highlights the vulnerability of forest-related workers to delayed treatment,

probably due to their occupational exposure to malaria and potential barriers to seeking healthcare services. The enhancement of healthcare access and awareness among forest-related workers should be prioritized to enable early detection and treatment of malaria.

Patients with *Plasmodium vivax* infections exhibited a 2.6 times higher incidence of delayed treatment-seeking than patients with *Plasmodium falciparum* infections. The findings are comparable to those of an Indonesian study, which discovered that the proportion of *Plasmodium vivax* malaria cases was a primary cause for patients delaying seeking malaria treatment (6). This finding suggests that patients' perceptions of the intensity of their symptoms or their perceived need for treatment may be influenced by specific types of malaria infection. Effective initiatives for enhancing awareness among vulnerable communities on the significance of timely intervention for all forms of malaria infections are mandatory.

The finding of living in rural areas increased the likelihood of delaying treatment-seeking by 1.4 times compared to urban areas is comparable to that of an Ethiopian study which discovered that patients who lived in rural regions were more likely to delay seeking malaria treatment (16). This reflects disparities in healthcare accessibility and availability between urban and rural settings, determining the timeliness of seeking treatment.

It was also discovered that patients who lived in different townships from the QGPs' clinics were 2.2 times more likely to delay seeking treatment. This result lines up with the finding of a study carried out in Thailand, which discovered that patients were more likely to delay seeking treatment for malaria if they had to walk more than 30 minutes to a nearby medical facility (9).

The finding emphasizes the influence of accessibility and geographic distance on treatment-seeking behavior. Strategies like mobile clinics, telemedicine, or improved means of transportation may be taken into consideration to reduce the gap, especially for people who reside in distant areas.

Additionally, in bivariate analysis, recent travel histories and the experience of QGPs related to delayed treatment-seeking, however, in multivariate analysis, they lost their significance. A prior study on returning travelers with malaria indicated that patient barriers like lack of knowledge about the infection, concern over treatment side effects, and self-medication are partially accountable for treatment delays (16).

CONCLUSION

In conclusion, the observed treatment-seeking delay in the majority of cases raises concerns about access to healthcare and awareness of early malaria diagnosis and effective treatment in Kachin State. Limited healthcare infrastructure, geographic barriers, lack of awareness of malaria symptoms, and sociocultural beliefs tend to be factors contributing to treatment-seeking delay.

The burden of malaria needs to be reduced by addressing these obstacles through focused interventions, such as expanding community education initiatives, enhancing healthcare facilities, and encouraging early diagnosis and treatment-seeking behavior.

The study also revealed the significant association of treatment-seeking delay with specific occupation as forest-related workers, *Plasmodium vivax* infection, patients' residential areas, and different locations between patients' residences and clinics.

The findings highlighted the need for focused interventions to address the specific vulnerabilities of forest-related workers to malaria infection. Furthermore, it is crucial to consider specific malaria species when developing interventions to encourage early treatment-seeking behaviors. Efforts should be directed toward improving access and upgrading healthcare infrastructure to enable prompt access to healthcare services.

LIMITATIONS

This study is subject to several limitations. Firstly, the cross-sectional nature of the study limits the capacity to establish a causal relationship. Secondly, there may be a possibility of selection bias because the study sample originated from individuals who are proactive in seeking healthcare or who have access to medical facilities, thereby underrepresenting people who do not seek medical treatment or who encounter barriers in accessing healthcare. Thirdly, the study was limited to only the private sector in Kachin State, which may restrict the generalizability.

Lastly, due to the limitation of information in secondary data, the study was unable to employ all the components in the Precede-Proceed framework. The study emphasized only identifying associations rather than evaluating specific interventions to address delayed treatment-seeking in Kachin State.

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STRATEGIES FOR COPING WITH DISCRIMINATION AND SEXUAL VIOLENCE AT WORK AND IN THE COMMUNITY OF LGBT MYANMAR MIGRANT WORKERS IN THAILAND

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ABSTRACT

Evidence shows that LGBT migrants are exposed to more risk of mental health problems due to discrimination and violence based on their gender. Similarly, LGBT Myanmar migrants come to work in Thailand not only for better opportunities but also for the avoidance of harsh treatment in their home country; however, discrimination and sexual violence still exist against them in Thailand. Therefore, coping strategies are important for them to build resilience. The main objective of this study is to explore adverse experiences of discrimination and sexual violence suffered based on gender and how to cope with these adverse experiences of LGBT Myanmar migrant workers in Thailand.

The qualitative study was conducted through 20 semi-structured interviews with LGBT Myanmar migrant workers who have experienced discrimination or sexual violence at the workplace or in the community in Thailand. Various forms of abuse including physical, verbal, and mental abuse were found in the study. Diverse healthy reactions were found such as self-soothing thoughts, relaxation activities, and social and professional support. Unhealthy reactions such as negative self-talk (e.g., overwhelming guilt of perceived mistakes), rumination, and suppressive thoughts (e.g., rejecting their gender) appeared to have hurt LGBT along with unhealthy activities (e.g., drinking alcohol), self-harm, and even suicidality.

The study fills the research gap in coping studies of LGBT Myanmar migrant workers in Thailand. It highlights the need for policy intervention since LGBT migrants play an important part in Thailand's workforce in various sectors.

Keywords: health theory of coping, resilience, abuse, Thailand, migrant workers

INTRODUCTION

Though the stigma against LGBT people is relatively reduced nowadays due to anti-discrimination activities, policies, and law changes towards a rightful society, the benefits of this improvement are inconsistent depending on various intersectionality including gender, race, and social class (1). The experiences of LGBT people in inferior social positions cannot be the same as those of LGBT in a more privileged social status even under the same policy, culture, and community. LGBT migrant workers are underprivileged due to their social position. Again, migration can also be regarded as political intersection to the gender and sexuality according to politics of pro-migrants and anti-migrants (2). LGBT migrant workers have suffered intersectionality challenges of being migrants and being LGBT (3). These experiences can have a detrimental effect on both the psychological and physical well-being of LGBT migrant workers. (4). As a secondary prevention strategy for these adverse consequences, coping and resilience strategies are important for them. Despite their disadvantages, discrimination and violence in LGBT people and LGBT coping studies were studied mostly within the national people and studies for the experiences of LGBT migrants were limited.

LGBT Myanmar migrant workers came to work in Thailand due to their economic hardship and for some LGBT Myanmar migrants, harsh treatment by their family or by their community in their original country can also be a push factor. Apart from these reasons, many LGBT Myanmar migrants were pushed out of the country recently because of inflation and political arrest after the political instability due to the military coup in 2020. However, they still face discrimination and sexual violence at their work and in the community.

According to previous literature, coping strategies of LGBT migrants to tackle intersectional challenges of being migrants and LGBT were various due to individual perception. Connectedness to the LGBT community was the common coping reaction (5-7). Their choice of disconnection or connection with the same ethnic community depended on their perception of their own ethnic culture. Some thought their culture was supportive to them in some ways and some disconnected with their own ethnic community due to homophobic culture (5). Staying hopeful and positive, utilizing community and legal services, receiving support from significant others and friends, letting go were also the strategies for resilience in LGBT migrants. However, some showed confusion of how to prioritize immigrant rights movement and LGBT rights movement. They chose according to their survival needs (5). In the perspectives of healthcare providers, increasing accessibility of competent mental health providers was the supportive factor to mental health. Providers should understand intersection of gender, race, social status, and migration (7). However, most of the LGBT migrant studies were not conducted on Asia and mainly focused on forced LGBT migrants. They did not reflect LGBT labor migrants or LGBT migrant workers and lack the context of discrimination and sexual violence in the workplace. To fill the research

gap, the current study has explored adverse experiences of gender-based discrimination and sexual violence suffered in the workplace and in the community in Thailand and how to cope with these adverse experiences of LGBT Myanmar migrant workers.

METHADOLOGYS

The qualitative study was conducted by 20 semi-structured interviews. The participants were self-identified LGBT who were Myanmar LGBT migrants in Thailand and aged over 18. They all have suffered discrimination or sexual violence in the workplace or in the community in Thailand based on their gender identity or sexual orientation the purposive sampling and snowball method was used to get different subgroups of LGBT with different occupations.

The study hypothesized the health theory of coping (8). The guidelines questions for interviews were prepared to get experiences of discrimination and sexual violence based on their gender identity or sexual orientation in Thailand and how to cope with these adverse experiences by probe questions based on the health theory of coping. The health theory of coping categorizes coping reactions into two categories, healthy coping reactions, and unhealthy coping reactions according to their consequences to the individual's well-being (8). This categorization helps explicate the impact on the overall health or well-being of LGBT Myanmar migrant workers by LGBT discrimination and sexual violence. According to the categorization of the health theory of coping, healthy coping reactions are healthy self-soothing techniques such as positive and encouraging self-talk and abdominal breathing, healthy activities, social support, and professional support. Unhealthy coping reactions are unhealthy self-talk such as negative and harmful thoughts, unhealthy activities, social withdrawal and suicidality (8). The thematic analysis method was used in the study. The findings from the interview were coded as themes and patterns in Microsoft Excel file. The interview conversations were transcribed and translated into English. Then, the information was quoted and aggregated into the corresponding themes in the Excel file. The validity of the findings was checked by two researchers by using the transcripts. The study was conducted with the approval of the Institutional Review Board of the Institute of Population and Social Research. The research information was first posted on 10th February 2023. The data collection started on 6th April 2023 after the approval of the Institutional Review Board and finished on 28th April 2023.

Discrimination findings included all physical and mental ill-treatment against LGBT Myanmar migrant workers related to their gender identity or sexual orientation at the workplace and in the community of Thailand. Sexual violence comprised all activities ranging from behavioral and verbal harassment to forced penetration and various types of sexual coercion (9).

RESULTS

The demographic factors of the participants were presented in table 1. Participants consisted of six gay men, eight transgender women, three transgender men, two lesbians, and a bisexual woman.

ID	Completed Age	Gender	Occupation	Education	Place of Residence	Length of time living in	Income
1	23	gay	Kitchen helper	tertiary	Bangkok	6 months	baht 10000-20000
2	23	gay	Hotel staff	tertiary	Bangkok	2 months	baht 10000-20000
3	28	gay	Teacher	tertiary	Bangkok	8 months	baht 10000-20000
4	24	gay	Waitress at Café	tertiary	Bangkok	3 months	baht 10000-20000
5	21	transman	Lotus cleaner	secondary	Nakhon Pathom	6 months	baht 10000-20000
6	26	transman	Journalist	tertiary	Tak	5 months	baht 20000- 30000
7	22	transwoman	Beauty Salon	secondary	Samut Sakhon	7 months	> baht 10000
8	26	gay	Hotel Receptionist	tertiary	Bangkok	8 months	baht 10000-20000
9	29	transwoman	Factory worker	secondary	Samut Sakhon	11 months	baht 10000-20000
10	26	transwoman	Factory worker	tertiary	Samut Sakhon	4 years	below baht 10000
11	23	transwoman	Make up artist	high school	Samut Sakhon	1 year and 4 months	baht20000-30000
12	29	transwoman	Accountant/make up artist	secondary	Samut Sakhon	16 years	baht 10000-20000
13	22	transwoman	Fisery and beauty salon	secondary	Samut Sakhon	1 year	> baht 10000
14	22	transwoman	Beauty Salon	secondary	Samut Sakhon	1 year	baht 10000-20000
15	30	transwoman	Clothing store/make up artist	high school	Phu Khet	10 years	baht 10000-20000
16	24	transman	Lotus cleaner	secondary	Samut Prakan	10 years	baht 10000-20000
17	21	lesbian	Housemaid	secondary	Bangkok	1 year	baht 10000-20000
18	21	lesbian	Prawn factory worker	secondary	Samut Prakan	6 years	baht 10000-20000
19	23	bisexual	Nanny	secondary	Bangkok	1 year	>baht 10000
20	24	gay	Content Moderator	tertiary	Bangkok	10 months	baht 20000- 30000

Table 1: Demographic Factors of the Participant

The experiences of being discriminated against and subjected to sexual violence by the participants based on gender identity and sexual orientation were presented as physical, emotional and verbal abuses. The perpetrators might be of various nationalities. Myanmar coworkers and neighbors were perpetrators more often since Myanmar migrants mostly stay together in the same neighborhood and Myanmar coworkers were also common to have. Another reason seemed to be that they were speaking the same language. Some people who could speak the Thai language fluently got harassed by Thai perpetrators and other migrants who could speak the Thai language.

Physical Abuse

Transgender women sometimes got into a fight after getting provoked physically by perpetrators. Some transgender women even got physical attacks such as being hit by a bike. Physical violence was rarely seen in other gender identities among participants. However, physical sexual violence was seen in transwomen and gay men. Attempts to rape were suffered by a transwoman. Touching body parts or private parts such as touching private parts while bending and slapping butts was common for transwomen and gay men both in the workplace and in the community. Molestation physically and sexual coercion by coworkers were also found in those two genders. Stalking and interference in daily life by a coworker had also been experienced by a gay man.

Emotional Abuse

Various types of unfair treatment in job operation based on gender identity was also found. The difficulty to get a job was common in transgender men. Gay men also had an experience that they must cover their gender identity not to get fired. Some transgender women and men had difficulty accessing toilets due to both discrimination and sexual harassment. Some seniors abused their authority to oppress gay men and transgender women because of their gender identity. Avoidance by coworkers or neighbors was suffered in all subgroups of LGBT. They did avoidance through many actions like pretending not to hear,

not replying to their greetings, not answering their questions, gossiping, and looking with hateful looks. Being treated like an HIV positive person was suffered by a gay man. Threatening with a nude video was also suffered by a gay man. Some gay men suffered molestation through behaviors such as knocking on his door to ask for sex and sleeping next to him by his roommate without consent.

Verbal abuse

Humiliating verbally, mocking their gender, and asking inappropriate questions were found for all genders. Calling with inappropriate words was found in transgender women and gay men. All subgroups of LGBT had experienced being asked sexually intrusive questions such as their sexual roles by coworkers and neighbors. Sexual harassment by inappropriate words such as asking to have sex or telling dirty jokes intentionally happened to gay men and transgender women in both workplaces and neighborhoods.

Coping strategies

Healthy coping strategies were analyzed into various findings of healthy self-soothing techniques, healthy activities, and social and professional support. On the other hand, unhealthy coping strategies were found as unhealthy self-talk, unhealthy activities, social withdrawal, and suicidality.

Healthy self-soothing techniques

Several healthy self-soothing strategies were identified. The LGBT specific self-soothing thoughts found in the study were reiterating their innocence of being LGBT, acceptance thoughts for their gender identity, acceptance of troubles as human nature to normalize being LGBT as a human, understanding and forgiving thoughts by regarding perpetrators as unimportant people or reminding themselves of perpetrators' low level of LGBT knowledge, having LGBT role model, and maintaining a positive reputation. The self-soothing thoughts practiced by the participants which were similar to general population were encouraging self-talk, optimistic thinking, focusing on personal goals, self-reliance, problem-solving focused thoughts, and a Buddhist perspective of valuing human life to combat suicidal thoughts. The following acceptance thought was reported by a bisexual woman who recently uncovered her gender by revealing her first same sex relationship in public.

I did not blame myself. I have already accepted myself as LGBT. Since the beginning, I have already understood that I would experience these things if I came out. I still choose this way. So, I don't mind these. _ID19 bisexual woman aged 23, nanny, Bangkok Unhealthy self-talk

The sad thoughts before going to work in the morning were presented in the case of workplace sexual violence.

When I woke up, the thought of going to work made me want to cry and I did not know how to react to this. That made me really stressed. _ ID1 gay man aged 23, kitchen helper, Bangkok.

The guilt was also overwhelming in some LGBT by thinking that they might harm their family. The sadness was overloaded in some LGBT by thinking about the worst things that can happen to them such as being killed. Long-term thoughts of insecurities and hating life of being LGBT were found in some participants with suicidal thoughts.

The upset thoughts about the attitude of perpetrators and the cultural and religious norms against them also hurt them. Some increased their anxiety by thinking about some serious events of sexual violence and discrimination again and again. Some said they were overthinking persons and could not stop thinking bad things. They even dreamed about their experiences of being discriminated against and cried again and again. There were also suppressive thoughts in some LGBT rejecting their gender identity or perceived mistakes in the past. Thinking about problems based on their gender and seeing their gender identity as a bad thing also makes them feel belittled and decreases their self-esteem.

Healthy Activities

Various healthy coping physical activities were also found in LGBT Myanmar migrants in Thailand but most of them were general healthy coping activities not specific to the LGBT context such as spending time alone in a peaceful space, listening to music, traveling, talking with a partner, opening feelings in social media, working hard, and learning new skills. Engaging in religious activities like meditation and listening to Dhamma was seen to cope with more intense distress. Volunteering practices and donations were also found in some participants and specific to the LGBT context. They used this practice to cope with the distress and remind themselves they were not worthless and could benefit their environment. Some endurance activities practiced by LGBT were also learned in our study. An undocumented transman journalist had to explain a lot in clinics about his biological sex. Some needed to shift multiple jobs to find an LGBT-friendly workplace regardless of a lower payment. A transgender woman tolerated sexual and physical abuse without taking actions to avoid bigger problems due to the disadvantages of being migrant and LGBT.

Unhealthy activities

Unhealthy activities used by the participants were similar to the general population such as aggression activities, emotional eating, smoking, alcohol drinking, and self-harm. Regarding aggression activities, some participants lost control and reacted with rude words or even harsh physical attacks when perpetrators provoked them again and again. Self-harm activities such as slapping their own face, starving themselves, and hitting themselves are also found and often associated with guilt based on their gender. They were found in transgender women. A transman recalled that he had harmed himself by doing exercises because of being humiliated.

Social support and social withdrawal

Participants avoided the perceived potential perpetrators and sometimes, they avoided socializing with people except their trusted ones who were mostly LGBT. Some did not socialize with co-workers and only talked about work-related matters since some were perpetrators. Some preferred to stay alone than open up their feelings to friends. Both social support and social withdrawal could happen in one person. Some got emotional support from family and friends but chose to stay lonely at some points. Social support from parents played an important factor in LGBT. The ones who got their parents' support could cope with their stress healthier than others. Unfortunately, the ones who did not get their family support struggled more emotionally.

Support from close relatives such as sister or aunt was shown in some gay men. Most participants tried to make new friends in Thailand who could protect them or help to find new proper jobs. Support from their partner was also a positive factor. Some transgender women with a more girly appearance were more comfortable in making friends with girls. However, some transgender women were more comfortable making friends with boys to avoid being accused by girls because of their remaining masculine body features. Some gay men also would like to have more female friends to avoid sexual harassment from males. Some transmen had difficulty socializing with both sex and preferred to stay alone but some transmen made friends with other transmen to get along and get support from each other. It depended on the availability of LGBT networks in their surroundings.

The perception that matured persons should not open up and socialize with many people also gave troubles for LGBT to get social support. However, transgender women usually got both emotional and physical support from same-gender transwomen. They had a culture of having fun together, helping each other, and fighting for each other.

Professional support and Suicidality

Only some LGBT with experience in working with NGOs could seek professional support such as talking online with counselors from previous working environments in Myanmar. Some LGBT who previously got some training, knew how to cope with distress better and had increased self-esteem. A gay man unclosed his suicidal thoughts such as jumping into the water and drinking medicine. Fortunately, he survived listening to music near the river. A transgender woman who faced much discrimination and sexual violence did a suicidal attempt by drinking shampoo when her husband also left her. She also had unbearable guilt for being LGBT.

Table 1: Summary of the main findings

	6 Gays	3 Transmen	8 Transwomen	2 Lesbians	1 Bisexual
Types of abuses					
1. Physical abuses,	Physical sexual abuse		Physical sexual abuse, Physical fight or hit by a bike		
2. Emotional abuses,	Covering gender identity to avoid termination, Oppression by seniors, Getting avoided, being treated like an HIV People, Molestation through behaviors, Being threatened with nude videos	Difficulty to get employment, difficulty to access toilets, Getting avoided	Difficulty to access toilets, Oppression by seniors, getting avoided	Getting avoided	Getting avoided
3. Verbal abuses	Humiliating verbally, mocking their gender, and asking inappropriate questions being asked sexually intrusive questions, Sexual harassment by inappropriate words such as asking to have sex or telling dirty jokes intentionally	Humiliating verbally, mocking their gender, and asking inappropriate questions	Humiliating verbally, mocking their gender, and asking inappropriate questions, Sexual harassment by inappropriate words such as asking to have sex or telling dirty jokes intentionally	Humiliating verbally, mocking their gender, and asking inappropriate questions	Humiliating verbally, mocking their gender, and asking inappropriate questions
Coping strategies					
1. Healthy Self soothing techniques	Acceptance thoughts for their gender identity, reiterating their innocence of being LGBT, acceptance of troubles as human nature to normalize being LGBT as a human, understanding and forgiving thoughts by regarding perpetrators as unimportant people or reminding themselves of perpetrators' low level of LGBT knowledge, maintaining a positive reputation,encouraging self-talk, optimistic thinking, focusing on personal goals, self-reliance, problem-solving focused thoughts,	Acceptance thoughts for their gender identity, reiterating their innocence of being LGBT, acceptance of troubles as human nature to normalize being LGBT as a human, understanding and forgiving thoughts by regarding perpetrators as unimportant people or reminding themselves of perpetrators' low level of LGBT knowledge, having LGBT role model,encouraging self-talk, optimistic thinking, focusing on personal goals, self-reliance, problem-solving focused thoughts,	Acceptance thoughts for their gender identity, reiterating their innocence of being LGBT, acceptance of troubles as human nature to normalize being LGBT as a human, understanding and forgiving thoughts by regarding perpetrators as unimportant people or reminding themselves of perpetrators' low level of LGBT knowledge, maintaining a positive reputation,encouraging self-talk, optimistic thinking, focusing on personal goals, self-reliance, problem-solving focused thoughts,a Buddhist perspective of valuing human life to combat suicidal thoughts	Acceptance thoughts for their gender identity, reiterating their innocence of being LGBT, acceptance of troubles as human nature to normalize being LGBT as a human, understanding and forgiving thoughts by regarding perpetrators as unimportant people or reminding themselves of perpetrators' low level of LGBT knowledge,encouraging self-talk, optimistic thinking, focusing on personal goals, self-reliance, problem-solving focused thoughts,	Acceptance thoughts for their gender identity,encouraging self-talk, optimistic thinking, focusing on personal goals, self-reliance, problem-solving focused thoughts,

	6 Gays	3 Transmen	8 Transwomen	2 Lesbians	1 Bisexual
Types of abuses					
2. Unhealthy self-talk	sad thoughts, guilt of being LGBT,The upset thoughts about the attitude of perpetrators and the cultural and religious norms	guilt of being LGBT,	guilt of being LGBT,The upset thoughts about the attitude of perpetrators and the cultural and religious norms		guilt of being LGBT
3. Healthy activities	spending time alone in a peaceful space, listening to music, traveling,talking with a partner, opening feelings in social media, working hard, Engaging in religious activities	spending time alone in a peaceful space,listening to music, working hard, and learning new skills,	spending time alone in a peaceful space,listening to music, traveling,talking with a partner, and working hard, Engaging in religious activities, Volunteering practices	listening to music,opening feelings in social media,	listening to music,opening feelings in social media,
4. Unhealthy activites	aggression, emotional eating, alcohol drinking (going to bars or music shows)	alcohol drinking, smoking, self harm (overexercise)	aggression,emotional eating, alcohol drinking (going to bars and music shows), self-harm (slaping her own face, starving herself)		
5. Social support and social withdrawal	Practice both	Practice both	Practice both	Practice both	Practice both
6. Professional support and suicidality	A gay man get professional support from his former coworker, a counsellor from Myanmar.Another gay man has suicidal thoughts.		A transwoman could cope better since she got LGBT related knowledge training in the past in Myanmar. Other two transwomen had suicidal thoughts and suicidal attempts.		

DISCUSSION

Our various findings agreed with the intersectionality theory that being migrants intersect their experiences of being discriminated against and subjected to sexual violence and even their coping mechanisms (2). Sexual violence was rarely seen in gender identity that are biologically female. The possible reason might be due to the stronger law enforcement for sexual harassment against the female sex (13). Discrimination and sexual violence in *public areas* such as on the road and in the market were suffered by transgender women. Previous studies also showed that transgender women were prone to physical abuse and public ridicule because of their gender expression and were often associated with elevated emotional distress (14, 15). We also saw not much different experiences according to the types of occupations in low-skilled LGBT migrant workers in the study. In contrast, highly skilled workers in our sample, a teacher and a journalist reported that they got no abuse in their workplaces.

Most of the participants practiced both healthy and unhealthy coping reactions. Only two participants who were a transgender woman and a lesbian practiced all healthy coping reactions. They also had increased self-esteem and strong acceptance of their gender identity.

These two have had overwhelming and continuous support from their parents, relatives, and close ones around their environment. Similar to them, six participants got their parents' support and suffered various types of discrimination and sexual violence. They used more healthy coping reactions than unhealthy reactions. These findings were consistent with a longitudinal study about family support in LGBT which showed that family support reduced distress in LGBT adolescents compared to ones those who did not have it (16). Many studies have shown the importance aspect of social support for LGBT and agreed that parental support before adulthood and connectedness to LGBT people were the most important form of social support for LGBT people (17-20). Some studies also pointed out that social support could be a low-cost intervention to protect the mental health of LGBT (18, 21). However, some participants especially transmen who were difficult to socialize with both males and females suffered a lack of social support because of no LGBT people in their surroundings.

The findings of coping strategies found in the study were consistent with the previous literature on coping with LGBT discrimination except for social culturally specific techniques such as Buddhist perspectives of human life (10, 12, 22, 23). Buddhist teaching was a factor that can benefit or harm their coping mechanisms according to the perspectives of the recipients in coping with LGBT discrimination and violence. That finding was also consistent with findings that learned the effect of Buddhism on homosexuality which showed that even though Buddhist teaching promoted love and acceptance and there was no teaching to condemn homosexuality, the practices were different among followers (24).

As contributions, the study filled the research gap in coping studies of LGBT migrants. It gave profound knowledge on LGBT discrimination and

sexual violence in LGBT Myanmar migrant workers in Thailand and coping strategies of them. However, as a limitation, according to online recruitment, LGBT Myanmar migrant workers in certain sectors can be missing out for example, agricultural sector.

CONCLUSION

The diverse experiences of LGBT discrimination and sexual violence revealed the need of policy interventions to protect LGBT migrants in Thailand. Since the Gender Equality Act does not cover for LGBT migrants, some managers with discriminatory attitude may terminate LGBT Myanmar migrant workers. Workplace violence and bullying based on gender identity were also hardly seen actions against them. Coping strategies learned in the study manifested their thoughts and behaviors reacted to the issues. Various intersectional challenges to cope with the situation were seen throughout the analysis. Mental health accessibility for LGBT migrant workers should also be increased as a secondary prevention strategy to prevent mental health consequences. Overall, adopting healthy self-soothing techniques, seeking social support, and accessing professional help is crucial for promoting the well-being of LGBT individuals facing discrimination and sexual violence. Law change and policy interventions to prevent discrimination and sexual violence based on gender identity for LGBT migrants in Thailand are recommended for effective workforce and rightful society since LGBT migrant workers play a part in Thailand workforce in various sectors.

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PERFORMANCE OF THE VILLAGE HEALTH VOLUNTEERS IN PREVENTION AND CONTROL OF LIVER FLUKE IN NAN PROVINCE, THAILAND

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ABSTRACT

Liver fluke disease has been a major public health problem in Southeast Asia for decades, especially in Thailand's northeastern and northern regions, approximately 6 million people have been infected with the liver fluke. Since 2016, the cabinet has approved the Decade Strategic Plan to Eliminate Liver Fluke and Cholangiocarcinoma 2016–2025. Despite extensive government-led public health prevention campaigns, the prevalence of liver fluke infection remains higher than 5% in some areas. People were still consuming raw freshwater fish, which led to liver fluke re-infection, and were at high risk of CCA, reflecting the lack of public awareness. WHO recommends the service of the Village Health Volunteers (VHVs), which is one of the important mechanisms for preventing and controlling liver fluke and CCA at the community level. VHVs' role was to be change agents in promoting health behavior among people in the community. However, the performance of VHVs in the prevention and control of liver fluke disease has not been studied. Thus, the availability of baseline data on the performance of VHVs in prevention and control of liver fluke was necessary to plan appropriate control programs and strategies for VHVs.

The study aims to examine the performance level of VHVs and determine the association between the performance of VHVs and knowledge, attitude, motivation, and social support in prevention and control of liver fluke.

A cross-sectional descriptive study was conducted in April-May 2023 among VHVs in Nan province, Thailand. The data were collected through a self-administered questionnaire. A total of 364 completed data were used for analysis. A chi-square test was used to examine the association between the performances of VHVs and each independent variable.

The results showed that the majority of the participants were female (82.4%) and aged more than 50 years (60.7%), duration of working as VHVs more than 10 years (59.6%) and has been attending training in 2022 - 2023. Over half of the VHVs had high-performance levels (57.7%), positive attitude (55.8%), and high level of motivation (52.7%). The VHV's knowledge (56.6%) and receiving social support were at low levels (55.5%). VHVs with female gender, duration working as VHVs for more than 10 years, had been attending training in 2022–2023, had a high level of knowledge scores, and had high level received social support are associated with high level of their performance (p-value <0.05).

The findings emphasize the importance of maintaining VHV training and providing social support for VHVs, It should be suggested that training enhances the knowledge of VHVs annually and integrating training programs to increase the skills of VHVs in writing project proposals to sub-district committees for acquiring budgets for liver fluke prevention and control activities in the community with participation will increase the level of VHVs' performance.

Keywords: Performance, Village Health Volunteers (VHVs), Liver fluk

INTRODUCTION

Liver fluke disease has been a major public health problem in Southeast Asia for decades (1). Thailand has a high prevalence of liver fluke infection caused by Opisthorchiasis viverrine (OV) (2). Especially in the northeastern and northern regions of Thailand, approximately 6 million people are infected with liver fluke (3). According to the World Health Organization, the International Agency for Research on Cancer; OV has been classified as a Type 1 biological carcinogen, associated with cholangiocarcinoma (CCA) (3). The CCA mortality rate increased steadily from 22.3 in 2011 to 24.0 in 2021 per 100,000 population, Thailand Public Health Statistics Report (4). The Ministry of Public Health (MOPH) Thailand has accorded this issue priority; in 2016, the Cabinet approved the Decade Strategic Plan to Eliminate Liver Fluke and Cholangiocarcinoma from 2016 – 2025 (5). The national strategic plan's goal is to decrease the prevalence to 1% by 2025 (5). Despite extensive government-led public health prevention campaigns, the prevalence of liver fluke infection was still higher than 5% in some areas. There were still people who were re-infected and at high risk of CCA, reflecting public awareness (6).

The Village Health Volunteers (VHVs), play an essential role at the community level and are closest to the people (7). WHO recommends the service of VHVs, which is one of the important mechanisms for preventing and controlling liver fluke and CCA at the community level (8). The MOPH has developed the potential and determined the roles and responsibilities of VHVs to become community health managers with knowledge of disease prevention, organize a process to create good habits, work with local leaders to organize campaign activities, and be a role model for appropriate consumption behaviors that lead to disease prevention and control in the area (9). However, the performance of VHVs in the prevention and control of liver fluke disease has not been studied. Thus, the availability of baseline data on the performance of VHVs in prevention and control of liver fluke was necessary to plan appropriate control programs and strategies for VHVs.

The study was conducted in Nan province one of the highest prevalence (11.97%) of liver fluke infections in Thailand (10). Therefore, this study aims to examine the performance level of the VHVs and determine the association between factors affecting the performance of VHVs in the prevention and control of liver fluke in Nan province, Thailand.

METHODOLOGY

This study was a quantitative cross-sectional survey design conducted in April-May 2023 in Nan province, Thailand. The study was conducted in two selected districts and four subdistricts selected in those two districts were selected using multi-stage sampling. There were four selected subdistricts and the number of VHVs in each subdistrict as follows; Sriphum 181, Thanchum 203, Sathan 177, and Ngaeng 189. A total of 362 VHVs were selected by proportional simple random sampling.

Study Population

The total population covered was 11,429 VHVs in Nan Province. Estimated a sample size by using the Daniel formula (2010). The total number of sample size required in this study were at least 362. The additional inclusion criteria VHVs were

aged 18 years and older, male or female, have been working as VHVs in the area for more than one year, and have the ability to use smartphones.

Research Instrument

The questionnaire was developed from previous literature and guideline of VHVs for prevention and control of liver fluke disease defined by the Department of Health Service Support, MOPH (2020). It consisted of six parts: 1) socio-demographic characteristics, 2) knowledge about liver fluke transmission, 3) attitude toward in prevention and control of liver fluke disease, 4) work motivation, 5) receiving social support, and 6) performance of VHVs in prevention and control of the liver fluke. The performance was measured based on five components; being a role model, transferring knowledge, screening for liver flukes, screening CCA at home, and participating in community campaign activities to promote the prevention and control of liver fluke. The questionnaire items were in the form of a rating scale with 5 levels: always, often, sometimes, seldom, and never with the scoring criteria at 5, 4, 3, 2, and 1, respectively.

The questionnaire was revised by three experts and validated by the Index of Item Objective Congruence (IOC) were between 0.90-1.00. Pre-tested after getting approval from the ethics committee at Mahidol University. The pre-tested 45 VHVs were in Non-Khong Health Promoting Hospital, Ban Fang District, Khon Kaen Province.

The reliability score for the knowledge part was measured by the Kuder-Richardson Formula 20 (KR-20) scale was 0.810, and Cronbach's alpha examined the attitude scale was 0.781, the motivation scale was 0.915, the social support scale was 0.708, and performance of VHVs scale was 0.754.

Data Collection

After getting permission from the Ethics Committee and collecting data from the director of the district health office, the researcher contacted the chief of four sub-district health promoting hospitals and set an appointment to meet all VHVs. Then the researcher met with all the VHVs of each sub-district to explain the objectives and process of this study. The research was conducted using a web-based online self-administered questionnaire during April–May 2023. A total of 392 completed were randomly selected to enroll in the study and achieved a response rate of 100%.

Data Analysis

A total of 364 completed questionnaires were used, and data were analyzed by IBM SPSS version 21. Descriptive statistics were utilized to analyze the sociodemographic characteristics, knowledge, attitude, work motivation, social support, and the level of VHVs performance in prevention and control of the liver fluke. In analyzing the performance of all five items, 14 total scores, using the median cut-off point of high and low-level performance of the VHVs. In this study, the median value was 8. Therefore, VHVs with scores greater than or equal to 8 = high-performance level and a score less than 8 = low-performance level. Moreover, the chi-square test was used to examine the association between the performances of VHVs and each independent variable.

Ethical Approval

The ethical review was approved by the Institutional Review Board (IRB) of Faculty of Social Science and Humanities, Mahidol University. This study certificate of approval number is 2023/048.2403.

RESULTS

Table 1 shows the socio-demographic characteristics of the respondents. The majority of the respondents in this study were female (82.4%), aged more than 50 years (60.7%), married (78.0%), completed higher than primary school (45.1%), agriculture occupation (65.7%), family monthly income were more than 5,000 Baht (67.0%), duration of working as VHVs more than 10 years (59.6%), and VHVs were responsible for 10-15 households (98.4%).

Table 1: Socio-demographic Characteristics of the Respondents (n = 364)

Variables	Number (n)	Percentage (%)
Socio-demographic factors		
Gender		
Male	64	17.6
Female	300	82.4
Age group (years)		
<50 Years	143	39.3
>50 Years	221	60.7
Median = 53.0 (QD= 6.50), Min 27.0 Max = 74.0		
Marital status		
Single Divorced Separated	80	22.0
Married	284	78.0
Education		
Primary school	115	31.6
Higher than Primary school	249	68.4
Occupation		
Agriculture (farmer/gardener)	239	65.7
General Employment	67	18.4
Trade	33	9.1
Employee	3	0.8
Government official/ State enterprise	7	1.9
Thai traditional medicine assistant	1	0.3
No employee/housewife	14	3.8
Family income per month (Baht)		
<5,000	120	33.0
≥ 5,000	244	67.0
Duration of working as a VHV (years)		
1-10	147	40.4
>10	217	59.6
Number of households responsible (households)		
10-15	358	98.4
> 15	6	1.6

Table 2 shows the factors affecting the performance VHVs in the prevention and control of liver fluke are as follows: The majority of the VHVs had low levels of knowledge about liver fluke transmission (56.6%), positive attitude toward prevention and control of liver fluke disease (55.8%), had high level of motivation (52.7%), were receiving social support at low levels (53.5%), the majority of VHVs received support from family participation 95.3%, followed by receiving support from the committee of VHVs (91.5%), had received support from public health officials through training in liver fluke prevention and control 90.4% and has been attending training in 2022 - 2023 (72.0%), and have received support from sub-district committee provides budget support for projects related to the prevention and control of liver fluke disease (71.7%).

Table 2: The factors affecting the performance VHVs in prevention and control of liver fluke (n = 364)

Variables	Number (n)	Percentage (%)
Individual factors		
Level of Knowledge about liver fluke transmission		
Low (< 8.00)	206	56.6
High (≥ 8.00)	158	43.4
Median =8.0 (QD=1), Min = 2.0, Max = 10.0		
Levels of attitude toward in prevention and control of liver fluke disease		
Negative (< 19)	161	44.2
Positive (≥ 19)	203	55.8
Median =19.0 (QD= 1), Min = 12.0, Max = 25.0		
Level of work motivation		
Low (<44)	172	47.3
High (≥ 44)	192	52.7
Median = 44.0 (QD= 3.5), Min = 33, Max = 50		
Social support factor		
Family support;		
Family members participate in preventing and controlling liver fluke disease.?		
No participation	17	4.7
Participations	347	95.3
Public health officials support;		
You have been trained in prevention and control liver fluke by public health officials.?		
Never	35	9.6
Ever	329	90.4
Number of receiving training per year (times);		
1-2	253	76.9
≥ 3	76	23.1
Training period (year);		
2020 - 2021	102	28.0
2022 - 2023	262	72.0
VHV club committee support;		
In the past year, VHV club committees participated in solving liver fluke disease in the community.?		
No participation	31	8.5
Participations	333	91.5
Sub-district committee support;		
The sub-district committee provides budget support for projects related to the prevention and control of liver fluke disease.?		
Never	103	28.3
Ever	261	71.7
Levels of social support		
Low (< 6)	194	53.5
High (≥ 6)	170	46.7
Median =6.0 (QD= 3.5), Min = 1.3, Max = 9.3		

Table 3 shows the performance level of VHVs in prevention and control of the liver fluke disease. The result of this study found that 210 (57.7%) of VHVs had high level of performance in prevention and control of liver fluke disease. The performance was measured based on five components as follows; 1) VHVs were role models by not consuming raw freshwater fish 56.6 %. 2) The ability to transfer knowledge; the majority of VHVs transferred knowledge by talking more than three times a month 95.1%, sent application to educate villagers 60.4% , and talk through broadcast towers 35.4%. 3) VHVs had been participating in liver fluke screening; the majority of VHVs invited people in the community to screen for liver fluke 93.7% and participate in fecal/urine collection for

diagnosis 1-2 times per year 90.4%. 4) VHVs had been screening for CCA and working with public health official; the majority of VHVs invite people aged over 40 to screen for CCA 1-2 times a year 70.9% and work with public health officials to follow up on people with risk behaviors and visit CCA patients at home 1-2 times per year 78.8%. 5) VHVs had been participation in community campaign activities to prevention and control of liver fluke disease in the community 80.8%.

Table 3: The Performance of VHVs in prevention and control of the liver fluke (n = 364)

Variables	Number (n)	Percentage (%)
The components of VHVs performance in prevention and control of Liver Fluke		
1) Be a model not consuming raw freshwater fish;	206	56.6
2) Ability to transfer knowledge		
Talk about liver fluke prevention;	346	95.1
Send a line message;	220	60.4
Talk through the broadcast tower;	129	35.4
3) Participation and invite people to screen for liver fluke;		
Invite people to screen for liver fluke;	341	93.7
Participation in collecting stool/urine samples;	329	90.4
4) Invite people to screen CCA and work with health workers		
Screening for CCA in people ≥ 40 years old;	258	70.9
Working with health workers to monitor risky group;	287	78.8
5) Participation in community campaign activities to promote the prevention and control of liver fluke;	294	80.8
Level of VHVs performance in the prevention and control of liver fluke disease.		
Low (<8)	154	42.3
High (≥ 8)	210	57.7
Median =8.0 (QD= 1.4), Min = 1.1, Max = 13.1		

Table 4 shows the association between variables and performance level of VHVs in prevention and control of liver fluke disease. In this study, there were five variables significantly associated with performance level of VHVs as follows; 1) gender, 2) duration working as VHV, and 3) knowledge about liver fluke transmission were associated with performance level ($p < 0.05$), 4) the training period and 5) receiving social support were significantly associated with performance level ($p < 0.001$). The study also found that the VHVs with high-performance levels were found in female VHVs, a duration working as VHVs for more than 10 years, had been attending training in 2022 - 2023, had a high level of knowledge of liver transmission, and had high level received social support. Regarding the attitude and motivation were not significantly associated with the performance level of VHVs.

Table 4: The Chi-Square test on Variables Associated with Performance Levels (n = 364)

Variables	Performance				$\chi 2$	*p*-value
	Low		High			
	(n)	%	(n)	%		
Gender					3.723	< 0.05
Male	34	53.1	30	46.9		
Female	120	40.0	180	60.0		
Duration working as VHV (years)					4.497	< 0.05
1 - 10	72	49.0	75	51.0		
≥ 10	82	37.8	135	62.2		
Training period (years)					24.250	< 0.001
2020 - 2021	64	62.7	38	37.3		
2022 - 2023	90	34.4	172	65.6		
Knowledge about liver fluke transmission					6.433	< 0.05
Low	99	48.1	107	51.9		
High	55	34.8	103	65.2		
Attitude toward prevention and control of liver fluke					2.163	0.141
Negative	75	46.6	86	53.4		
Positive	79	38.9	124	61.1		
Motivation to working					1.236	0.266
Low	78	45.3	94	54.7		
High	76	39.6	116	60.4		
Receiving social support					25.879	< 0.001
Low	106	54.6	88	45.4		
High	48	28.2	122	71.8		

DISCUSSION

The result of this study found that 210 (57.7%) of VHVs had high-performance levels in the prevention and control of liver fluke disease. There were five variables significantly associated with the performance level of VHVs in prevention and control of liver fluke, as follows: gender, duration of working as VHVs, the training period, knowledge, and receiving social support. In particular, the VHVs with high-performance levels were found in female VHVs, a duration working as VHVs for more than 10 years, had been attending training in 2022 - 2023, had a high level of knowledge of liver transmission, and had high level received social support. Regarding the attitude and motivation were not significantly associated with the performance level of VHVs.

The female gender of VHVs had a significant association with the performance level of VHVs in the prevention and control of liver flukes. The result showed the same pattern as the study of Kambarami et al., was found a statistically significant between the high level of performance among female gender VHVs in referral care pregnant

women in rural Zimbabwe (11). The reason may be that roles for some diseases are more appropriate for female VHVs, such as cervical cancer screening, breast cancer, pregnancy care, and maternal and child health. The study of Hester et al. could explain that female VHVs received trusted and compassionate neighbors, one of the critical success factors for high routine immunization performance in Nepal (12).

Duration of working as VHVs had a significant association with the performance level of VHVs in the prevention and control of liver flukes. The result showed the same pattern as the study of Otambo et al. study in Western Kenya. The findings demonstrated that the VHVs who have experience more than ten years had a significant influence on their service quality (13). Also, the results of ASEAN Institute for Health Development (2022) found that the performance level of VHVs was higher in the VHVs had a duration of working as VHVs more than five years (14). It could be explained VHVs have a long work experience, they have had more opportunities to receive effective training, supervision, and incentives and to build a confidential relationship with community members.

The training periods had a significant association with the performance level of VHVs in the prevention and control of liver flukes. In particular, the VHVs had been attending training in 2022 – 2023. The findings corresponded with Ogutu et al., was found that regular training influences the performance and knowledge of VHVs (15). It can be explained that the appropriate training period and training support affects stimulating knowledge, increasing skills, and working motivation of VHVs. This result was supported by Orji et al., study in Nigeria (16).

Knowledge level of VHVs had a significant association with the performance level of VHVs in the prevention and control of liver flukes. The study also found that the VHVs with high-performance levels were found in VHVs had a high level of knowledge about liver fluke disease transmission. The result showed the same pattern as the study of Narkkul et al., found that VHVs with good knowledge were more likely to have good practices to control soil-transmitted helminthiasis (17). This may be because increased knowledge gives VHVs confidence in their work, affecting performance and credibility among people in the community. This result was supported by Acharya et al., found that an increased level of knowledge among VHVs was significantly associated with the service performance of VHVs in rural Nepal (18).

The social support had a significant association with the performance level of VHVs. The study also found that the VHVs with high-performance levels were found in VHVs had high level received social support. The obtained result is similar to previous studies Aiamnui S., found that the social support of the VHVs was at a high level, and statistically significant positive effect on the performance of the VHVs (7). It can be explained that the social support of the VHVs came from the participation process of people in the community who gave importance to solving liver fluke disease, a health problem of people in the community at each level; public health staff, VHV clubs, and sub-district committees, which is the community is empowered to participate in the decision-making process for policy supporting, budget activities to support the performance of VHVs activities. The findings also corresponded with Sato et al., found

that the receiving community support for the activities of VHVs is a particularly essential factor in enhancing their performance (19).

Finally, the findings of this study can be used to develop and implement projects related to VHVs in the prevention and control of liver fluke disease. Based on the results, it is necessary to propose measures to increase the performance of VHVs by selecting the qualified characteristics of VHVs, and regularly training to increase the knowledge and social support of VHVs.

CONCLUSION

The findings emphasize the importance of maintaining VHV training and social support factors, especially receiving support from the family of VHVs, public health officials, VHV committees, and subdistrict committees as contributing to VHVs' high-performance level in the prevention and control of liver fluke. It should be suggested that training enhances the performance of VHVs annually, by clarifying and understanding their perceived roles and responsibilities., Integrating training programs to increase the skills of VHVs in writing project proposals to sub-district committees for acquiring budgets for liver fluke prevention and control activities in the community with participation will increase the level of VHVs' performance.

RECOMMENDATIONS

Based on the findings of this study, public health policymakers may consider supporting VHV training annually to maintain the performance of VHVs and clarifying policies to understand the roles and responsibilities of each relevant sector to foster social support for VHVs in the prevention and control of liver fluke disease in the community. Build cooperation with other network sectors in the community to support VHV's roles. The policymakers should enhance community participation in supporting VHVs in the prevention and control of liver fluke by awarding certificates to the sub-district committee team for supporting VHVs in their outstanding work.

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PREVALENCE AND ASSOCIATED FACTORS OF MINIMUM ACCEPTABLE DIET AMONG THE INTERNALLY DISPLACED POPULATION IN KAYIN STATE, MYANMAR

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ABSTRACT

Malnutrition contributes to 45% of global mortality among children under five. Proper Infant and Young Child Feeding Practices prevent malnutrition and improve children's nutritional status. Internally Displaced Populations (IDPs), particularly in Kayin, Myanmar, face heightened malnutrition risk due to inadequate dietary diversity and meal frequency. Addressing this requires understanding the prevalence and associated factors of Minimum Dietary Diversity (MDD), Minimum Meal Frequency (MMF), and Minimum Acceptable Diet (MAD). This study explored the prevalence of MDD, MMD, and MAD and associated factors among IDPs in Kayin, Myanmar. The cross-sectional study was conducted among the mothers of 6-23-months-old children from IDPs in Kayin, Myanmar. The structured questionnaire was developed to assess the characteristics of children, fathers, and maternal practices on MDD and MMF. MAD prevalence was calculated from collected MDD and MMF. Data were cleaned, coded, and analyzed in Excel and SPSS for descriptive, bivariate (chi-square), and multivariate (logistic regression) analysis with a significant level of 0.05. Most study participants (n=617) were 26 years and above, literate in Karen and Burmese, housewives, residing in vegan areas, and earning a monthly household income above 25,000 MMK. This study reported the prevalence of MDD, MMF, and MAD were 39.4%, 40.0%, and 27.4%, respectively. As reported by multivariate logistic regression, MAD was associated with Children's (aOR = 3.515) and father's Age Groups (aOR = 2.090), and Malnutrition History (aOR = 4.382) with a p-value <0.05. The revealed prevalence enumerated that the practice of MAD was not satisfactory, leading to both acute and chronic consequences of malnutrition among vulnerable children under five. Nutrition-specific interventions must be enforced to counteract the nutrition-related burdens of the internally displaced under-five population.

Keywords: Minimum Acceptable Diet, MAD, Internally Displaced Population, Infant and Young Child Feeding Practices.

INTRODUCTION

Adequate nutrition is a human right, critical in emergencies, particularly for women and children under five, who are highly susceptible to communicable diseases. Malnutrition contributes to high maternal and under-five mortality, especially in low-income countries. UNICEF and World Bank indicate that most of the 5 million under-five deaths are related to poor nutrition. Despite 45% of these preventable deaths, the global under-five mortality rate was 37 per 1,000 live births in 2020, with Myanmar's rate higher at 44 (1-3).

Infant and Young Child Feeding practices (IYCFP) are key community-based measures to boost under-five nutrition by ensuring access to a balanced diet during the crucial first 1,000 days. Both acute and chronic malnutrition consequences can be efficiently reduced using cost-effective IYCFPs recommended by the WHO and UNICEF (4, 5). IYCFP can be assessed by indicators, both breastfeeding and complementary feeding, recommended by WHO and UNICEF. The IYCF indicators 2021 included proper complementary feedings such as soft, semi-solid, and solid food introduction (ISSSF), minimum dietary diversity (MDD), minimum meal frequency (MFF), minimum acceptable diet (MAD), and others for consuming vegetables, and foods of animal origin (6). To ensure optimal nutrition, a child should regularly consume a minimally acceptable diet.

About UNICEF, the global prevalence of MDD and MMF for 2021 was 29% and 52%. As reported in a secondary data analysis in Indonesia, MAD prevalence was 26.3% in 2017 while MAD in Cambodia for 2018 was 32% (7). Comparatively, 2015-16 Myanmar DHS reported that the nationwide prevalence of MAD, MDD, and MMF was 16%, 25%, and 58%, respectively. The prevalence of MAD and MDD among the Internally Displaced Population [IDP] from Kachin state was 43% and 59% in 2015. In 2019, a study in the IDP camp from Kayin state reported that the MDD prevalence was 11.5%. The MDD prevalence for the IDP population from Kayin is comparatively lower than the nationwide data and other areas (8). It is credentialed to explore the causal factors behind the low IYCFP prevalence in Myanmar, especially among the vulnerable population after the 2021 military takeover.

Internally Displacement resulted from conflict/violence and natural disasters, highlighting that the affected population was more vulnerable to food security and malnutrition. Myanmar now hosts pproximately 448,000 IDPs, and 90% were attributable to armed conflicts between Myanmar Tatmadaw and the revolutionary armies. After the 2021 military coup, the Myanmar IDP reached 1,175,300 in 2022, and the health and nutrition-related humanitarian needs are significantly demanding nationwide (9, 10).

In Myanmar, meeting standards for Minimum Acceptable Diet (MAD), Dietary Diversity (MDD), and Meal Frequency (MMF) are challenging due to political unrest, poor household conditions, food insecurity, and cultural beliefs. Despite health system disruptions and workforce shortages, maintaining health and nutrition services for the Internally Displaced Population (IDP), especially under-five children, is critical to mitigating risks from inadequate dietary habits. Prioritizing initiatives or synergistic actions on existing Infant and Young Child Feeding programs is essential to increase community demand and awareness about dietary diversity and meal frequency among the IDP community in Kayin state (11-13). The strategy of Infant and Young Child Feeding and Integrated Management of Acute Malnutrition in emergencies (IYCF-e and IMAM-e) is highly recommended for populations impacted by any crisis, whether man-made or natural. Elevating community demands for optimal nutrition practices can break the intergenerational malnutrition cycle by promoting the adoption of IYCF practices and nutritional status screening (14).There's limited empirical evidence on the minimally adequate diet and associated factors among the Internally Displaced Population (IDP) both pre- and post-military coup, especially in decade-lasting conflict-affected ethnic regions, Kayin. Especially after the 2021 military coup, the mothers residing in the IDP camps became more inaccessible to healthcare and nutrition services (9).

Therefore, this study aimed to examine the prevalence of the Minimum Acceptable Diet (MAD) and related factors among children aged 6-23 months in an IDP camp in Kayin, Myanmar. The updated data will be a definite plus to enumerate the impact of arm conflicts on prevalence of recommended feeding practices for further academic study and aid the health and humanitarian sectors in planning and implementing timely, nutrition-specific interventions for this vulnerable population.

METHODS

Study Design and Setting

A cross-sectional study was conducted to explore MAD prevalence and its associated factors among 6-23-months-old children residing in Aye Lin Myat Shin IDP camp, Myaing Gyi Ngu Special Zone, Kayin State, Myanmar during June 2023. Myaing Gyi Ngu is a mix-controlled areas of union government and border guard forces. It is now hosting approximately 2,485 of IDPs, shifted from the neighboring townships due to conflicts. The total number of 6-23-months-old children during the research period was 650. The study was conducted in three clusters of Myaing Gyi Ngu special zone.

Study Population

The study recruited all mothers of 6-23-months-old children who 1) were living together with husbands in the same household within the camp for more than 2 consecutive years, 2) came to the nutrition screening site, 3) were mentally and physically healthy, 4) care for their children, and

5) residing in three clusters was recruited for this study. With the aim of exploring the influence of fathers on adoption of Infant and Young Child Feeding Practices among mothers of 6-23-month-old children residing in the IDP camps, this study was designed to recruit mothers living together with their husbands. As children whether fit or not both physically and mentally have to come to the MUAC screening site for their nutritional status monitoring, this study recruited all children of 6-23-months residing with their parents. Data was collected at the government healthcare facilities during the monthly GMP (Growth Monitoring Promotion) sessions and camp committee office.

Measurement tool

The structured questionnaire was developed and comprised of 5 sections. Section 1, 2, and 3 focused on general characteristics of mothers, fathers, and 6-23-month-old children. Section 4 involved questions related the household characteristics. The last section mainly emphasized the IYCF practices of MDD, MMF, and MAD, which retrieved and adapted from the WHO recommended indicators for assessing infant and young child feeding practices (2021 Version). Pre-test questionnaire was done in another camp and checked for reliability and validity with the nutrition and public health experts.

Data Analysis

Data were cleaned and coded in the Microsoft EXCEL and imported to the SPSS version 28 for descriptive and inferential analysis. The dietary diversity score was computed out of nine from nine food groups, and the household members was measured with a mean cut point for categorizing above 6, and 6 and below members. The prevalence of MDD, MMF, and MAD were calculated with the formula and counterchecked with the frequencies reported by SPSS. Tables and graphs were applied for visualizing the data. For exploring the association of independent variables on the outcome variables, the bivariate logistic regression analysis was applied. Variables with a p-value less than 0.1 in Chi-square analysis were considered as a candidate for multivariate logistic regression to control the potential confounders effect and identify the impendency of the explanatory variables on MDD, MMF, and MAD. A significant level was set at 0.05 for multivariate logistic regression. The strength of associations and statistical significances between the variables were reported using adjusted odd ratios and 95% confidence interval, respectively.

Ethical Statement

The study was ethically approved by the Research Ethics Review Committee for Research Involving Human Research Participants, Group 1 of Chulalongkorn University with the COA No. of 114/66. The participants information sheets and instruments were culturally adapted by the ethnic

language experts. The enumerators declared the project details and requested the informed consent from all participants before the data collection. All the information collected were anonymized, coded, analyzed, and archived with a high confidential access only to principal researcher.

RESULTS

.617 mothers of 6-23-months-old children were enrolled for this study with mean age was 29 ± 5.924 (SD) and the majority (48.1%) was between 25-34 years, and literate (69%). More than a half (66.3%) was currently unemployed, their AN care history (62.6%) met the WHO recommendation of at least 4 times and received post-natal services (61.3%) and IYCF counselling about Minimum Meal Frequency (58.8%) and Avoiding Breastmilk Substitute (52.5%). Whereas more than 80% of fathers of 6-23-month-old children were above 25 years and the mean age was 29 ± 5.924. Literate fathers accounted for 69.7% and just above four-fifths (81.5%) were employed.

50.1% were female. Nearly half of them received routine under-five children nutrition promotion activities, Vitamin A supplementation, Multiple Micronutrient Blanket Supplementation, and Expandable Program for Immunization. Although nearly hree-quarters (79.9%) of the children received routine childhood immunization, only 4.9 percent of the vaccination were updated as the routine expendable program of the immunization schedule. Only 5.3 percent were registered to the malnutrition treatment program. By household characteristics, more than half (60.1%) were residing in vegetarian areas, and 52.4% of the household was hosting family members of six to ten. Nearly seven out of ten (67.7%) were nuclear family type, and 81.2% of the household were led by fathers. Less than 10 percent were led by Grandfathers (n=51), Grandmothers (n=14), Aunt (n=2), Parents-in-law (n=1), and Sisters (n=3). More than four-fifths (82.3%) were earning a household income of above 25,000 Myanmar Kyats.

Table 1: General Characteristics of Parents of 6-23-months-old children in an IDP camp, Kayin, Myanmar, 2023 (n = 617)

Characteristics	Frequency (N)	Percent (%)
Mother Age Group		
Between 18 and 24 Years	176	28.5
Between 25 and 34 Years	297	48.1
Older than 34 Years	144	23.3
Mean ± SD	29 ± 5.924	
Min - Max	18 – 40 Years	
Mothers' Literacy Status		
Literate	426	69.0
Illiterate	191	31.0
Mother's Occupation		
Employee (Paid)	208	33.7
Unemployed (Not Paid)	409	66.3
Number of Ante-natal Care Received		
4 times and above (Met with WHO's Recommendation)	231	62.6
Below 4 times	386	37.4

Characteristics	Frequency (N)	Percent (%)
(Not Met with WHO's Recommendation)		
Post-natal IYCF Counselling		
Yes	378	61.3
No	239	38.7
Father Age Group		
Between 18 and 24 Years	81	13.1
Between 25 and 34 Years	271	43.9
Older than 34 Years	265	42.9
Mean ± SD	29 ± 5.924	
Min - Max	18 – 40 Years	
Father's Literacy Status		
Literate	430	69.7
Illiterate	187	30.3
Father's Occupation		
Employee (Paid)	503	81.5
Unemployed (Not Paid)	114	18.5

Table 2 General Characteristics of 6-23-months-old children and households in an IDP camp, Kayin, Myanmar, 2023 (n = 617)

Characteristics	Frequency (N)	Percent (%)
Children Age Group		
6-9 months	40	6.5
9-12 months	57	9.2
12-24 months	520	84.3
Mean ± SD	18.46 ± 5.358	
Min - Max	6 – 23 Months	
Sex of Children		
Male	308	49.9
Female	309	50.1
Routine Childhood Vaccination (EPI)		
Yes	493	79.9
No	124	20.1
EPI Status		
Update	30	4.9
Not Update	587	95.1
Malnutrition History		
Yes	33	5.3
No	584	94.7
Household Location		
Vegetarian Areas	371	60.1
Non-vegetarian Areas	246	39.9
Household Member in Group		
6 members and below	348	56.4
Above 6 members	269	43.6
Mean ± SD	6.38 ± 2.465	
Min - Max	2-21	
Household Type		
Nuclear	433	70.2
Extended	184	29.8
Household Leader		
Father	501	81.2
Mother	45	7.3
Other	71	11.5
Household Income		
Above 25,000 MMK	508	82.3
25,000 MMK and Below	75	12.2

Minimum Acceptable Diet Prevalence

Calculated MMD prevalence with the nominator of children who scored more than and equal 5 dietary diversity score was 39.4 percent,and MMF prevalence for children who received age-appropriate complementary foods was 40%. The MAD prevalence for the 617 mothers of 6-23-months-old children was 27.4%.

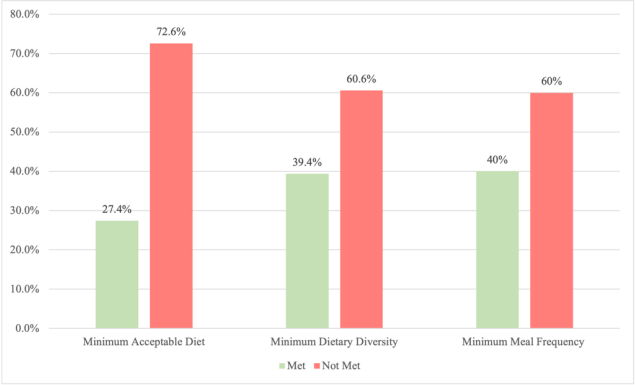

Figure 1: Summary of selected core IYCF indicators (MAD, MDD, and MMF) among mothers of 6-23-months-old children in IDP camp, Kayin, Myanmar, 2023 (n = 617)

Factors Associated with Minimum Acceptable Diet and Related IYCF Practices.

Factors Associated with Minimum Acceptable Diet

Mothers who received the IYCF counseling topics of avoiding breastmilk substitutes have 3.462 times higher odds of practicing a minimum acceptable diet (MAD) in contrast to another group (aOR = 3.462, 95% CI = 1.372 – 8.734). Regarding the general characteristics of children, children's age groupand malnutrition history were the statistically significant associated factors for MAD. Children of 9-12 months were 3.515 times higher odds of receiving a minimum acceptable diet in contrast to other children (aOR = 3.515, 95% CI = 1.133 -10.903), and children without acute malnutrition history were 4.382 times more likely to receive a minimum acceptable diet relative to children with a history of acute malnutrition (aOR = 4.382, 95% CI = 1.270 – 15.126). Women of husbands of 25-34 years have 2.090 times higher odds of practicing MAD in contrast to husbands of other age groups (aOR = 2.090, 95% CI = 1.128 – 3.873). Mothers those from vegan areas, were 1.587 times more likely to feed their children with a minimum acceptable diet. (aOR = 1.587, 95% CI = 1.069 residing in non-vegetarian areas, in contrast to – 2.357).

Table 3: Factors associated with minimum acceptable diet among mothers of 6-23-months-old children in an IDP camp, Kayin, Myanmar, 2023 (n = 617)

Variables	Minimum Acceptable Diet (MAD)			
	p-value	aOR	95% CI	
			Lower	Upper
Mother's Literacy Status				
Illiterate	Ref			
Literate	0.942	1.018	0.622	1.668
Post-natal Counselling on Infant and Young Child Feeding Practices				
No	Ref			
Yes	**0.009***	3.462	1.372	8.734
Children Age Group				
6-8 months	Ref			
9-11 months	**0.029***	3.515	1.133	10.903
13-24 months	0.158	2.071	0.754	5.684
Malnutrition History				
Yes	Ref			
No	**0.019***	4.382	1.270	15.126
Father Age Group				
Between 18 and 24 Years	Ref			
Between 25 and 34 Years	**0.019***	2.090	1.128	3.873
Older than 34 Years	0.345	1.366	0.715	2.610
Father's Literacy Status				
Literate	Ref			
Illiterate	0.197	1.380	0.846	2.254
Household Location				
Vegetarian Areas	Ref			
Non-vegetarian Areas	**0.022***	1.587	1.069	2.357
Household Type				
Nuclear	Ref			
Extended	0.158	1.351	0.890	2.050
Household Income				
Below and equal to 25,000 MMK	Ref			
Above 25,000 MMK	0.307	1.792	0.585	5.488

* Significant at p-value <0.05

DISCUSSION

This study found the Minimum Acceptable Diet (MAD) prevalence to be 27.4%, slightly higher than Myanmar's 2015-2016 DHS data (15.9%) and a 2019 study (16%). This disparity may result from differing study populations and areas. MAD prevalence in Myanmar is relatively similar to neighboring countries.

Indonesian data reported a 2017 MAD prevalence of 26.3%, while Cambodia reported 32% in 2017 and less than 25% in 2018.

UNICEF's data shows Myanmar's MAD prevalence lower than Indonesia (2017), Nepal (2014), and Thailand (2019). Camp communities, constrained by limited job opportunities, poverty, and traditional food taboos, exhibit below fifty percent MAD prevalence. Furthermore, post-pandemic economic inflation and political instability due to the 2021 Military Coup have deteriorated Myanmar's health status (7, 16-19).

In contrast to the prevalence studied in Africa, the current MAD result was higher than the prevalence in Ethiopia DHS 2016 (6.1%), Malawi (8.36%), and Nigeria (7.3%). Also, the MAD prevalence of Philippine (6.7%) was also lower than the current study (15-19). Lower prevalence from these areas might be due to the different approaches in study design, cultural diversity in eating habits, disparities in sample size, study population, and socio-economics characteristics. As stated by the multivariate logistics regression, there are higher odds of meeting MAD when the children get older according to this current study's result, inconsistent with the study in Ethiopia. Children with no previous malnutrition history had a higher chance to meet MAD. Optimal IYCF practices are considered the preventive intervention for any type of malnutrition in children. (6, 20, 21).Additionally, the inaccessible distance between the nearest bazaar and their camp sites might alsobe highlighted as barrier for adopting healthy IYCF practices. In coincidence, the dietary diversity of the vegetarian community from Ghana was also reported as low (68.9%) (22, 23). Regarding the Post-natal counselling on the IYCF practices, the consistency was found with the studies in Ethiopia, Kenya, Tanzania, and India, and the reason might be due to the higher chance of receiving the IYCF topics more frequently among women who got the PN services more frequently (24-27). The Father age group was found to be statistically significantly associated with the MAD practices. These findings are consistent with the results of MAD-related studies in Ethiopia (15). There are no related studies showing the association between the father's age group and MAD practice but one research in south Ethiopia, Malawi, and Madagascar mentioned that the complementary feeding practices were better through a better father's involvement (28-30).

LIMITATIONS

Frequent armed conflicts during the study period posed significant challenges to data collection. The study's generalizability might be limited, as it represents only IDP camps in Southeast Myanmar. Moreover, the cross-sectional analysis does not establish causal relationships between Infant and Young Child Feeding practices. Despite using WHO and UNICEF-recommended indicators, the focus on meals consumed in the previous 24 hours may not accurately reflect the eating habits and lifestyle of 6-23-month-old children.

CONCLUSION

This study explored the prevalence and associated factors of the Minimum Acceptable Diet among mothers with children aged 6-23 months in IDP camps amidst Myanmar's humanitarian crisis. While MAD, MDD, and MMF prevalence was slightly higher than Myanmar's 2016 DHS national figures, they were significantly lower than neighboring countries and some African nations. These findings underscore that children most vulnerable to conflict and violence are not receiving a healthy diet during their crucial first 1,000 days. It emphasizes the need for enforcing nutrition-specific interventions. The results can guide health and humanitarian sectors in addressing barriers to nationwide nutrition programs. Greater intersectoral collaboration among health and humanitarian stakeholders, ethnic armed forces, ethnic health organizations, and the provisional government is needed during such crises to effectively plan and implement nutrition promotion strategies.

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ASSOCIATION OF KNOWLEDGE LEVEL AND DISCRIMINATORY ATTITUDES TOWARD PEOPLE LIVING WITH HIV/AIDS AMONG ADULT CITIZENS IN MYANMAR: AN ANALYSIS OF 2015-2016 MYANMAR DEMOGRAPHIC AND HEALTH SURVEY

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ABSTRACT

In countries such as Myanmar, HIV/AIDS-related stigma and discrimination pose significant public health challenges, often due to misinformation about the disease. In Myanmar, however, the relationship between HIV/AIDS knowledge and attitudes is understudied. The current state of research on the factors associated with discrimination against PLHIV in Myanmar is limited. Therefore, it is necessary to understand the situation comprehensively and propose implications for addressing this issue. The objective of the study is to determine the proportion of knowledge level and discriminatory attitudes and examine the association between knowledge and discriminatory attitudes towards people living with HIV/AIDS among Myanmar's adult population.

The Myanmar Demographic and Health Survey (MDHS) dataset in 2015-2016 was utilized in this study. The study included participants aged 15-49 with awareness of AIDS and expressing accepting or discriminatory attitudes were included. Descriptive statistics were used to present the proportion of discriminatory attitudes. Simple logistic regression examined the association between knowledge and discriminatory attitudes towards people living with HIV/AIDS.

Among 13,978 adults in Myanmar, revealed that respondents with poor knowledge, 93.68% exhibited discriminatory attitudes, which decreased to 88.08% among those with a middle level of knowledge and further to 70.80% among those with high knowledge. Correspondingly, the odds ratios indicated that individuals with middle and high knowledge were about half (OR=0.496, 95% CI: 0.376-0.654, p=0.001) and nearly 84% less likely (OR=0.163, 95% CI: 0.122-0.218, p=0.001) respectively, to hold discriminatory attitudes compared to those with poor knowledge. These findings emphasize the crucial role of education in reducing stigma and highlight the need for ongoing efforts to enhance HIV/AIDS knowledge for a more inclusive society.

This study highlights discriminatory attitudes and the pivotal role of HIV/AIDS knowledge in shaping attitudes towards individuals living with the disease in Myanmar. The findings underscore the urgent need for targeted educational interventions to challenge societal misconceptions about HIV/AIDS. The ongoing importance of sustained efforts in education and awareness-raising initiatives to promote understanding and acceptance and, ultimately, to eradicate stigma and discrimination against people living with HIV/AIDS.

Keywords: Discriminatory Attitudes, Stigma, HIV, AIDS, Myanmar, Knowledge Level

INTRODUCTION

The Human Immunodeficiency Virus (HIV) is a viral pathogen that selectively attacks white blood cells, leading to a decline in the host's immune function. Acquired Immune Deficiency Syndrome (AIDS) is a condition that occurs in the later stages of immune system deterioration caused by Human Immunodeficiency Virus (HIV) infection (1). The transmission of the virus can occur via sexual intercourse, sharing of needles for drug injection, and vertical transmission from mother to child during pregnancy, delivery, or breastfeeding. The virus is not transmissible via airborne or waterborne routes, saliva, sweat, tears, non-intimate kissing, arthropods or animals, or sharing restrooms, food, or drinks (2).

Based on the most recent data from the World Health Organization (WHO), the global prevalence of HIV infection is estimated to be 40.1 million individuals. In 2022, a recorded 1.5 million individuals got a new HIV infection (3). In 2015, the Southeast Asian region reported approximately 3.5 million cases of AIDS. The above statement designates the part as the second most impacted globally, following sub-Saharan Africa (4). The total HIV diagnosis count in Myanmar was recorded to be 224,794 individuals. Over time, there has been a steady increase in documented cases, with the latest statistics revealing that the number of cases has exceeded 27,000 in the year 2021. In 2021, the incidence rate was 0.20 per 1000 uninfected individuals, and IV drug users had the highest prevalence at 19%, followed by men who have sex with men (8.8%) and sex workers (8.8%). This highlights the need for greater control of HIV infection rates in the future (5).

Insufficient knowledge about HIV/AIDS is a primary factor contributing to increased new HIV infections (6). Previous research studies demonstrated a significant lack of knowledge regarding HIV in various settings [6-8]. In Ethiopia, the percentage of women with a comprehensive knowledge of HIV/AIDS was only 25.2% (6). In both Vietnam and Yemen, the knowledge about HIV was below 50% (7, 8). In the 2017 study conducted in Myanmar, it was found that approximately 30% of the study population possessed knowledge related to HIV (9).

Since the emergence of the HIV epidemic, various factors, including social stigma, discrimination, and gender inequalities, have created a significant barrier to the efficacy of HIV testing, prevention, and care and treatment interventions (10). There was a positive correlation between a lower level of knowledge of HIV and an increased prevalence of misunderstandings regarding the transmission mechanisms of the virus (11). People who lack HIV knowledge are frequently misinformed and misunderstood, resulting in fear of transmission, as well as moral judgement, stigmatization, and discrimination against HIV patients. So, HIV/AIDS misconceptions and social isolation possibly came from a lack of awareness and knowledge (12-14).

HIV-positive individuals often encounter stigmatization, which can manifest in various forms of negative behavior (such as declining to share meals, physical touch, or proximity), gossiping, verbal harassment, and social rejection (such as ostracism and loss of respect or status) (15).

Several studies have revealed that stigmatization of HIV-positive individuals frequently originates within their own families, from parents, siblings, relatives,

and in-laws (16). In addition, individuals may face discriminatory experiences from healthcare providers (17, 18).

Various factors have been identified as contributing to the stigma and discrimination experienced by individuals living with HIV/AIDS. These include a lack of knowledge about HIV, fear of infection, personal ethical beliefs, religious convictions, socio-cultural norms and values, educational background, and marital status (17, 19). Commonly, individuals diagnosed with HIV are encouraged by their relatives to maintain confidentiality regarding their condition to avoid potential rejection from society (20). The societal stigma surrounding HIV compels affected individuals to hide their HIV status from their relatives and the broader community (21). The phenomenon of stigmatization has been observed to have a deleterious effect on the social and emotional well-being of individuals living with HIV/AIDS and their ability to recover (22).

The study aims to achieve two objectives: 1) To determine the percentage of knowledge level and discriminatory attitudes level among adult citizens in Myanmar, and 2) To examine the association between knowledge level related to HIV/AIDS and discriminatory attitudes towards individuals living with HIV/AIDS.

METHODOLOGY

Study Design and Study Population

The present investigation constitutes a secondary analysis of data obtained from the 2015-2016 Myanmar Demographic and Health Survey (MDHS) conducted by the Ministry of Health and Sports in Myanmar. Technical support for the MDHS was provided by the DHS Programme (17). The primary purpose of the Myanmar Demographic and Health Survey (MDHS) is to compile exhaustive, nationally representative data on maternal and infant health, reproductive health, and nutritional status. In addition to gathering information on domestic violence, fertility preferences, and health-seeking behaviors, the survey also collects data on related topics.

The study recruited individuals between the ages of 15 and 49 who possessed knowledge of AIDS and exhibited accepting or discriminatory attitudes toward PLHIV. Many Demographic and Health Surveys, like the 2015-2016 Myanmar DHS, alert local authorities first and send introduction letters to chosen families. Interviewers then visit these families to explain the survey's goals and gain informed permission before conducting face-to-face interviews using paper or computerized questionnaires. All interviews are conducted in private settings to maintain confidentiality and encourage candid responses.

Data Collection of DHS

Myanmar is geographically partitioned into 15 distinct regions. Typically, a stratified, multi-stage cluster sampling design was used as sampling techniques. The validity and reliability of measurements in Demographic and Health Surveys like the MDHS are ensured through several methods. Questionnaires undergo pilot testing for validity, and standardized, internationally recognized tools are used. Interviewers receive rigorous training to minimize errors, and data undergo quality checks,

including double-entry and inconsistency checks, to boost reliability. The use of standardized methodologies across different surveys also allows for data comparison over time, further affirming the reliability of the measurements. Please kindly check at the DHS website: The DHS Program - Quality information to plan, monitor and improve population, health, and nutrition programs sampling design is used to obtain a nationally representative sample for the survey, which enabled the generation of statistically representative estimates for the entire country, as well as for urban and rural areas and 15 distinct regions within the country. A total of 12,500 households were successfully surveyed.

Inclusion and Exclusion Criteria

People who have heard of HIV/AIDS and have accepting or discriminatory attitudes towards PLHIV are included in this study, whereas participants who did not respond to all ten HIV knowledge questions and four attitude questions were excluded.

Data Cleaning Process

Following DHS guidelines, all input data were weighted using the functions v005/1,000,000 and mv005/1,000,000. There are 13,454 eligible women and 5,218 eligible men, for 18,672 qualified individuals. Within these populations, only 12,885 women and 4,737 men who have heard of HIV/AIDS were selected for this study. The total number of individuals with receptive or discriminatory attitudes towards HIV/AIDS patients is 13,854. Therefore, the final sample size for this study is 13,854.

Statistical Analysis

Using Stata version 17.0, the proportional prevalence of HIV-related knowledge and discriminatory attitudes towards PLHIV was presented with frequency and percentage. The relationship between independent and dependent variables was examined using simple logistic regression. The independent variables included age, gender, education level and HIV/AIDS-related knowledge. The dependent variable is discriminatory attitudes towards PLHIV. Sampling weights and cluster survey designs were considered for the data analysis to be representative of the population. Variables with a p-value less than or equal to 0.05 were deemed statistically significant.

Ethical Approval and Consent

This study received ethical approval from the Chulalongkorn University Ethics Review Committee and was approved with COA No. 121/66.

RESULTS

Sociodemographic characteristics

The summary of the sociodemographic characteristics of the participant is presented in Table 1. The study's sample size comprises 13,978 participants, with weights applied to account for potential biases. There exist four distinct age groups. The study's sample population had an average age of 31.77 years (SD± 9.77). The minimum age observed was 15, while the maximum was 49 years. More than 70% of the participants are females. This is due to a sampling bias in which only half of the selected households were included in the male population sample.

Concerning educational attainment, the investigation revealed that 7.85% of the sample still needed to acquire formal education. Meanwhile, the most significant percentage, 42.74%, completed secondary school, and 39.29% completed primary school. The study's findings indicate that a minority of the participants, precisely 10.10%, had attained a higher level of education.

Table 1: Socio-demographic characteristics of participants (N= 13978) (weighted)

Variables	n	%
Age in years		
(mean ± SD)	31.77 ±9.77	
(Maximum-Minimum)	49-15	27.66
• 15-24	3,866	30.44
• 25-34	4,255	29.40
• 35-44	4,109	12.50
• 45-49	1,748	
Sex		
• Male	3,678	26.31
• Female	10,300	73.69
Level of education		
• No education	1,097	7.85
• Primary	5,492	39.29
• Secondary	5,974	42.74
• Higher	1,412	10.10

Proportion of Knowledge Level Related to HIV/AIDS

This section presents data on HIV prevention, comprehensive knowledge, and awareness of preventing mother-to-child transmission (vertical transmission) of the virus. The team on knowledge consists of a total of ten questions. According to the literature review, the variable representing composite knowledge was derived by combining ten individual variables. This composite knowledge variable was then classified into three categories: "poor knowledge" if the respondent provided no correct responses, "middle knowledge" if the respondent provided seven correct responses, and "high knowledge" if the respondent provided eight to ten correct responses. The knowledge level and attitude variables have been cut in accordance with research conducted in other countries using the same survey question variables (13).

Table 2: The percentage of incorrect and correct answers among participants

HIV-related Knowledge	Answer	Correct	Incorrect
Prevention of HIV through one-on-one intercourse with an uninfected companion with no other sex partners.	Yes	9,947 (71.80%)	3,907 (28.20%)
People can reduce the risk of HIV transmission by always using a condom accurately.	Yes	11,121 (80.27 %)	2,733 (19.73%)
Can an individual with a normal appearance have HIV?	Yes	9,326 (67.32%)	4,528 (32.68%)
Can insect bites transmit HIV?	No	6,027 (43.50%)	7,827 (56.50%)
Can HIV be transmitted through dining with HIV-positive individuals?	No	8,848 (63.87%)	5,006 (36.13%)
Can HIV be transmitted through witchcraft or black magic?	No	10,678 (77.08%)	3,176 (22.92%)
Can HIV be transmitted from mother to child during pregnancy?	Yes	12,431 (89.73%)	1,423 (10.27%)
Can HIV be transmitted from mother to child during childbirth?	Yes	10,605 (76.55%)	3,249 (23.45%)
Can HIV be transmitted from mother to child during breastfeeding?	Yes	11,504 (83.04%)	2,350 (16.96%)
There are specific medications that a physician or nurse may administer to an HIV-positive mother to reduce the risk of transmission to the fetus.	Yes	10,017 (72.30%)	3,837 (27.70%)

Table 2 shows how many people answered HIV-related knowledge questions correctly and how many got them wrong. Most of the statements had a high rate of correct answers, with the highest rate being 89.73% for the statement that HIV can be passed from a pregnant woman to her future child. High rates of correct answers were also seen for comments about how using condoms consistently can lower the risk of getting HIV (80.27%) and how HIV can be passed on during breastfeeding (84.04%).However, the data showed some misconceptions related to HIV/AIDS. For example, only 43.50% of respondents knew insect bites could not spread HIV. Also, 36.13 per cent of those who answered the survey thought wrongly that HIV could be spread by sharing food with someone with HIV. Even though most people know a lot about how HIV is spread, these results show that some areas of confusion or wrong information must be fixed to improve comprehensive understanding and HIV prevention.

Table 3: Level of knowledge about HIV in adult citizens in Myanmar (N= 13978) (weighted)

Independent variable	**n**	**%**
Level of knowledge		
• Poor	1,118	8.00
• Middle	5,816	41.60
• High	7,044	50.40

Table 3 shows that most participants had a high level of knowledge about HIV/AIDS, as shown by the fact that 50.4% of the respondents knew what HIV/AIDS was. This indicates a high familiarity with the subject matter and a significant level of understanding. Also, 41.61% of the population has moderate knowledge about the disease. On the other hand, only 8.0% of the participants did not know enough about HIV/AIDS.

Table 4: Prevalence of discriminatory attitudes toward PLHIV

Dependent Variables	n	%
If they knew a shopkeeper had HIV, would they still buy fresh vegetables from him?	4,959	35.48
• Yes	9,019	64.52
• No	7,423	7,423
Permission for a teacher who has HIV to continue teaching	6,555	46.89
• Yes	11,033	78.94
• No	2,944	21.06
Willing to care for HIV-infected family members at home	10,814	77.36
• Yes	3,164	22.64
• No		
Would not want to keep secret that a family member was infected with HIV	2,824	20.20
• Yes	11,154	79.80
• No		
Discriminatory attitudes (A person who answered "no" to at least one of the four questions)		
• No		
• Yes		

Participants may express their attitudes using "yes," "no," or "not given" for each situation. Discriminatory attitude criteria are well-defined. Negative or confusing responses to any questions indicate HIV/AIDS discrimination. The first question is whether survey participants buy fresh food and meat from HIV-positive vendors. Most participants, 64.52% did not continue financing. 35.48% of participants intend to fund. The second scenario involves HIV-positive teachers working in education. 53.11% supported the idea, while 46.89% opposed it.

According to 78.94% of participants, they would care for an HIV-positive family member. Approximately 21.06% reported adverse reactions. Among most participants, 77.36% supported honesty regarding a relative's HIV status. 22.64% preferred opposition. In conclusion, only 20.20% of participants were non-discriminatory towards HIV/AIDS-positive people. 79.80% of the sample showed discriminatory attitudes according to the pre-determined criteria. The results show that HIV/AIDS discrimination persists in Myanmar.

Association of knowledge level and discriminatory attitudes toward PLHIV

This portion used bivariate analysis to examine socio-demographic factors, HIV/AIDS knowledge, and discriminatory attitudes towards PLHIV in Myanmar. The findings show an age-discriminatory relationship. Evidence shows that age groups and discriminatory attitudes are inversely related. 83.04% of 15-24-year olds are discriminating, defining a standard category.

Discriminatory attitudes were significantly decreased in the older age groups (25-34 and 35-44 years). The study shows that a high education level decreases discriminated attitudes. Education seems to be inversely related to discrimination. The odds ratio of 0.16 (with a 95% confidence range of 0.117-0.232 and a p-value of 0.01) supports this. The pattern above suggests that enhancing educational attainment may be a viable way to reduce HIV/AIDS stigma.

Table 5: Association of knowledge level and discriminatory attitudes toward PLHIV

Variable	Discriminatory Attitudes		Crude OR	95% CI		p-value
	No	Yes		Lower	Upper	
	N (%)	N (%)				
Socio-demographic characteristics						
Age (years)						
15-24	656(16.96)	3,210(83.04)	Reference			
25-34	940(22.09)	3,315(77.91)	0.720	0.630	0.822	0.001*
35-44	894(21.75)	3,215(78.25)	0.734	0.635	0.850	0.001*
45-49	335(19.16)	1,413(80.84)	0.861	0.722	1.028	0.009*
Sex						
Male	736(20.00)	2,943(80.00)	Reference			
Female	2,088(20.28)	8,211(79.72)	0.983	0.872	1.107	0.775
Level of education						
No education	109(9.89)	989(90.11)	Reference			
Primary	733(13.34)	4,759(86.66)	0.71	0.526	0.967	0.003*
Secondary	1,418(23.74)	4,556(76.26)	0.35	0.258	0.482	0.001*
higher	565(39.99)	847(60.01)	0.16	0.117	0.232	0.001*
Knowledge level						
Poor	71(6.32)	1,047(93.68)	Reference			
Middle	696(11.97)	5,120(88.08)	0.496	0.376	0.654	0.001*
High	2,057(29.20)	4,987(70.80)	0.163	0.122	0.218	0.001*

*Significant at p-value < 0.05

Our research found a strong link between HIV/AIDS-related knowledge level and discrimination. The reference knowledge level is 'Poor'. Only 6.3% of this group are non-discriminatory. 88.08% of 'Middle' knowledge holders make discriminating remarks, whereas the "Middle" knowledge group is 50.4% less likely to discriminate than the "Poor" knowledge group. In the "High" knowledge category, 29.20% discriminate, and 83.7% are less likely to exhibit discriminatory attitudes than in the 'Poor' knowledge group.

DISCUSSION

This research found a significant relationship between knowledge of HIV and discriminatory attitudes toward PLHIV in Myanmar. Twenty percent of participants showed accepting attitudes towards PLHIV, whereas 80% were discriminated against. International research has shown similar findings. Compared to other nationally represented studies, Pakistani researchers found widespread discrimination towards PLHIV, indicating that only 16% of people have an acceptance attitude (13). An Iranian study found the same trend, confirming similar discriminatory attitudes (23). HIV stigma is a significant problem. According to the Joint United Nations Programme on HIV/AIDS, over 50% of people worldwide have discriminatory views towards PLHIV (24).

HIV-related information was linked to HIV/AIDS discrimination in this research. Higher HIV knowledge reduced discriminated attitudes. Middle and high HIV-related knowledge levels reduced discriminatory attitudes by 40% and 80%, respectively, compared to low knowledge. India, Bangladesh, and Iran research had comparable results (28-31). Thus, HIV-positive people must be educated to prevent discrimination and prejudice. Official efforts and health education activities may spread this specific information. The simple, clear HIV information will eliminate discrimination (32).

The comprehension of information can eliminate HIV-positive worries and misconceptions. Effective HIV/AIDS education programs in schools should emphasise the prevention and transmission, fostering community awareness (33). Advertising and educational entertainment may spread information. TV and radio programming that promotes understanding and discourages stigma is beneficial (34). When a substantial portion of the population is informed about HIV, discrimination against people living with HIV will reduce.

Study implication

The findings of the research suggest a significant association between discriminatory attitudes towards individuals affected by HIV in Myanmar and factors such as age, level of education, and awareness of HIV/AIDS. This indicates a significant need for focused educational initiatives, particularly among younger and less-educated demographics, in order to enhance knowledge about HIV/AIDS and mitigate social stigma. The implementation of such interventions has the potential to greatly reduce instances of prejudice against those who are living with HIV.

CONCLUSION

The study findings indicate a high prevalence of discriminatory attitudes towards people living with HIV (PLHIV) among the adult population in Myanmar, with a rate of 79%. The findings suggest a significant association between individual characteristics, namely age group, educational level, and knowledge level related to HIV/AIDS. Therefore, it is crucial to reduce the prevalence of HIV/AIDS and promote HIV-related education and awareness. By increasing the public's understanding of HIV/AIDS, it is anticipated that the discrimination associated with PLHIV can be diminished.

LIMITATIONS

Due to its reliance on self-reported data, the study has several limitations, including the possibility of recall bias. Based on the DHS survey, the findings have limited applicability both within Myanmar and internationally. In addition, individuals living with HIV/AIDS who have been stigmatized were not included in the survey, limiting insights into the relationship between personal HIV status and discriminatory attitudes. Lastly, the 2016 data may not reflect current attitudes that are influenced by the swift evolution of online media.

RECOMMENDATIONS

Due to its limitations, the study recommends several avenues for future research. First, the cross-sectional design precludes establishing causality, suggesting that longitudinal cohort studies are required. The second objective of the study is to investigate discriminatory attitudes in various contexts, such as healthcare and among high-risk populations. Thirdly, the age range was limited to 15 to 49 years, leaving no space for the study of attitudes among senior age groups. For more effective interventions, the study concludes with a call for ongoing research to monitor shifts in attitudes and societal perceptions over time.

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DETERMINANTS OF PSYCHOLOGICAL DISTRESS AMONG UNDERGARDUATE STUDENTS IN THAILAND: CROSS-SECTIONAL STUDY IN PATHUM THANI PROVINCE

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ABSTRACT

Mental illness has been recognized as a significant global challenge across the world. In Thailand, youth aged 15-24 has the lowest psychological health, and the youth suicide rate has increased annually. Furthermore, social support has been accepted as a significant factor that is related to mental illness, although the mechanism underlying the development of mental illness is not clarified. The objectives of this study were to determine factor associated with psychological distress among undergraduates in Thailand.

A cross-sectional study was conducted among undergraduate students in Pathum Thani Province, Thailand. Research assistants approached the participants during students' leisure time in campus. Data were collected through a self-administrative questionnaire using Google Forms in February and March 2023. The Kessler Psychological Distress Scale (K6) was used for the measurement of psychological distress.

A total of 483 undergraduate students were used for analyzed. The result revealed that 86 (17.8%) students had severe psychological distress. As a result of multiple logistic regression, lower grade point average (AOR: 1.86, 95% CI: 1.11-3.12), positive for internet addiction (AOR: 2.25, 95% CI: 1.32-3.83), positive for insomnia (AOR: 6.54, 95% CI: 2.28- 18.74), high self-perceived stress (AOR: 4.40, 95% CI: 2.17-8.94) were found to be predictors significantly on severe psychological distress among undergraduate students.

The association between the number of social supports from individuals and psychological distress in undergraduates was not identified. It would be suggested that surveillance of internet addiction, insomnia, and stress should be conducted among those who are lower grade point average. Furthermore, the implementation of cognitive behavioral therapy for insomnia and internet addiction, as well as the design of secure public spaces that promote conversation and consultation to alleviate stress, may be effective health promotion activities for the alleviation of psychological distress.

Keywords: Psychological distress, social support, Biopsychosocial approach, Undergraduate student, Thailand

INTRODUCTION

In recent years, mental health has been identified as an important development issue, with mental health crises occurring on many university campuses around the world (1). In Thailand, youth suicide has been increasing year by year, with the suicide rate for 20-24-year olds increasing from 4.94 per 100,000 in 2017 to 5.33 in 2018, according to data from the National Statistics Office of Thailand 2018 (2). Suicide and suicide attempts are most likely due to symptoms of mental disorders, primarily depression and anxiety disorders (3, 4). Young people aged 15-24 in Thailand have the lowest psychological health scores compared to other age groups, and depression is a major cause of youth suicide in Thailand (2). International surveys by WHO and others have shown that three-quarters of all mental disorders occur by the age of 24, suggesting that college students may have a higher incidence of mental disorders than the general adult population (5). WHO World Mental Health Survey which was conducted internationally among undergraduate students in some countries showed that 12 months prevalence was 18.5% for depression, and 16.7% for anxiety disorder (6). According to the systematic review regarding mental health among undergraduate student in ASEAN countries, however, the median 12months prevalence was 29.4% for depression, and 42.4% for anxiety disorder (7). In addition, Mahidol University has reported that the estimate prevalence of depression in the general population in Bangkok is 5.1%, which is higher than 2.6% of the average of country's overall prevalence (6). In previous studies in the Philippines, the prevalence of depression among urban youth was higher than in other areas (7). In Canada, urban and suburban areas reported slightly higher rates of depression, a weaker sense of community belonging, and less social support (8).

Psychological distress is a common mental health problem in the community and is a state of emotional distress typically characterized by symptoms of depression and anxiety (9). High levels of psychological distress indicate impaired mental health and may reflect common mental disorders such as depression and anxiety disorders (10). One of the medical models needed to explain mental illness is the biopsychosocial model (BPS) proposed by Dr. George Engel in 1977 (11). The BPS model systematically describes the complex interplay of three major dimensions (biological, psychological, and social) in the etiology of mental illness and states that relative health and illness depend on the interaction of these three factors ((12). Examples of the three dimensions are described as 1) biological factors which relate to heredity, chronic disease, and physical health; 2) psychological factors which relate to mental and emotional aspects of behavior and stress; and 3) social factors which include socioeconomic status and interpersonal factors such as social support and community activities (13). The BPS model has been used in studies with undergraduates (16) and The WHO Global Mental Health Initiatives also endorses the BPS model, although it is still under consideration due to the complexity of the mental health incidence factors.

ASEAN countries struggle to accurately assess and treat many mental health problems due to a lack of mental health laws, effective policies, and human resources (14). Research on risk factors for mental illness is urgently needed to predict and prevent suicide. Untreated mental illness among college students is an important issue because it can significantly affect academic performance, productivity, substance use, and social relationships, and can hinder the nation's human capital (15). However, there are still gaps in our knowledge of the underlying determinants of the increase in mental health problems among university students (16). Research on psychological distress such as depression and anxiety disorders among university students in Thailand is very limited. Therefore, this research sought to determine the prevalence and to identify the determinants related to biopsychosocial factors on psychological distress among undergraduates in Thailand.

METHODOLOGY

Study Design

This study was a cross-sectional study with an online questionnaire using Google Forms for undergraduate students in Pathum Thani province, located in the Bangkok Metropolitan area. The Bangkok Metropolitan area was purposively selected because of the reported higher prevalence of mental illness such as depression compared to other areas (6).

Research Instrument

The questionnaire was developed from previous literature and existing scales and translated into Thai by public health experts. The biological factors included questions on physical activity, alcohol addiction, smoking, internet addiction, sleep quality, presence of chronic diseases and history of COVID-19. A shortened version of the International Physical Activity Questionnaire (IPAQ) was employed to measure physical activity (20). Alcohol dependence was measured by the AUDIT-C (21). Smoking was measured using the WHO questionnaire survey items (22). Internet addiction was measured by The Young Diagnostic Questionnaire for Internet Addiction (23). Sleep was measured using the Athens Insomnia Scale (AIS) (24). The presence of chronic illnesses and history of COVID-19 infection were answered by yes/no. Psychological factors investigated were cognitive stress and negative feelings towards COVID-19. Cognitive stress was measured by the four-item Perceived Stress Scale (PSS-4) (25), while negative feelings towards COVID-19 were based on previous studies (26). Social factors then asked about sociodemographic characteristics and social support. For social support, A short version of the Adapted Social Capital Assessment Tool (SASCAT) was used to determine the number of support participants had received from the group level to which they belonged or from the individual level (family, friends, classmates, etc.) (27). Psychological distress was assessed using the Kessler Psychological Distress Scale (K6) with a cutoff value of 13 points, which is recognized as a brief screening

instrument to assess the level of psychological distress and risk of suicidal ideation (28). It was finally classified into two level according to the central tendency. The Cronbach alpha for K6 was 0.87.

Data Collection Procedures

The research project was approved by the Ethical Review Committee of Mahidol University. The questionnaire was modified after pre-testing to identify the reliability and obtain internal consistency. The researcher obtained the permission from the university committee of administration, and trained the research assistants who were the university students in senior level. Research assistants were trained to distribute a QR code during the leisure time at the university between February and March 2023. There were 603 enrolled and 483 completed cases were used for analysis.

Data Analysis

A total of 483 responses were used in the data analysis, and data analysis was conducted using the IBM Statistical Package for Social Science (SPSS) version 25. Descriptive analyses were conducted to describe participant characteristics and to indicate the prevalence of psychological distress. In addition, chi-square analysis was used to investigate the association between independent variables and psychological distress. Normality assumption of logistic regression was checked. Variables with a p-value of 0.25 or less in the binomial logistic analysis were selected for multiple logistic regression analysis to identify predictors of psychological distress. Variables with a p-value < 0.05 were considered statistically significant.

Ethical Approval

Ethical approval was sought and granted by the Research Ethics Committee of Mahidol University Social Science Independent Review Board (MUSSIRB) in February 2023. The certification number for this study is No. 2023/025.2202. The purpose of the study and the privacy policy were clearly stated on the first page of the questionnaire created in Google form.

RESULTS

Table 1 shows that socio-demographic characteristic of participants and the prevalence of psychological distress. Most participants were female (83.4%). Respondents ranged in age from 18 to 42 (Median=20, SD=1). 67.9% of students had a GPA of 3.0 or higher. In addition, only 2.7% of the students reported that their self-perceived family economic status was good, while 20.5% of the students reported that their self-perceived family economic status was poor. The results show that 17.7% of the undergraduates reported a high level of psychological distress, while 82.2% reported a low level of psychological distress.

Table 1: General Characteristics and Level of Psychological Distress of Participants (n=483)

Characteristics	Frequency (n)	Percentage (%)
Age		
18	36	7.5
19	113	23.4
20	101	20.9
21	126	26.1
22	59	12.2
≧ 23	48	9.9
(Median = 20.00, Q.D = 1, Min = 18, Max = 42)		
Sex		
Male	73	15.1
Female	403	83.4
Not identify	7	1.4
School Year		
Year 1	172	35.6
Year 2	81	16.8
Year 3	171	35.4
Year 4	59	12.2
Grade Point Average (GPA)		
< 3.0	155	32.1
≧ 3.0	328	67.9
(Median = 3.20, Q.D = 0.4, Min = 0.3, Max = 4.0)		
Academic Discipline		
Education	99	20.5
Management Science	95	19.7
Science and Technology	44	9.1
Industrial Technology	11	2.3
Agricultural Technology	2	0.4
Humanities and Social Sciences	76	15.7
Public Health	156	32.3
Living Status		
Living Alone	138	28.6
Living with Parents	206	42.7
Living with Friends, Relatives and Couple	139	28.8
Living Allowance		
≦ 5,000	303	62.7
> 5,000	180	37.3
Self-perceived Family Economic Status		
Good	13	2.7
Fair	371	76.8
Poor	99	20.5
Marital Status of Parents		
Living together	288	59.6
Divorce	99	20.5
Separation	57	11.8
Other (widow etc.)	39	8.1
Psychological Distress Level		
Low	397	82.2
High	86	17.8

Table 2: Description of biopsychosocial factors (n=483)

Individual Characteristics	Number (n)	Percentage (%)
Physical Activity		
Low	30	6.2
Middle	146	30.2
High	307	63.6
(Median = 4194.00, Q.D = 2973.00, Min = 0, Max = 44982)		
Alcohol Use Disorders		
Negative	259	53.6
Positive	224	46.4
(Median = 2.0, Q.D = 2.5, Min = 0, Max = 12)		
Smoking		
Non-smoker	428	88.6
Smoker	55	11.4
Internet Addiction		
Negative	263	54.5
Positive	220	45.5
(Median = 4.0, Q.D = 1.5, Min = 0, Max = 8)		
Insomnia		
Negative	123	25.5
Positive	360	74.5
(Median = 8.0, Q.D = 2.5, Min = 0, Max = 24)		
Having a Chronic Disease		
No	430	89.0
Yes	53	11.0
History of COVID-19 Infection		
No	156	32.3
Yes	327	67.7
Self-perceived Stress		
Low	187	38.7
High	296	61.3
(Median = 6.0, Q.D = 1.5, Min = 0, Max = 13)		
Negative emotions related to COVID-19 pandemic	282	58.4
Low	201	41.6
High		
(Median = 9.0, Q.D = 1.5, Min = 0, Max = 12)		
Social Support from Groups		
1	447	92.5
≧ 2	36	7.5
(Median = 1.0, Q.D = 0, Min =1, Max = 4)		
Social Support from Individuals		
1	298	61.7
≧ 2	185	38.3
(Median = 1.0, Q.D = 0.5, Min = 1, Max = 6)		

Chi-square analysis on independent variables and psychological distress showed that the factors of grades, self-perceived family economic status, smoking, Internet addiction, insomnia, presence of chronic illness, and self-perceived stress were associated (p<.05).

Table 3 shows the results of the logistic regression analysis. Multiple logistic regression results showed that low grade point average with lower 3.0 (AOR: 1.86, 95% CI: 1.11-3.12), positive Internet addiction (AOR: 2.25, 95% CI: 1.32-3.83), positive insomnia (AOR: 6.54, 95% CI: 2.28-18.74), self-perceived high stress (AOR: 4.40, 95% CI: 2.17-8.94) were found to be significant predictors of serious psychological distress among undergraduate students.

Table 3 Predictors of Psychological Distress by Bivariate Analysis and Multiple Logistic Regression (n = 483)

Independent Variables	Psychological Distress			
	COR (95% CI)	*p-value*	*AOR (95% CI)*	*p-value*
Age ***(Ref: 18-20)***				
≧ 21	1.44 (0.90-2.31)	.122		*N.E.*
GPA ***(Ref: ≧ 3.0)***				
< 3.0	2.01 (1.24-3.23)	.004**	1.86 (1.11-3.12)	.017*
Academic Discipline ***(Ref: Social Science)***				
Other	0.75 (0.46-1.21)	.239		*N.E.*
Self-perceived Family Economic Status ***(Ref: Good and Fair)***				
Poor	1.78 (1.05-3.03)	.031*		*N.E.*
Smoking (***Ref: Nonsmoker)***				
Smoker	2.32 (1.24-4.35)	.008**		*N.E.*
Internet Addiction ***(Ref: Negative)***				
Positive	3.41 (2.06-5.64)	< .001***	2.25 (1.32-3.83)	.003**
Insomnia ***(Ref: Negative)***				
Positive	8.77 (3.14-24.48)	< .001***	6.54 (2.28-18.74)	< .001***
Having a Chronic Disease ***(Ref: No)***				
Yes	1.99 (1.04-3.82)	.037*		*N.E.*
History of COVID-19 Infection ***(Ref: No)***				
Yes	0.72 (0.44-1.17)	.185		*N.E.*
Self-perceived Stress ***(Ref: Low)***				
High	6.11 (3.07-12.17)	< .001***	4.40 (2.17-8.94)	< .001***
Social Support from Individual ***(Ref: 0-1)***				
≧ 2	1.51 (0.94-2.41)	.085		*N.E.*

Notes: *p < .05, **p < .01, ***p < .001, Crude Odds Ratios = COR, Adjusted Odds Ratio = AOR, CI = Confidence Interval, and N.E. = Not in the Equation

DISCUSSION

The results of this study of 483 undergraduate students in the Bangkok Metropolitan Area, Thailand, revealed that 86 (17.8%) students reported high level of Psychological Distress The results of this study are in the same range as those of a previous study in Italy by Giuseppina et al. that investigated the mental health of university students using the same cutoff value as K6 (severity: K6≥13) (17). The majority of respondents were female according to high proportion of female in the university. The finding that students with relatively low GPAs were more likely to report severe mental

illness than students with relatively high GPAs was similar to a systematic review of the mental health of university students in six Southeast Asian countries, including Thailand (18). This may be because GPA is one of the most important factors for employment after graduation in Thailand, and students with low GPA may be more likely to experience stress and anxiety. Additionally, Grotan et al. reported that the possession of depressive and anxiety symptoms tended to be associated with lower academic self-efficacy, learning ability, and motivation to learn, which may affect students' academic progress and ultimate academic outcomes (19). However, further research is needed on the causal relationship between academic performance and psychiatric disorders, as GPA cutoffs vary by university and country and may not be applicable. The significant association between positive Internet addiction and psychological distress was consistent with the results of previous studies (18). Thummaporn et al. proposed that university students in Thailand use the Internet to relieve stress psychologically and then shift to compulsive use, which further negatively affects daily functioning and academic performance, ultimately leading to mental illness (20). A study by Young et al. showed that the weakening of serotonin function by the SS-5HTTLPR gene was associated not only with Internet addiction but also with psychiatric disorders (21). Thus, screening for Internet addiction in university students may significantly predict psychiatric disorders.

In a study by Chen et al. of university students in seven countries (China, Ireland, Malaysia, Taiwan, South Korea, the Netherlands, and the United States) (22), a significant association between sleep disturbances and psychiatric disorders was found as in the present study. Teris et al. pointed out the possibility of a reciprocal causal relationship whereby mental illness causes sleep disorders and sleep disorders are risk factors for mental illness (23). The characteristic of Thai youth to use the internet for long periods of time to reduce stress could contribute to sleep deprivation. It was shown that sleep disturbances were in fact accompanied by pathological organic features of depression, such as increased expression of inflammatory cytokines known to influence mental illness (24). Cognitive-behavioral therapy for insomnia has been reported to have high remission rates in both insomnia and depression (25), thus cognitive-behavioral therapy for insomnia may be an effective approach to psychiatric disorders in university students. The finding that high levels of self-perceived stress were significantly associated with severe psychological distress is consistent with previous studies of university students in Indonesia (26) . Previous studies in Thailand have reported academic performance, career paths, financial problems, relationships with others, and physical health as stresses affecting depression (27). In the present study, no significant association was identified between the number of social supports and psychological distress which could be due to the sensitivity of the measurement. However, Lee et al. reported that whether social support was positive or negative for the recipients had an effect on psychological distress (28). Therefore, future studiesneed to consider the content of social support and whether it is positive for the recipients.

CONCLUSION

About one-fifth of students reported high levels of psychological distress in this study. Low academic performance, insomnia, internet addiction and high levels of stress are the predictors of high levels of psychological distress.

RECOMMENDATIONS

It is recommended that university committees set up a system whereby students be able to access check their own mental health status using social media. Additionally, it is recommended that assessment and monitoring by means of screening tests for psychological distress should be carried out for students on an annual basis. Consideration should also be given to providing peer counselling and online counselling to students with high levels of psychological distress.

LIMITATIONS

The target population for this study was undergraduate students which might not be generalized to another group population. Furthermore, data collection was conducted during the examination period at the university, which may have increased the prevalence of high levels of psychological distress.

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FACTORS CONTRIBUTING TO SUICIDE IDEATION AMONG THAI RECIPIENTS OF GOVERNMENT FINANCIAL SUPPORT PROGRAM IN 2022

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ABSTRACT

Suicide is a leading course of mortality worldwide including Thailand. Ideation though or suicide ideation refers to contemplation of suicide which is a significant factor of mental distress. Economic crisis leads to the mental health disorder including suicide ideation in general population. The COVID-19 pandemic triggered global and country economic crisis which is worsen individual income. Thai government launched the government financial support namely Thai government's 50:50 co-payment scheme to not only unburden the expenditure but also reduce the economic stressor of Thai population. However, few studies have been assessed the mental health disorder including suicide ideation among the government financial support recipients.

The main objective of this study is to find the factors associated with suicide ideation among Thai individuals who participated in Thai government's 50:50 co-payment scheme in 2022.

A cross-sectional study was conducted in January 2022. The 401 online questionnaire was collected. General characteristics of participant and basic health information were asked. Suicide ideation was evaluated by a question item 9 in Patient Health Questionnaire-9 (PHQ-9). Descriptive statistic was reported. Chi-square test was performed to assess the associated factors.

10.4% of respondents who registered in Thai government's 50:50 co-payment scheme reported suicide ideation. Average age was 43.04 and 66.6% was female. Suicide ideation was associated with age (p-value ≤ 0.001), education (p-value = 0.005), and marital status (p-value = 0.002). Self-reported sufficient income (p-value ≤ 0.001) and individual economic burden due to COVID-19 (p-value = 0.005) were linked to the ideation of respondents.

Percentage of suicide ideation in this study was higher than the general population. Economic burden at an individual level was linked with the ideation of suicide. Therefore, the Government Financial Support Program would support the individual's income and indirectly cope with suicide ideation. Moreover, the results would be applied to the implementation of suicide prevention policies. Because people with suicide ideation should be promptly evaluated and improved for mental health, especially in the economic crisis population.

Keywords: Suicide, Suicide Ideation, Government Financial Support Program, General Characteristics

INTRODUCTION

The global suicide situation is a public health concern because more than 700,000 people die each year as a result of suicide. (1) The global age-standardized suicide rate was 10.5 per 100,000 population in 2016. (2) All deaths worldwide, it accounted for 1.3% and suicide is the 17th leading cause of death in 2019. (3) In low- and middle-income countries, there were over 77% of world's suicides while suicide is the fourth leading cause of death among 15-29 years old. (1) WHO Director-General response that "Despite progress, one person still dies every 40 seconds from suicide." (2)

COVID-19 pandemic caused global financial crisis. Thai economy in 2020 contracted 6.1 percent from the year of 2019 and closed to 'Tom Yum Kung' financial crisis in 1997. (4) The suicide rate in Thailand abruptly increased after 'Tom Yum Kung' financial crisis to 8.59 per 100,000 population in 1999. (5) According to country financial crisis situation, Thai government implements a policy to support Thai personal financial to enhance country's economy. Thai government's 50:50 co-payment scheme, which supports fifty percent of purchases. It is launched by finance ministry. Its aims are to stimulate domestic spending, to decrease burden of expenses for Thai people and to increase purchasing power and liquidity of retail stores. (6)

In US, the government provided support food expenditure which could decrease suicide mortality. (7) In Japan, the government offered financial relief to people who lose income due to the pandemic such as Loans for living expenses, Emergency Petty Fund, and Self-Independence Support Aid for People in Need due to COVID-19. A study in Japan found financial expenditure on welfare reduced suicide mortality in Japan. (8) Although financial support directly in suicide prevention program can reduce suicide mortality rates in Japan. (9) The greater financial support the lower reduction in suicide mortality in Japan. (10) And financial independence is associated with suicide mortality rates in South Korea. (11) More than that, economic environment is related to suicide rates in Europe. (12) So far there are many theories about suicide, cumulative financial strain and increased suicide risk are significantly associated. (13)

There is association between suicide and economic crisis. The economic changes may related to Asia's rising suicide rates. (14) Link to Thai suicidal situation, Thailand is the second highest suicide rate in ASEAN in 2019. After COVID-19 situation, suicide rate gradually increased in Thailand. According to a study in Chiangmai province of Thailand financial problem is the fifth common precipitating factors of suicide. (15)

Financial hardship is a major risk factor for suicide attempts (16), and financial stress can be a significant risk factor for suicide ideation. (17) Studies suggest that financial debt/crises, unemployment, homelessness, and lower income can elevate suicide risk. (13) Research has also shown that money stress can make people up to 20 times more likely to attempt suicide. (17) High levels of financial burden can contribute to feelings of hopelessness and despair, which are risk factors for suicide. (18) Governments can play an essential role in preventing suicides by

providing financial support to those who are vulnerable. (19) (20)

Governmental support for economic stimulation may cause the reduction in suicide ideation. In terms of lowering suicide rates, a well-designed financial support program can make significant improvements. Financial stress and mental health problems frequently coexist, which can make people feel helpless. If the fourth phase of the Thai government's 50:50 co-payment scheme can give hope, it may also mitigate suicide ideation. However, there is a little known of the reduction of suicide ideation rate after implementation of governmental financial support campaign, including Thai government's 50:50 co-payment scheme. Therefore, this study aims to find the factors associated with suicide ideation among Thai people who participated in the Thai government's 50:50 co-payment scheme.

METHODOLOGY

Study Area and Study Participants

This study is an online survey conducting during January 2022. The questionnaire was distributed via social media platforms. Sample size is calculated by using Yamane's formula; $n=N/1+N(e)^2$: with a 95% confidence level with 5% precision as shown below limited to any specific province or area in Thailand. The Thai population who has the rights of using the fourth phase of the Thai government's 50:50 co-payment scheme is 28,980,000. The calculated sample size of this study was 400 respondents. Respondents was selected by convenience sampling. The inclusion criteria was Thai people who had rights using the fourth phase of the Thai government's 50:50 co-payment scheme and planned to use this phase and the exclusion criteria was the respondents who did not use the fourth phase of the Thai government's 50:50 co-payment scheme. After distributing the online questionnaire, 401 respondents were achieved the criteria and included in the analysis. And after the fourth phase of the Thai government's 50:50 co-payment scheme, there was a question to ensure that the respondents enrolled in this phase.

Measurement Tools

A self-reported online questionnaire was sent out through multiple channels of online platform. General characteristic was collected including age (years), gender (male/female), education (Less than high school/ High school/ Bachelor/ More than bachelor), marital status (Single/Married/Widow), and sufficiency of income (Income is less than expenses/ Income equal to expenses/ Income is more than expenses). Effect of economic crisis due to COVID-19 was classified into 5 Likert scale (1-Least to 5-Most)

Suicide ideation was extracted from item 9 of Patient Health Questionnaire-9 (PHQ-9). The question was "Thoughts that you would be better off dead, or of hurting yourself". Respondents rated themselves as Not at all, Several days, More than half the days, and Nearly every day. For analysis, the suicide ideation was dichotomized into "No" for whom rated themselves as Not at all and "Yes" for whom rated themselves as Several days, More than half the days, and Nearly every day. The online questionnaire was

evaluated the validity by three experts. They do the Item Objective Congruence (IOC) Index. The IOC Index was between 0.67-1.00. The pilot test of this online questionnaire was done for testing the reliability. The Cronbach's alpha of this online questionnaire was 0.85.

Data analysis

The respondents had to have a plan for usage the fourth phase of the Thai government's 50:50 co-payment scheme or had a history of usage the prior of Thai government's 50:50 co-payment scheme. Descriptive statistics including mean, standard deviation (SD), min-max, frequency and the percentage was reported. A chi-square test was performed to assess the associated factors. The significant level was 0.05.

RESULTS

Table 1, Average age of respondents was 43.04 and 66.6% was female. Most of respondents were bachelor and more than bachelor. Half of respondents were married and "income equal to expenses."

Table 1: General characteristics of respondents (n = 401)

Independent Variables	Number of Respondents (%)
Age Group (years)	
- 18-35	152 (37.9)
- 36-50	102 (25.4)
- 51-65	125 (31.2)
- 66-75	22 (5.5)
mean±SD; 43.04±14.71	
max; 75 min; 18	
Sex	
- Male	134 (33.4)
- Female	267 (66.6)
Education	
- Less than high school	10 (2.5)
- High school	39 (9.7)
- Bachelor	229 (57.1)
- More than bachelor	123 (30.7)
Marital Status	
- Single	175 (43.7)
- Married	207 (51.6)
- Widow	19 (4.7)

Independent Variables	Number of Respondents (%)
Occupation	
- None	2 (8)
- Daily hire	5 (20)
- Monthly hire	5 (20)
- Agriculturist	0.7 (3)
- Government officer/State	62.6 (251)
enterprise employee	12 (48)
- Private company	6.5 (26)
employee	6 (24)
- Personal business	0.2 (1)
- Student	
- ETC	
Sufficiency of Income	
- Income is less than	87 (21.7)
expenses	207 (51.6)
- Income equal to expenses	107 (26.7)
- Income is more than	
expenses	

Table 2, Slightly higher than one third of respondents answered “medium” for the effect of economic crisis due to COVID-19.

Table 2: Effect of economic crisis due to COVID-19 (n = 401)

Independent Variables	Number of Respondents (%)
Economic crisis due to COVID-19 affect you and your family because you lose job or income	55 (13.7)
- Least	79 (19.7)
- Little	151 (37.7)
- Medium	69 (17.2)
- Very	47 (11.7)
- Most	

Table 3: Frequency of each answer for question items 1 to 9 in PHQ-9 (n = 401)

Independent Variables	**Number of Respondents (%)**
PHQ-9 (item1)	
- Not at all	250 (62.4)
- Several days	140 (34.9)
- More than half the days	9 (2.2)
- Nearly every day	2 (0.5)
PHQ-9 (item2)	
- Not at all	288 (71.8)
- Several days	100 (24.9)
- More than half the days	10 (2.5)
- Nearly every day	3 (0.8)
PHQ-9 (item3)	
- Not at all	226 (56.4)
- Several days	141 (35.2)
- More than half the days	29 (7.2)
- Nearly every day	5 (1.2)
PHQ-9 (item4)	
- Not at all	223 (55.6)
- Several days	154 (38.4)
- More than half the days	20 (5)
PHQ-9 (item5)	
- Not at all	262 (65.3)
- Several days	120 (29.9)
- More than half the days	15 (3.8)
- Nearly every day	4 (1)
PHQ-9 (item6)	
- Not at all	308 (76.8)
- Several days	75 (18.7)
- More than half the days	13 (3.3)
- Nearly every day	5 (1.2)
PHQ-9 (item7)	
- Not at all	289 (72.1)
- Several days	91 (22.7)
- More than half the days	17 (4.2)
- Nearly every day	4 (1)
PHQ-9 (item8)	
- Not at all	335 (83.6)
- Several days	61 (15.2)
- More than half the days	2 (0.5)
- Nearly every day	3 (0.7)
PHQ-9 (item9)	
- Not at all	359 (89.6)
- Several days	35 (8.7)
- More than half the days	5 (1.2)
- Nearly every day	0.5 (2)

Table 4, there were 10.4% of respondents who registered in Thai government’s 50:50 co-payment scheme reported suicide ideation.

Table 4: Frequency of question item 9 in PHQ-9 (n = 401)

PHQ-9 (item9)	Number of Respondents (%)
No (Not at all)	89.6 (359)
Yes (Several days, More than half the days, Nearly every day)	42 (10.4)

Table 5, the suicide ideation was associated with age (p-value ≤ 0.001), education (p-value = 0.005), and marital status (p-value = 0.002). Self-reported sufficient income (p-value ≤ 0.001), individual economic burden due to COVID-19 (p-value = 0.005) and depression (p-value ≤ 0.001) were linked to the ideation of respondents.

Table 5: Association between independent variables and suicide ideation (chi-square, n = 401)

Independent Variables	Suicide Ideation PHQ-9 (item9)		chi-square	p-value	OR	95% CI
	Yes	No				
	Number of Respondents (%)	Number of Respondents (%)				
Age						
- 18-35	27 (17.8)	125 (82.2)	13.871	0.000	3.370	1.729-6.568
- 36-75	15 (6)	234 (94)				
Sex						
- Male	14 (10.4)	120 (89.6)	0.000	0.990	0.996	0.506-1.962
- Female	28 (10.)	239 (89.5)				
Education						
- Less than bachelor and bachelor	37 (13.3)	241 (86.7)	7.771	0.005	3.623	1.388-9.458
- More than bachelor	5 (4.1)	118 (95.9)				
Marital Status						
- Single and widow	30 (15.5)	164 (84.5)	9.980	0.002	2.973	1.475-5.992
- Married	12 (5.8)	195 (94.2)				
Occupation						
- Government officer/State enterprise employee	4 (10)	96 (241)	30.139	0.000*	0.153	0.073-0.322
- Other	21.3 (32)	78.7 (118)				
Sufficiency of Income						
- Income is less than expenses	19 (21.8)	68 (78.2)	15.305	0.000	3.535	1.823-6.857
- Income equal to expenses and Income is more than expenses	23 (7.3)	291 (92.7)				
Economic crisis due to COVID-19 affects you and your family because you lose job or income						
- Least and little	6 (4.5)	128 (95.5)	7.717	0.005	0.301	0.123-0.733
- Medium, very and most	36 (13.5)	231 (86.5)				
PHQ-9 (item1-8, depression)						
- Minimal and mild						
- Moderate, moderately severe and severe	28 (7.3)	355 (92.7)	91.043	0.000	0.023	0.007-0.073
	14 (77.8)	4 (22.2)				

DISCUSSION

Factors associated with suicide ideation were age, education, marital status, occupation, sufficiency of income, effect of economic crisis due to COVID-19 and depression. It still was a controversy about suicide ideation across different age groups. For example, adolescents and young adults have been found to have higher rates of suicide ideation compared to older adults. (21) On the other hand, older adults may also be at an increased risk of suicide ideation. (22) (23)

better. The use the appropriate sampling method, and the result will generalize the Thai population.

education level as higher rates of suicide ideation. (24) Education can provide individuals with better problem-solving skills, increased knowledge about mental health, and improved coping mechanisms.

Research studies have found that individuals who are unmarried or have experienced marital disruption (such as divorce or separation) tend to have higher rates of suicide ideation compared to those who are married or in stable marital relationships. (25) Marriage can provide social support and a sense of belonging, which can serve as protective factors against suicide ideation.

Research studies have found that individuals who perceive their income as insufficient to meet their basic needs and financial obligations may be at an increased risk of suicide ideation. (26) Adequate income can provide a sense of security, reduce financial stressors, and improve overall well-being. The percentage of respondents with suicide ideation who answered "medium, very and most" as an economic crisis due to COVID-19 was higher than that of those who answered "least and little" as an economic crisis due to COVID-19. It indicated that individuals who have limited financial resources were more likely to exhibit increased suicide ideation during COVID-19. (27) Correspondingly, occupations are also related to suicide ideation.

Numerous research studies have consistently shown a strong association between depression and an increased risk of suicidal thoughts and behaviors. (28)Those factors that relate to suicide ideation could have implications for the suicide prevention program during an economic crisis.

LIMITATIONS

1. This study used convenience sampling so the result could not be completely generalized Thai people because there was researcher bias for collection data. It was prone to collect the data from acquaintances who was agreeable respondents.

2. Because the online questionnaire was distributed then Thai people who had no the internet connection could not participate the study. The chance for inclusion of Thai people with suicide ideation and economic problem would be decrease due to selection bias.

CONCLUSION AND RECOMMENDATION

The percentage of suicide ideation in this study was 10.4%. It was higher than in the previous period without COVID-19 in the general population. The United States population with suicide ideation in 2017–2018 was 3.4%, but in 2020 (COVID-19 pandemic), it was 16.1%, so suicide ideation was 4.8 times higher. (29) Therefore, the Government's Financial Support Program would support the individual's income and indirectly cope with suicide ideation. Moreover, the results would be applied to the implementation of suicide prevention policies. Because people with suicide ideation should be promptly evaluated and improved for mental health, especially in the economic crisis population. The recommendation about further study is that it will be better to use the appropriate sampling method, and the result will generalize the Thai population.

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FACTORS ASSOCIATED WITH STUNTING AMONG NON-CASH FOOD ASSITANCE PROGRAM RECEIVERS AND NON-RECEIVERS IN PEKALONGAN MUNICIPALITY, INDONESIA

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ABSTRACT

According to World Health Organization (WHO) standard, stunting prevalence should not be exceeded than 20%. Indonesia as the second highest of stunting prevalence (24.4%) among Southeast Asia country in 2021, targeted to reduce the prevalence to 14% by 2024 through the convergence action, one of which is assigning the sensitive nutritional intervention by implementing Non-Cash Food Assistance Program (BPNT) for families with the lowest income in the implementation area.

This study aims to assess the stunting prevalence among receivers and non-receivers' program. Besides that, the factor associated with stunting of children under five years.

A cross-sectional study was conducted among households in Pekalongan Municipality, Central Java, Indonesia. A total of 317 children under 5 years with their mothers were assigned as a sample to generate primary data by interview and anthropometric measurement which was conducted during May 2023. IBM SPSS version 21 using Chi-square test and Multiple Logistic Regression were performed in this study.

The number of households which receive and did not receive the program were 97 (30.59%) and 220 (69.41%) respectively. Among 317 children under-five-age children screened, it showed that 33 children (34.5%) in the program receiver and 54 children (24.5%) in the non-program receiver were found to be stunted. Meanwhile, the majority of mothers were finished junior high school (40.1%) and the average age was 31 years old. Multiple logistic regression showed that male children (AOR= 2.12, 95% CI: 1.25, 3.58), having diarrhea in previous month (AOR= 1.85, 95% CI: 1.02, 3.32), and children whose mother is working (AOR= 2.15, 95% CI: 1.21, 3.81) were found to be predictors of stunting.

The study established that the major predictors of stunting among children under five years were the child's gender, mother's occupation status and history of diarrhea. It can be seen that there was no significant association of the program with stunting. In response to this, it requires a collaborative action to raise awareness of the parents about nutrient intake, avoid sex discrimination in the community and practice of hygiene in the house. In addition, in order to improve the implementation of Non-Cash Food Assistance Program in achieving stunting prevention as government has planned, providing information for caregivers in the form of utilizing the assistance effectively during the socialization of the program should be considered as a priority approach.

Keywords: Stunting, Non-Cash Food Assistance Program, Pekalongan Municipality

INTRODUCTION

Indonesia carries the fifth-highest burden of stunted children globally. According to the World Health Organization (WHO) report, the stunting prevalence in Indonesia known as the second rank among the ASEAN country which was 36% from 2013-2018 (1). Even though the prevalence consistently declined to 24.4% in 2021 yet it has not fulfilled the WHO's standard which is 20% (2).

Stunting is one of the public health issues that indicates malnutrition and linear growth fails. Based on the WHO Child Growth Standard, stunting is defined by height-for-age with z-score < -2 SD. Stunting frequently occurs from the time of conception because of inadequate nutrient intake during pregnancy, infancy which knows as the first 1,000 days of life. It will lead to not only physical development but also health risks and cognitive impairment which have an impact on children productivity in the future (3).

Since the stunting considered as one of child's nutritional status and population health indicator, thus plenty of examination of stunting proved that the causes of stunting were very complex. Accordingly, it can be divided into three categories; the fundamental causes which include economic, social, and political factors; the indirect causes which include food availability, parenting practices and health services; immediate causes include the nutrient intake and infectious disease (4). Moreover, the conceptual model from WHO explains that stunting is classified by five contributing factors and one of them come from external side of children which is household and family factor that divided into maternal and household environment factors (5).

Some studies said that factor influencing stunting in Indonesia were level education of mother, household income, food availability (6, 7). Those finding also in accordance with study that highly educated mother, did not work, has height more than 150cm, less number of household member and higher household income were tend to have children who are not stunted (8). Further, mother who have birth at young age ae at risk of having babies with low birth weight who are at risk of stunting (9). This implies that the maternal and household characteristic also can be one of contributing factor in stunting. Thus, it requires integrated nutritional interventions including specific and sensitive nutritional interventions to address the multi-sectoral issue related. Global experience shows that implement integrated approach in high risk group is the key to success in nutrition improvement, child growth and stunting prevention (10).

Prevalence of stunting in Indonesia is aimed to be reduced to 14% by 2024. Therefore, Indonesian government established 'National Strategy to Accelerate Stunting Prevention' by implementing sensitive intervention for non-health sector. One of purpose of the intervention is to improve the access to nutritious food by implementing the Non-Cash Food Assistance (BPNT) since 2017 for families with the lowest income in all over Indonesia, one of which is in Pekalongan Municipality. Hence, the program receiver especially household with children under five years of age could avoid cases of stunting.

As part of the stunting prevention strategy, several studies have been observed the impact of the program to the household food security but did not observe any impact on stunting. Therefore, this study aims to analyze the role of the BPNT program by identifying the factors related to stunting among the program receiver and non-receiver of program.

METHODOLOGY

Study Design

This study is a quantitative study using cross-sectional design and conducted among households in Pekalongan Municipality, Central Java, Indonesia.

Population and Data Collection Procedure

This study unit was located in Pekalongan Municipality, Central Java, Indonesia. Children under 5 years of age and their mother in household were included in this study to generate primary data through face-to-face interview. In case, if there was more than one child under 5 years of age in selected household, a simple random sampling using paper numbers was used to select one child as the participant of study. The sample was selected randomly at integrated health post which has a schedule in May 2023. The mother who refused to participate and children with disability were excluded from study. In responsible for the ethical consideration, the Committee for Research Ethics Faculty of Social Sciences and Humanities of Mahidol University has approved this study with certificate of approval number 2023/084.08.05.

Research instruments

The questionnaires were designed and asked in Indonesian language to obtain participant's status of program exposure, socio-economic demographic characteristic and morbidity assessment which confirmed by pink book. In the context of stunting, the height-for-age (HAZ) score was generated by measuring the height of children under five years three times and the average score will be used to avoid the fallacy. The measurement was done by midwife or nurse in integrated health service post. In addition, the microtoise was used for measuring the children who were able to stand up straightly while for children below toddler were measured by length board. All of the equipment has been calibrated before it was utilized for this study.

Data analysis

IBM SPSS version 21 using frequency for descriptive analysis and for define the association, Chi-square test and Multiple Logistic Regression which showed crude odd ratio and adjusted odd ratio with 95% confidence interval were performed in this study. WHO Anthro software version 3.2.2 also used to generate HAZ score and children with not applicable result were excluded from the study. This study utilized the regulation from Indonesian Ministry of Health and National Population of Family Planning to set the cut-off points for study variables.

RESULTS

Frequency of stunted children were 87 children (27%) and the rest 230 children (72.5%) were normal. Among these 87 children, 49 children (15.5%) were stunted and 38 children (12%) were severely stunted.

Table 1: Child's Nutritional Status defined by HAZ score among study population

Child's nutritional status	Number	Percentage (%)
Normal (± 2SD)	230	72.5
Stunted (< -2SD)	49	15.5
Severely stunted (< -3SD)	38	12
Total	**317**	**100,0**

Table 2: Distribution of child's characteristics among the receiver and non-receiver of program

Variables	Program Receiver		Program Non-Receiver	
	n	%	n	%
Child's characteristic				
Age groups				
0-6 months	10	19.2	42	80.8
7-24 months	39	36.1	69	63.9
25-36 months	19	30.6	43	69.4
37-48 months	17	32.7	35	67.3
49-60 months	12	27.9	31	72.1
Child gender				
Male	42	30.2	97	69.8
Female	55	30.9	123	69.1
History of Diarrhea				
No	74	30.3	170	69.7
Yes	23	31.5	50	68.5

Table 3: Distribution of maternal' s characteristics among the receiver and non-receiver of program

Variable	Program Receiver		Program Non-Receiver	
	n	%	n	%
Age during pregnancy				
Low risk (20-35 years old)	80	30.8	180	69.2
High risk (< 20 years / > 35 years)	17	29.8	40	70.2
Marital status				
Married	94	30.0	219	70.0
Divorce/Widowed	3	75.0	1	25.0
Education level				
No formal school	1	100.0	0	0
Primary school	31	46.3	36	53.7
Junior high school	42	33.1	85	66.9
Senior high school	23	21.1	86	78.9
Higher studies	0	0	13	100.0
Occupation status				
No	65	27.4	172	72.6
Yes	32	40.0	48	60.0
Maternal height				
Normal (≥ 150 cm)	91	30.6	206	69.4
Short (< 150 cm)	6	30.0	14	70.0

Among 317 children recorded in this study, the median of children age was 26 months. The majority of them was female (n=178). Approximately 244 children were not having diarrhea in previous month.

Meanwhile the characteristics of mother were dominated by mother with spouse (n=313), mother who not working (n=237) and graduated from junior high school (n=127). The majority of participant were having low risk of pregnancy age (n=260) and have minimum height of 150 cm (n=297).

Table 4 showed that the majority of participants was household with 4 or less than 4 members (n=237), had total income more than IDR 2,400,000 (n=127) and spent at least IDR 1,500,000 for the food expenses (n=223).

Table 4: Distribution of household's characteristics among the receiver and non-receiver of program

Variable	Program Receiver		Program Non-Receiver	
	n	%	n	%
Household size				
Small ≤ 4 members	66	27.8	171	72.7
Large >4 members	31	38.8	49	61.3
Household income in IDR				
Low (800,000 -1,600,000)	58	59.8	39	40.2
Middle (>1,600,000 – 2,400,000)	24	25.8	69	64.5
High (>2,400,000)	15	11.8	112	88.2
Monthly food expenditure				
Low (< 1,500,000)	50	53.2	44	46.8
High (≥ 1,500,000)	47	21.1	176	78.9

As from the table 5 it showed that there were four variables which have significant association with stunting namely child's gender, history of diarrhea, mother's occupation status, household size (p<0.05).

Table 5: Association between Independent and Dependent Variable

Dependent variables	Independent variables	p-value of Chi-Square
Child nutritional status (normal or stunted)	Child's age	0.233
	Child gender	**0.025***
	History of diarrhea	**0.037***
	Maternal age during pregnancy	0.128
	Marital status	1.000
	Education level of mother	0.332
	Occupation status of mother	**0.009***
	Maternal height	0.434
	Household size	**0.021***
	Household income	0.709
	Monthly Food Expenditure	0.740

Table 6: Association between Non-Cash Food Assistance Program with stunting

Program Receiver	Stunting	Normal
No	54 (24.5%)	166 (75.5%)
Yes	33 (34.0%)	64 (66.0%)
p-value	0.081	

From table 6 it revealed that the proportion of stunted children was higher in the group who received the program which provided by the government. However, this program was not significantly associated with stunting (p>0.05). Out of 73 from 317 children were had diarrhea in the last month and 27 (37%) of them were stunted. In the context of maternal characteristics, the only factors that has association with stunting was mother occupation status which proportion of stunting (38.8%) higher in children whose mother is working. Lastly, one of household characteristics found to be significantly associated with stunting was household size where the larger household has lower proportion of stunted children (17.5%).

Table 7: Cross-tabulation between associated factors with stunting

Variable	Normal		Stunted		p-value	COR
	n	%	n	%		
Child's gender						
Female	138	77.5	40	22.5	1	
Male	92	66.2	47	33.8	0.026	1.76 (1.07-2.89)
History of diarrhea						
No	184	75.4	60	24.6	1	
Yes	46	63.0	27	37.0	0.039	1.80 (1.03-3.14)
Mother's occupation status						
No	181	76.4	56	23.6	1	
Yes	49	61.3	31	38.8	0.009	2.04 (1.19-3.51)
Household size						
Small	164	69.2	73	30.8	1	
Large	66	82.5	14	17.5	0.023	0.47 (0.25-0.90)

As table 7 shown the distribution of normal and stunted children in the study area based on the associated factors. According to the result, the proportion of the stunting was higher in male children (33.8%) and the other way around, female children demonstrated tendency of the absence of stunting (77.5%).

Table 8: Multiple Logistic Regression between related factors and stunting

Variable	Full Model 95% CI			Final Model 95% CI		
	AOR	Lower	Upper	AOR	Lower	Upper
Occupation status of mother						
No	1			1		
Yes	2.12	1.18	3.80	2.15	1.21	3.81
History of diarrhea						
No	1			1		
Yes	1.89	1.02	3.50	1.85	1.02	3.32
Household size						
Small (≤ 4 members)	1			1		
Large (> 4 members)	0.45	0.22	0.91	0.47	0.22	0.83
Child's gender						
Male	2.28	1.32	3.93	2.12	1.25	3.58
Female	1			1		

The selected variables were included in the next step of multiple regression the remained associated factors are shown in table 8 explained that male children were about 2.15 times more likely to be stunted compared with those female children (AOR= 2.12, 95% CI: 1.25, 3.58). Working mother tend to increase the risk by 2.15 times of having stunted children (AOR= 2.15, 95% CI: 1.21, 3.81). Children that having diarrhea in the last month also 1.85 times more likely to be stunted rather than those who did not (AOR= 1.85, 95% CI: 1.02, 3.32). Meanwhile, children who live with more than 4 members in the household found to be less likely stunted compared to those with smaller size of households (AOR= 0.47, 95% CI: 0.22, 0.83).

DISCUSSION

The purpose of this study was designed to observe the program in influencing maternal and household environment factors on stunting among children under 5 years old in Pekalongan Municipality as the region with the largest number of program recipients of Central Java Province. Overall, there was no association between the program with stunting occurrence in study area as shown that more than half children from program receiver had stunting. It found that the program only facilitating poor family to afford the food without consideration of required nutritional intake for children under five years to prevent stunting and target of program remained unclear as this study proved that high income household was enrolled as the receiver. This finding in line with a study regarding the integrated nutrition intervention in Tanzania and Mozambique which has no significant association in stunting reduction (11, 12). In addition, a study about program implementation of stunting prevention, revealed that instead of collaborative action, most of program carried out according to the function of certain institution

without other parties and community engagement. Hence, strengthening cooperation with the private sector and community empowerment should be done to create the equitable in collaborative action (13).

Further, this study revealed that the associated factor of stunting was occupation status of mother (AOR= 2.15, 95% CI: 1.21, 3.81). Mother who work tend to had less time to take care of children and able to increase the risk of having stunted children rather than non-working mother. This is consistent with previous study Rwanda that depict that stunting less occurred in household where the father only works (14). It reflected the importance of housewife's contributions to the children's development. Another study claimed that the more time mother spends at work, the less time is given to the child, hence, it raises the likelihood of poor nutrition intake for children (15). This relevant with study that explained the situation of working mother will affect to the parenting style which relevantly relate to children growth and development (16).

It can be seen from this study that male children more likely to be stunted than the female children (AOR= 2.12, 95% CI: 1.25, 3.58). Similarly, in the east part of Indonesia and India, the recent study identified that stunting occurrence in male children was higher than female children even though the common pattern of dimorphism stated boys typically weigh more and taller than girls (17, 18). Relevantly, former studies demonstrated that the male children tend to get malnutrition easily (19).

Another factor that influences in stunting was history of diarrhea (AOR= 1.85, 95% CI: 1.02, 3.32). It found that children who had diarrhea in last month were more likely to be stunted. This finding was relevant with the several studies which explained that diarrhea is one of risk factor for stunting because of diarrhea's direct consequence was a reduction in body weight so that if not treated effectively it will be an indication of acute malnutrition (20).

Meanwhile, according to the result, children in household with more than 4 members was less likely to be stunted (AOR= 0.47, 95% CI: 0.22, 0.83), this result was inconsistent with previous study which claimed that children in household with many members usually shorter because of the least amount and distribution of food also the children likelihood receive the less attention within the household member (21). The finding was allegedly because of the the majority of participants were belong to the smaller households with high income, nonetheless, this also would be possible because the participants might only have one children and live with their grandparents, so that child has the chance to receive better care from his surrounding within the household (22).

This study had a variety of methodological constraints including the unobserved variables which possible to determine a better result. In terms of Non-Cash Food Assistance Program, the measurement might not sensitive enough to assess the program's impact and there was no evidence that the program had reduced the rate of stunting in the study area but there was an indication of implementation issue particularly in the program distribution.

CONCLUSION AND RECOMMENDATION

The study established that Non-Cash Food Assistance did not contribute in the stunting occurrence in study area. Meanwhile, it found that the major predictors of stunting among children under five years of age were the child's gender, occupation status of mother and history of diarrhea. Nonetheless, the limitation because of the small number of samples and absence of other potential factors in this study might contributing the change in the latter result, so that it is necessary for future research to involve bigger samples and more comprehensive variables for the better program evaluation.

In response to the study result, it requires a collaborative action to raise awareness of the parents about nutrient intake, avoid sex discrimination in the community and practice of hygiene in the house. In addition, in order to improve the implementation of Non-Cash Food Assistance Program in achieving stunting prevention as government has planned, providing information for mothers or caregivers in the form of how to utilize the assistance effectively during the socialization of the program should be considered as a priority approach.

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FACTORS ASSOCIATED WITH HEALTH INSURANCE PREMIUM COMPLIANCE AMONG SMALL AND MEDIUM ENTERPRISES IN SOUTH JAKARTA, INDONESIA

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ABSTRACT

Many developing countries, including Indonesia, develop social insurance to achieve Universal Health Coverage. Premium compliance is important to prevent the imbalance between health expenditure and health revenue of social health insurance schemes. It was recorded in 2022 that 11% of private Small and Medium Enterprises (SMEs) enrolled into Indonesia's National Health Insurance System (NHIS) do not comply with the premium payment.

This study aims to identify factors associated with NHIS premium compliance among SMEs in South Jakarta municipality, Indonesia.

A cross-sectional study was conducted among SMEs in South Jakarta municipality in Indonesia. A paper-based self-administered questionnaire survey were approached to 278 representatives of the SMEs in June 2023. Financial payment report from Social Security Agency for Health (SSAH) till April 2023 were used to determine the premium compliance. IBM SPSS version 21 were used for analysis. Chi-square tests were performed to determine the association between characteristics of enterprise, isomorphic forces, strategic responses, financial performance and premium compliance. Logistic regressions were used to determine the predictor factors of premium compliance.

Out of 278 SMEs' data analyzed, 234 SMEs (84%) were classified as compliance. By Chi-square tests, participation in the National Health Insurance System, perception of isomorphic forces (e.g., law, regulations, other SMEs) towards premium payment, and applied strategic responses were significantly associated with the premium compliance among the SMEs (p-value<0.05). The regression result revealed that premium compliance was significantly associated with participation time (AOR=2.50, 95%CI: 1.22-5.15); isomorphic forces (AOR=2.06, 95%CI: 1.03-4.12); and strategic responses (AOR=2.58, 95%CI: 1.26 –5.32).

More than 80% of SMEs were classified as compliance. Participation time, isomorphic forces, and strategic responses were significantly associated with NHIS premium payment compliance. The result might contribute necessary information to recommend an effective approach to increase the compliance rate of SMEs with NHIS premium payment.

Keywords: SMEs, NHIS, participation time, isomorphic forces, premium compliance.

INTRODUCTION

Health financing system reforms is currently being undertaken by several countries to achieve Universal Health Coverage (UHC) (1). One of the mechanism in financing the health system by organizing the social health insurance (2). National Health Insurance System (NHIS) was implemented in Indonesia since 2014 adopting contributory and noncontributory arrangement (3, 4). Civil servant and private sector worker as contributing participants have to pay the premium based on their salary. The mandatory system requires private enterprises' employer to register their employees. Premium is set at 5% of salary, divided into 4% paid by employer and 1% paid by employee (4). However, this program experienced financial deficit in 2014 to 2019 (5). The low compliance of premium payment from both formal and informal worker caused imbalance between health revenue and health expenditure. Among the inactive or non-compliant participant, 11% were from private enterprises while 50% from Small and Medium enterprises (SMEs) in the year 2022 (6).

South Jakarta municipality of Indonesia has the largest number of private employees in the country of which 18.2 % do not comply with the premium payment regulations . However, in terms of number of employees it accounts to nearly 40% of all non compliant private emplyees in Jakarta province (6). The under performance of the municipality in revenue collection for the NHIS has impacted overall performance at country level and needs attention.

Several studies have been carried out in Indonesia and developing countries related to compliance with the obligation too pay contributions to government such as taxes and insurance (7-9). Based on previous research characteristics of enterprise i.e. number of employees; industry category; type of ownership have been widely accepted in social science researches as factor affecting premium compliance (7, 8). Studies have also shown that percentage of female employees, presence of employees union or participation time affect compliance to premium payemnet in social health insurance (7, 8)

The institutional theory (9-11) can also be useful to study issues relating to social health insurance premium compliance. Components of the institutional theory including: isomorphic forces; strategic responses; combine with fairness and financial performance of enterprises were used as independent variables for this research. Isomorphic forces is the pressure faced by organization from professionalism, government, professional association, and the society to increase performance (12, 13). The increasing isomorphic forces has impact on compliance on tax research (9). Organizations develop strategic response to isomorphic force which varies from conformity to resistance response (13-15). Frezatti et al., stated that there is a tendency of managers to apply strategic responses such as manipulation tactics to meet regulatory requirements (16). An instrinsic function of health system is to maintain premium fairness for social justice (17). In tax research, the tax fairness was reported as a factor that plays a significant role in compliance. Likewise, financial performance is the achievement of financial action from sales, revenue and profits or losses earned by

the enterprise (18). The enterprise with good financial performance have access to a wider range of financing sources, enabling them to fulfill their financial obligations more easily, including premium payment (10). There is inadequate knowledge about the application of institutional theory to study issues related to premium compliance among enterprises in social health insurance programs.

This research utilized the components of institutional theory along with enterprise's characteristics to determine the factors associated with premium compliance in South Jakarta municipality, Jakarta province of Indonesia. The results of this study would be beneficial in improving the premium compliance rate by providing information for suitable approaches to improve the health insurance premium collectibility among SMEs.

METHODOLOGY

Study design and data collection procedure

A cross sectional study was performed in this research. Data were collected using paper-based self-administered survey questionnaire among SMEs in South Jakarta municipality. Enterprises were selected randomly SMEs list provided by SSAH. Respondents were human resources or financing staff from SMEs who were reponsible for the SSAH. After the representative of SMEs was successfully contacted, concent was taken and survey questionnaire forms were filled . Ethical approval was granted by Committee for Research Ethics (Social Science, Faculty of Social Science and Humanities, Mahidol University (MUSSIRB) with certificate approval number 2023/101.26. There were 300 SMEs contacted, among them 9 were not willing to participate. Out of the responses from 291 SMEs, 13 samples were removed because of inconsistency and 278 samples were used for data analysis after data cleaning.

Study Instrument

The questionnaire were divided into 5 sections: 1) characteristics of enterprise, 2) financial performance 3) isomorphic forces, 4) strategic responses, and 5) premium fairness

The independent variables included characteristics of enterprises, isomorphic forces, strategic responses, premium fairness, and financial performance. Based on number of employee, small enterprise consist of 5-19 employees and medium enterprise consist of 20-99 employees (19). The researcher used modified questionnaire survey from previous researchers (7, 9, 11). Enterprise characteristic included percentage of female employees; presence of employee union; additional health insurance ownership; type of industry; and participation time in NHIS (7, 8). The percentage of female employees was calculated and categorised based on the distribution of the responses. Presence of employee union and additional insurance ownership were measured as categorical variables, '0' = no and '1'= yes. Type of industry used Indonesian Standard Industrial Classification 2020 categorised into three groups (1= agriculture, forestry and fisheries; 2= mining,quarrying and manufacturing; 3= trading and service sector) (20, 21). Participation time was measured in number of

years and later categorised into ordinal scale variable. Isomorphic forces, strategic reponses, premium fairness, and financial performance were measured by using a 5-points Likert scale items (1= strongly disagree, 5=strongly agree) (9, 22). Total result of each variable was converted to nominal scale variable based on mean or median score categorised into two groups. Respondent categorised as weak (0) and strong (1) for isomorphic forces; not apply (0) and apply (1) for strategic responses; perceived of unfair (0) and fair (1) for premium fairness; poor (0) and good (1) for financial performances. Financial report from Social Security Agency for Health (SSAH) by the end of April 2023 were used to determine the premium compliance as dependent variable. SMEs without arrears categorised as compliant (1) and with arrears categorised as non-compliant (0) .

Data analysis

The Statistical Package for Social Sciences (SPSS) Version 21 software was used to data analysis. Descriptive statistic used for characteritics of enterprise. Bivariate analysis with chi square used to estimate the crude odds ratios of premium compliance factors. Variables with p-value <0.25 were included for multiple logistic regression to determine the predictors of premium compliance.

RESULTS

Descriptive statistics of SMEs in South Jakarta municipality, Indonesia

Characteristics of SMEs in South Jakarta municipality, Indonesia are described in Table 1.

The research respondents were 51% small enterprises and 49% medium enterprises based on number of employees (20). More than 80% of SMEs are compliant. Additionally, majority of SMEs did not have employee union (92.4%) and any additional health insurance (67.6%). However, 47.5% of the SMEs intend to apply strategic response and 72.3 % perceived that the premium rate was unfair.

Table 1: Characteristics of SMEs in South Jakarta municipality, Indonesia (n=278)

SME Characteristics	Number	Percentage
Type of enterprise		
Small enterprise	143	51.0
Medium enterprise	135	49.0
Premium Compliance		
Compliant	234	84.2
Non compliant	44	15.8
Percentage of Female Employee		
≤30	143	51.4
>30	135	48.6
Median= 29.65 QD= 14.74 Minimum= 0 Maximum= 100		
Presence of employee union		
No	257	92.4
Yes	21	7.6
Additional health insurance ownership		
No	188	67.6
Yes	90	32.4
Type of industry		
Agriculture, forestry, and fishing	10	3.6
Mining and quarrying and manufacturing	73	26.3
Trading and service sector	195	70.1
Participation Time (in years)		
≤6	146	52.5
>6	132	47.5
Median= 6 QD= 3 Minimum= <1 Maximum= 9		
Isomorphic forces		
Weak	120	43.2
Strong	158	56.8
Strategic response		
Not apply	146	52.5
Apply	132	47.5
Premium fairness		
Unfair	201	72.3
Fair	77	27.7
Financial performance		
Poor	165	59.4
Good	113	40.6

Results of bivariate analysis are described in Table 2. The study found that participation time (COR=2.47, 95%CI: 1.23-4.95); isomorphic forces (COR=2.41, 95% CI: 1.24-4.66); and strategic responses (COR=2.47, 95%CI: 1.23-4.95) have significant association with premium compliance ($p<0.05$).

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The multiple logistic regression analysis by backward wald elimination method revealed that participation time in NHIS (AOR=2.50, 95%CI: 1.22-5.15); isomorphic forces (AOR=2.06, 95%CI: 1.03-4.12); and strategic response (AOR=2.58, 95%CI: 1.26-5.32) were significant predictors of premium compliance

Table 2: Predictors of Premium Compliance by Bivariate Analysis and Multiple Logistic Regression (n=278)

Variables	Compliance		COR (95%CI)	AOR (95%CI)
	No (%)	Yes (%)		
Percentage of female employees				
≤30	21 (14.7)	122 (85.3)	1	-
>30	23 (17.0)	112 (83.0)	0.84 (0.44-1.60)	-
Additional health insurance ownership				
No	34 (18.1)	154 (81.9)	1	-
Yes	10 (11.1)	80 (88.9)	1.77 (0.83 – 3.76)	-
Participation time (in year)				
≤ 6	31 (21.2)	115 (78.8)	1	1
> 6	13 (9.8)	119 (90.2)	2.47 (1.23-4.95)	2.50 (1.22-5.15)
Isomorphic forces				
Weak	27 (22.5)	93 (77.5)	1	1
Strong	17 (10.8)	141 (89.2)	2.41 (1.24-4.66)	2.06 (1.03-4.12)
Strategic response				
Not apply	31 (21.2)	115 (78.8)	1	1
Apply	13 (8.9)	119 (90.2)	2.47 (1.23-4.95)	2.58 (1.26-5.32)
Financial performance				
Poor	24 (14.5)	141 (85.5)	1	-
Good	20 (17.7)	93 (82.3)	0.79 (0.41-1.51)	-

DISCUSSION

The study found that 16% of SMEs in South Jakarta municipality were non-compliant. Nguyen et al, 2021 stated that strong law enforcement and inspections for arrears is needed to improve the SMEs premium payment awareness (23). The mandatory arrangement of NHIS forces SMEs to enroll and any SME not complying to regulation cannot receive certain public service e.g. business-related license (4, 24) in Indonesia. A research in Angiang Province of Vietnam showed that 98% of enterprises were compliant in 2018 (7) while in Lao PDR the enrollment compliance is still low (8).

Participation of SMEs into the NHIS for more than 6 years had 2.5 times higher odds of premium compliance compared to participation for less than 6 years Although participation time have a weak association on the ability to premium payment, enrolled to the health insurance system for more years of participation, improves compliance (7).

The SMEs perception of strong isomorphic force implied that implementation of regulation, other SMEs influence and the professionalism norm of SMEs would affect 2.06 higher compliance compared to SMEs who perceived weak isomorphic forcesFostering professionalism among employers and reducing the influence of non-compliant SMEs, in addition to imposing penalties, would enhance premium compliance (9, 11).

SMEs that intend to apply strategic responses, the odds of premium compliance were 2.58 times higher compared to SMEs that did not. These findings are contrasting with the results of tax compliance research where perception about strategic response as shown to be insignificant to SMEs tax compliance behavior in Ghana and Uganda (9, 11). a Possibility, SMEs implement conceal and escape tactics in order to have premium compliance. Under-reported wages for premium reduction by certain SMEs affected compliance rate in Vietnam (7). The researcher explored three tactics as comply, conceal, and escape tactics. Related to the obligation to enroll and comply with premium payment, SMEs could apply conformity or resistance response according to the surrounding isomorphic forces (11, 14).

The financial performance does not significantly impact premium compliance in this study. About 60% of SMEs representatives acknowledged poor financial performance, yet 85.5% were still compliant. NHIS participation is obligatory with penalties, compelling compliance even among financially weak SMEs. An Indonesian study on informal workers also suggests a link between premium payment and financial capacity. Similar with study among informal worker in Indonesia report that premium payment is related to financial ability (25). However, research on SMEs tax compliance has opposite finding that better financial performance provides better financial source for SMEs to become compliant taxpayer (10). Enterprises generally alter their financial report showing losses in their business to avoid taxes (26) which can be one of the reasons for insignificant results in the study.

There are some limitations of this study. Since this study was a cross-sectional study with simple random sampling and small sample size might not enough to represent all type of SMEs business. Size of enterprise was categorized based on number of employees and net asset value or annual sales was not considered in the study which might result on misclassification of SMEs (27).

CONCLUSION

This study clearly demonstrates that longer participation time in social insurance positively affects premium compliance. The pressures to comply with regulations; compliance behavior of other SMEs; and professional norm collectively known as isomorphic forces has shown correlation with premium compliance. SMEs would apply strategic response as conformity to resistance tactics to comply with premium payment. Therefore, it can be concluded that participation time, isomorphic forces, and strategic responses are predictors of premium compliance.

RECOMMENDATION

A focused intervention that may be useful to improve premium compliance are strengthening isomorphic forces and anticipation of resistance response among SMEs. Socialization among SMEs about the premium regulation, law enforcement, and periodical inspection for noncompliant SMEs might strengthened the isomorphic forces. Coordination of SSAH with stakeholders like attorney and local authorities throughout the country to enforce penalties according to the regulations to non-compliant SMEs may turn useful. Regular validation of SMEs data might detect the possibility of resistance response and to achieve premium assessment correctly (number of employees, number of employee's family member, salary).

Since this study was limited to South Jakarta municipality with small sample size, future research involving larger area would be more representative of the SMEs premium compliance in Indonesia. The next research involving all components in strategic response and isomorphic forces in more details is also recommended.

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ACCESSIBILITY TO HEALTH SERVICES AMONG NATIONAL HEALTH INSURANCE PROGRAM USERS IN CHAMPASAK PROVINCE OF LAO PEOPLE'S DEMOCRATIC REPUBLIC

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ABSTRACT

Accessibility and barriers to healthcare are crucial for achieving equitable Universal Health Coverage. Ensuring accessible and necessary services without imposing unaffordable burdens is essential. In addition to the lack of financial protection such as health insurance accessibility, the willingness to make out-of-pocket payments for health care signifies a lack of effective access to health services. In Lao PDR, little is known about access barriers to health care among health insurance users.

This study aims to describe the status of accessibility and barriers to getting health services among Lao National Health Insurance (NHI) users and ultimately to identify the predictors of accessibility to healthcare services among this population through Lao's NHI.

A cross-sectional survey was used to collect data from 397 NHI users who were 18 years or older, residing in Champasak Province from April to May 2023. The instrument was a set of questionnaires consisting of a Personal Data Form, Barriers to getting services, and Accessibility to Healthcare Services. Descriptive statistics, Pearson Chi-square test, and Multiple logistic regression model were employed for data analysis.

The results revealed that the overall level of accessibility to health services was low (less than 50 %) among health insurance users and the findings revealed that the majority of participants (63.7%) had a low level. The study identified that gender, education level, occupation, health insurance type, and waiting time were found to be significant with accessibility level ($p < 0.05$). Furthermore, the multiple logistic regression model revealed that health insurance type (AOR: 1.843; 95% CI: 1.066-3.185), and waiting time (AOR: 2.849; 95% CI: 1.657-4.900) were the strongest significant predictors of accessibility level to NHI.

This study emphasizes the significance of health insurance coverage and waiting time in improving healthcare accessibility. Policymakers should conduct comprehensive assessments and implement targeted interventions to enhance the National Health Insurance policy, ensuring equitable access to healthcare services for all individuals.

Keywords: Accessibility, Health care services, and Health insurance users.

INTRODUCTION

Access to healthcare encompasses the ability to obtain services for disease prevention, diagnosis, and treatment, promoting overall well-being. Ensuring convenience and affordability is vital for making healthcare accessible to all (1). To achieve equitable Universal Health Coverage (UHC) by 2030, accessible and necessary services must be provided for the entire population without imposing unaffordable burdens on individuals or households (2).

According to the World Health Organization (WHO), about 30% of the global population lacks access to essential healthcare, and nearly 2 billion people experience financial hardships due to healthcare expenses. Addressing inequalities within countries is a crucial challenge for achieving UHC (3). Additionally, an International Labor Organization (ILO) report reveals that 1.6 billion individuals in Asia and the Pacific lack effective access to social health protection (4).

Factors such as family composition (age, occupation, education), health beliefs, access to regular care providers, and community resources significantly influence the level of healthcare service accessibility (5). Additionally, long waiting times for appointments or visits can affect patients' overall satisfaction with their medical treatment, even if unrelated to the actual care received treatment (6). Similarly, health conditions and individual behaviors significantly determine the need for healthcare services (7).

The National Health Insurance (NHI) program in Lao PDR aims to achieve UHC and reduce out-of-pocket (OOP) expenses by 30% by 2025, ensuring affordable healthcare access for citizens. As of 2016, NHI operates on a tax-based funding system with small co-payments and contributions from formal sector workers. Coverage is extensive, encompassing 17 provinces and 94% of the population, excluding only Vientiane Capital (8). While access to healthcare has improved, the effectiveness of high coverage remains uncertain due to various factors including physical, economic, and socio-cultural variables. Moreover, low availability of the available healthcare services, providers, and medicines (9). Notably, OOP spending accounted for 41.76% of total health expenditure in 2020 (10).

In addition, expanding access to health services is an important step toward reducing health disparities (11), affordable health insurance is an important part to address this issue, and evidence on health care access among service NHI users is not available (12). There is a significant evidence gap regarding the accessibility of the National Health Insurance (NHI) scheme in Lao PDR, particularly in the context of social health protection. It is crucial to conduct studies assessing NHI accessibility among service users to address this gap and ensure the program's sustainability.

This study examines to describe the status of accessibility and barriers to getting health services among Lao NHI users and ultimately identifies the predictors of accessibility to healthcare services among this population through Lao's National Health Insurance.

METHODOLOGY

Study Design

A cross-sectional survey used the quantitative approach by interviewing the patients from the paper based structured questionnaires.

Sample Size

The sample size was determined by using the Cochran's formula for cross sectional study, as Access proportion (p) 36 %) access the health care services under compulsory migrant health insurance among Myanmar migrant workers in Thailand and the total sample size was 397 (13, 14)

The study utilized a multi-stage cluster sampling method to collect data from Champasak provincial hospital, Xanasomboun, and Khong community district hospitals in Champasak Province, Lao PDR. The analysis included data from 397 Lao NHI users aged 18 years and above who were OPD patients.

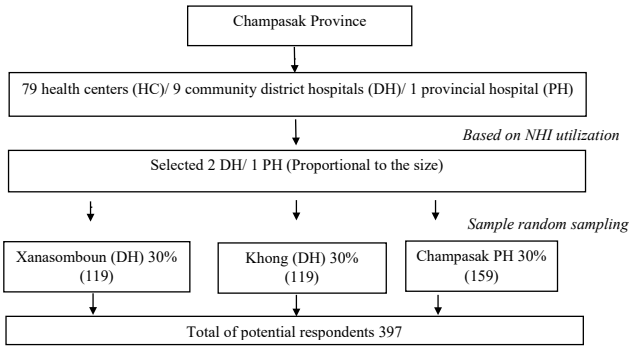

Figure 1: Sampling procedures

Data Collection Procedure

Data collection for the study involved administering a standardized interview questionnaire to all OPD patients. The questionnaire covered three domains: socioeconomic demographic, factors influencing healthcare access, and measurement of healthcare accessibility. The data collection period took place from April to May 2023.

Ethical Considerations

This research study was proposed and approved by the Mahidol University Social Science Independent Review Board (MUSSIRB) and received the certificate of MUSSIRB approval with the approval number 2023/058.1904.

Study Variables

The theoretical framework of the accessibility to healthcare services was based on the framework of access to health services developed by Andersen's Behavioral Model of health service access, which posits that healthcare service access is influenced by three key components: health behavioral model (HBM), predisposing factors, enabling factors, and perceived needs for healthcare (15).

Accessibility: Accessibility to health services refers to the frequency with which individuals can obtain healthcare when needed and ensures that services covered by NHI are within reach and available to all individuals.

Low access to health services refers to the limited availability and utilization of healthcare facilities and benefit coverage experienced by NHI users under the NHI.

High access to health services refers to the extensive availability and utilization of healthcare facilities and benefit coverage experienced by NHI users under the NHI.

Predisposing factors are associated with the individual receiving care and include demographics and socio-economic factors.

Enabling factors refer aspects that influence healthcare access as mode of travel, travel distance,

and waiting time for services are the factors related to NHI users accessing healthcare services.

Need factors are related to benefits from the NHI program and necessary to seek medical services as health medical conditions by NHI users.

Analysis

Statistical Package for Social Science (SPSS) 21 version was used for statistical analysis. Descriptive statistics were used to describe barriers and the accessibility to healthcare services, and categorized of total sum scores into low and high using mean calculation. Chi-square and multiple logistic regression were employed to assess relationships between independent and dependent variables.

RESULTS

Socio-economic demographic

As shown in Table 1, the sample was predominantly female, with (72%) of respondents being female and age of 18-30 years were (34.3%). In terms of education level, roughly half (52.4%) had education up to the secondary education level and occupation as farmers or agriculturalists (41.6%). According to the health insurance type was from the informal sector (71.8%). Motorbikes were the most commonly used mode among the respondents (79.6%) to health facilities. Additionally, reason to visit the hospital, a proportion of respondents (65.5%) due to unknown health conditions and did not have chronic diseases (82.1%). Moreover, the data similar counted the distance to the hospital as 0 to 8 km (68%). Time spent visiting the hospital was >15 to 30 minutes (46.6%) and the waiting times were generally shorter, with most patients being attended (3 to 15 minutes) (41.8%).

Table 1: Socio demographic

Variables	Frequency	Percentage (%)
Age (years)		
18-30	136	34.3
31-42	131	33.0
> 42	130	32.7
Gender		
Male	111	28.0
Female	286	72.0
Education level		
Secondary level or below	208	52.4
Higher than secondary level	189	47.6
Occupation		
Famer/agriculturalist	165	41.6
Others	232	58.4
Health insurance type		
Informal sector	285	71.8
Formal sector	112	28.2
Mode of transportation		
Car	61	15.4
Motorbike	316	79.6
Others	20	5.0
Travel distance (KM)		
0 - 3 Km	135	34.0
> 3 – 8 Km	135	34.0
> 8 Km	127	32.0
Waiting time to access the health services		
3 - 15 minutes	166	41.8
> 15 - 45 minutes	98	24.7
> 45 minutes	133	33.5
Reason to visit the hospital		
Known health conditions	137	34.5
Unknown health conditions	260	65.5
Chronic conditions		
Yes	71	11.9
No	326	82.1

Measurement and accessibility level of NHI

In Table 2, It was evident that the majority of respondents were more evenly distributed between sometimes (47.4%). Necessary healthcare services covered by NHI showed a relatively positive perception, with agreement (57.9%). As shown in Table 3, the measurement was done by sum of the total scores of the respondents based on giving the scoring on getting to health services and NHI services coverage with health condition questionnaires. The mean of the final score was defined to categorizes low and high by using "mean" calculation and the overall level of accessibility to health services was high (36.3%) and low (63.7%).

Table 2: Measurement of accessibility to NHI

Access to NHI health services	Frequency (%)				
	Never	Rarely	Sometimes	Often	Always
Getting health service at the hospital	0 (0.0)	49 (12.3)	188 (47 .4)	87 (21.9)	73 (18.4)

Access to NHI health services	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Necessary health conditions covered by NHI services	0 (0.0)	30 (7.6)	97 (24.4)	230 (57.9)	40 (10.1)

Table 3: Accessibility level to health service of NHI

Accessibility	Frequency	Percentage (%)
Low access	253	63.7
High access	144	36.3

Pearson chi-square and binary logistic regression analysis of factors with accessibility level

Table 4 demonstrates the female gender exhibited 1.6 times higher accessibility to health services compared to males (OR: 1.686, 95% CI: 1.046-2.718). Individuals with secondary level or below education had 2.1 times greater accessibility than those with higher education (OR: 2.188, 95% CI: 1.435-3.336). Moreover, those employed as farmers or agriculturalists displayed 1.7 times higher accessibility compared to individuals in other occupations (OR: 1.799, 95% CI: 1.188-2.725). Health insurance coverage showed a noteworthy association, with 2.6 times higher accessibility to health services for informal sector compared to the formal sector (OR: 2.667, 95% CI: 1.603-4.436). Additionally, waiting time within 3 - 15 minutes was linked to 3.5 times higher accessibility in contrast to longer waiting times (OR: 3.501, 95% CI: 2.098-5.841).

Table 4: Association of independent variables with accessibility level of NHI users

Factors	Accessibility		Pearson	Crude	95% CI	P-value
	Low access (%)	High access (%)	Chi-square	OR	Lower – Upper	
Predisposing factors						
Age (years)			2.786			0.250
18-30	83 (61.0)	53 (39.0)		1.453	0.875-2.412	0.149
31-42	91 (69.5)	40 (30.5)		1		
> 42	79 (60.8)	51 (39.2)		1.4469	0.880-2.451	0.141
Gender			4.641			
Male	80 (72.1)	31 (27.9)		1		
Female	173 (60.5)	113 (39.5)		1.686	1.046-2.718	**0.032***
Education level			13.462			
Secondary level or below	115 (55.3)	93 (44.7)		2.188	1.435-3.336	**0.000*****
Higher secondary level	138 (73.0)	51 (27.0)		1		
Occupation			7.760			
Famer/agriculturalist	92 (55.8)	73 (44.2)		1.799	1.188-2.725	**0.006****
Others	161 (69.4)	71 (30.6)		1		
Health insurance type			14.871			
Informal sector	165 (57.9)	120 (42.1)		2.667	1.603-4.436	**0.000*****
Formal sector	88 ((78.6)	24 (21.4)		1		
Enabling factors						
Mode of transportation			1.944			0.382
Car	43 (70.5)	18 (29.5)		1		
Motorbike	199 (63.0)	117 (37.0)		1.405	0.774-2.548	0.264
Others	11 (55.0)	9 (45.0)		1.955	0.692-5.522	0.206
Travel distance (KM)			1.216			0.545
0 - 3 Km	91 (67.4)	44 (32.6)		1		
> 3 – 8 Km	84 (62.2)	51 (37.8)		1.299	0.782-2.157	0.312
> 8 Km	78 (61.4)	49 (38.6)		1.256	0.761-2.071	0.373
Waiting time to access the health services			24.701			**0.000*****
3 - 15 minutes	84 (50.6)	82 (49.4)		3.501	2.098-5.841	0.000
> 15 - 45 minutes	65 (66.3)	33 (33.7)		1.821	1.012-3.276	0.046
> 45minutes	104 (78.2)	29 (21.8)		1		
Need factors						
Reason to visit hospital			0.657			
Known health conditions	91 (66.4)	46 (33.6)		1		
Unknown health conditions	162 (62.3)	98 (37.7)		1.197	0.775-1.848	0.418
Chronic conditions			0.782			
Yes	42 (59.2)	29 (40.8)		1.267	0.749-2.141	0.377
No	211 (64.7)	115 (35.3)				

Note: *p < 0.05, **p < 0.01, ***p < 0.001

Multiple logistic regression of factors with accessibility level

It was conducted using the enter method, including all independent variables with a p-value less than 0.25 from the bivariate test. The full model revealed that waiting time was a significant predictor of accessibility to health services, with individuals having 2.9 times higher likelihood of achieving higher accessibility (AOR: 2.977; 95% CI: 1.652-5.364), as shown in Table 5.

Table 5: Full model of multiple logistic regression analysis for accessibility level of NHI users

Factors	Adjusted OR	95% CI Lower - Upper	P-value
Predisposing factors			
Age (years)			0.449
18-30	1.160	0.667 - 2.016	0.599
31-42	1		
> 42	1.4428	0.821 - 2.483	0.207
Gender			
Male	1		
Female	0.616	0.368 - 1.029	0.064
Education level			
Secondary level or below	1.402	0.806 - 2.441	0.232
Higher than secondary level	1		
Occupation			
Famer/agriculturalist	0.800	0.466 - 1.374	0.418
Others	1		
Health insurance type			
Informal sector	1.672	0.869 - 3.217	0.124
Formal sector	1		
Enabling factors			
Waiting time to access the health services			**0.001****
3 - 15 minutes	2.977	1.652 - 5.364	0.000
> 15 - 45 minutes	1.760	0.933 - 3.321	0.081
> 45 minutes	1		

Note: *p < 0.05, **p < 0.01, ***p < 0.001

Final model was used the backward: Wald method revealed two significant predictors of accessibility to health services among NHI users in **Table 6**. The informal sector of health insurance was 1.8 times more likely to have higher accessibility compared to formal sector (AOR: 1.843; 95% CI: 1.066-3.185). Additionally, waiting time was found to have a substantial impact, with individuals 2.8 times more likely to have higher accessibility (AOR: 2.849; 95% CI: 1.657-4.900).

Table 6 Final model of multiple logistic regression analysis for accessibility level of NHI users

Factors	Adjusted OR	95% CI Lower - Upper	P-value
Predisposing factors			
Gender			
Male	1		
Female	0.641	0.389 - 1.059	0.082
Health insurance type			
Informal sector	1.843	1.066 - 3.185	**0.028***
Formal sector	1		
Enabling factors			
Waiting time to access the health services			**0.001****
3 - 15 minutes	2.849	1.657 - 4.900	0.000
> 15 - 45 minutes	1.650	0.933 - 3.049	0.110
> 45 minutes	1		

Note: *p < 0.05, **p < 0.01, ***p < 0.001

DISCUSSION

The study found that the majority of participants (63.7%) had low accessibility to healthcare services (less than 50%). Similarly, the study conducted in informal settlements of Nairobi, Kenya, found that people had low access to healthcare services (16). Most participants were female, inconsistent with a previous study in Myanmar where women less likely to seek outpatient services than men (17). The respondents in the study had low or equal secondary education, and agriculture was the predominant occupation. This aligns with a previous study that indicated primary education was associated with perceived barriers to accessing healthcare in Ethiopia (18), an occupation was also a key factor in determining NHI scheme membership in Ghana, impacting healthcare-seeking behavior and financial barriers (19). The informal sector, emphasizing their significant dependence on informal health insurance coverage. This consistent with the previous study that insurance status was linked to increased outpatient service utilization among the elderly, likely due to the elimination of financial barriers to care in Indonesia (20). The study highlighted waiting time as the most influential predictor of accessibility levels, with NHI users experiencing shorter waiting times being more likely to access healthcare services. This finding aligns with previous study in Nepal, which also identified extended waiting times at healthcare institutions as a barrier to accessing healthcare services (21).

LIMITATION

This study's limitations include its focus on three hospitals in Champasak province, Lao PDR, potentially limiting generalizability. Selection bias from the sampling method may affect representativeness. The study's use of variable factors for accessibility is limited. Additionally, being a cross-sectional study, causal relationships may remain inconclusive for barriers to care and healthcare accessibility.

CONCLUSION

This study highlights the need to consider predisposing and enabling factors to reduce their barriers to getting care. Therefore, NHIB and policymakers should address these factors that could be considered to impact their ability to access healthcare services.

RECOMMENDATION

This study underscores health insurance type and waiting time as critical factors in improving healthcare accessibility. Policymakers and the NHIB should focus on equitable policies for insured members and reducing waiting times in healthcare facilities to enhance the NHI system's efficiency. A prospective study of OPD patients would provide valuable insights into healthcare service access in Lao PDR. For future studies, additional essential factors influencing healthcare accessibility and employing qualitative methods such as in-depth interviews and focus group discussions are recommended to ensure clarity and accuracy of findings.

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INTIMATE PARTNER VIOLENCE AMONG LGBT COMMUNITY IN YANGON, MYANMAR

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ABSTRACT

Intimate partner violence (IPV) is a significant concern that impacts individuals from diverse backgrounds, including those who identify as lesbian, gay, bisexual, and transgender (LGBT). Similar to heterosexual relationships, IPV can take many different forms, including physical, sexual, and psychological abuse by current or former romantic or sexual partners. Although intimate partner violence (IPV) remains a serious health problem regionally and globally, there is limited research on intimate partner violence among gender minority.

The objective of this study is to investigate the prevalence and individual factors associated with intimate partner violence among the LGBT community in Yangon, Myanmar.

A cross-sectional study was conducted among the LGBT community. A self-administered online questionnaire was used to collect the data in Yangon by using the snowball sampling method. This study follows the protocol of a violence study, keeping confidentiality, and participants can stop at any time. Intimate partner violence was assessed using the Intimate Partner Violence World Health Organization Standard Questionnaire. A chi-square test and simple logistic regression were done to determine the associated factors.

In this study, there are 232 preliminary LGBT participants with a median (IQR) of 26 (10), ranging in age from 18 to 56. The findings revealed that 170 LGBT individuals (73.28%) were survivors of intimate partner violence, with psychological abuse accounting for 163 (70.26%), physical abuse for 109 (46.98%), and sexual abuse for 63 (27.16%) throughout their lifetime. Age between 25 and 34 (COR = 2.17, 95%CI = 1.14 – 4.15), age >34 (COR = 8.89, 95%CI = 2.58 – 30.61), occupational status (COR = 3.15, 95% CI = 1.72 – 5.78), monthly income between 288,000 to 500,001MMK (COR = 5.19, 95% CI = 1.83 – 14.72), monthly income between 500,000 to 1,000,000MMK (COR = 2.50, 95% CI = 1.05 – 5.91) and childhood experience of violence (COR = 2.90, 95% CI = 1.46 – 5.75) are significant risk factors for intimate partner violence.

The findings highlight the skyrocketing prevalence of intimate partner violence among LGBT people in Yangon, Myanmar. The findings point out the need for focused interventions and support networks to deal with this problem and prevent the adverse impacts of intimate partner violence on the health and safety of LGBT individuals.

Keywords: Intimate partner violence, LGBT, gender minority, Myanmar

INTRODUCTION

Intimate partner violence (IPV) is a serious societal problem for the lesbian, gay, bisexual, and transgender (LGBT) community (1). "Intimate partner violence refers to behaviour within an intimate relationship that causes physical, sexual, or psychological harm, including acts of physical aggression, sexual coercion, psychological abuse, and controlling behaviours. This definition covers violence by both current and former spouses and partners" (2). The prevalence of IPV among gender minorities ranges between 10% and 20%, with some studies reporting rates as high as 50% (3). According to research on IPV in LGBT populations, the prevalence is equivalent to or higher than in heterosexual populations (4). While the issue of IPV has gained considerable attention, particularly in relation to heterosexual relationships, there remains a significant gap in understanding the unique experiences of intimate partner violence within the LGBT community (4, 5).

While LGBT people have existed in various countries, their distribution and estimated global population size are limited. In Myanmar, LGBT people have lived since ancient civilizations and kingdoms, with the most visible identities in the Yangon and Mandalay regions (6). Their existence is rarely expressed in educational textbooks or state-owned media, making it unlikely that the LGBT community exists in Myanmar (7). LGBT people were socially excluded from their communities because of their gender identity and/or sexual orientation (8), and their rights and participation are not recognised because of social norms, perspectives, and cultural discrimination by the community and society in Myanmar (6, 7). In Yangon, the largest city in Myanmar, the LGBT community faces a complex set of challenges that intersect with broader societal norms, cultural values, and legal frameworks (9). Traditional gender roles, conservative attitudes, and a lack of legal protection contribute to an environment where intimate partner violence against LGBT individuals often goes unnoticed, unreported, and unaddressed (10, 11).

IPV has negative physical and psychological health outcomes, including increased rates of physical injury, depression, posttraumatic stress disorder, substance abuse, sexually transmitted infections, suicide ideations, and obesity (12). Survivors of IPV are more likely to experience depressive symptoms, substance use, isolation, anxiety, and suicide threats (13–15). The higher prevalence of IPV among LGBT young adults may increase the risk of these negative health outcomes (16).

This study aims to fill this critical knowledge gap by examining the prevalence and individual factors associated with intimate partner violence among the LGBT community in Yangon, Myanmar. Based on the World Health Organisation ecological model, this study seeks to uncover the unique factors contributing to intimate partner violence in this context and understand the various forms of violence experienced by LGBT individuals.

METHODOLOGY

Study design

A cross-sectional study was carried out to investigate the characteristics and experiences of the LGBT population residing in Yangon, Myanmar. The present study employed a self-administered online questionnaire to gather data, utilising the snowball sampling method.

Study Procedure

The online questionnaire was designed as a Google form. The researcher initiated the process by sharing a Google Form link with the focal persons of local LGBT community organisations. These individuals then distributed the Google Form link within their respective networks. And also, participants who have already completed the survey shared the Google Form link with other LGBT people who may be interested in participating in this study.

In order to ensure that potential participants fulfil the inclusion criteria, the researcher utilises the Google Form platform to facilitate two steps for participants. Firstly, they are provided with a participant information sheet that has been approved by "The Research Ethic Review Committee for Research Involving Human Research Participants, Chulalongkorn University", which provides them with the study's objectives and requirements. Participants are reassured that their responses are kept confidential and are used for research purposes. Secondly, a screening questionnaire serves as a means to determine if potential participants meet the eligibility criteria for the study. The screening questions include three questions, which are: 1. How can you identify yourself? 2. Are you 18 years of age or older? 3. Are you currently living in Yangon for at least six months? At the screening questionnaire, participants need to click the "I agree" checkbox to indicate their acceptance of the agreement before they answer the questionnaire. Participants who fail to meet the inclusion criteria are removed from the study. It is clearly stated that participants have the option to discontinue the survey at any time if they feel uncomfortable or distressed.

The validated intimate partner violence (World Health Organisation) standard questionnaire is used for this study. The questionnaire includes four sections for independent variables: individual factors, relationship factors, community factors, and social factors. The dependent variable is intimate partner violence, which involves four psychological violence questions, six physical violence questions, and three sexual violence questions. The dependent variables are intimate partner violence variables, which involve four psychological violence questions, six physical violence questions, and three sexual violence questions. The questionnaires were translated into Burmese by the principal investigator, and an English professor from Myanmar translated the Burmese version. An expert (an associate professor from the University of Public Health Yangon, Myanmar) cross-checked the translation of the English and Myanmar versions for accuracy and cultural appropriateness. The result of the Cronbach's alpha for the outcome questionnaires is 0.856.

Data Analysis

This study was analysed in two major steps using Stata 14 software. Descriptive statistics were presented in the form of frequencies and percentages for socio-demographic data, including age, sex at birth, gender identity, highest education, employment, and income, alcohol intake, and childhood experience of violence. Chi-square and simple logistic regression were used to examine the relationship between individual characteristics and intimate partner violence.

Ethical approval

Ethical approval was obtained from "The Research Ethic Review Committee for Research Involving Human Research Participants, Chulalongkorn university (COA number 110/66)". This study follows the protocol of a violence study, keeping confidentiality, and participants can stop at any time.

RESULTS

The table 1 displays the respondents' individual factors. The respondents' average age (median 26 ± interquartile range 10) was 26 years, with a range of 18-56. The largest percentage of participants (44%), were between the ages of 18 and 24, followed by those between the ages of 25 and 34 (36.21%). 72.84% of the study participants were designated as male at birth. 48.71% of respondents identified as gay. 43% of participants had a bachelor's degree or above as their highest degree of education, with 30.60% having a basic education. In terms of employment, 67.67% of those respondents were employed. The majority of participants stated being frequent and regular drinkers, with 60.34%. In terms of their childhood experiences with violence, 81.03% of respondents said they had such experiences.

Table 1: Individual Factors (Social demographic characteristic of the LGBT) (n = 232)

Social demographic characteristic of the LGBT	Frequency (n)	Percentage (%)
Age of LGBT (year)		
Mean ± Standard deviation (SD)		27.5±7.9
Median ± Interquartile range (IQR)		26±10
Minimum – maximum		18-56
• ≥ 18 - 24	103	44.4
• 25 - 34	84	36.21
• > 34	45	19.40
Sex (at Birth)		
• Male	169	72.84
• Female	63	27.16
Gender identity		
• Lesbian	32	13.79
• Gay	113	48.71
• Bisexual	43	18.71
• Transgender	44	18.97
Education level		
• Basic Education (Primary, Middle, and High school)	71	30.60
• Undergraduate	60	25.86
• Graduate and above	101	43.53
Occupation		
• Unemployment	75	32.33
• Employment	157	67.67
Monthly income		
• Below or equal 144,000 MMK	44	18.97
• Between 144,001 to 288,000 MMK	53	22.84
• Between 288,001 to 500,000 MMK	51	21.98
• Between 500,001 to 1,000,000MMK	60	25.86
• Above 1,000,000 MMK	24	10.34
Alcohol consumption		
• Never and occasional drunker	92	39.66
• Frequent and regular drinker	140	60.34
Childhood experience of violence		
• No	44	18.97
• Yes	188	81.03
- Psychological aggression	185	79.74
- Mild to moderate physical punishment	164	70.69
- Severe physical punishment	130	56.03

Note: Monthly income is based on Myanmar's minimal salary wages (1 USD = 2100 MMK).
Alcohol consumption (occasional drinker <4 days a month, frequent drinker 1-4 days a week, regular drinker >4 days per week)
Childhood experience of violence is regarded as 'Yes' if at least one form of violence is present.

Table 2: Different forms of intimate partner violence among LGBT (n =232)

Type of violence	Frequency (n)	Percentage (%)
Psychological Violence		
• Insulted/ made to feel bad	153	68.53
• Humiliated/belittled	111	47.84
• Did things to scare	73	31.47
• Threatened to hurt	52	22.41
Physical Violence		
• Slapped/threw something	78	33.62
• Pushed/shoved	86	37.07
• Hit with fist	63	92.16
• Kicked, dragged, beaten up	30	12.93
• Choked/burnt	23	9.91
• Threatened to use weapon	35	15.09
Sexual Violence		
• Physically forced to have sex	52	22.41
• Unwilling to have sexual intercourse	53	22.84
• Forced to do sexual activity that was degrading or humiliating	27	11.64

Table 3 shows the result of the lifetime prevalence of intimate partner violence among LGBT individuals and also the prevalence of different types of IPV, which include psychological violence, physical violence, and sexual violence. According to the preliminary results, 73% of the respondents experienced intimate partner violence at some point in their lives. Psychological violence accounts for 70.26 percent of these incidents, whereas physical violence accounts for 46.98 percent and sexual violence accounts for 27.16 percent.

Table 3: Lifetime prevalence of intimate partner violence among LGBT (n =232)

Type of violence	Frequency (n)	Percentage (%)
Psychological Violence		
• No	69	29.74
• Yes	163	70.26
Physical Violence		
• No	123	53.02
• Yes	109	46.98
Sexual Violence		
• No	169	72.84
• Yes	63	27.16
Intimate partner Violence		
• No	62	26.72
• Yes	170	73.28

Note: Intimate partner violence is regarded as 'Yes' if at least one form of violence is present.

Table 4 showed the relationship between individual factors and the outcome of intimate partner violence, as determined through the methods of chi-square analysis and simple logistic regression methods. The present study found that several independent variables were significantly associated with intimate partner violence (IPV) at a p value of 0.05 using a chi-square test. Specifically, individuals aged between 25 and 34 years and those over 34 years of age, as well as employment, monthly income, and having experienced childhood violence, were significant risk factors for IPV. LGBT individuals aged between 25 and 34 are 2.17 times more likely to experience intimate partner violence compared to those aged ≤ 24 years (COR = 2.17, 95% CI = 1.14–4.15). LGBT individuals aged >34 are 8.89 times more likely to experience intimate partner violence compared to those aged ≤ 24 years (COR = 8.89, 95% CI = 2.58–30.61). The study also indicates that, as for employment status, LGBT people who are employed are 3.15 times more likely to experience intimate partner violence (COR = 3.15, 95% CI = 1.72–5.78). LGBT people who have experienced childhood violence are 2.90 times more likely to experience intimate partner violence compared to those who have not experienced childhood violence (COR: 2.90, 95% CI: 1.46–5.75).

Table 4: Binary association of individuals factors with intimate partner violence (n = 232)

Sociodemographic characteristics	COR	95% CI		χ2	p-value [a]
		Lower	Upper		
Age group				**12.04**	**0.002***
18-24	1				
25 - 34	2.17	1.14	4.15		
> 34	8.89	2.58	30.61		
Sex at Birth				**0.003**	**0.960**
Female	1				
Male	2.97	0.53	1.96		
Gender Identity				**1.865**	**0.601**
Lesbian	1				
Gay	1.74	0.76	3.99		
Bisexual	1.55	0.58	4.12		
Transgender	2.33	0.84	6.50		
Highest Educations				**3.053**	**0.217**
High School	1				
Undergraduate	0.59	0.28	1.23		
Graduate and above	1.48	0.72	3.03		
Employment				**6.484**	**0.011***
No	1				
Yes	3.15	1.72	5.78		
Income				**10.72**	**0.030***
<144, 000 MMK	1				
Between 144,001 to 288,000 MMK	1.14	0.50	2.59		
Between 288,001 to 500,000 MMK	5.19	1.83	14.72		
Between 500,001 to 1,000,000MMK	2.50	1.05	5.91		
Above 1,000,000 MMK	2.63	0.83	8.34		
Alcohol Consumptions				**1.092**	**0.296**
Never and occasional drinker	1				
Frequent and regular drinker	1.25	0.69	2.25		
Childhood experience of violence				**8.781**	**0.003***
No	1				
Yes	2.90	1.46	5.75		

COR – Crude Odd Ratio
CI – Confident Interval
p-value [a] = Chi square test
*p-value <0.05, if statistically significant at α = 0.05

DISCUSSION

This research comprises a representative group of individuals identifying as LGBT, and the average age is approximately 26 years. Additionally, over 44% of the LGBT participants included in the study were under the age of 24. The age distributions observed in the present study are comparable to those reported in a prior online investigation of the LGBT population in Myanmar, as published by Michael McGrath in 2021 (6). The present analysis revealed that approximately 50% of the subjects self-identified as homosexual. This proportion matches the rates reported in prior research conducted in Germany, Portugal, and the United Kingdom as part of the FRA EU-LGBT online recruitment survey. Specifically, previous research indicated that the proportion of

individuals identifying as gay in Germany was 69%, while in Portugal and the UK, it was 55% and 57%, respectively (17). The present results suggest that there is a comparable incidence of self-identification as gay among participants in both researches.

When considering the forms of violence in this study, psychological violence and physical violence were more prevalent than sexual violence. In this study, the finding that psychological violence is the most common form of intimate partner violence among LGBT, and it is consistent with existing heterosexual and gender minority violence literature in Myanmar and all over the world (18–22). This may be due to societal attitudes and norms in which some LGBT individuals may internalise negative beliefs about their sexual orientation or gender identity. This self-stigmatisation can affect self-worth and contribute to abusive dynamics within relationships (23). Another reason is that the cultural acceptance of partner-control behaviour in Myanmar can normalise violence as a means of discipline and control, which can lead to the use of psychological violence (22). Psychological abuse is often a part of a larger cycle of abuse that includes various forms of control and manipulation. Abusers might use psychological tactics to maintain power and control over their victims, making it more challenging for survivors to break free from the abusive relationship.

The study's participants' income, occupation, and level of education served as indicators of their socioeconomic situation. The majority of them had a graduate or higher education and an income that was twice as high as the minimum wage of 144,000 MMK, while around two-thirds of them were employed. It could be because of the data collection methods applied in this study, which included Google Forms and snowball sampling. To respond to this study, respondents needed to have internet access and be more technologically proficient. A snowball effect can result in the recruitment of people from comparable social networks or communities. As a result, this could be a factor in attracting people with better levels of education, money, and employment status, perhaps resulting in a more accurate portrayal of their socioeconomic positions. The distribution of educational levels in this study is similar to that of another online LGBT study in Myanmar (6), with graduate and postgraduate education accounting for 40% of the total, and basic education (high school, middle school, and primary) accounting for around 20% of the total.

In this study, almost 81% of LGBT respondents experienced childhood violence, which is similar to the Myanmar Demographic and Health Survey (MDHS), which found that more than three-fourths of children in Myanmar were committed in any violent way (77.2%) (24). This could be because parents and other carers in Myanmar often believe they have the right to physically punish children for misbehaving, particularly within the family (25). Furthermore, Corey et al. discovered that childhood abuse was linked to relationship violence towards gender minority survivors (26). Furthermore, Whitton et al. (2016) discovered that LGBT children who experienced childhood maltreatment were more likely

to report IPV victimisation in a longitudinal study of IPV victimisation among sexual minority youth (27).

The study found that LGBT individuals aged 25–34 and over 34 years are 2 times and 8 times more likely to experience intimate partner violence compared to those under 24. Older individuals may have accumulated past traumas, unresolved conflicts, and patterns of behaviour, that may influence their relationships. Additionally, socioeconomic challenges and stress can contribute to increased tension and conflict, potentially escalating IPV victimisation (28, 29).

Moreover, the study found that LGBT individuals who experienced childhood violence were about three times more likely to experience non-intimate partner violence compared to those who did not. The Cycle of Violence Theory suggests childhood violence increases adult vulnerability to violence, potentially leading to future victimisation (30). In contrast to previous research, this study reveals that LGBT individuals who are employed are 3.15 times more likely to experience intimate partner violence. However, this result should be interpreted with caution, as it may be attributable to several factors. The research questionnaire assessed lifetime experiences of violence, which could occur regardless of previous employment status.

Since the study employs judgmental sampling as a snowball technique and solely gathers data from the Yangon area. Consequently, the study's generalizability may be limited. The potential for selection bias in this study may be attributed to political saturation and the use of an online self-response questionnaire, as well as the intermittent accessibility of the internet.

CONCLUSION

This study shows the high prevalence of IPV among LGBT community in Yangon, Myanmar. Therefore, this study highlights to inform policymakers, activists, and service providers about the urgent need for targeted interventions and support systems for the LGBT community in Yangon by focusing on the particular challenges they face. Ultimately, it is hoped that this study will contribute to the development of more inclusive policies and practices aimed at combating intimate partner violence and promoting the well-being and safety of the LGBT community in Yangon, Myanmar.

RECOMMENDATIONS

Based on the study from regarding the experiences faced by the LGBT community in Yangon, Myanmar, policymakers, and practitioners should design and implement more effective interventions at individual level, community level, and policy level as well as support systems to prevent and respond to intimate partner violence among LGBT. *Individual level*

Education and empowerment programs are essential to raising awareness and training LGBT individuals with the necessary life skills to protect themselves from various forms of violence. Culturally sensitive and inclusive counselling and support services should be developed to provide to the specific needs of LGBT individuals experiencing IPV.

Community level

Community support plays a vital role in addressing intimate partner violence (IP). within the LGBT community. Given the unique challenges faced by LGBT individuals, including stigma and discrimination, having a supportive community can create a safe space where survivors of IPV can seek help without fear of judgment. Community organisations, LGBTQ+ centres and support groups can offer tailored resources, counselling, and legal assistance that acknowledge the specific needs of LGBT survivors. Moreover, community support fosters awareness and education, challenges harmful stereotypes, and promotes healthy relationships. By promoting inclusivity, acceptance, and understanding, the community can significantly contribute to preventing, addressing, and ultimately reducing IPV within the LGBT population.

Policy level

Existing policies in Myanmar do not accept the LGBT relationship according to Section 377 of the Penal Code that criminalizes the same sex intercourse and shall be punished with imprisonment or fine. There is a need for comprehensive legislation that clearly recognises and addresses IPV within LGBT relationships.

Recommendation for further research

More research should be conducted through using a variety of mixed methods, including both qualitative and quantitative approaches, such as focus group discussions or in-depth interviews, to further explore the underlying factors contributing to instances of intimate partner violence. Since this study focuses on lifetime prevalence, it is advisable to specify the scope within the 12-month prevalence.

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HUMAN HEALTH RISK ASSESSMENT RELATED TO HEAVY METALS IN ROADSIDE DUST NEAR HYDROPOWER DAMS CONSTRUCTION AREAS: A CASE STUDY IN WANGDUEPHODRANG DISTRICT OF BHUTAN

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ABSTRACT

The concern over the heavy metal laden dust and its impact on human health is increasing over the years due to its deleterious consequences on public health. Evidence around the world shows that exposure to roadside dust could lead to numerous serious health conditions. As a developing nation, Bhutan is facing environmental issues due to various anthropogenic activities. The two hydropower dams in Wangduephodrang District of Bhutan are under construction since 2008. Therefore, the residents nearby may experience adverse health effects from dust exposure.

This study aimed 1) to find the heavy metals concentrations in roadside dust near hydropower dams construction areas and 2) to assess the noncancer and cancer risk of exposure to heavy metals laden dust among Bhutanese living nearby the construction areas.

This study was a cross sectional study. The roadside dust samples near hydropower dam construction in Wangduephodrang District were collected and analyzed for As, Pb, Cr, and Hg concentration by using ICP-OES. The anthropogenic data were from the nationally representative surveys of Bhutan and standard references.

The mean concentration of the heavy metals in the dust samples were Hg<As<Pb<Cr<Cd at 0.00047± 0.00067, 0.65±1.16, 5.61±5.9, 15.72±5.57, and 0.034±0.00 mg $\mathbf{kg^{-1}}$ respectively. All the concentrations of the heavy metals in the dust were lower than the permissible range for safety. The noncancer risk assessment showed that the HQ were $1.30x10^{-09}$, $3.82x10^{-07}$, $5.18x1^{-07}$, $1.71x10^{-03}$, $8.15x10^{-09}$ for Hg, Pb, As, Cr, and Cd. The HI was $1.71x10^{-03}$, which indicates an acceptable risk at <1. The carcinogenic risk due to exposure to Pb, As, Cr and Cd was $2.42x10^{-11}$, $1.00x10^{-09}$, $3.55x10^{-15}$ and $2.20x10^{-11}$. The total carcinogenic risk was $1.05x10^{-09}$, which indicates that 1 in billion people exposed may get cancer and lower than the acceptable range of $1.0x10^{-6}$.

There was no potential non-carcinogenic and carcinogenic risk due to exposure to the heavy metals laden dust in the hydropower dam construction areas in Bhutan. However, it's recommended that residents should use face masks for self-protection from roadside dust and prevention of other adverse health effects apart from exposure to heavy metals under the study.

Keywords: Heavy metals, health risk assessment, dust, inhalation, Bhutan

INTRODUCTION

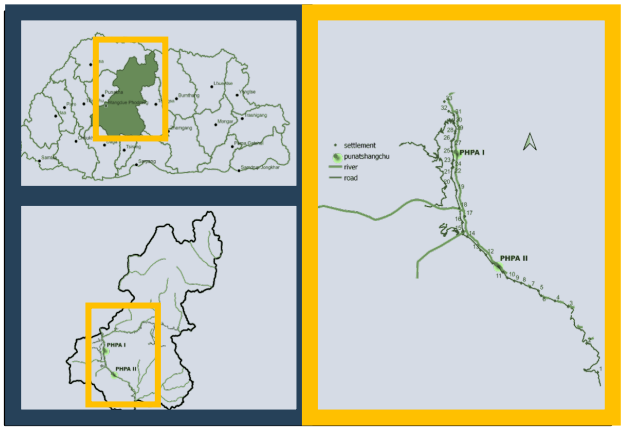
The concern over the heavy metal laden dust and their impact on human health is increasing over the years due to its deleterious consequences on public health (1). The concern has further exacerbated due to rapid anthropogenic activities that has potential to increase heavy metal in the environment (2). It is a cause of concern globally due to their characteristics such as non-biodegradable, highly toxic, longevity and bioaccumulation ability (3, 4). Heavy metals such as Arsenic (As), Cadmium (Cd), Chromium (Cr),Nickel (Ni) and Lead (Pb) are known carcinogenic and has huge impact on the human health (5). The evidences around the world shows that the inhalation and ingestion of dust could lead to numerous serious health conditions such as cancers, chronic kidney diseases, hypertension, dermal lesions, peripheral neuropathy, and vascular diseases (3,4,6).

Bhutan is witnessing a rapid growth in infrastructure such as urban infrastructure development, land use changes, mining and industrial development (7). The number of vehicles in the country has also increased by three folds in the last decade (8,9). In recent decade Bhutan has geared towards construction of various hydropower dams across the country (10,11). large number of pollutants is emitted during the construction of infrastructure due to machinery, earthmoving and transportation of the excavated materials (2,12). Studies also points out the presence of heavy metals in the rivers where there is increasing anthropogenic activities (13,14). Tashi et al., (2022). Ministry of Labor, as a nodal agency, in collaboration with other relevant stakeholders, oversees the workplace safety and health through enforcement of labor and employment act of Bhutan and related rules and regulations, including Regulation on OHS&W.

However, not many studies are conducted to assess the human health risk associated with presence of heavy metals in these areas. Health risk assessment of the heavy metal contamination in the roadside dust would aid in assessing the health effects of exposure to heavy metals through dust in the area. Therefore, this study attempts to assess the concentration of heavy metals in the road-side dust near hydropower construction areas in Bhutan and conduct human health risk assessment by employing established quantitative risk assessment by US-EPA.

METHODOLOGY

This study was a cross-sectional study that was conducted during May – June 2023. The study area was along Tsirang-Wangdue national highway areas which is along the right bank of Punatsang Chhu river, Wangduephodrang District of Bhutan. The area has two major hydropower dams under construction since 2008 (Punatsangchu I and Punatsangchu II).



A total of 25 sampling sites were selected for the study. The sample sites were selected using random points along line in Qgis with minimum distance between the points of 150mts.

Settled dust samples were collected using a natural bristle brush and stainless-steel dustpan. The samples were collected from 20 different sites selected randomly. Three sub-samples (10grams each) were drawn from each sample site and mixed thoroughly to get the overall sample from the site. The collected samples were stored in zip log bags and stored in cooler box before transporting to the laboratory for analysis. All the samples were labeled with sample identification numbers.

The chemicals and reagents used were of ICP-Trace metal grade of high purity. Multi-element standards (1000mg/ml) of lead, chromium, cadmium, arsenic, and mercury were used for analysis. The samples were digested in microwave oven. A sample weight of 0.25 gram was digested with 5 ml of ultra-pure nitric acid and 2.5 ml of hydrogen peroxide and made the final volume of 50 ml with distilled water. The samples were filtered through a 0.22 µm pore diameter membrane filter of plastic filtering apparatus and analyzed using ICP-OES. Commercially available standards were used for the analysis (Merck. USA). The measurement was performed using an Agilent 5110 ICP-OES instrument at Royal Center for Disease Control, Ministry of Health, Thimphu, Bhutan. The samples were analyzed based upon the US EPA method 200.7 on "determination of metals and trace elements in water and wastes by Inductively coupled plasma - atomic emission spectrometry".

Quantitative health risk assessment

For risk assessment, personal information was obtained from the National STEPS survey, 2019. The U.S. EPA's four steps of risk assessment was used to find cancer and non-cancer risk (16) as following.

Step 1 Hazard identification

In this step, the assessors identify the potential incidences of adverse health effects due to exposure to the stressors. It assesses heavy metals and their causal association with health effects. Exposure to heavy metals (As, Cr, Cd, Hg and Pb) can cause non-cancer effects such as skin lesions, neurological effects, and reproductive system damage. Further, As, Cd, Cr and Pb are known carcinogens.

Step 2 Dose-response assessment

In this step, the association between amount of the heavy metals in the environment and exposure/contact with the stressor and its health impacts are assessed. In this study, the cancer slope factor (CSF) and inhalation reference dose (RfD) of heavy metals are presented in Table 1.

Table 1: slope factor and inhalation reference dose of the heavy metals studied.

Analyte	Slope factor	reference	Rfd	Reference
Arsenic	1.50E+01	(17)	3.01E-04	(18)
Chromium	2.20E-06	(17)	2.20E-06	(17)
Cadmium	6.30E+00	(17)	1.00E-03	(19)
Lead	4.20E-02	(20)	3.52E-03	(19)
Mercury	-	-	8.60E-05	(17)

Step 3 Exposure assessment

Exposure assessment is "identification and evaluation of the human population exposed to a toxic agent, describing its composition and size, as well as the type, magnitude, frequency, route, and duration of exposure". (21) The cancer and non-cancer risks of exposure to the heavy metals will be calculated by using;(21–23)

$$ADD_{inh} = \frac{C_{dust} \times Inh_{rate} XEF \times ED}{PEFxBW \times AT}$$

ADD_{inh}: Average Daily Dose (exposure through inhalation; mg/Kg-day)

Table 2: variables and their values used in the study.

Variable	Unit	Value	Source
C_{air}: concentration of HM in dust	*mg/kg*	Current study	
Inh_{rate}: inhalation rate	*m3/day*	20	US EPA
EF: Exposure frequency	*days/year*	350	US EPA
ED: Exposure duration	*year*	14 (non-cancer) 70.20 (cancer)	PHCB, 2017
AT: Averaging time	*days*	EDx365	
BW: body weight		46.50	NCD STEPs survey, 2019
PEF: Particle emission factor	(m3/Kg	1.32×109	US EPA

Step 4 Risk Characterization

This is the final step in risk assessment to evaluate the health risks posed by the exposure to heavy metals (individuals and populations) and describes the extent and severity of probable harm. Non-carcinogenic risk: the non-carcinogenic risk due to the exposure to the individuals will be calculated using.

$$Hazard\ quotient(HQi) = \frac{ADD_{inh}}{Rfd}$$

Where;
ADD_{inh}: average daily dose through inhalation
Rfd: reference dose

Hazard quotient (HQ) shows the risks associated with health effects. The hazard index (HI) which is the sum of the HQs will be calculated using.

$$Hazard\ Index(HI) = \sum HQ_i$$

It's assumed that the effects of the different heavy metals are additive. The HI>1 indicates the potential adverse health risks while HI≤1 indicates no significant health risks.

Carcinogenic Risk Characterization

The lifetime cancer risk posed by heavy metals (As, Cd, Cr and Pb) through inhalation (CRinh) was calculated using:

$$CR_{inh} = ADD_{inh} \times CSF$$

Where;

CR_{inh}: Cancer risk

CSF: Cancer Slope factor

ADD_{inh}: average daily dose through inhalation

The Total cancer risk was calculated to see the overall risk of exposure to heavy metals.

$$TCR_{inh} = \sum CR_{inh}$$

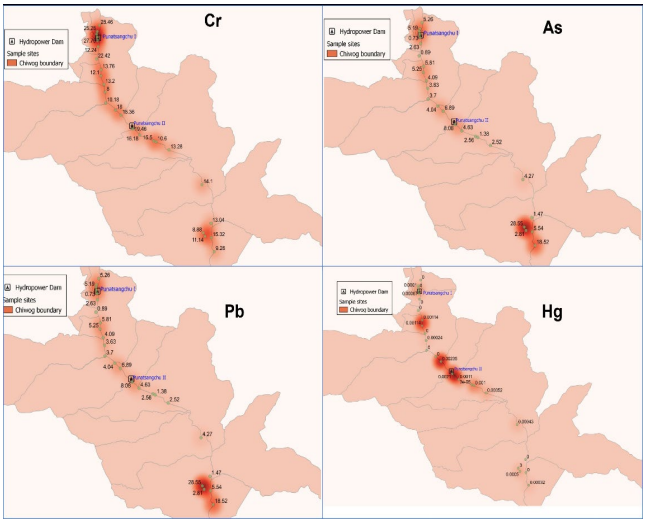
The total cancer risk of <1 × 10-6 is considered no risk while ≥1 × 10-6 is classified risk.

RESULTS

The mean concentration of the heavy metals in the dust samples were 0.00047± 0.00067, 5.61±5.9, 0.65±1.16 and 15.72±5.57 and for Hg, Pb, As, Cr. The concentration Cd in all the samples were below the LOD (<0.000759).

Table 3: The concentration of HM in dust samples (mg kg–1)

	Heavy metals ($mgKg^{-1}$)				
	Mercury (Hg)	Lead (Pb)	Arsenic (As)	Chromium (Cr)	Cadmium (Cd)
Mean	0.00047	5.61	0.65	15.71	<0.000759
Std. dev.	0.00067	5.90	1.16	5.58	<0.000759
median	0.00010 (0-0.00067)	4.27 (2.63-5.54)	<0.0403 (0-1.31)	14.13 (12.1-18.0)	<0.000759
Min	<0.000014	0.73	<0.0403	8.00	<0.000759
Max	0.00235	28.55	5.16	27.76	<0.000759
LOD	0.000014	0.014412	0.0403	0.000668	0.000759
Reference value	24.9	18.76	9.68	56.39	0.12



The maximum concentration of Cr was 27.76mg/kg and was found near the hydropower dam I. Mann-Whitney U test showed a significant difference in the Cr concentration between the samples closer to Dam I (M:19.36; SD:6.26) and Dam II (M: 13.29; SD: 3.51) at *t(23)=3.1, p=0.005*. The concentration of the Cr was higher near the dam and decreased as we moved further from the dam.

Table 4: Difference in mean concentration of heavy metals by nearest hydropower dam.

	Dam1		Dam2			
	M	SD	M	SD	Z value	*p-value*
Chromium	19.356	6.26	13.29	3.51	2.22	0.03
Arsenic	0.38	0.17	0.83	1.42		
cadmium				0.000		
mercury	0.003	0.0004	0.0005	8	-0.98	*>0.05*
lead	4.16	2.09	6.57	7.37	0.00	*>0.05*

For risk assessment, the overall mean ADD for the heavy metals were $1.60x10^{-10}\pm2.81x10^{-10}$, $3.84x10^{-09}\pm 7.30x10^{-10}$, 1.86x10-13±0, $1.15x10^{-13} \pm 1.62x10^{-13}$ and $1.37x10^{-9}\pm1.44x10^{-9}$ for As, Cr, Cd, Hg and Pb respectively. Similarly, the hazard quotient for As, Cr, Cd, Hg and Pb was $5.46x10^{-7}\pm9.34x10^{-7}$, $1.21x10^{-3}\pm3.33x10^{-4}$,$3.84x10^{-6}\pm1.36x10^{-6}$,$1.34x10^{-9}\pm1.88x10^{-9}$,$3.90x10^{-07}\pm4.10x10^{-7}$. The hazard index of the heavy metals or the non-carcinogenic risk of exposure to As, Cd, Cr, Hg and Pb through inhalation in the study area was $1.75x10^{-03}\pm6.22x10^{-04}$, which is lower than the standard hazard index of 1.

Table 5: Non-cancer risk assessment of exposure to heavy metals through inhalation.

		Mean	Standard Deviation	median	Min	Max
Arsenic	ADD	1.64e-10	2.81e-10	9.86e-12	9.86e-12	1.26e-09
	HQ	5.46e-07	9.34e-07	3.28e-08	3.28e-08	4.19e-06
Chromium	ADD	3.84e-09	1.36e-09	3.45e-09	1.96e-09	6.79e-09
	HQ	1.75e-3	6.20e-4	1.57e-3	8.90e-4	3.09e-3
cadmium	ADD	1.86e-13	0.00	1.86e-13	1.86e-13	1.86e-13
	HQ	3.84e-06	1.36e-06	3.45e-06	1.96e-06	6.79e-06
Mercury	ADD	1.15e-13	1.62e-13	2.45e-14	3.43e-15	5.75e-13
	HQ	1.34e-09	1.88e-09	2.97e-07	3.98e-11	6.69e-09
Lead	ADD	1.37e-09	1.44e-09	1.04e-09	1.79e-10	6.98e-09
	HQ	3.90e-07	4.10e-07	2.84e-10	5.07e-08	1.98e-06
HI		1.75e-3	6.22e-4	1.57e-3	8.92e-4	3.09e-3

The mean cancer risk of the heavy metals was $1.64x10^{-10}$±$2.18x10^{-10}$, $8.46x10^{-15}$±$3.00x10^{-15}$, $1.17x10^{-12}$±0.00, and $1.70x10^{-08}$±$2.04x10^{-08}$ for As, Cr, Cd and Pb respectively. The total cancer risk was $1.95x10^{-08}$±$2.10x10^{-08}$ and was below the USEPA safety limit of 1 x 10^{-6}.

Table 6: Cancer risk assessment of exposure to heavy metals through inhalation.

		Mean	Standard Deviation	median	Min	max
Arsenic	ADD	1.64e-10	2.81e-10	9.86e-12	9.86e-12	1.26e-09
	CR	2.47e-09	4.22e-09	1.48e-10	1.48e-10	1.89e-08
Chromium	ADD	3.84e-09	1.36e-09	3.45e-09	1.96e-09	6.79e-09
	CR	8.46e-15	3.00e-15	7.59e-15	4.31e-15	1.49e-14
cadmium	ADD	1.86e-13	0.00	1.86e-13	1.86e-13	1.86e-13
	CR	1.17e-12	0.00	1.17e-12	1.17e-12	1.17e-12
Lead	ADD	1.37e-09	1.44e-09	1.04e-09	1.79e-10	6.98e-09
	CR	1.70e-08	2.04e-08	1.00e-08	7.50e-12	8.41e-08
TCR		1.95e-08	2.10e-08	1.24e-08	3.75e-10	8.90e-08

DISCUSSION

Similar study in China found an average of Cd (0.64)>Cr (69.33)>Pb (201.82) (3). A study in Nigeria found that the mean concentration of Cd was lower than other heavy metals with average concentration of Pb 25.0 – 66 mg/kg, Cd 1.54 – 2.58 mg/kg, and Cr 1.13 – 2.79 mg/kg. (24) While the concentration of heavy metals differs significantly from around the world, the magnitude and the order remain comparable (2,12,25–27). The low concentration of heavy metals in the current study area could be due to differences in the use of heavy machinery and traffic movement. It could also be due to lesser number of human settlements along this construction areas as compared to other countries.

The results from this study was similar to study from Riyadh and Mahad AD 'Dahab (urban and sub urban) areas where HQ of the heavy metals was <1 in all samples from sub-urban areas. (12) Similarly, the HQ of Cd and Pb from Bangladesh was 3.94x10-11 and 1.5x10-2 respectively.(28) However, many of the studies conducted in the road-side dusts were much higher than the current study area. (2,29,30) The cancer risk due to exposure to the heavy metals in the study was negligible (<1x10-6) and was lower than many of the studies around the world (2,19,29,30). A study from Bangladesh assessed the carcinogenic risk of exposure to heavy metal laden dust and found that highest risk was through inhalation of Cr (4.89x10-8). The risk was in chronological order of Cr>Pb>As>Cd. Yang *et.al* (2019) assessed the health risk of exposure to Cr, Ni, Cu, Zn, Pb and Cd. The study found that the total cancer risks of 2.1x10-7 (19). A low human health risk associated with the heavy metal contamination in the study area was due to low concentration of the heavy metals in the study area. The difference in the human health risk as compared to other studies could also be due to the inclusion of other heavy metals (apart from As, Cr, Cd, Hg and Pb included in the current study).

CONCLUSION AND RECOMMENDATION

The current study assessed the non-carcinogenic and carcinogenic risks due to exposure to heavy metal laden road-side dust in the hydropower dam construction area. There is no potential non-carcinogenic or carcinogenic risk due to exposure to the As, Cr, Cd, Hg and Pb through inhalation. However, traces of heavy metals were found in the dust samples and thus it's recommended that residents should use face masks and other PPEs for self-protection from roadside dust and prevention of other adverse health effects apart from exposure to heavy metals under the study. Additionally, the source of heavy metals needs to be studied and the impact on human health through different exposure routes needs to be explored.

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FACTORS ASSOCIATED WITH MENSTRUAL HYGIENE PRACTICES AMONG BUDDHIST NUNS IN BHUTAN

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ABSTRACT

Most Buddhist nuns in Bhutan belong to low sociodemographic status and suffer from traditional beliefs and menstrual hygiene practices that affect their health and well-being. Inadequate knowledge and poor attitude toward menstrual hygiene are susceptible to reproductive tract infections. Therefore, the study aims to explore the knowledge, attitudes, and practices (KAP) among nuns and examine factors associated with menstrual practices.

An institution-based monastic survey was conducted in April 2023 using a KAP questionnaire adapted from UNICEF Bhutan. A total of 171 nuns (aged 10 to 25 years, 39.2% rural and 60.8% urban) were recruited for this study using Cochran's simple calculation. We used the bivariate analysis (t-test or chi-square test) and multiple linear regression for data analysis.

The study revealed that 33% of the participants had a low level of knowledge regarding menstruation. Over 60% learned about menstruation before experiencing menarche, primarily from sisters (27%). About one-fifth of nuns (23%) emphasized discreet pad purchasing, while 22% believed in avoiding temples during menstruation. Most nuns (91%) used sanitary pads as their preferred absorbent material, but 37% reported a lack of designated dustbins for disposing of pads. We found access to resources significantly determined Menstrual Hygiene Practice (MHP) among nuns (β=2.30, 1.81-2.79, p<.001). Additionally, knowledge (β=0.60, 0.09-1.11, p<.001) and attitude (β=0.97, 0.46-1.49, p<.001) were positively associated with MHP. Moreover, nuns living in urban areas were inclined to have better practices (β=0.52, 0.034-1.01, p<.05).

Overall, this study revealed that the accessibility to resources, knowledge, and attitude was positively associated with MHP, while the urban residence was also linked to better MHP. Addressing knowledge gaps, promoting positive attitudes, and improving resource accessibility will enhance MHP. Menstrual health education and awareness programs should focus more on rural areas for better menstrual health and contribute to well-being and empowerment.

Keywords: Knowledge, Attitude, Practices, Menstruation, Buddhist Nuns, Bhutan.

INTRODUCTION

Menstrual Hygiene Management (MHM) refers to the effective management of menstrual hygiene, including knowledge, resources, and facilities required to handle menstruation efficiently and healthily (1). Despite being a natural and essential process for women, millions of adolescent girls worldwide lack the necessary means to manage their menstrual cycles with dignity and health (2). To address this issue, the World Health Organization (WHO) and UNICEF have emphasized the importance of MHM. Girls and women often face challenges such as inadequate knowledge, lack of proper water, sanitation, and hygiene (WASH) facilities, and limited access to soap and toilets, especially in developing countries (3). These challenges lead to fear, embarrassment, and exclusion, causing girls to miss out on education and opportunities. In Bhutan, like many other parts of the world, menstruation is surrounded by social stigmas and limited knowledge, leading to unhygienic practices and missed educational opportunities for young girls, particularly those in nunneries. Nunneries in Bhutan, female monastic institutions, lack government funding and receive limited support from private donors and the community (4). Unlike formal schools, nunneries focus primarily on Buddhist philosophies and traditional learning, with no curriculum related to health and hygiene. This leaves adolescent girls in nunneries vulnerable and neglected, without access to essential health education and awareness programs. Including nuns in policy programs to improve their health and living standards is crucial, as they are integral members of society and play important roles in their communities. Therefore, this research study aims to assess menstrual hygiene management among adolescent and youth nuns, exploring the various factors, including socio-demographics, knowledge, attitude, and access to hygienic resources. By understanding the challenges and factors affecting menstrual hygiene management in rural-urban settings, policymakers and organizations can work toward empowering girls and women to manage their periods in a healthy and dignified manner.

METHODOLOGY

Design and Setting

An institution-based monastic survey was conducted in April 2023 using a KAP questionnaire adapted from UNICEF Bhutan. There is a total of 26 nunneries located in 12 districts of Bhutan. The nunneries house a total of 1,241 nuns, with 447 located in rural areas and 794 in urban Bhutan (5).

Population

The target population for this study was nuns aged between 10 to 25 years from 6 districts. Those nuns who have attained age ten but have not yet experienced menarche were excluded from the sample.

Sample Size

The sample size for this study was determined using Cochran's formula, which allows researchers to calculate the appropriate sample size based on a desired level of precision (margin of error), confidence level (95%), and the estimated proportion of the attribute of interest (0.5) present in the population (N). Consequently, the calculated sample size required for this study was 169 nuns. However, a total of 171 nuns participated in the survey. Stratified sampling was utilized to ensure equal distribution. The proportion of nuns from rural areas was 39% (67 nuns), while 61% were from urban areas (104 nuns).

Data Collection

The data collection team was recruited from the Bhutan Nuns Foundation (BNF) office, and a Google Form was used to collect the responses. For adolescent nuns below 18 years of age who did not have access to mobile phones or computers, the BNF team or senior/head nuns acted as interviewer assistants to administer the survey. Before commencing the survey, these interviewer assistants received training via Zoom, which covered the questionnaire content and the process of filling out the Google Form. The survey was self-administered for nuns above 18 and below 25 years old.

The survey questionnaires had been adapted from previous studies conducted by UNICEF in collaboration with the Ministry of Education, Bhutan, in 2016, and the Department of Health, Ministry of Health, Thimphu, Bhutan, in 2018. The questionnaires were finalized after consultation with a technical working group consisting of officials from UNICEF, SNV, the Ministry of Health, and the Ministry of Education. In this study, the adapted questionnaire included modifications to make it more relevant to the nuns. Before implementation, the modified KAP survey questionnaire underwent testing. Two pilot tests were conducted, one with nuns above 18 years old and another with nuns below 18 years old, to ensure the survey questions were understandable and feasible.

The questionnaire was constructed of 4 parts. Part I: Socio-demographic questions about age, education, location, and spoken language. Part II consists of 7 questions related to knowledge and information about menstruation and MHM. Part III: there are 8 negative statements related to attitudes, beliefs and misconceptions about menstruation. Part IV: consists of questions related to an individual's MHP and resources/facilities available in their nunnery.

Ethical Approval

Approval to conduct the study was obtained from the Institutional Review Board (IRB) of IPSR, Mahidol University. The use of the KAP survey was approved by UNICEF Bhutan and the Ministry of Health via email on 26th February 2023. The consent of participants below the age of 18 was taken from the head of monastic institutions.

Data Analysis

The data collected was analyzed using the IBM SPSS statistics 2023. The socio-demographic characteristics of the study population and their knowledge, attitude, and practices were described using frequencies and percentages. Subgroup analysis was conducted based on residence (rural and urban) to compare the KAP outcomes. A chi-square test and t-test were performed to examine the association between the dependent and independent variables. Given that the study utilized the KAP model, where knowledge and attitude impact practice, a multiple linear regression model was employed.

RESULTS

Socio-Demographic Characteristics

Table (1) reveals, the number of nuns from rural areas who participated in the survey is 67 (39.2%), while the number of nuns from urban areas is 104 (60.8%). The mean age of the respondents was found to be 18.9. Furthermore, the table indicates that the majority of the nuns (77%) in this study received education up to primary and secondary school levels, while those with no education accounted for 18% of the total nun population. The findings also reveal that a significant proportion of the nun's mothers (84% of the total) had no formal education, with only 11.1% having completed primary/secondary school.

Table 1: Socio-demographic characteristics of nuns (n=171)

Demographic characteristic	Rural (n=67) Percent	Urban (n=104) Percent	Total %
Mean age (SD) in year	17.6 (4.1)	19.6 (3.6)	18.9 (3.9)
Education of nuns			
No Education	34.3	7.7	18.1
Primary/Secondary	59.7	87.5	76.6%
Diploma	0.0	1.0	0.6
College and Above	6.0	3.9	4.7%
Total	100.0	100.0	100.0
Education of mother			
No Education	83.6	83.7	83.6
Non-formal education (NFE)	6.0	2.9	4.1
Primary/Secondary	7.5	13.4	11.1
Diploma/College	3.0	0.0	1.2
Total	100.0	100.0	100.0
Spoken language			
Ngalop	11.9	45.2	32.2
Sharshop	53.7	29.8	39.2
Lhotsam	3.0	2.9	2.9
Kurtoep/Khengkha	16.5	16.4	16.4
Bumtap/Trongsap	14.9	5.8	9.4
Total	100.0	100.0	100.0

Knowledge about menstruation

Table 2 shows that 61.2% of the nuns have a good knowledge, as reflected by their mean score above 4.4. The range of mean scores observed in the study varied between 0 and 6. The proportion of nuns with good knowledge score was slightly higher among those residing in urban areas compared to those in rural areas (68.2% vs 52.2%). This difference in proportion was found to be statistically significant, with a p-value of 0.035. The data also reveals that approximately 60% of individuals in both rural and urban areas are aware of the onset of menstruation and their main source of early information about menstruation were from sisters (26.2%), mothers 24.2%), and friends (22.3%).

Table 2: Respondents' correct knowledge about Menstruation (n=171)

Knowledge	Rural (n=67)	Urban (n=104)		
	Percent	Percent	Total %	P/value
Meaning of menstruation (a)	71.7	83.6	79.0	0.060
Causes of menstruation (b)	56.7	70.1	65.0	0.071
Name of an organ from where women menstruate ©	76.1	80.8	79.0	0.467
Menstrual Hygiene Day (d)	65.7	82.7	76.1	0.011
Awareness of the onset of menstruation (e)	61.1	59.6	60.2	0.837
Awareness-infection from MHM (f)	67.1	86.6	79.0	0.002
Menstrual Cycle (Duration) (g)	76.1	83.7	80.7	0.223
Knowledge (summary index)				
Good Knowledge	52.2	68.2	61.9	
Poor knowledge	47.8	31.8	38.1	0.035

Mean score: 4.4 (<4.4=lower level of knowledge and >4.4 higher level of knowledge)

a. It's "Natural shedding of blood every month" and it's not ("a disease every month," "Type of curse received by women," and "Don't know").

b. It's Hormones and it's not ("Curse of God," "Caused by diseases," and "Don't know").

c. It's Uterus and it's not (bladder, abdomen, and "don't know").

d. It's 28th May and It's not ("28th April" or "28th June")

e. "Yes" correct

f. "Yes" Correct

g. It's days and it's not ("15 days" or"40" days) **p-value<0.05, **p-value<0.01, ***p-value<0.001*

Attitude towards Menstruation

Over half of the participants (54.9%) agreed with the notion that menstruation impacts their daily activities. Furthermore, one-third (37.3%) of the nuns either agreed or maintained a neutral stance concerning the belief that women must not enter the temple while menstruating, as illustrated in Figure 1. Additionally, 31.7% of the nuns agreed with the belief that women should refrain from touching prayer books during menstrual periods. 39.7% of the nuns felt uncomfortable talking about their periods; however, 90% of the nuns expressed the need for a platform to discuss menstruation openly.

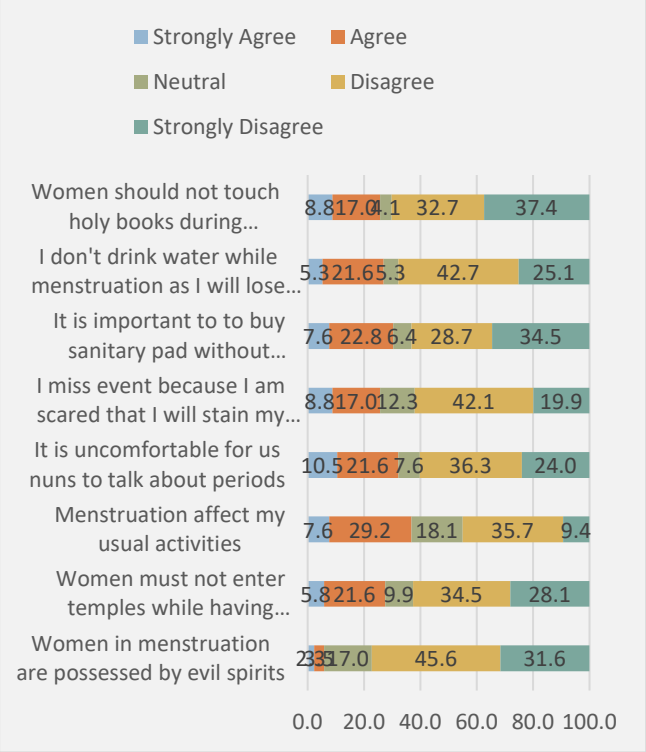

Figure 1: Attitude towards menstruation among nuns in Bhutan (n=171)

Accessibility to menstrual hygiene resources

The assessment of hygienic resource accessibility in the nunnery involved six questions related to soap, water, disposal facilities, pocket money to purchase pads, and nearby shops to buy pads. The chi-square test indicated a significant association ($\chi 2 = 4.67$, $p = 0.02$) between the location and resource availability. Table 3 illustrates that in the rural region, 53.7% of the nuns reported having limited access to resources, while 46.3% reported having sufficient access. Conversely, in the urban area, a smaller proportion of 29.8% reported limited access, while a larger proportion of 70.2% reported sufficient access to hygienic resources.

Table 3: Overall resources distribution among the nuns in rural and urban (Chi2-test)

Resources	Rural (n=67)	Urban (n=104)		
	Percent	Percent	Total %	P/value
Less access to resources	53.7	29.8	39.1	0.02
More access to resources	46.3	70.2	60.9	

Practice During Menstruation

The findings indicate that the majority of participants in both rural (85%) and urban (96.1%) areas used sanitary pads as their primary absorbent material. Regarding drying practices, most participants in rural (74.7%) and urban (89.4%) areas reported drying their materials in the sunlight. Most participants in both rural (82%) and urban (96.1%) areas changed their pads twice or more per day. Notably, a small proportion of participants reported disposing of pads in drains, toilets, or open fields. In terms of personal hygiene practices, wrapping pads was more common among participants, but 37.3% of the rural nuns did not wrap the used pad before disposing. Bathing during menstruation was more prevalent in urban areas (92.3%) than in rural areas (74.7%), with a majority of participants in both settings bathing daily (44.7% urban, 56% rural). The nuns in rural areas (38.9%) reported not cleaning the genital area during menstruation.

Table 4: Respondents' correct MHP among rural and urban nuns

Practices	Rural (n=67)	Urban (n=104)	
	Percent	Percent	Total
Absorbent Material			
Sanitary pad	85.0	96.1	91.8
Reusable Absorbent material washing			
With water and soap	73.1	89.4	83.1
Reusable Absorbent material drying			
Sunlight	25.3	10.6	16.4
Number of times Pads changed in a day			
Twice or more	82.0	96.1	90.6
Disposal of Pads			
Pad disposal bin	91.1	84.6	87.1
Wrapping of Pads			
Yes	62.7	95.1	82.5
Do you take a bath during periods?			
Yes	74.7	92.3	85.3
How often do you bath			
Daily	56.0	44.7	48.7
Cleaning of the genital area during the period			
Yes	71.7	94.2	85.3
Disposal facilities in a nunnery			
Yes	85.1	95.9	91.2
A place for drying cloth			
Yes	88.1	97.1	93.6

Regression Analysis

The correlation analysis revealed that all the independent variables exhibited correlations below 0.65, indicating the absence of substantial multicollinearity.

Table 5: Multiple linear regression analysis of menstrual hygiene practice

Variables	Coefficient	SE	P-value	95% CI	Interval
Age	0.0588	0.031	0.067	-0.004	0.121
Education (self)					
Below college	Ref				
Above college	0.02	0.031	0.969	-1.004	1.044
Education (Mother)					
Not Educated	Ref				
Educated	0.197	0.311	0.528	-0.418	0.812
Location					
Rural	Ref				
Urban	0.522	0.246	0.036	0.034	1.010
Knowledge	0.606	0.259	0.021	0.094	1.119
Attitude	0.606	0.261	0.000	0.460	1.491
Resources	2.306	0.249	0.000	1.814	2.798

No of observation-171, R^2-0.552, Adjusted R^2 – 0.533, F-value=0

**p-value<0.05, **p-value<0.01, ***pvalue<0.001*

The regression analysis results in Table 5 indicate significant associations between various independent variables and MHP. The location demonstrates a significant coefficient (0.522) at a p-value of 0.036*, suggesting it is associated with an MHP. Additionally, knowledge showed a significant coefficient (0.606) with a p-value of 0.021*, indicating an association between knowledge and MHP. Likewise, attitude displayed a significant coefficient (0.606) with p=value of 0.000***, highlighting a strong association of attitude with MHP. Moreover, among all the independent variables, resources demonstrate a highly significant relation with MHP (coefficient 2.306, P-value 0.000***).

DISCUSSION AND RECOMMENDATION

Most girls in urban areas were more advanced than those in rural areas in terms of awareness of menstruation and hygienic practices. The past studies revealed the girls in rural areas still use cloth/rags and change them just once a day, and the urban girls use sanitary pads, and they have better facilities to change (6).

Girls and women coming from poor socio-demographic status have poor menstrual hygiene management. The study found that the nuns with a good knowledge of MHM were 61.9%, with the majority knowing the meaning of menstruation and also aware of which organ the women menstruate. Both regions displayed good knowledge overall, although urban nuns had a slightly higher proportion of individuals with a high level of knowledge. A similar study conducted in West Bengal revealed that the difference in awareness regarding menstruation in urban and rural areas was highly significant (6). These findings emphasize the need for comprehensive and accurate menstrual health education programs targeting both rural and urban areas. Efforts should be made to involve family members, peers, and community leaders in promoting accurate information and dispelling myths and misconceptions.

The study revealed mixed attitudes toward menstruation among nuns. While more than half of the participants agreed that menstruation impacts their daily activities, a significant proportion either agreed or maintained a neutral stance regarding the belief that women should not enter temples or touch prayer books during menstruation. A similar study in Bhutan found that nearly one-third of the school girls believed women must not enter the shrine or temple during menstruation (7). These findings highlight the persistence of cultural and religious beliefs that associate menstruation with impurity or restrictions. A study conducted in Nepal discovered that the social-cultural beliefs surrounding menstruation, including the notion of not entering the temple and impurity, highlighted how some girls challenge these beliefs while others still adhere to them (8). Also, a minority of nuns still have the misconception of not drinking while on period and almost one-third of them still thinks they have to buy sanitary pads without being seen by others. It is crucial to address these attitudes through educational programs and awareness campaigns that promote a positive and inclusive understanding of menstruation. The high percentage of nuns expressing discomfort in discussing their periods underscores the need for creating safe and supportive spaces for open dialogue and destigmatizing menstruation.

This study revealed a significant association between location and resource availability. Nuns in rural areas reported limited access to hygienic resources compared to their urban counterparts. This finding emphasizes the need to address resource disparities and ensure equitable access to menstrual hygiene products, water, soap, and disposal facilities in all areas. The nuns in rural regions had limited access to resources like nearby stores to purchase pads, a free supply of pads, and identified disposal bins inside toilets. A similar result was found in a previous study among college girls (9). Efforts should be made to establish partnerships with local organizations, businesses, and government agencies to ensure a sustainable supply of affordable and accessible menstrual hygiene products and other facilities.

The use of sanitary pads as the primary absorbent material was prevalent among participants in both rural and urban areas, with higher usage reported in urban settings. Drying facilities for cloth were generally available, with 83% of them saying

they dried their underwear in the sunlight, unlike the study in Bangladesh where most girls (70%) preferred drying their clothes inside a dark space (10). Hygiene practices such as wrapping pads and cleaning the genital area varied between rural and urban areas. This difference highlights the importance of considering location-specific factors and tailoring interventions accordingly. The regression analysis identified several significant factors associated with menstrual hygiene practices among nuns. Location, knowledge, attitude, and resources significantly impacted menstrual hygiene practices. These findings suggest that addressing these factors is crucial for promoting positive menstrual hygiene practices. Interventions should focus on improving knowledge and attitudes, ensuring the availability and accessibility of resources, and creating an enabling environment that supports menstrual hygiene practices.

Contribution of the study

The study provides insights into how current MHP affect public health. Based on the findings, targeted intervention can be developed to promote healthier habits, reducing the risk of infections and other health issues. The study also highlights barriers to accessing menstrual products. This information can be used to implement distribution programs that provide affordable, sustainable, and easily accessible products to those in need. Even the organization working on public health and situation can collaborate based on the study's recommendations, leading to more coordinated effort in improving MHM among the nuns.

CONCLUSION

A study focused on menstrual hygiene practices among Buddhist nuns. The findings emphasized the need to address knowledge gaps, promote positive attitudes, and improve resource accessibility for better menstrual hygiene practices. Many nuns had limited knowledge about menstruation, highlighting the importance of comprehensive menstrual health education. Sanitary pads were the preferred absorbent material, but the lack of proper disposal facilities posed a challenge. Access to resources significantly influenced menstrual hygiene practices, and knowledge and attitude played a positive role. Urban nuns had better practices compared to rural areas, highlighting the need for targeted interventions. Overall, comprehensive education and awareness programs can empower nuns and ensure dignified and healthy management of their menstruation.

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HEALTH RISK ASSESSMENT RELATED TO CONSUMPTION OF HEAVY METALS CONTAMINATED FOXTAIL MILLET *(SETARIA ITALICA)*: A CASE STUDY IN ANYANG, CHINA

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ABSTRACT

Heavy metal contamination is one of the major environmental health issues. Heavy metals could be contaminated in food crops through polluted soil, pesticides and fertilizers use, and other factors. Consumption heavy metals contaminated food could cause negative health impacts. Millet is commonly consumed by Asian, especially Chinese.

This study aimed 1) to identify the concentrations of heavy metals contaminated in foxtail millet in Anyang, China and 2) to find the non-carcinogenic and carcinogenic risks related to heavy metals contaminated in foxtail millet.

The study area was Anyang, China, 9 millet samples were collected from local market. 100 grams of millets per sample were digested and investigated As, Cr, Cd, Pb, Hg by ICP-MS. The carcinogenic and non-carcinogenic risk were calculated by using the secondary data from Highlights of the Chinese Exposure Factors Handbook and primary data from laboratory.

The results showed all the concentrations of As, Cr, Cd, Pb, Hg did not exceed the safety standard for food. However, the heavy metals contaminated in millets have a potential risk of both carcinogenic and non-carcinogenic due to the high consumption rate. The HQs for non-carcinogenic risk for As, Cr, Cd, Pb and Hg were 0.917, 0.063, 0.168, 0.065, 0.559 for males and 1.048, 0.072, 0.192, 0.075, 0.639 for females respectively, and the HI value 1.771 and 2.026 which are exceeded acceptable limits. In addition, the results found cancer risk from As, Cr, and Pb, that were 4.13×10^{-4}, 9.39×10^{-5}, 1.94×10^{-6} for male and 4.72×10^{-4}, 1.07×10^{-4}, 2.22×10^{-6} for female respectively, and total carcinogenic risk (TCR) were 5.05×10^{-4} for males and 5.81×10^{-4} for females.

Health risk assessment indicated that there were both cancer and non-cancer risk found in Chinese who consume the millets for a long-term with high consumption rate. Around 600 of a million Anyang residents who continue consume the millets may have possibility to develop cancer.

Keywords: Heavy Metals, Health Risk Assessment, Millet, Cancer, China

INTRODUCTION

Heavy metal contamination is one of the global issues including China. The study reported that the heavy metals contamination is getting worse in recent years (1). Heavy metals are a class of elements characterized by the high atomic weight and density which naturally exist in the crust (2, 3). The use of pesticides and fertilizers in agriculture, as well as industrial processes like mining, smelting, and manufacturing, can all result in the release of heavy metals into the environment (4), which can contaminate food and drinking water.

Heavy metal contamination in the agricultural process can occur through several pathways, including soil contamination, water contamination, pesticide, and fertilizer use. The roots of plants can be contaminated by heavy metals that accumulate in agricultural soil, which can later enter the food chain (5). Irrigation water can contain heavy metals if it is sourced from contaminated water bodies. In addition, certain pesticides and fertilizers contain heavy metals, and using them can contaminate the soil, water, and plants directly. There are many studies that found heavy metal contamination in fresh produce, including millet, rice, vegetables, and other crops (6-8). The previous study conducted in Macedonia found arsenic (As), cadmium (9), copper (10), lead (Pb) and zinc (Zn) with very high concentrations in rice *(Oryza sativa L.)* (11). Naseri et al. also evidence that the values of Pb and Cd in rice were higher than the safety standard set by Food and Agriculture Organization of the United Nations (12) or World Health Organization (WHO)(13). The study conducted in Zhejiang, China found that the concentration of Cd, Pb and Hg in rice are exceed the safe limits for children and adults (14).

Through inhalation, skin contact, and oral ingestion, heavy metals can lead to adverse negative health impact. Chronic exposure to As and chromium (15) causes various types of health problems including the respiratory system, gastrointestinal system, renal system, dermatological system, neurological involvement, and cancer effects(16, 17). Cadmium is absorbed mostly through the respiratory system and to a lesser amount through the gastrointestinal tract(18). Lead poisoning in drinking water and a high prevalence of elevated blood lead levels(19). Elemental mercury can be dispersed from the blood throughout the body, through cell membranes, the blood-brain barrier and the placenta. The conversion of elemental mercury to mercury in the blood, regulated in part by the enzyme catalase, has implications for the absorption of mercury in the brain (20).

There are several different types of millet that are commonly cultivated and consumed around the world. In China, foxtail millet *(Setaria italica)* is often used to make congee, “Wotou” which is a type of steamed bread and consumed as a breakfast and dinner. In Anyang, foxtail millet is used to stew with pork, carrot, and other vegetables as lunch or dinner. Human health risk assessment is used to determine the probability of negative health effects of people who exposed to chemical substances from the environment(21). Thus, in order to determine the non-carcinogenic and carcinogenic risks for Chinese people associated with consuming heavy metals contaminated in foxtail millet, it is necessary to analysis the concentration of heavy metals contaminated in foxtail millet in Anyang, China. The objectives of this study are 1) to identify the concentrations of heavy metals contaminated in foxtail millet in Anyang, China and 2) to find the non-carcinogenic and carcinogenic risks related to heavy metals contaminated in foxtail millet.

METHODOLOGY

Study Area

This was a cross-sectional study conducted from February to June 2023 in Anyang China (Figure 1). Anyang City is located in the middle part of China, with latitude and longitude coordinates ranging from 35°41′ to 36°21′ north and 113°38′ to 114°59′ east (22).

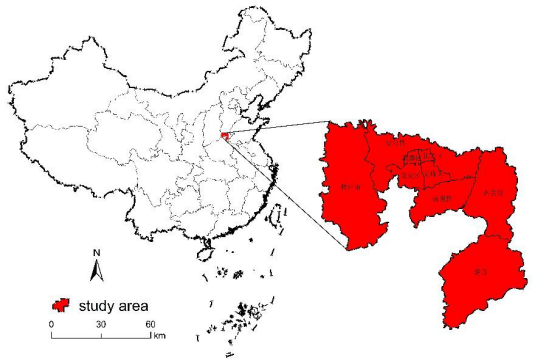

Figure 1: Study Area

Sample Collection

Foxtail millet samples were obtained from one of the biggest local markets, Tiexi Road Market. Three shops were selected randomly, three samples were obtained from each shops (23-25). Totally 9 samples were collected with 100 grams per sample.

Sample Analysis

The samples were analyzed according to the standard process GB 5009.268 published by the National Health Commission of China in 2017. In this study, the samples were dried millet samples. The millet samples need to be dried and ground into a fine powder. First, two accurately weighed samples of 5 g of millet were taken and placed in two 300 ml nylon tubes. Next, a 25 mm diameter grinding bead was placed in each nylon jar, the grinder parameters were set to 1100 rpm for 2 minutes. After the grinding was completely stopped, the nylon jar was removed, the lid was unscrewed, and the ground millet sample was removed (26). Next, the millet powder was subjected to microwave digestion with acid. Approximately 0.2 gram-0.5 gram of millet flour was weighed into the digestion jar, 5-10 ml of nitric acid was added, and left for 1 hour or overnight. The samples were then placed in a microwave digester with a digestion temperature of 180-200°C for 10-20 minutes. After the sample cools naturally, the digestion solution is transferred to a 50 ml volumetric flask without acid flushing and the solution is fixed in ultrapure water for measurement (27).

After preparing and digestion the sample, inductively coupled plasma mass spectrometry (ICP-MS) instrument was set up to analyze the specific heavy metals. The limit of detection (LOD) for heavy metals were 0.05 ppb. The equipment was calibrated using reference solutions that have known concentrations of the heavy metals before it can analyze the samples. Once inside the ICP-MS device, the prepared sample was examined for the presence and concentration of the heavy metals. Based on the calibration curve, the instrument determines the mass-to-charge ratios of the metal ions in the plasma and calculates their concentration (28).

Health Risk Assessment

The health risk assessment was calculated by using the primary data of concentration of foxtail millet samples from laboratory analysis and secondary data of consumption behavior from Highlights of the Chinese Exposure Factors Handbook. After health risk assessment, Mann-Whitney U test were conducted by SPSS program to compare the difference between male and female. There were four steps to evaluate the carcinogenic and non-carcinogenic risk including 1) Hazard

identification, 2) Dose-Response Assessment, 3) Exposure Assessment and 4) Risk Characteristics.

1) Hazard identification was the first step of risk assessment. In this study, the concentration and health risk of five heavy metals were analyzed which are As,(15), (9), Pb, and Hg. Among there heavy metals, As, (15), and Pb have both carcinogenic and non-carcinogenic effect, while (9) and Hg have non-carcinogenic effect only which means will not develop cancer, so cancer risk of Cd and Hg are not necessary to calculate.

2) Dose-response assessment shows the association between the exposure and the incidence of negative health effect(29). Reference dose (RfD) and Slope Factor (SF) values of heavy metals were

$$ADD=\frac{CxIR\times ED\times EF}{BW\times AT} \quad \ldots\ldots (1)$$

Where C is the concentration of heavy metals contaminated in millet (mg/kg), IR is ingestion rate (kg/day), ED is the duration of exposure (days/years), EF is the frequency of exposure (year), BW is body weight of participants (kg), and AT is average time (days). In this study, the concentrations of heavy metals were used the primary data from laboratory analysis. IR, ED, EF, and BW were used the secondary data from Highlights of the Chinese Exposure Factors Handbook(32, 33).

4) Risk Characteristics was to compile data from previous phases of risk assessment into a comprehensive, all-encompassing risk assessment. To determine the non-carcinogenic risk effects of consuming heavy metals contaminated millet, the hazard quotient (HQ) and hazard indices (HI) were calculated by equation below (31).

$$HQ=\frac{ADD}{RfD},$$

$$HI=\sum HQ \quad \ldots\ldots (2)$$

applied in this study to examine risk characteristics. The SF of As, Cr, and Pb were 1.5 mg/kg-day, 5×10^{-1} mg/kg-day, and 8.5×10^{-3} mg/kg-day respectively. The RfD of As, Cr, Cd, Pb, and Hg were 3×10^{-4} mg/kg-day, 3×10^{-3} mg/kg-day, 1×10^{-3} mg/kg-day, 3.5×10^{-3} mg/kg-day, and 3×10^{-4} mg/kg-day respectively.

3) Exposure Assessment was a process to examine the frequency, timing, and degree of human exposure with a hazard(30). The average daily dose was used to calculate non-cancer effects and lifetime average daily doses (LADDs) was used to calculate the cancer effects by the equation below(31):

If the HQ and HI were more than 1, it is considered as have non-carcinogenic risk of consuming heavy metals contaminated millets.

For carcinogenic risk, the equation (3) and equation (4) were used to calculate the cancer risk (CR) and total cancer risk (TCR) (31). Where LADD is Lifetime average daily dose (LADDs) (mg/kg-day), and SF is Slope Factor (per mg/lg-day).

$$\text{Cancer Risk}=\text{LADD}\times SF \quad \ldots\ldots (3)$$

$$TCR=\sum CR \quad \ldots\ldots (4)$$

If the result of CR or TCR was greater than 1×10^{-6}, it was considered as unacceptable, while risk below 1×10^{-6} was recognized to pose no obvious hazard.

RESULTS AND DISCUSSIONS

Heavy Metals Concentrations in Millet

The concentrations of heavy metals were analyzed by the ICP-MS method. Table 1 presented the concentration of heavy metals in millet samples. The average concentration of As and Pb were 0.082 mg/kg, and 0.068 mg/kg respectively, which is consistent with the previous study conducted by Huang in Zhejiang, China(14). The mean content of chromium is 0.056 mg/kg, which is lower than the research from Jiangsu, China(34). It is possible since the study was done around an industrial zone. Soil pollution is particularly severe in these locations as a result of industrial activity(35). The concentrations of heavy metals Cd and Hg were lower than limit of detection which is 0.05 mg/kg and not founded. However, prior research by Ihedioha and Hemati indicated that the concentrations of Cd and Hg in rice samples are 1.10 mg/kg and 0.936g/g, respectively(36, 37). The different result may be caused by different methods of heavy metals analysis. While the concentration of all heavy metals (As, Cr, Cd, Pb, Hg) were within the safety standard. Besides, the order of heavy metals concentration is As>Pb>Cr>Cd and Hg.

Table 1: Concentration of Heavy Metals

Code	As (mg/kg)	Cr (mg/kg)	Cd (mg/kg)	Pb (mg/kg)	Hg (mg/kg)
A1	0.089	0.057	<0.05	0.082	<0.05
A2	0.081	0.059	<0.05	0.073	<0.05
A3	0.090	0.065	<0.05	0.071	<0.05
B1	0.077	<0.05	<0.05	0.063	<0.05
B2	0.069	<0.05	<0.05	0.058	<0.05
B3	0.074	0.051	<0.05	0.057	<0.05
C1	0.075	0.059	<0.05	0.065	<0.05
C2	0.086	0.061	<0.05	0.073	<0.05
C3	0.094	0.055	<0.05	0.067	<0.05
Mean	0.082	0.056	<0.05	0.068	<0.05
Median	0.081	0.057	<0.05	0.067	<0.05
Min-Max	0.069-0.094	<0.05-0.065	<0.05	0.057-0.082	<0.05
LOD	0.05	0.05	0.05	0.05	0.05
Standard	0.35 (12)	0.1 (38)	0.1 (38)	0.2 (38)	0.2 (12)

**A1: Shop A Sample 1, A2: Shop A Sample 2, A3: Shop A Sample 3*
**B1: Shop B Sample 1, B2: Shop B Sample 2, B3: Shop B Sample 3*
**C1: Shop C Sample 1, C2: Shop C Sample 2, C3: Shop C Sample 3*

Cancer Risk and Non-cancer Risk

Heavy metals contamination can lead to adverse health effects both carcinogenic and non-carcinogenic risk. Health risk assessment was evaluated for male and female by using the parameter below (Table 2)

Table 2: Parameter for Health Risk Assessment

Parameter	Symbol	Unit	Value	Reference
Concentration	C	mg/kg	As: 0.082	Laboratory analysis
			Cr: 0.056	
			Cd: 0.05	
			Pb: 0.068	
			Hg: 0.05	
Ingestion Rate	IR	kg/day	0.238	MEE, 2015 (32)
Exposure Duration	ED	years	Non-cancer: 40	MEE, 2015 (32)
			Cancer: 70	
Exposure Frequency	EF	days/year	340	MEE, 2015 (32)
Weight	BW	kg	Male: 66.1	MEE, 2015 (33)
			Female: 57.8	
Average Time	AT	days	Non-cancer: 14600	MEE, 2015 (33)
			Cancer: 25550	
Reference Dose	RfD	mg/kg-day	As: 3×10^{-4}	EPA, 2023
			Cr: 3×10^{-3}	EPA, 2023
			Cd: 1×10^{-3}	EPA, 2023
			Pb: 3.5×10^{-3}	EPA, 2023
			Hg: 3×10^{-4}	RAIS, 2022
Slope Factor	SF	mg/kg-day	As: 1.5	EPA, 2023
			Cr: 5×10^{-1}	OEHHA, 2011
			Cd: N/A	-
			Pb: 8.5×10^{-3}	OEHHA, 2009
			Hg: N/A	-

For non-carcinogenic risk, the hazard quotient and hazard index were computed by using the equation (1), and (2). The male hazard quotients for As, Cr, Cd, Pb, and Hg were 0.917, 0.063, 0.168, 0.065, and 0.559, respectively, and female hazard quotients were 1.048, 0.072, 0.192, 0.075, and 0.639. The order of hazard quotients of each heavy metal was As>Hg>Cd>Pb>Cr. The average hazard index for male was 1.771 and 2.026 for female. The hazard index of both male and female were slightly above 1, indicating that the cumulative risk from all the heavy metals combined exceeded the acceptable level (HI≤1) (Table 3). However, it is contrast with the previous study in Northern Ghana(39), it is possible due to the different ingestion rate and consumption duration.

For carcinogenic risk, the cancer risk of As, Cr, and Pb are 4.13×10^{-4}, 9.39×10^{-5}, and 1.94×10^{-6} for male respectively, and 4.72×10^{-4}, 1.07×10^{-4}, and 2.22×10^{-6} respectively for female. The total cancer risk is 5.08×10^{-4} and 5.81×10^{-4} for male and female respectively (Table 3). The risk of male was greater than female because of the different of average body weight between male and female. As the total cancer risk was greater than 1×10^{-6} which is considered as not acceptable. Around 500 of a million male and 600 of a million female who are living in Anyang, China may develop cancer due to heavy metals contamination in foxtail millet. It is similarly with

the study conducted by Guo in the Jin-Qu Basin of China (40) and the study conducted by Djahed in Iran(41). It was affected by the concentration of heavy metals in soil and foxtail millet, weight, exposure duration and ingestion rate.

Furthermore, the Mann-Whitney U test was used to investigate male and female differences; the results demonstrate that there is no significant difference between the hazard index and the total cancer risk of male and female (*p-value*=0.37).

Table 3: Non-Carcinogenic and Carcinogenic Risk

Millet Samples	Mean	As	Cr	Cd	Pb		Hg
Non-Cancer Risk	HQ	Male	0.917	0.063	0.168	0.065	0.559
		Female	1.048	0.072	0.192	0.075	0.639
	HI	Male				1.771	
		Female				2.026	
Cancer Risk	CR	Male	4.13×10^{-4}	9.39×10^{-5}	-	1.94×10^{-6}	-
		Female	4.72×10^{-4}	1.07×10^{-4}	-	2.22×10^{-6}	-
	TCR	Male		5.08×10^{-4}			
		Female		5.81×10^{-4}			

Figure 2 illustrates the non-cancer risk assessment of heavy metals revealed the following percentages of risk contribution for each metal: As accounted for the highest proportion, representing 52% of the overall risk. Hg contributed to 31% of the non-cancer risk, making it the second most significant contributor. Cd posed a moderate level of risk, accounting for 9% of the overall non-cancer risk. Pb and Cr contributed 4% each to the non-cancer risk. The order of non-cancer risk is As>Hg>Cd>Pb=Cr. For cancer risk, As poses the highest cancer risk, accounting for 81% of the total. Cr contributes to 19% of the cancer risk, while Pb almost not appear to any. The order of cancer risk is As>Cr>Pb.

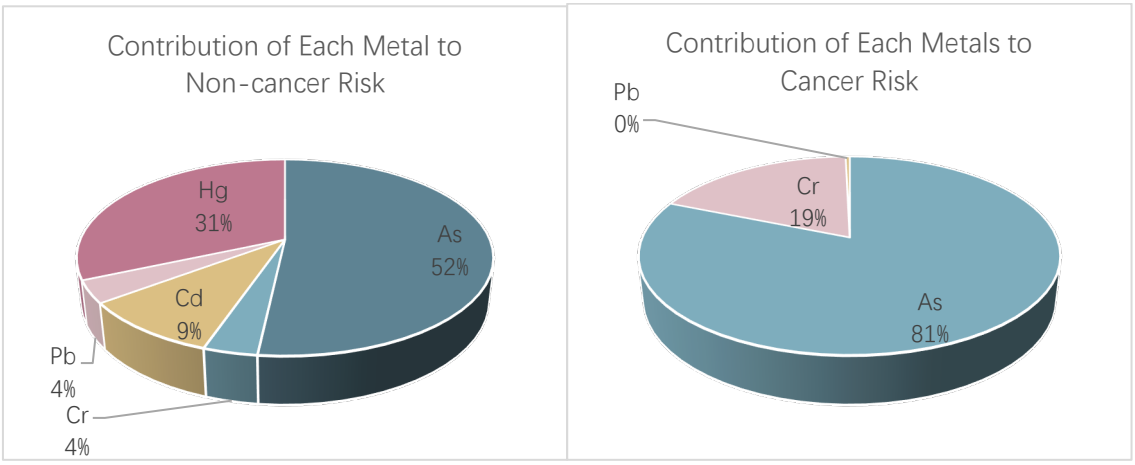

Figure 2: Percentage of Each Heavy Metals to Non-Cancer and Cancer Risk

CONCLUSION

The foxtail millet samples from Anyang, China indicates that there were heavy metals contaminated in millet. As, Cr, and Pb were identified in foxtail millet samples, with average concentrations were 0.082 mg/kg, 0.056 mg/kg, and 0.068 mg/kg, respectively. Cd and Hg levels were lower than the LOD of 0.05 mg/kg. The order of concentration was As>Pb>Cr>Cd and Hg. All heavy metal concentrations (As, Cr, Cd, Pb, Hg) were within the safety standard level. The study found both carcinogenic and non-carcinogenic risk for both men and women. Around 600 of a million Anyang residents may develop cancer because of heavy metal contamination in millet. This research suggests that individuals should limit their daily intake of foxtail millet to reduce the risk of both cancer and non-cancer, especially from arsenic exposure including skin cancer, bladder cancer, and lung cancer. Additionally, people can choose different ways to prepare foxtail millet, such as millet congee to reduce the amount consumed per meal. Individuals should choose trusted brands also that prioritize food safety and quality control measures. To raise food safety standards and provide better protection for the general public's health, the government should adjust its policies for food safety, including any rules relating to heavy metal contamination in food.

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TRANSCRIPTOMIC ANALYSES OF KNOCKDOWN CELL LINES REVEAL THE POSSIBLE ASSOCIATION OF *ITPR3* AND OLFACTORY SENSING GENES IN HEAD AND NECK SQUAMOUS CELL CARCINOMA

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ABSTRACT

Head and neck squamous cell carcinoma (HNSCC) is the seventh most common cancer globally. Despite treatment options such as surgery, radiation therapy, and targeted therapy, the survival rate of HNSCC patients remains low. Our previous studies have indicated a potential expression alteration of Inositol 1,4,5-trisphosphate receptor type 3 (*ITPR3*) in HNSCC, which may be associated with the development and progression of the disease. However, the underlying molecular mechanisms of *ITPR3* in HNSCC remain unknown. *ITPR3*, located in the cell's endoplasmic reticulum (ER) membrane, functions as a calcium ion channel activated by inositol 1,4,5-trisphosphate (IP3). It plays a critical role in intracellular calcium signaling, regulating cellular processes like proliferation, differentiation, and apoptosis.

This study aims to investigate the function of *ITPR3*-associated calcium flux in HNSCC cells, and elucidate the downstream pathways involved in the same regulatory networks with *ITPR3* by RNA-Seq.

ITPR3 was knocked down by shRNA in CAL27 and FaDu cell lines. The concentration of Ca^{2+} in these cell lines was measured to understand the role of ITPR3 on Ca^{2+} flux under normoxia and hypoxia conditions. Additionally, RNA-seq analysis was performed in three biological replicates between ITPR3-knockdown cells and controls using QIAGEN CLC Genomics Workbench and R studio packages. Expression fold changes were calculated followed by Gene Set Enrichment Analysis (GSEA) using the Gene Ontology (GO) and KEGG databases.

A significant decrease in calcium flux was observed under hypoxic conditions in ITPR3-knockdown cell lines. Furthermore, RNA-seq analysis revealed the enrichment of olfactory receptor genes, G-protein coupled receptor activity genes and ribosome-associated genes in CAL27 ITPR3-knockdown cell line. In FaDu ITPR3-knockdown cells, we also observed the significant enrichment of olfactory receptor associated genes, G-protein coupled receptor activity genes, but not ribosome-associated genes. Instead, genes involved in regulation of keratinocyte differentiation were observed in FaDu cell line.

Our study revealed that the loss of ITPR3 expression may result in significant changes in HNSCC cells including reduced calcium flux under hypoxic conditions and alterations in genes associated with olfactory receptor and G-protein couple receptor activities. These findings provided novel knowledge of the roles of ITPR3 in HNSCC. Further research is needed to fully understand the mechanisms underlying these observations and their relevance to disease development.

Keywords: head and neck squamous cell carcinoma (HNSCC), ITPR3, Calcium flux, Olfactory receptors, G-protein coupled receptors

INTRODUCTION

HNSCC occurs in head and neck areas including lips, oral cavity, nasal cavity, nasopharynx, oropharynx, hypopharynx, larynx and saliva glands (1). HNSCC is linked to multiple genetic alterations, such as mutations in tumor protein p53 (*TP53*) (2, 3). Additionally, epidermal growth factor receptor (*EGFR*), notch receptor 1 (*NOTCH1*) and phosphatidylinositol-4,5-bisphosphate 3-kinase catalytic subunit alpha (*PIK3CA*) were also proposed to be associated with the onset and progression of HNSCC (4). In our previous studies, the results suggested that alterations in the expression of *ITPR3* may play a role in the development and progression of HNSCC (5). From literature, *ITPR3* may be an oncogene or a tumor suppressor gene in different types of cancers (6-8). However, the underlying molecular mechanisms of the gene in HNSCC remained unclear.

ITPR3 is a protein found on ER membrane of all cells (9). It is a calcium ion channel gene activated by IP3, a secondary messenger produced in response to the binding of ligands to G protein-coupled receptors and receptor tyrosine kinases (10, 11). *ITPR3* plays a critical role in intracellular calcium signaling, and it regulates a wide range of cellular processes such as cell proliferation, differentiation, and apoptosis (12). Other than cancer, mutations in *ITPR3* have been associated with several diseases including spinocerebellar ataxia and Gilles de la Tourette syndrome (10, 13, 14).

We, therefore, hypothesized that the alteration of ITPR3 may also change Ca2+ influx in resulting in changing downstream pathways in HNSCC. Some studies have shown that hypoxia can increase the concentration of Ca^{2+} inside cells and may lead to a longer residence time of Ca^{2+} in cells, thereby affecting many calcium-regulated physiological processes such as contraction, secretion, cell death, etc (15-17). To examine our hypothesis, we conducted two experiments to address two main questions. First, we would like to know whether *ITPR3* involves in Ca^{2+} flux regulation under different conditions, i.e. normoxia and hypoxia conditions. Second, we would like to elucidate the possible pathways involving in *ITPR3* regulating networks in HNSCC. We conducted Ca2+ flux assays and transcriptomic analyses in the cells with abolished *ITPR3* expression (shRNA knockdown) to answer the above two questions, respectively. Overall, these experiments aimed to shed light on the role of ITPR3 in Ca^{2+} flux regulation and identify potential genes involved in the regulatory network of *ITPR3* in HNSCC.

METHODOLOGY

Cell lines

Human tongue squamous cell carcinoma cell line CAL27 (ATCC, Manassas, Virginia, USA) and human embryonic kidney cell line HEK293T (ATCC, Manassas, Virginia, USA) was used in this study and cultured in DMEM (Cytiva, Washington, D.C, USA). Human squamous cell carcinoma cell line, FaDu (ATCC, Manassas, Virginia, USA), was grown in Eagle's Minimum Essential Medium (EMEM; ATCC, Manassas, Virginia, USA). All the culture media contain 10% fetal bovine serum (FBS). Cells were incubated in an incubator at 37°C and 5% CO_2.

Knockdown of ITPR3 by shRNA

The sh-scramble (ULTRA-NT#4), shITPR3#91 (ULTRA-3316791) were purchased from Transomics Technologies. Third-generation lentiviruses were used to transfect shRNA plasmid using Lipofectamine 3000 (Invitrogen, Carlsbad, California, USA) in HEK293T cells. The medium was collected for usage after 24 hours (two batches), and the viral particles and 8 ug/mL polybrene were utilized to infect target cells (HNSCC cell lines).

Western blot

Twenty micrograms of total protein from cell lines were loaded into Mini Protean TGX Stain-Free gels (BioRad, Hercules, California, USA). ITPR3 (610312, BD Biosciences, New Jersey, USA) was detected using a monoclonal antibody at a concentration of 1:4000 and Hypoxia-inducible factor 1-alpha (HIF1A) (Ab216842, Abcam, Cambridge, UK) at 1:1000 dilution. Blots were incubate for one hour at room temperature with a 1:10000 dilution of an anti-mouse IgG (Prod # 31430). Bands were visible utilizing the Clarity MaxTM ECL Substrate (BioRad, Hercules, California, USA) and ChemiDocTM MP Imaging System (BioRad, Hercules, California, USA). ITPR3 protein levels were calculated with a loading control of 1:8000 dilution of β-actin (Sigma-Aldrich, USA).

Ca^{2+} detection

A total of 2 x 10^6 cells were added to 500 µL of Calcium Assay Buffer (Abcam, ab182458, Cambridge, UK) and were sonicated on ice. Cell lysates were centrifuged at 12,000 x*g* for 30 minutes at 4°C. Supernatant were transferred to a clean tube. and assayed using Calcium Assay Kit (Abcam, ab10250, Cambridge, UK). We determined the chromogenic complex formed between Ca^{2+} and cresolphthalein by plate reader Infinite M200 PRO (OD 575 nm).

Transcriptomic analyses

RNA was isolated by homogenizing cells in QIAzol Lysis Reagent (Qiagen, Germany). Followed by manufacturer's protocol of using RNeasy® Mini Kit for RNA. Transcriptomic sequencing was performed with Novaseq (Illumina) with an average of 30 million reads per sample.

Normalized expression of genes from each sample were analyzed by CLC Genomic Workbench. Gene expression results from the CLC Genomic Workbench were used to analyze gene enrichment between control and shITPR3 treatments. Briefly, sequence reads were mapped to the human reference genome GRCh38. Gene set enrichment analysis (GSEA) was performed using clusterProfiler v4.4.4 (18), enrichplot v1.16.2, and msigdbr v7.5.1 packages in R v4.2.1 (under Rstudio v2022.07.1 build 554). The fold change in expression of shITPR3 compared with control was used as input for GSEA analysis of Gene Ontology terms and KEGG pathways with the *gseGO()* and *gseKEGG()* commands, respectively. For all functions, the minimum gene set size (minGSSize) was set to 15, the P-value cutoff (pvalueCutoff) was set to 0.05, the false discovery rate (FDR) was set as the adjusted P-value method (pAdjustMethod), and the weight of each step (exponent) was set to 0.5. For the visualization of gene networks, significant gene sets were imported into Cytoscape v3.9.1.

Statistical Analyses

The results are displayed as mean ± SD. Every result represents an average of at least 3 wells from 2 independent cultures of each cell line. Statistical significance (*t*-test) compares each bar chart. * ($p < 0.05$) was considered to be significant, ** ($p < 0.01$), *** ($p < 0.001$).

RESULTS

Knockdown of ITPR3 affects the calcium ion flux in CAL27 and FaDu cell lines

Stable ITPR3-knockdown and control HNSCC cell lines were generated by lentiviral transduction with shITPR3#91 targeted *ITPR3* and non-specific regions (scramble), respectively. We showed that *ITPR3*-knockdown cell lines had significant reduction in mRNA and protein levels of the gene **(Figure 1A and 1B)**.

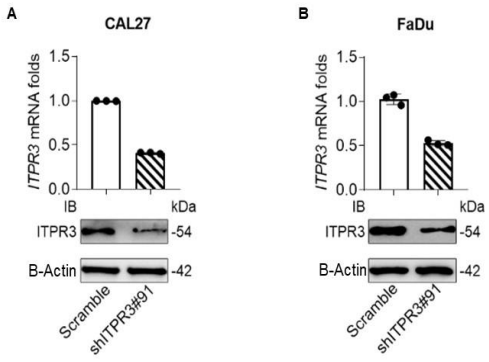


Figure 1: Knockdown of ITPR3 reduces mRNA and protein level expression. *ITPR3* gene knockdown drastically lowered mRNA and protein expression levels in CAL27 and FaDu cell lines **(A and B)**.

We first examined the effect of knockdown of *ITPR3* on Ca^{2+} flux in the cells under normoxia and hypoxia conditions, which was confirmed by HIF1A (hypoxia-inducible factor 1-alpha, a hypoxia marker). HIF1A is a protein playing a key role in the response to hypoxia (low oxygen levels) in cells. Under hypoxic conditions, HIF1A is accumulated in the cells and is translocated to the nucleus, where it binds to specific DNA sequences known as hypoxia-response elements (HREs) and activates the expression of target genes. The results from the figure show an increase in the expression of the HIF1A protein in cells cultured under hypoxic conditions. Under normoxia condition, Ca^{2+} concentration did not change in *ITPR3*-knockdown cells **(Figure 2A and 2B)** while it was significantly reduced in the knockdown cells under hypoxia condition. These findings suggest that hypoxia stress influences calcium signaling and *ITPR3* may be involved in maintaining calcium homeostasis specifically under hypoxic conditions.

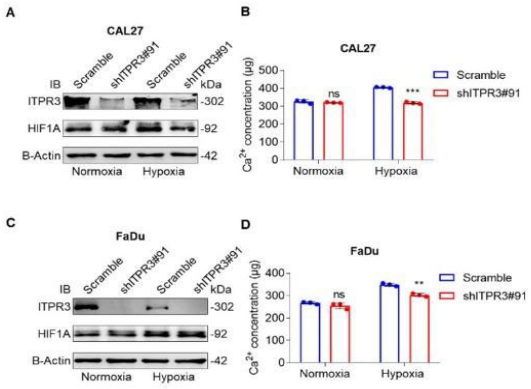


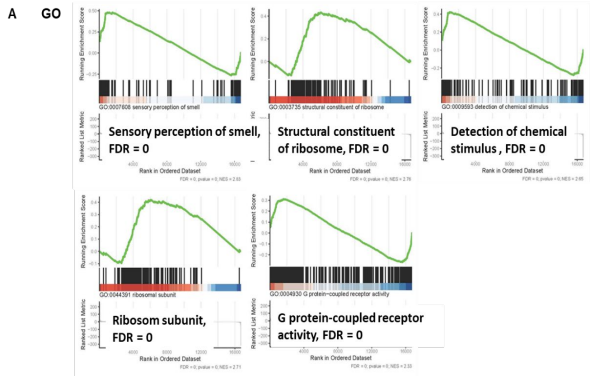
Figure 2: The impact of reduced ITPR3 expression on intracellular Ca^{2+} concentration in CAL27 and FaDu cells under hypoxic conditions. The intracellular Ca^{2+} ion concentrations were assessed using calcium assays **(panels A to D)**. HIF1A was used as a hypoxia marker.

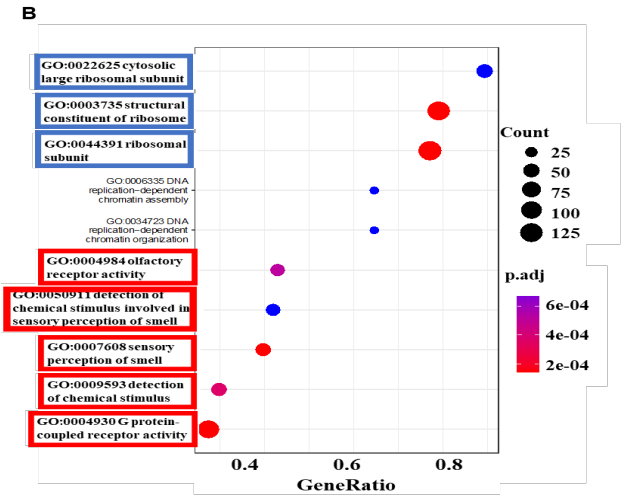
Knockdown of ITPR3 altered expression of olfactory receptor genes in HNSCC cell lines

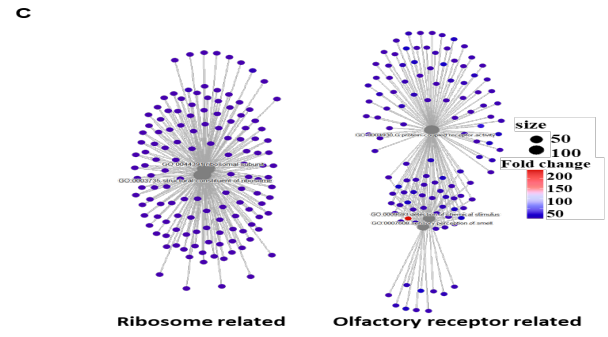
In CAL27 cell line, the top 5 gene sets with highest enrichment score from GO terms are mostly olfactory receptor related genes, i.e., sensory perception of smell, detection of chemical stimulus, and genes with G-protein-coupled receptor activities **(Figure 3A)**. The other two gene sets were related

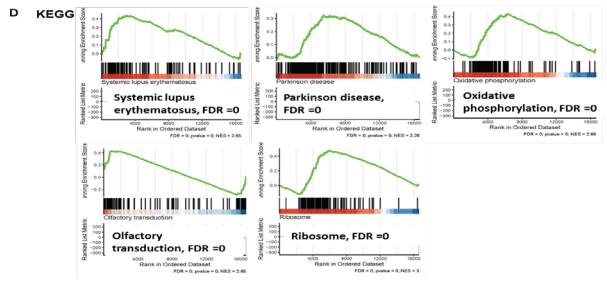
to ribosome functions, i.e., structural constituent of ribosome and ribosome subunit (Figure 3A). The relative number of genes in each gene set was shown in the dot plot in Figure 3B. The gene concept network showed that the networks could be partitioned into two major groups: olfactory receptor related on the right-hand side and the ribosome related on the left **(Figure 3C)**.

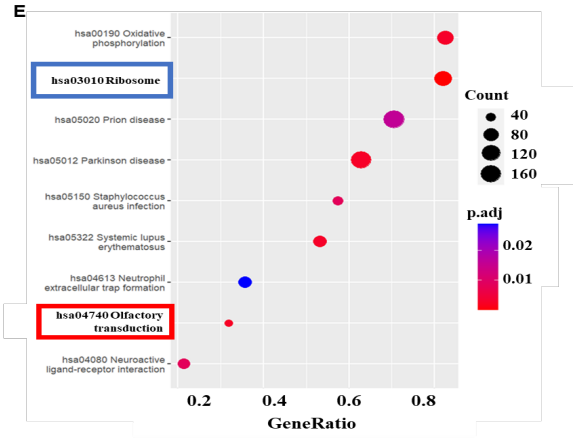
Using KEGG pathways, the genes were found to be enriched in olfactory transduction and ribosomes as well **(Figure 3D and 3E)**. In addition, the genes were found to be significantly enriched in the systemic lupus erythematosus (SLE) and Parkinson disease associated pathways. Furthermore, genes involved in oxidative phosphorylation were also enriched in *ITPR3*-knockdown CAL27 cells. The gene concept network indicated 3 major unrelated groups including olfactory receptor related genes, SLE, and ribosome together with oxidative phosphorylation and Parkinson disease (**Figure 3F**).











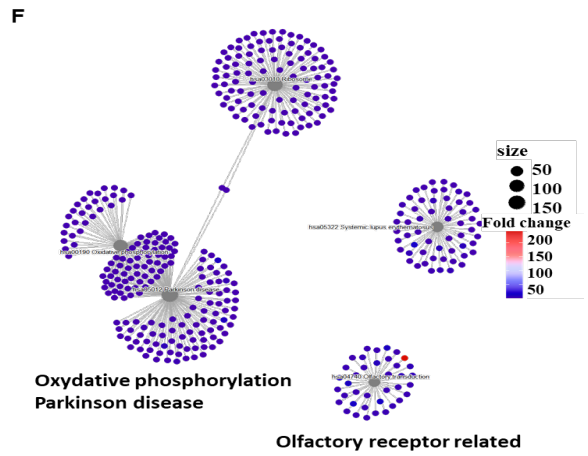
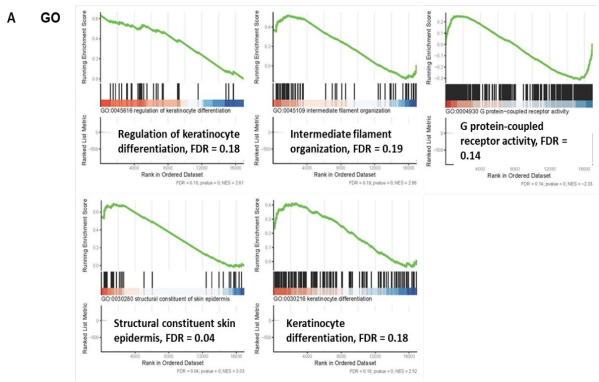


Figure 3.: **RNA-Seq and GSEA analysis of *ITPR3* knockdown cells in CAL27 cell line using GO and KEGG databases.** Ribosomal subunits, detection of chemical stimuli, sensory perception of smell, G protein-coupled receptor activity, and structural components of the ribosome, the green line represents running score with the enrichment score at the peak The green line represents running score with the enrichment score at the peak (y-axis) **(A)**. Dot plots of the top 10 enriched GO gene sets showing cytosolic large ribosomal subunit, structural constituent of ribosome, ribosomal subunit, DNA replication-dependent chromatin assembly, DNA replication-dependent chromatin organization, olfactory receptor activity, detection of injured chemical Sensory perception of smell, sensory perception of smell, detection of chemical stimulus and G protein-coupled receptor activity **(B)**. Gene concept network of top 5 statistically significant GO terms in CAL27 between ITPR3 knockdown vs. control cell lines **(C)**. Systemic lupus erythematosus, Parkinson disease, olfactory transduction, ribosome, oxidative phosphorylation **(D)**. Top 10 enriched KEGG gene sets showing oxidative phosphorylation, ribosome, prion disease, Parkinson disease, staphylococcus aureus infection, systemic lupus erythematosus, neutrophil extracellular trap formation, olfactory transduction, and neuroactive ligand-receptor interaction **(E)**. Gene concept network of top 5 statistically significant KEGG pathways in CAL27 between ITPR3 knockdown vs. control cell lines **(F)**. FDR < 0.05.

In FaDu cell line, the top 5 gene sets with highest enrichment scores from GO terms include regulation of keratinocyte differentiation, G protein-coupled receptor activity and structural constituent skin epidermis (**Figure 4A**). The gene numbers in each gene set were shown in **Figure 4B**. Gene concept network showed that the gene sets can be categorized into two major networks similar in CAL27: genes with G protein-coupled receptor activity and the others pathways, e.g. keratinocyte differentiation, structural constituent of skin epidermis and intermediate filament organization (**Figure 4C**).

For KEGG pathways, we observed enrichment of genes in olfactory transduction and the other 4 pathways in the top 5 gene sets including systemic lupus erythematosus, Parkinson disease, olfactory transduction, ribosome, oxidative phosphorylation (**Figure 4D**). The number of genes in the pathways were shown in **Figure 4E**. Similar to the previous results, the gene concept network analysis also indicates a major network of olfactory receptor related genes in KEGG pathway in FaDu cells.



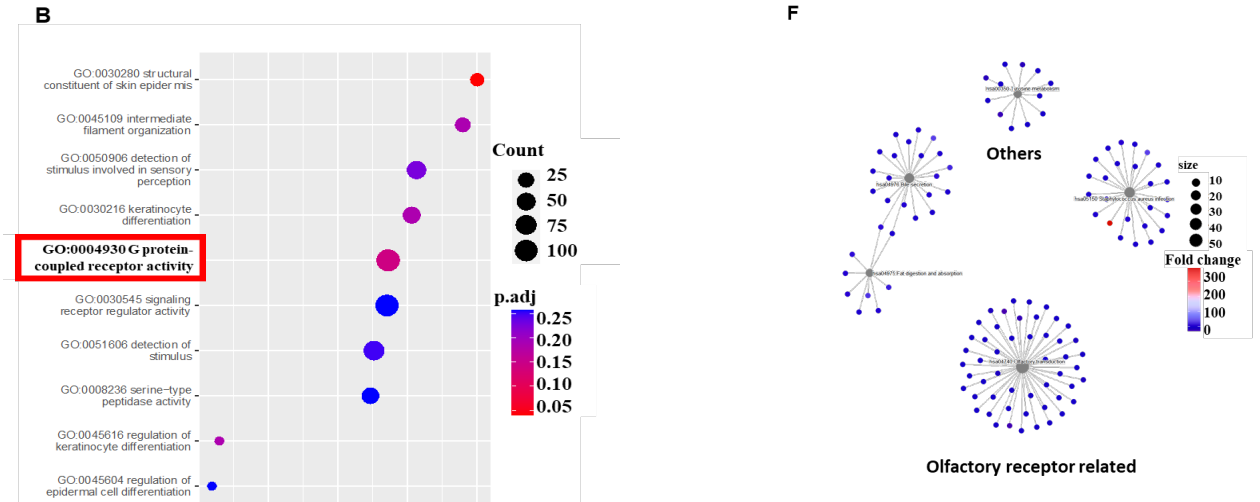


Figure 4. ***ITPR3*** **knockdown cells in the FaDu cell line were analyzed using RNA-Seq and GSEA, utilizing the GO and KEGG databases**. GSEA plot shows the regulation of keratinocyte differentiation, intermediate filament organization, structural constituent of skin epidermis, keratinocyte differentiation, and G protein-coupled receptor activity after knockdown of ITPR3 **(A)**. Dot plot of GO gene sets including structural constituent of skin epidermis, G protein-coupled receptor activity, regulation of keratinocyte differentiation, keratinocyte differentiation, intermediate filament organization, regulation of epidermal act type cell alignment differentiation, serine receptor regulator activity **(B)**. ITPR3 knockdown vs. control cell lines gene concept network of top 5 statistically significant GO pathways in FaDu cell line **(C)**. GSEA plot shows when knockdown of ITPR3 regulated staphylococcus aureus infection, bile secretion, fat digestion and absorption, olfactory transduction, and tyrosine metabolism **(D)**. KEGG pathway in FaDu cells are staphylococcus aureus infection, fat digestion and absorption, olfactory transduction, bile secretion, tyrosine metabolism, estrogen signaling pathway, steroid hormone biosynthesis, neuroactive ligand-receptor interaction, viral protein interaction with cytokine and cytokine receptor and primary bile acid biosynthesis **(E)**. ITPR3 knockdown vs. control cell

lines gene concept network of top 5 statistically important KEGG pathways in FaDu **(F)**. FDR < 0.05.

Olfactory receptors genes consistently showed altered expression in both HNSCC cell lines

We would like to know whether there are genes whose expression is consistently altered by knocking down *ITPR3* in two cell lines. We focused on the top gene sets shown consistently enriched in GO terms and KEGG pathways, which included G-protein coupled receptors, olfactory receptors, and genes detect stimuli involving in sensory functions. (please see Supplementary Table 1 for gene list). Interestingly, the Venn Diagram showed that a total of 12 genes altered in expression overlapped between four gene lists **(Supplementary figure 1)**, which are olfactory receptor family 7 subfamily G member 2 (*OR7G2*), olfactory receptor family 52 subfamily W member 1 (*OR52W1*), olfactory receptor family 56 subfamily B member 4 (*OR56B4*), olfactory receptor family 1 subfamily K member 1 (*OR1K1*), olfactory receptor family 2 subfamily B member 11 (*OR2B11*), olfactory receptor family 1 subfamily J member 1 (*OR1J1*), olfactory receptor family 10 subfamily AC member 1 (*OR10AC1*), olfactory receptor family 52 subfamily I member 1 (*OR52I1*), olfactory receptor family 2 subfamily V member 1 (*OR2V1*), olfactory receptor family 4 subfamily D member 9 (*OR4D9*), olfactory receptor family 8 subfamily D member 1 (*OR8D1*) and olfactory receptor family 56 subfamily A member 4 (*OR56A4*).

DISCUSSION

In this study, we found that the calcium flux decreased significantly in knockdown cells under the condition of hypoxia. In addition, we identified that genes with altered expression were enriched in olfactory receptor activities from GSEA analyses with both GO terms and KEGG pathway in two cell lines. We also identified the alteration 12 olfactory receptor genes in both cell lines and enrichment of ribosomal related genes exclusively in CAL27 cells.

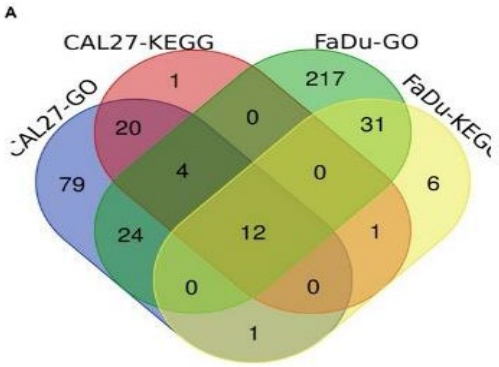
Hypoxia, characterized by low oxygen levels, has been shown to be associated with alterations in intracellular calcium dynamics, which can impact various Ca^{2+}-dependent physiological processes. The observed decrease in Ca^{2+} concentration in *ITPR3*-knockdown cells under hypoxia further highlighted the potential role of *ITPR3* in regulating calcium dynamics. These results contribute to our understanding of the interplay between hypoxia, Ca^{2+} signaling, and the involvement of *ITPR3* in HNSCC. Further investigations are warranted to elucidate the precise mechanisms underlying these interactions and their implications for HNSCC pathophysiology.

Our study revealed the impact of reduced ITPR3 on the expression of G-protein coupled receptor and olfactory receptor genes. Olfactory receptor genes have been found to have association with various types of cancers including prostate cancer, breast cancer, melanoma, colon cancer, bladder cancer, neuroendocrine cancer, liver cancer, lung cancer, and brain cancer (19), which suggested the potential roles of OR genes in tumorigenesis and cancer progression. From our results, alteration of *ITPR3* may subsequently affect the expression of OR and other G-protein coupled receptors resulting in anomalies in cell proliferation, metastasis, and transformation properties in HNSCC.

We identified 12 olfactory receptor genes with altered expression in all the analyses in both cell lines. Among the genes, we found that *OR7G2* has been reported to be associated with the risk of pediatric neuroblastoma (20), while *OR2B11* is implicated in predicting the efficacy and adverse events of axitinib in individual patients with advanced renal cell carcinoma (21). From literature, several olfactory receptor genes have been found to be associated with different cancer types and play roles in regulating cell functions including initiating mesenchymal transition and MAPK/ERK pathway in breast cancer (22). In addition, *OR51E1* and *OR51E2* were found to be associated with various cancer types and showed association in overall survival rate of cancer patients (19). Moreover, *OR2W3* and *OR2B6* were found to be associated with cancer progression in invasive subtype of breast cancer (23). However, the molecular mechanisms of olfactory receptor genes and their interaction with *ITPR3* in HNSCC require more studies in the future.

In this study, we also observed alteration in the expression of ribosomal genes in CAL27 cell lines. It has been reported that several ribosomal genes were associated with different cancer types (24). For example, ribosomal protein LP1 (*RPLP1*) expressed at higher level in invasive HNSCC and silencing of the gene promoted apoptosis and decreased radioresistance *in vitro* in HNSCC (24). Additionally, altered ribosome modifications have emerged as oncogenic drivers that can trigger tumorigenesis or promote cancer progression (25, 26).

In summary, we are the first study showing that the alteration of *ITPR3* may change the Ca2+ flux and subsequently change the downstream expression of a group of G-protein couple receptors, i.e. olfactory receptor genes. Additionally, we found that ribosome subunits, oxidative phosphorylation, may play important roles in development of HNSCC in the *ITPR3* involving regulatory pathways as well. Further studies including functional analyses, i.e. effect of alteration of *ITPR3* in cell proliferation, migration and invasions, as well as proteomic analyses are required to provide a deeper understanding of the specific mechanisms, which may contribute to the development of novel diagnostic and therapeutic strategies in HNSCC patients.



Supplementary Figure 1. Venn Diagram Analysis. We performed Venn Diagram Analysis between CAL27 and FaDu cell lines on the identified olfactory pathway-related genes in Go and KEGG and found 12 genes overlapped **(A)**.

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FACTORS AFFECTING THE PARTICIPATION OF INTEGRATED COMMUNITY CASE MANAGEMENT PROGRAM AMONG KEY PLAYERS AT COMMUNITY LEVEL IN CENTRAL RIVER REGION NORTH, THE GAMBIA

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ABSTRACT

Pneumonia, malaria, and diarrhoea are leading causes of death among children under 5 years. Children in hard-to-reach villages face increased vulnerability due to limited access to healthcare services. The Integrated Community Case Management (iCCM) program is being implemented in the Gambia since 2019 to address this issue. This study examines the factors affecting the participation in iCCM program among key players at community level in Central River Region North, The Gambia.

A community-based cross-sectional study was conducted to investigate the participation level and its determinants among 322 iCCM key players at community level. The key players of the iCCM program were the village health workers, village development committee chairpersons and community health nurses. Face-to-face interview was employed using a structured questionnaire to collect data from the entire study population. SPSS version 21was used for data analysis. Percentages, mean, bivariate and multivariate logistic regression were performed to identify the determinants of participation in iCCM program as the outcome of interest. Finally, p-value of less than 0.05 was stated statistically significant.

Among the 322 key players interviewed, 93.5% were males and the overall level of participation was 49.8%. Binary logistics regression has shown that age, education, occupation, knowledge, attitude, satisfaction and logistics availability were found to have significant associations with participation. In the multivariate logistics regression: secondary education (AOR = 3.43; 95% CI = 1.34, 8.78), higher education (AOR = 4.80; 95% CI = 2.06, 11.19), satisfaction (AOR = 2.05; 95% CI = 1.10, 3.83) and logistics availability (AOR = 5.57; 95% CI = 2.93, 10.59) were found to be significant predictors of participation in iCCM program.

Half of the key players were not optimally participating in iCCM program. Low educational level, inadequate logistics and supplies directly impact the participation of key players in iCCM program in The Gambia. Addressing these factors is crucial to improve the effectiveness of the iCCM program.

Keywords: Community, Participation, Child health, Health System, The Gambia.

INTRODUCTION

Integrated Community Case Management (iCCM) is a community-based intervention that help in the prevention, promotion, diagnoses, treatment and referral of pneumonia, malaria and diarrhoea among under 5 children in Low and Middle-Income Countries (LMIC) or hard to reach areas (1). The principal cause of death among children under 5 years are pneumonia, malaria, and diarrhoea which claimed approximately 5.6 million children under five years in 2016 (2). It was estimated that 5 million children under the age of 5 years succumbed to death, mostly from preventable and treatable causes (3).

About 750,000 children died from pneumonia each year in sub-Saharan Africa (4). Although malaria is observed to decline globally from 577,000 in 2015 to 568,000 in 2019, it remains to be one of the major killer diseases among children under 5 years (5). Similarly, diarrhoea-related deaths in children under the age of five were estimated to be 1.87 million worldwide of which 78% occur in African and South-East Asia Regions (6). The Gambia is battling with increasing under-5 mortality ratio of 54 per 1,000 live births in 2013 to 56 per 1,000 live births in 2019 - 2020 (7, 8).

The Gambia, being the smallest country on mainland Africa, is situated on the West African coast and stretches approximately 400 km inland from the Atlantic Ocean (9). The country is divided into eight Local Government Areas (LGAs) with a total area of 10,689 square kilometres (10). It has a population of 1,882,450 with growth rate of about 3.1% (11).

The health service in The Gambia is anchored on three tiers: primary (village health services and community clinics), secondary (minor and major health centres) and tertiary (hospitals) care with a well-established decentralization health system structure that spans from central to community level (9). Despite a well-designed Primary Health Care (PHC) structures in place, the system has significantly declined over time and is no longer providing enough care for the populace.

Central River Region North (CRRN) is about 240 km from the capital city Banjul, with a population of about 96,703 (12) is also consider as one of the poorest LGAs in The Gambia (13). The LGA is divided into 5 districts which are further divided into 18 circuits. Although each district has at least one community clinic, there is no hospital in the whole CRRN (9). CRRN has 152 villages enrolled into the iCCM program which focus on prevention, treatment and referral of pneumonia, malaria and diarrhoea among children of 2 to 59 months. Each village has one Village Health Worker (VHW) who offers basic treatment, referral, and health education and promotional activities, and one Village Development Committee (VDC) chairperson who coordinate environmental health issues such as waste management in relation to iCCM program. These 152 villages are supervised by 18 Community Health Nurses (CHNs) on both preventives and curative aspects related to iCCM program. CRRN has the worst health indicators on pneumonia, malaria and diarrhoea across the whole country (14).

This study aims at assessing the challenges affecting the participation in iCCM program among key players in CRRN based on the integration of theory of participation (15) and model of effective community participation which were adapted and modified in this research (16). Participation, being the outcome of interest in this study, refer to the involvement of community members in addressing their own health issues.

The anticipated findings in this study are expected to yield an important recommendation to policy makers that can help to improve community commitment toward iCCM program, foster community participation, ownership and increase utilization of service.

METHODOLOGY

Study design Population sample and sample size

A cross-sectional quantitative study was conducted in CRRN. The target population of this study were VHWs, VDC chairpersons and CHNs who are the key players of iCCM program at community level. The reason for conducting this research among the entire study population is that there was no research study that investigate the possible cause of high morbidity among children under 5 years (14). In this regard, 322 participants from 152 villages in five districts were enrolled into this study. The number of key players in each district was determined based on the number of iCCM villages per district. Lower Saloum had 57 key players, Upper Saloum had 82 key players, Nianija had 28 key players, Niani had 88 key players and Sami had 67 key players. Inclusion criteria for this study includes all the VHWs, VDC chairpersons and CHNs in all iCCM villages in CRRN.

Research Instrument

A questionnaire which has similar variable and was successfully implemented in Malaysia was adapted and modified based on their roles and responsibilities of each key players on iCCM program (18). It was reviewed by external experts and pilot testing was conducted prior to data collection. Each key player had equal number of questions developed from four independent variables: knowledge, attitude, satisfaction and logistic availability and one dependent variable: participation in iCCM program. Different questions for each group based on their roles and responsibilities performed on iCCM program (17). Participation was measured based on nine questions related to key players involvement in iCCM program at community level.

Reliability and validity of instrument

This study used questionnaire adapted and modified from similar research conducted in Malaysia (18) and were further reviewed by the researcher's major and co-advisers. Finally, it was validated by independent experts. In addition, the questionnaire was tested to 65 subjects who were also engaged in iCCM program in CRRS, which have a similar setting as in CRRN. Cronbach's alpha of 0.73 was obtained for internal consistency.

Data Collection procedure

Four research assistants with undergraduate qualification were hired and oriented on the research instruments by the researchers via zoom meeting. Face-to-face technique was employed to collect data from the entire study population. Permission from the local authorities was obtained prior to data collection and consent forms were signed by the participants after accepting to join in the study. Data collection was conducted in April, 2023.

Measurement

Each variable (knowledge, attitude, satisfaction of key players on iCCM program, iCCM logistics availability at community level and participation in iCCM program were measured based on the 9 items for each (19). Each correct answer was assigned a score of 1 mark while a wrong answer was assigned zero score. Mean score: sum of the scores divide by the counts, was used to disentangle between low and high scores. For the precent of mean score: individual score divided by mean score multiply by 100 was the formula employed. Score above-mean were high knowledge, positive attitude, high satisfaction, high logistics availability or high participation on iCCM program whereas score below mean were scored as low knowledge, negative attitude, low satisfaction, low logistics availability or low participation on iCCM program.

Data analysis procedure and statistical analysis

Each item was coded and checked for consistency in the questionnaire. Coding table, checking and auditing consistency in all variables was also employed**.** IBM Statistical Package for Social Science (SPSS) was used to analyse the data using percentages, mean, standard deviation, bivariate and multivariate logistics regression to associate between independent: knowledge, attitude, satisfaction and logistics availability of iCCM program and dependent variable: participation in iCCM program.

Ethical Consideration

Ethical approval was granted from Committee of Research Ethics (Social Science), Faculty of Social Science and Humanity, Mahidol University. Certificate of approval number: 2023/049/2403. Inform consent was also sought from the participant after thorough explanation the purpose of the research by the research assistants. Personal information and data were kept confidential throughout the research process.

RESULT

Personal characteristics of participants

This study includes sociodemographic factors of 322 respondents. The majority of the respondents were males (93.5%) and 34.2% aged between 45-54 years old. Also, majority (94.7%) were married while 15.5% were not educated. Furthermore, 25.5% had a household income of less than 70USD per month whereas 80.4% were farmers. 48.4% had work experience between 2 – 5 years. Details of these personal factors are shown in table 1 below.

Table 1: Frequency and percentage of respondents by sociodemographic factors. N=322

Socio-demographic variables	Number	Percent (%)
Age group (years)		
< 35	71	22.0
35 - 44	100	31.1
45 - 54	110	34.2
≥ 55	41	12.7
Median = 44 QD = 7 Min= 23 Max= 60		
Gender		
Male	301	93.5
Female	21	6.5
Marital status		
Married	305	94.7
Single	15	4.7
Divorce	2	0.6
Educational level		
Primary education	66	20.5
Secondary education	53	16.5
Higher education	86	26.7
Informal	67	20.8
Not educated	50	15.5
Family income (per month)		
<70 USD	82	25.5
≤70 USD	240	74.5
Median = 33.33 SD =205.43 Min= 5 USD Max= 300USD		
Occupation		
Farming	259	80.4
Trading	26	8.1
Others	37	11.5
Work Experience		
2 – 5 years	156	48.4
6 – 10 years	120	37.3
>10 years	46	14.3
Median = 6, QD = 4, Maximum = 39, Minimum = 2		

Table 2: Frequencies and percentages of mean scores among key players N=322 (individual scores divide by mean score multiply by 100)

Key players	Knowledge** (%)	Attitude* (%)	Satisfaction* (%)	Logistics availability* (%)	Participation* (%)
VHWs	71.8	53.9	53.6	44.6	49.2
VDC Chairpersons	54.8	48.5	63.4	51.6	51.6
CHNs	66.3	55.3	56.3	48.7	48.7
Overall	64.3	52.6	57.8	48.3	49.8

Score: low < 60% ≥ high** Score: low < 50%≥ high*

Overall scores of iCCM key players on knowledge, attitude, satisfaction of key players in iCCM program, logistics availability and participation

Table 2 shows 322 respondents who were interviewed. The overall score has shown high knowledge (64.3%), positive attitude (52.6%) and high satisfaction (57.8%). However, logistics availability (48.3%) and Participation (49.8%) were low

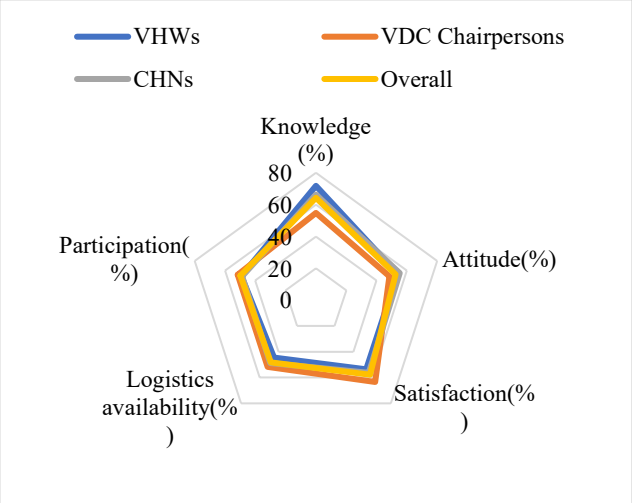

Figure 1 shows the dimensional presentation of a radar chart. N=322

Figure 1: Radar chart showing scores of iCCM key players Bivariate between independent variables with participation. Bivariate logistics regression in table 3 shows that secondary education (COR = 6.08; 95% CI = 2.72 – 13.59), higher education (COR = 6.68; 95% CI =3.22 – 13.85), knowledge (COR = 2.18; 95% CI = 1.31 - 3.60), attitude (COR= 0.58; 95% CI = 0.37- 0.90), satisfaction (COR = 3.18; 95% CI = 2.01 - 5.03) and logistics availability (COR = 5.78; 95% CI = 3.43 - 9.74) were associated to participation.

Table 3: Bivariate analysis of variables with Participation. N=322

Variables	Participation		COR (95% CI)	p-value
	Low	High		
	173(53.7%)	149 (46.3%)		
Education				
Primary	51 (77.3%)	15 (22.7%)	1	
Secondary	19 (35.8%)	34 (64.2%)	6.08 (2.72 - 13.59)	<0.001
Higher edu.	29 (33.7%)	57 (66.3%)	6.68 (3.22 – 13.85)	<0.001
Knowledge				
Low	63 (67.0%)	31 (33.0%)	1	
High	110 (48.2%)	118 (51.8%)	2.18 (1.31 - 3.60)	<0.005
Attitude				
Low	93 (60.8%)	60 (39.2%)	1	
High	80 (47.3%)	89 (52.7%)	0.58 (0.37- 0.90)	0.016
Satisfaction				
Low	118 (66.3%)	60 (33.7%)	1	
High	55 (38.2%)	89 (61.8%)	3.18 (2.01 - 5.03)	<0.001
Logistics availability				
Low	146 (67.0%)	72 (33.0%)	1	
High	27 (26.0%)	77 (74.0%)	5.78 (3.43 - 9.74)	<0.001

Multivariate between independent variables with participation

Multivariate logistics regression shows that secondary education (AOR=3.43; 95% CI= 1.34 - 8.78, p-value = 0.010), higher education (AOR = 4.80; 95% CI = 2.06 – 11.19, p-value = <0.005), satisfaction (AOR =2.06; 95% CI =1.10 – 3.83, p-value = 0.011) and logistics availability (AOR =5.57; 95% CI = 2.93 – 10.59, p-value = <0.001) were the predictors to participation in iCCM program as shown in table 4.

Table 4: Multivariate logistics regression of the independent and participation. N=322

Independent Variables	AOR	95% CI		p- value
		Lower	Upper	
Education				
Primary	1			
Secondary	3.43	1.34	8.78	0.010
Higher education	4.80	2.06	11.19	<0.001
Satisfaction				
Low	1			
High	2.06	1.10	3.83	0.011
Logistics availability				
Low	1			
High	5.57	2.93	10.59	<0.001

DISCUSSION

In this section the findings of the key players are discussed in detail. Though the groups of each key players have different level of educational background, they have different job description on iCCM program. Therefore, each group was interviewed based on their respective roles and responsibility performed in iCCM program. This study revealed that the overall score of key players on participation (49.8%) in iCCM program was low. The factors that contributed to low participation are suggested to be multiple factors and some of them are discussed below. Although, there was no similar study conducted in The Gambia that the research can make reference from, The Gambia Health Policy 2021 – 2030 has raised the issue of low partnerships, networks and alliances between the health and non-health professionals, government, private sector and civil society(9). This finding is supported by a similar study which was conducted in Ethiopia, stated that participation level among key players on iCCM was at 35% owing to low medicines and supplies (20). The level of participation among each key player also identified: VHWs had low participation representing

49.2% this may be associated to low logistics availability. Furthermore, CHNs had low participation representing 48.7%. The reason behind this could be associated with big circuit size assigned to each CHNs couple with inadequate mobility among the same group (9). Some CHNs are overseeing more than 15 villages (Both iCCM villages and non-iCCM villages), despite the fact that the PHC roadmap recommended that a CHN should supervise 4 to 10 villages (10).

Secondly, secondary and higher education were 3.43 and 4.80 times more likely to participation on iCCM program than primary education (AOR=3.43; 95% CI: 1.34, 8.78) and (AOR=4.80; 95% CI: 2.06, 11.19) respectively. Therefore, this study has revealed that the higher the level of education among key players, the more the likelihood for key players to participation in iCCM program. This finding is in line with similar research conducted in Uganda which stated that education is significantly associated to participation of iCCM stakeholders (21). One of the driving forces behind low participation on iCCM program might be low or lack of educated key players to effectively run the program given the facts that there are critical areas in the management of iCCM program such as data management and drugs calculation that required basic knowledge and understanding among key players.

The third important issue highlighted in this study is that the overall satisfaction was high (57.8%) among key players and more importantly, it was significantly associated to participation on iCCM program. This has suggested that the key players are explicitly satisfied with the level of participation that they were doing, but the cause of barriers can be as a result of weak support from both central government and local area councils such as inadequate supply chain and iCCM supervisors to run the program. This is strongly supported by research conducted in Kenya and another in Uganda both stressed that satisfaction was strongly association to the participation iCCM key players (22, 23).

Finally, this research suggested that due inadequate logistics and supplies from the government to support the iCCM program and low knowledge of the VDCs (54.8%) on the benefits of iCCM, that the program was very weak across the five districts in CRRN. A similar article conducted from three African countries has stated low availability of logistics among iCCM stakeholders was found to be significant to participation in iCCM program (24). The finding has suggested that due to low logistics availability and weak knowledge of VDC, who would have step in and fund the iCCM program in the absent of central government support had led to low participation among key players. This finding is in line with similar research conducted in Nigeria which stated that close to four-fifths (79.5%) of the trained stakeholders of iCCM program were not participating due to low logistics availability (25).

CONCLUSION

Based on the study results, knowledge, attitude and satisfaction were generally found to be high among iCCM key players. However, logistics availability and participation were relatively low. Participation being the outcome of interest was found to be significantly associated with higher education, satisfaction to iCCM program and logistics

availability. Therefore, need for both central and local government to support in logistics and supplies for effective participation in iCCM program is crucial. The ministry of health should endeavour to provide a fix incentive for iCCM key players and hire higher educated personnel who can effectively run the iCCM program at community level. These recommendations, if applied are expected to contribute to the reduction of child morbidity and mortality in The Gambia

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ADOPTING HORMONE THERAPY FOR TRANSGENDER PEOPLE WITHIN THE HEALTHCARE SYSTEMS IN THAILAND: PERSPECTIVES OF HEALTH SERVICE PROVIDERS

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ABSTRACT

The need to assert their sexual identity is critical for transgender people in Thailand. In particular, recourse to hormonal therapy is seen as a priority among many of them. However, the services in governmental health facilities are still limited. This results in transgender individuals opting for hormonal self-medication and relying on the advice of their peers. These practices expose them to a high risk of physical and mental health issues. A study on structural and social determinants for limited services in this area is rare. This study seeks to address the related determinants that contribute to the limitation of hormone therapy service delivery from the perspective of health providers.

The study aims to explore the current situation of hormone therapy services for gender transition in Thailand, it also examines the structural determinants associated with the provision of hormone therapy services. Finally, it investigates health providers' knowledge, attitudes, and practices regarding hormone therapy services for transgender individuals.

This study is based on qualitative research. A desk review and in-dept interview method were applied to collect the data. 11 health facilities, including public facility; private facilities; and community-based health facility these offer hormone therapy service. Additionally, nine health facilities that do not offer hormone therapy services were selected as sample. 22 key respondents were interviewed using semi-structured interview guidelines. Respondents included eight medical practitioners, eight nurses, two clinic manager, and four service staff. The collected data were analyzed using content analysis. The study received approval from the IPSR Human Subject Review Board.

The study found 30 government health facilities that provide hormone therapy for gender transition. All of these can implement the major processes following the hormone therapy guidance. Yet, only 6 of these are situated outside Bangkok. The study also revealed that 1) Healthcare systems through health resources, universal health coverage, and the consensus of healthcare authority; 2) Political context through health and relevant policies, and government support, are the related structural barriers and facilitators of hormone therapy services. In terms of individual determinants, the study shows that most health service providers in health facilities that have already established hormone therapy services have better knowledge and understanding of transgender people's characteristics and their specific health needs. In contrast, providers working in healthcare facilities that do not have hormone therapy services did not have adequate knowledge about hormone therapy for gender transition. However, providers of both types of facilities perceive hormone therapy services as important and

necessary for trans individuals. In addition, providers in different environments treat trans patients like other patients and try to respond to their health needs. However, health facilities that do not have hormone therapy services have deprived transgender people's right to access such services.

In Thailand, hormone therapy services for gender transition experience a huge inequality between Bangkok and other areas in the capacity to deliver services. Also, structural determinants, namely health resources and health policies that do not meet the health needs of transgender people, contribute to the limitation of hormone therapy services and it turns these services into inaccessible and unaffordable health services. However, having adequate knowledge of hormone therapy for gender transition is an important issue among health providers as it helps them to understand and be confident when delivering services. Yet, health facilities that do not have hormone therapy services have deprived transgender people's human right to access such services.

Keywords: structural determinants, individual determinants, hormone therapy, transgender, trans health

INTRODUCTION

Gender Affirming Hormone Therapy (GAHT) is a necessary medical process for transgender and gender-nonconforming people who desired to change their bodies to affirm their gender identity. These processes should depend on individual factors and provide by health providers to reduce the negative effect of hormonal use and achieve the goal of the gender transition (1, 2, 3). Regarding the guidance of the World Professional Association of Transgender Health, which integrated knowledge and information from many specialists on transgender health, they suggested that hormone therapy should be delivered by health providers who are experts on this issue to reduce the negative effects of hormonal use, achieve the goal of gender transition (2), and improve quality of transgender life (4)..

In Thailand, asserting their sexual identity is critical for transgender people. In particular, recourse to hormonal therapy is seen as a priority for many of them. The national survey conducted by the United Nations Development Programme and Human Rights Watch reported that health facilities and specialists providing hormone therapy services were limited, and Universal Health Coverage (UHC) did not cover these services (5, 6). Including, trans people experiencing stigma and discrimination in healthcare settings (7, 8). These factors became barriers to accessing hormone therapy services. Therefore, trans people often opted hormone therapy for gender transition through self-medication and relying on the advice of their peers. The study conducted by Ittiphisit et al. in 2022 found that most trans people, both trans men and trans women, took hormone medication outside the recommended regimen and without consultation from a healthcare practitioner (9). The study by Salakphet et al. revealed that contraceptive pills were commonly used among trans women to increase feminine characteristics, even though this was not in line with the hormonal guidance (10). Similarly, the study by Samakkeekarom et al. found that most trans women took contraceptive pills based on the suggestions of their peers and social network (11).. These practices expose trans people facing risk of physical and mental health issues (2, 3).

Social determinants, such as socioeconomic and political contexy, social class, culture, and social values, including the healthcare system (12), are important factors that influence health equity, including adopting trans healthcare services (13). In a study conducted in the United States, it was found that social and legal contexts, societal attitudes, gender sensitivity, and the availability of comprehensive health resources are factors related to the provision of hormone therapy for transgender individuals (14). Although many countries were able to adopt theses service within their health system, understanding and attitude towards trans individuals and trans health needs were significant with providing healthcare services for trans (15).

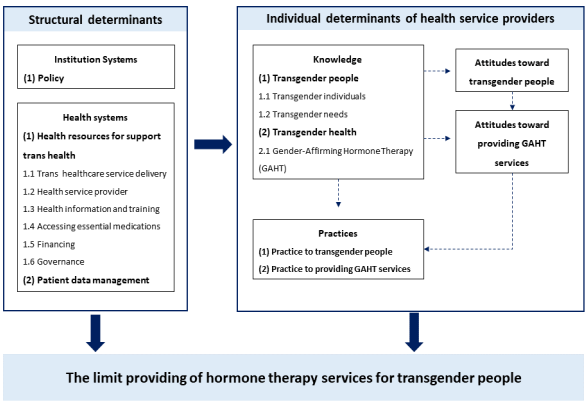
However, a study on comprehensive structural and social determinants for limited hormone therapy is rare in Thailand. To understand the situation of adopting hormone therapy services for transgender people and relevant determinants, this study seeks to address the related determinants that contribute to the limitation of hormone therapy service delivery from the perspective of health providers.

The objectives of this study are three folds. Firstly, to explore the current situation of hormone therapy services for gender transition in Thailand. Secondly, to examine the structural determinants associated with the provision of hormone therapy services. Thirdly, to explore individual determinants regarding health providers' knowledge, attitudes, and practices regarding hormone therapy services for transgender.

Conceptual Framework

This study utilized the Social Determinants of Health framework by the World Health Organization as a conceptual basis to explore the structural factors related to policies and healthcare systems that influence the provision of transgender hormone therapy services (12, 16). Additionally, the study reviewed the gender ideology and sociological theory, namely, heteronormativity, gender binary, transphobia, stigmatization, and discrimination to considers the forms of knowledge, attitudes, and practices of healthcare providers towards transgender individuals and transgender hormone therapy services within the healthcare system.

Figure 1: The Conceptual Framework of The Study



METHODOLOGY

Study design

This study relied on the qualitative research approach using multiple in-depth interview case studies and a desk review method. Non-probability purposive sampling was applied to select health facilities and health services providers for interview.

A total of 11 health facilities that provide hormone therapy services for transgender persons were included in the sample, comprising 4 university hospitals, 1 public hospital and 1 public health center under the Bangkok Metropolitan Administration, 2 community-based health facilities, and 3 privately-run health facilities. Nine health facilities that do not provide hormone therapy services were also studied, consisting of 1 public health center under the Bangkok Metropolitan Administration; 2 community-based health facilities, 1 private hospital, 1 private clinic, 2 regional public hospitals, and 2 sub-district health promoting hospitals.

Twenty-two voluntary interviews with health service providers were carried out. In the sampled facilities that provided hormone therapy services, 12 interviews were conducted with key informants whose duties more or less related to the hormone therapy services. They included 5 practitioners, 4 nurses, 1 clinic manager, and 2 service staff. In the sampled facilities that do not provide the services, 10 key informants were selected to be interviewed. Criteria for selecting key informants in this setting included health service provider working in a clinic or department related to the endocrine system, sexual health, reproductive medicine, or gender diversity health They are 3 practitioners, 4 nurses, 1 clinic manager, and 2 service staff.

A semi-structured interview guideline was developed based on the aforementioned conceptual framework. It contains 4 sections 17 principal questions and probing questions. The face-to-face interviews were conducted either on site or online, depending on the convenience of key informants via the ZOOM meeting program. Each interview took 30–60 minutes. The study also engaged with desk research review. Relevant national policies, handbooks, government documents, health facility information, other preexisting documents and information made available by transgender networks and NGOs.

Data analysis

Relevant information extracted from secondary documents was analyzed for given themes. The interview transcriptions of 22 health service providers were analyzed using a descriptive content analysis method. The data is synthesized by integrating similar data to summarize the perspectives of health service providers towards each theme. On the other hand, the different data or opinions in each factor are summarized to demonstrate different perspectives among health service providers. In addition, if participants have other suggestions or attitudes related to the research topic, those data will be summarized as attitudes related to transgender hormone services in Thailand.

Ethical consideration

This study received approval from the Institutional Review Board, Institution for Population and Social Research (IPSR-IRB). Certificate of approval No. 2023/04-081. Researchers informed all key informants about the objectives of this study, the benefits, and risks of participation in this study to the participants, before requesting permission to interview and to record the interview.

RESULTS

The current situation of hormone therapy services for gender transition in Thailand

The main agencies involved in healthcare provision in Thailand are the Ministry of Public Health, which is responsible for adopting healthcare services, and the National Health Security Office, which oversees the Universal Health Coverage program to support access to necessary healthcare for all population (17). However, the regulations from these two organizations concerning healthcare services often discuss overall healthcare provision without specifically addressing the health needs of transgender individuals.

On November 2022, the Medical Council of Thailand officially declared hormone therapy services as an integral component of gender-affirming healthcare. The regulatory pronouncement defined the qualifications for medical practitioners offering these services, along with the guidelines for their provision (18).

The provision of gender-affirming hormone therapy services in Thailand is implemented through 47 health facilities where prescribe hormone therapy by practitioner according to the regulatory. Among these facilities, as shown in Table 1. Total 30 of were categorized as public health facilities, 16 as private health facilities, and one as a community-based healthcare center. The geographical distribution of these facilities revealed that the majority, 34 in number, were located in Bangkok, the capital city of Thailand, while only 13 health facilities were situated outside the city. Moreover, hormone therapy services still have limitations in terms of service hours as they are unable to operate every working day. It is estimated once in week (3, 6, 19, 20).

Table 1: The Number of Available Health Facilities that Provide Hormone Therapy Services

No.	City/ Region	Hormone therapy services			Relevant services*
		Public facility	Private facility	CBHC**	CBHC**
1	Bangkok (Capital city)	24	9	1	3
2	The North	2	2	-	3
3	The North East	1	1	-	2
4	The Central region	2	3	-	3
5	The South	1	1	-	1
	Total	**30**	**16**	**1**	**12**

Last updated: 2, June 2023

*Relevant services refer to hormonal use consultations and hormonal level test service

**CBHC refers to Community-Based Healthcare Center

According to interviewing health service providers, health facilities that provide hormone therapy services have four main procedures, namely:

1) Providing counseling and information about hormone therapy services, which includes discussing treatment options, hormone medication effects, hormone medication indications, and setting treatment goals for transgender individuals to design a treatment plan.

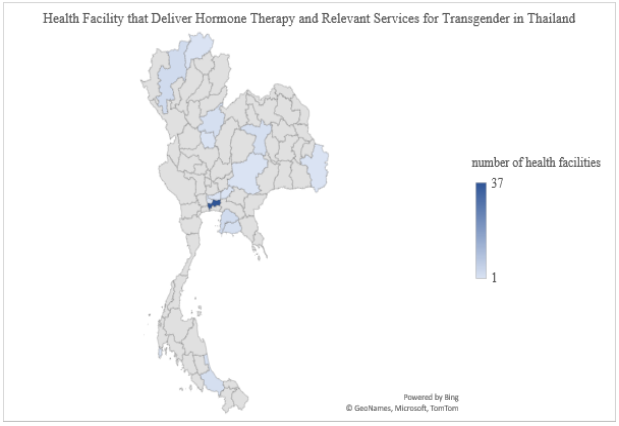
2) Assessing mental and physical health, including gender dysphoria, before initiating hormone therapy. During this step, the physician conducts medical examinations to evaluate any pre-existing medical conditions, potential risks, or hormone levels in transgender individuals with a history of hormone medication use. The assessment of gender dysphoria is carried out to certify that the person is transgender or non-binary who has the desire to change their physical appearance using hormone medication to align with their gender identity while also preventing mental issues arising from a non-conforming between gender identity and assigned sex at birth.

3) Prescribing hormone medication. This procedure differs between transmen and transwomen individuals in terms of medication formats and dosages.

4) Monitoring and evaluating mental and physical health after treatment, which involves measuring hormone levels to assess the effectiveness in achieving gender transition goals for patients. Additionally, it includes evaluating any side effects resulting from hormone medication use. For newly initiated patients, follow-up appointments are typically scheduled every three months in the first year of hormone therapy and then reduced to every six months or annually. For patients with a history of hormone medication use exceeding one year, follow-up appointments and evaluations occur every six months or annually.

Besides the aforementioned health facilities, various community-based organizations and healthcare centers are involved in hormone therapy services by providing the relevant services for trans individuals. In total, the 12 community-based healthcare centers are providing such relevant services. These services include hormonal use consultations and hormonal level tests. However, it is important to emphasize that these centers lack the authority to prescribe hormone medication through the practitioner.

Figure 2: The Prevalence of Health Facility that Deliver Hormone Therapy and Relevant Services for Transgender in Thailand



Structural determinants of hormone therapy service

Healthcare system

Health Resources of hormone therapy services for gender transition

Health service provider

Providers play a central role in delivering services, particularly practitioners who are responsible for directly prescribing medication for transgender individuals. They do not only meet the qualifications set by the Medical Council; these physicians must also possess a willingness to provide hormone therapy services to transgender individuals. Healthcare facilities with practitioners interested in hormone therapy services can encourage and expand implementation of such care. However, in Thailand, there is still a limited number of qualified practitioners who are capable and willing of providing this service. This limitation contributes to the constraint on the number of available healthcare facilities. In health facilities that do not provide transgender services, even if there are specialized practitioners in hormone, but they still are unable to provide these services.

Furthermore, other health service providers and service staff, including nurses, medical record personnel, pharmacists, financial personnel, or administrative personnel, are also involved in different stages of hormone therapy service delivery for transgender individuals.

"At that time, when there were very few staff members, only three people were responsible for everything (laughs). If there were more government positions available, it would be great to recruit and involve new gen practitioners to help with the work. This would allow for a significant expansion of services and greatly enhance the capacity." (HTSA002, Practitioner in university hospitals that provide hormone therapy service)

Gender-affirming hormone therapy information and training

Training is the process of providing knowledge, education, and courses related to hormone therapy for gender-affirming care. Providers in healthcare facilities, both those offering and not offering hormone therapy services, believe that training is essential to ensure that staff have the necessary knowledge and skills to deliver hormone therapy services that are accurate, safe, and effective. In addition to medical training, gender sensitivity is also crucial in providing these services. This is because transgender patients are often stigmatized or may face discrimination in healthcare settings, which can deter them from seeking care. Therefore, understanding the diversity and specific needs of transgender individuals can enhance the effectiveness of care and better meet the unique needs of this population.

"Let's assume that the hospital in question has some doctors who may be endocrinologists or gynecologists familiar with hormone-related issues. Even if they have doctors, these healthcare providers may not be highly experienced in providing hormone therapy services because, ultimately, it may require additional training and education. Not only should they possess knowledge about the medical aspects, but they should also be knowledgeable about how to provide friendly and compassionate care. For example, they should be sensitive in communication and conversation, paying attention to details to ensure a comfortable and inclusive environment." (HTSA004, Clinic Manager in community-based healthcare center that provide hormone therapy service)

For healthcare facilities that do not provide hormone therapy services, it is considered beneficial for their staff to receive training on hormone therapy for transgender individuals. This training can equip healthcare providers with knowledge to offer appropriate services and guidance to transgender people who seek such care.

Hormone medication

When categorizing hormone therapy medications used for gender transition, it is found that transmen typically require injectable hormone medications, while transwomen can use hormone pills and topical hormone preparations. In Thailand, participants often encounter uncertified hormone medications that are illegally imported, counterfeit, or non-standardized. These uncertified hormone medications are generally available at a lower cost compared to prescribed medications from healthcare providers, leading some transgender individuals to choose self-purchasing over seeking care from specialized professionals.

Financial support

Both of health facilities that provide hormone therapy service and those that do not perceived that budget and funding are crucial for the development of hormone therapy services for transgender individuals. They can be utilized to improve facilities, conduct research to generate knowledge about trans health services, and provide training for staff in healthcare facilities. However, the budget allocated for transgender hormone therapy support is relatively small compared to other healthcare services, mostly relying on agency management and external funding sources. This slow progress in service development and research on hormone therapy for transgender individuals is mainly due to limited financial resources.

"There is a lack of various funding sources for the clinic because it is relatively new, and the proportion of funding is not substantial. For example, diabetes clinics receive much more funding, and when people talk about diabetes, everyone agrees that it is a significant problem that deserves attention and funding. It is understood that it is a major issue and should receive ample financial support. With sufficient funding, there would be easier establishment of clinics and the ability to undertake various projects and research. However, it is relatively limited compared to other fields. It doesn't mean that there is no funding at all, but it may not be as abundant." (HTSA008, Practitioner in university hospitals that provide hormone therapy service)

Medical supplies and laboratory

Due to the requirement for physical health assessments before and after taking hormone therapy for transgender individuals, which involve blood tests to evaluate their overall health, the use of equipment and laboratories enables healthcare providers to monitor and ensure the safety of the individuals in accordance with guidelines. Additionally, these resources help assess the outcomes of hormone therapy, including its effectiveness in achieving the desired goals of transgender healthcare. Most healthcare facilities, both those providing and not providing transgender services, have sufficient equipment. In cases where a healthcare facility does not have its own laboratory, patients can be referred to other healthcare facilities for blood testing, and the results can be sent back to the practitioner for evaluation of symptoms.

Health insurance

As gender-affirming hormone therapy is a service that requires continuous utilization, individuals need to access the service regularly to receive the prescribed hormones and to be monitored for any side effects resulting from hormone usage. However, hormone therapy service for gender transition is not included as part of the coverage under the Social Security Scheme (SSS) and the Universal Coverage Scheme (UCS). As a result, health facilities must either charge transgender individuals for the services they receive or seek external funding sources to manage hormone therapy services. Furthermore, health services providers in healthcare facilities that offer hormone therapy have found that some patients are unable to afford follow-up appointments or health evaluations after using hormone therapy due to insufficient funds for healthcare services and hormone medication. This leads to discontinuation of healthcare services for these individuals.

"It is not a right that is covered to be free or reimbursed. There is a part regarding associated costs that individuals have to pay for themselves. Some individuals may have the means to cover the expenses initially, but eventually, when the costs increase, they have to discontinue seeking services at clinics or hospitals while still continuing to use self-purchased hormones or hormones purchased from pharmacies at affordable prices." (HTSA001, nurse in university hospitals that provide hormone therapy service)

Furthermore, most participants, both within healthcare facilities that provide hormone therapy service and those that do not, believe that if hormone therapy for transgender individuals could be incorporated into the health insurance, it would stimulate greater interest and concern among healthcare facilities and providers regarding transgender health issues. Additionally, it may promote an increase in the number of healthcare facilities that offer such services.

Consensus of authority in healthcare center

Individuals with authority within an organization, such as management committees, organizational leaders, or physicians with the highest decision-making power in healthcare facilities or clinics, are responsible for determining the direction of transgender hormone services within the healthcare facility. This includes granting permission for service provision, supporting facility infrastructure, staff, and service amenities, as well as promoting services through communication and outreach efforts. In healthcare facilities that provide transgender hormone services, it is necessary to provide detailed information about the service, such as service formats, the importance of the service, and budget allocation, to the authorities and obtain permission for establishing such service centers. If individuals with authority recognize the significance of the issue and provide support, they can proceed with the service implementation, particularly in healthcare facilities that currently do not offer transgender hormone services. Participants emphasize that the provision of services depends on the decisions made by the individuals with the highest authority within the organization. If those individuals understand the importance of transgender health issues, the importance of service provision, possess the necessary resources, or receive directives from higher authorities within the organization, they may be able to provide the requested services. However, if individuals with

authority lack understanding or expertise in transgender health or choose not to prioritize it, they have the right to deny service provision.

"When we change doctors, do we need to ask for permission from the new doctor to continue hormone injections? The doctor said there are risks involved because we are not an expert. So, the doctor suggested that we should stop the injections for now. I agreed because the doctor is the one in control." (HTSU010, clinic manager in community-based healthcare center that do not provide hormone therapy service)

Political Context

Health Policy and relevant policies of transgender health

The relevant policies concerning the health of transgender individuals primarily focus on HIV and AIDS, recognizing trans people as a key population at risk for HIV infection and providing support for HIV prevention services such as HIV testing and antiretroviral medication. However, in both settings, it is acknowledged that the laws in the country only recognize two gender categories based on sex assigned at birth, which affects the healthcare environment. For instance, restroom facilities, patient rooms, and changing rooms are typically segregated into male and female spaces, requiring transgender individuals to conform to their sex assigned at birth. Moreover, laws related to gender also have implications for healthcare services, including gender recognition laws and recognition of same-sex marriage, which can limit access to gender-affirming healthcare services and family planning rights. Interestingly, transgender providers acknowledge that most policies are unable to address the healthcare needs of transgender individuals due to a lack of inclusive community input and stakeholder engagement in policy design.

In contrast, policy reversals also serve as a factor that promotes transgender hormone services. This can be observed in the operations of local offices in Bangkok, where a policy supporting access to healthcare services for the gender-diverse population has been announced. As a result, the establishment of the Pride BKK Clinic provides healthcare services, including hormone therapy for transgender individuals.

Government support

Based on interviews with providers in health facilities that provide hormone therapy services, it is widely observed that the government's support for factors related to transgender healthcare services is very limited. This includes insufficient resources in terms of medical personnel, budget, and policies. Currently, the development of transgender healthcare services and the advancement of transgender health policies are predominantly driven by community-based organizations, the private sector, and transgender networks, with the government playing a minimal leadership role. This slow progress hinders the development of services, including the lack of public awareness campaigns regarding hormone therapy for gender transition provided by the government. As a result, transgender individuals are often uninformed and lack access to safe healthcare service. However, participants from both settings agree that increased government involvement and prioritization of transgender health would lead to an expansion of service and safer hormone therapy for transgender individuals.

Individual determinants of health service provider toward transgender people and hormone therapy service

Knowledge

All providers in health facilities that provide hormone therapy have a comprehensive understanding and medical knowledge related to hormones for gender transition, including gender dysphoria and gender-affirming healthcare. They also understand the individualized healthcare needs of transgender individuals, recognizing that these needs vary from person to person. On the other hand, providers in facilities that do not offer hormone therapy generally possess general knowledge about various health conditions but lack in-depth knowledge. Other healthcare staff may not have a specific understanding of hormone therapy services but are aware that self-administration of hormones by transgender individuals is not a safe health practice. However, they may not be able to provide guidance on safe alternatives for transgender individuals.

Providers in healthcare facilities that do not offer transgender services may recognize the importance of hormone therapy in gender transition based on the self-administration practices observed among transgender individuals. However, they may lack knowledge regarding specific hormone medications used in the provision of transgender healthcare.

Attitude

The attitude of healthcare providers, both those who offer services and those who do not, tends to be diverse. In general, many providers do not hold biases against gender-diverse individuals and transgender people, viewing them as general patients. Many participants, both in health facilities that provide hormone therapy and those that do not, are unaware that transgender individuals are a highly stigmatized population and perceive transgender patients similarly to cisgender patients. However, some participants in facilities that offer hormone therapy believe that transgender individuals are not concerned about being treated according to their assigned gender at health facilities. As for attitudes towards hormone therapy services for gender transition, all participants recognize the necessity of such services for transgender individuals and agree that there should be provision of safe hormone therapy services in health facilities. Unfortunately, some participants recognized that hormone therapy may be considered less important when compared to other non-communicable diseases that have high treatment costs, a large number of patients, and expensive medications. Therefore, if prioritization of services is required, hormone therapy may be ranked lower in terms of importance.

Practice

Providers in health facilities that offer hormone therapy services strive to provide gender-affirming care by, for example, not using gender-specific titles or language when addressing patients in public areas. In delivering hormone therapy, providers consider the individual needs and preferences of patients, ensuring that the hormone regimen is both satisfactory to the patient and within safe parameters. On the other hand, providers in health facilities that do not offer hormone therapy services typically attempt to maintain patient privacy regarding their assigned sex at birth and

provide care for transgender patients similar to other gender identities. However, in case of hormone therapy services, most health providers may have to decline service when asked about it or refer trans patient to another health facility.

"Just tell them straightforwardly that while I may have some basic knowledge, but I am not able to prescribe or dispense medication without a specialist's involvement. I told her that I cannot provide hormone therapy for you." (HTSU002, nurse in private hospital that do not provide hormone therapy service).

CONCLUSION

In Thailand, hormone therapy services for gender transition experience a huge inequality between Bangkok and other areas in the capacity to deliver services. These services are primarily established in the capital city and major provinces of each region. The provision of hormone therapy for gender transition is influenced by structural determinants related to healthcare systems and political context, which can either promote or hinder service delivery. These determinants align with the social determinants of health framework.

In the case of Thailand, the society still adheres to a binary concept of gender, recognizing only two genders, male and female, based on sex assigned at birth. This perspective influences the legal and healthcare systems, leading to the exclusion of individuals who identify as transgender or non-binary. As a result, there is stigma and discrimination towards trans individuals at a structural level due to their exclusion from these systems. Additionally, there is a lack of resources in various aspects, including provider, training, financial support, and government support, further hindering the development and accessibility of hormone therapy services. These incidents contribute to limiting the availability of hormone therapy services, resulting in inadequate and delayed service provision. Consequently, hormone therapy services become inaccessible and unaffordable for many individuals seeking gender transition, which contradicts the targets set by Sustainable Development Goal 3, which aims to ensure healthy lives and well-being for all, including access to sexual and reproductive healthcare services and universal health coverage for standard health services (21).

Furthermore, the health concerns of transgender individuals are often overlooked by society and, particularly, by the government, leading to discriminatory practices against transgender individuals in healthcare settings. The lack of adequate knowledge of hormone therapy for gender transition among healthcare providers adds to the issue as it hinders their ability to deliver appropriate and confident services. As a result, the denial of hormone therapy services violates the Yogyakarta Principles, which deal with human rights related to sexual orientation and gender identity, particularly Principle 17 concerning the right to the highest attainable standard of health (22).

In summary, the unequal distribution of hormone therapy services for gender transition in Thailand is influenced by structural determinants related to healthcare systems and policies, social perspectives on gender, and the lack of resources and support. This disparity limits the accessibility and affordability of hormone therapy services, contradicting international development goals, and disregards the human rights of transgender individuals.

RECOMMENDATION

The findings of the study suggest that the government needs to promote gender-affirming hormone therapy services by investing in health resources. In particular, integrating these services into a universal health coverage package also need to be done. More importantly, the government should develop health policies that incorporate transgender person' health needs by involving both transgender individuals and healthcare providers in policy-making process. Training on gender diversity and gender sensitivity for health providers to ensure a gender-diversity-friendly environment free from stigma and discrimination towards transgender people is the important as well. The service staff, including administrator, manager, healthcare providers, and supportive personnel should have the knowledge and positive attitudes necessary for delivering inclusive healthcare services for transgender people.

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ASSOCIATED FACTORS AMONG CONFIRMED COVID-19 CASES AND TELEMEDICINE TREATMENT OUTCOME DURING THE THIRD WAVE OF COVID-19 IN MYANMAR: A SECONDARY DATA ANALYSIS

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ABSTRACT

The COVID-19 pandemic effects on the health, economy, and society - worldwide. Millions of people around the world have been infected by the virus, which has killed hundreds of, thousands of people. COVID-19 has a wide range of clinical manifestations and progression. Fever, dry cough, fatigue, myalgia, headache, sore throat, abdominal pain, and diarrhea are common symptoms reported. Hospitalization and severity of COVID-19 were strongly correlated with the presence of certain co-morbidities. Telemedicine has emerged as a vital tool in the COVID-19 era, addressing several pressing challenges faced by healthcare systems. The widespread adoption of telemedicine during the COVID- 19 crisis underscores its transformative potential in enhancing the overall quality, accessibility, and equity of healthcare services.

The aim of this study is to explain the personal factors, presence of comorbidities, and covid-19 symptoms and signs and outcome after telemedicine consultation in patients registered through telemedicine service during the third wave of the pandemic in Myanmar.

A secondary data analysis was utilized in this study. Medical records of patients who consulted to the telemedicine service during third wave of COVID-19 in Myanmar were collected. 841 patients aged 2-79 years in 15 regions of Myanmar were recruited. A bivariate analysis using Chi-square and Fisher's Exact test was used to examine the relationship between the personal factors, presence of comorbidities, covid-19 symptoms and signs and the outcome of telemedicine consultation.

Out of the 841 patients, only 190 patients have undergone Rapid Diagnostic Test (RDT) and 172 of them were tested positive. Outcomes of the patients were recorded at first follow up from patients in: Better, Same, Worse. These are based on multiple factors like improvement in symptoms of signs and SpO2 level. In confirmed RDT-positive patients, the outcomes of the 37 (21.5%) patients were better – 61 (35.5%) were the same – 74 (43.0%) were worsened. Among personal factors, presence of comorbidities, and covid-19 symptoms and signs, only fever (p-value = 0.047) is associated with the outcome after telemedicine consultation.

This study found that many patients in Myanmar have not undergone Rapid Diagnostic Test of COVID-19 although they feel sick. This can be due to lack of knowledge about Rapid Diagnostic Test and how to use them. Among confirmed RDT-positive patients, 43% patients of patients become worse in second follow-up. Fever was an indicator of COVID-19 among personal factors, presence of comorbidities, and covid-19 symptoms and signs.

Keywords: COVID-19, Rapid Diagnostic Test (RDT), Telemedicine, Myanmar

INTRODUCTION

Since it started in China, the COVID-19 pandemic has had a huge effect on the health, economy, and society of the whole world. Millions of people around the world have been infected by the virus, which has killed hundreds of, thousands of people. The World Health Organization (WHO) called the outbreak of the new coronavirus (COVID-19) a global pandemic on March 11, 2020 (1). As of 1 February 2023, the WHO reported 753,651,712 confirmed cases of COVID-19, including 6,813,845 deaths (2). Myanmar is not much of an exception, since the first case of COVID-19 was reported in March 2020 and the country has seen several waves of the disease since then. As of February 1, 2023, WHO had heard about 633,820 confirmed cases of COVID-19 and 19,490 deaths in Myanmar (2).

COVID-19 is a new disease with a wide range of clinical manifestations and progression. Fever, dry cough, fatigue, myalgia, headache, sore throat, abdominal pain, and diarrhea are common symptoms reported in many parts of the world (3). Coronaviruses are significant human and animal pathogens that can cause a variety of respiratory disorders, from the common cold to more severe and sometimes fatal respiratory infections. Two very dangerous human coronaviruses emerged in the last 20 years as a result of two distinct outbreaks: the Middle East respiratory syndrome coronavirus (MERS-Cov) and the severe acute respiratory syndrome coronavirus (SARS-Cov) (4).

Close contact with an infected person, contact with contaminated objects or surfaces, or inhalation of respiratory droplets were the most common routes of transmission of SARS-CoV-2 (5). During the pre-symptomatic period, some infected persons may be contagious; hence, COVID-19-infected individuals may transmit the virus prior to the onset of severe symptoms (6). Hospitalization and severity of COVID-19 were strongly correlated with the presence of certain co-morbidities. These included diabetes, cardiovascular disease, chronic renal disease, and obesity. A number of studies have shown that factors like age, preexisting conditions (like hypertension, diabetes, cardiovascular disease), and presenting symptoms (like fever, cough, diarrhea, and breathlessness) can all be used to predict the poor prognosis or severity of COVID-19 (6).

In addition to the pandemic, Myanmar also has a challenging political climate. In February 2021, when the military coup happened, Myanmar's democratic dilemma was beset with many challenges, most notably the COVID-19 pandemic. The situation was more dire and catastrophic than ever before, with the public health issue having an alarming impact on every business and every region in the nation (7). According to the Ministry of Health in Myanmar, the third wave had a CFR of 4.11 percent, with 391,353 confirmed cases (760 per 100,000 people) and 16,094 deaths (31 per 100,000 population) (8). People in Myanmar have to rely on telemedicine services, especially during the waves of COVID-19, because so few hospitals and clinics can function as a result of the ongoing political crisis.

Knowing the illness's symptom profile is critical for developing a realistic strategy for swiftly identifying patients and determining infection progression. This will improve treatment outcomes while lowering disease transmission and fatality rates. If the severity of symptoms is connected with COVID-19 outcomes,

examining the relationship between symptom severity and COVID-19 results may provide insight into the disease's risk or protective mechanisms (3).

Telemedicine has emerged as a vital tool in the COVID-19 era, addressing several pressing challenges faced by healthcare systems worldwide. Its role in mitigating the effects of the pandemic has been multifaceted. Firstly, telemedicine has alleviated the burden on overtaxed healthcare facilities by enabling remote consultation, diagnosis, and monitoring of patients. This has allowed for a more efficient allocation of medical resources and reduced the risk of disease transmission. Secondly, during the pandemic, telemedicine has contributed to public health resilience by facilitating remote triage and patient management. The widespread adoption of telemedicine during the COVID-19 crisis underscores its transformative potential in enhancing the overall quality, accessibility, and equity of healthcare services in contemporary societies.

This study will add to our understanding of COVID-19 and help to shape public health policy and practice in Myanmar and beyond. Furthermore, the findings of this study may give insight on the impact of the military coup on public health as well as the difficulties that adult populations in Myanmar face in the face of the ongoing pandemic and political upheaval.

METHODOLOGY

Study Design

This is a secondary data analysis using medical records of patients who consulted to the telemedicine service during third wave of COVID-19 in Myanmar.

Study Area

This study area was 15 regions of Myanmar, and it was conducted as online survey by a telemedicine service in Myanmar. 15 regions of Myanmar are: Yangon, Mandalay, Nay Pyi Taw, Bago, Magway, Ayeyarwady, Sagaing, Tanintharyi, Kachin, Kayah, Kayin, Chin, Mon, Rakhine and Shan.

Study Population

Study population was patients from 15 regions of Myanmar who consulted to a telemedicine service during the third wave of COVID-19 in Myanmar. They were categorized into 4 age groups (0-17), (18-49), (50-64) and (65-79). The reason of using age groups in this manner was due to the recommendation of WHO. Sex was categorized as male & female. For study regarding prevalence, the data of all people who consulted to the telemedicine service was used. For study regarding prognosis, the data of patients who were RDT confirmed positive at the time of consultation was used. RDT confirmed positive patients were used as cases although it might not be as exact as PCR confirmation. This was due to the nature of confirming cases in telemedicine.

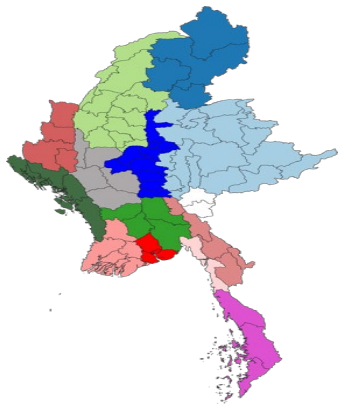

Figure 1: 15 regions of Myanmar

Survey data of total 842 patients of telemedicine service was used. We calculated the sample size estimation by using following formula (which is called formula for determining minimum sample size) (9):

$$n = \frac{(Z^2 \times p \times (1-p))}{E^2}$$

Where:
n = sample size
Z = Z-score for the desired level of confidence (e.g., Z=1.96 for 95% confidence)
p = estimated prevalence of COVID-19 in the population (if unknown, use 0.5)
E = desired margin of error (e.g., E=0.05 for 5%)

Data Collection

After obtaining the explicit consent of patients, their data was used in this study, all of which was extracted from the telemedicine service's database. This database was a comprehensive digital archive meticulously maintained by the telemedicine service's volunteer medical officers, who recorded all relevant patient details during each telemedicine session.

Every patient who signed up for the telemedicine service was promptly requested to consent to participate in a survey. The consent form clearly outlined the nature and purpose of the study, ensuring the patients were well-informed of how their data would be used. Once they agreed, their anonymized data was made available for research purposes.

Data collection was facilitated using the Kobo Toolbox, a versatile open-source tool used for collecting and managing data in challenging settings. After obtaining the patients' consent, an online survey form powered by Kobo Toolbox was used to capture specific patient data. This allowed for systematic data gathering, ensuring consistency and accuracy across all patient entries.

The data was accessed through a secure portal with specific credentials, ensuring privacy and data security. The portal enabled the download of data in a format compatible for further analysis. Ethical guidelines were strictly adhered in accessing and handling this data, respecting patient confidentiality at all times.

To use this secondary data, official email request was sent to the telemedicine clinic and acquired the written consent. Data cleaning and data analyses were proceeded only after receiving the consent letter.

Data Analysis

Prior to analysis, the obtained data will be processed and cleaned. Only data with comprehensive sets of questions and answers will be used. The information and data used were checked to be correct and exact during the data screening process. The information were be input into an Excel spreadsheet. Following data entry, data analysis was performed using SPSS and an Excel file.

Continuous data in this research were categorized into groups. Frequency and percentage were used to evaluate categorical data. The relationship between the independent and dependent variables were also determined via inferential analysis. To identify the most significant independent variable predictors for the dependent variable, a bivariate analysis using Fisher's exact test was performed.

Ethical Consideration

The Research Ethics Review Committee for Research Involving Human Research Participants, Group 1 at Chulalongkorn University provided written

approval for the research. We also requested permission from the telemedicine service to use their data. For data privacy, it's paramount to ensure the confidentiality of the secondary data. This data was de-identified prior to our access, with all identifiable information replaced with pseudonyms or code numbers. This ensured patient anonymity as it's impossible to trace back to individual patients.Access to this data was secured through encrypted connections and password-protected systems. Upon completion of the study, any copies of the data on my local systems was securely erased to maintain strict data privacy.

RESULTS

Prevalence of RDT testing and COVID-19 among patients at telemedicine service

Table 1 shows the prevalence of the patients who registered at the telemedicine service. Out of 841 patients, 651 patients (77 %) were not tested and only 190 patients (41%) were tested with Rapid Diagnostic Test (RDT) at the time of telemedicine consultation. Out of the 190 patients who have tested, 14 were tested negative, 172 were tested positive, and 4 did not know their results.

Table 1: Prevalence of COVID-19 among patients at telemedicine services

Prevalence of RDT testing and COVID- 19	N (%)
RDT Testing	
• Tested	651 (77.0%)
• Not tested	190 (23.0%)
COVID-19 prevalence (among RDT tested patients)	
• Negative	14 (7.4%)
• Positive	172 (90.5%)
• Unknown	4 (2.1%)

Personal factors among COVID-19 positive patients at telemedicine service

Table 2 shows the personal factors of the COVID-19 positive patients at telemedicine service. Most of the COVID-19 positive patients, 63.9% were between 18-49 years old. More than half of the COVID-19 positive patients were female (51.2%) and 48.8% were male. The majority of the COVID-19 positive patients at telemedicine service are from Yangon (43%), followed by Mandalay (27.9%). For contact history, 57% of the COVID-19 positive patients reported to have contact history while 43% of them did not have one. Most of the COVID-19 positive patients (98%) did not have obesity and smoking also had the exact same result with (98%) without its history. For SPO2 and hypoxia, around half of the COVID-19 positive patients had normal SPO2 level which is followed by unknown SPO2 level (27.9%), mild hypoxia (15.7%), moderate hypoxia (4.7%) and severe hypoxia (1.2%) as respectively.

Table 2 : Personal factors among COVID-19 positive patients at telemedicine service (N=172)

Personal factors among COVID-19 positive patients	N (%)
Age (in years)	
• 0-17	1 (0.6%)
• 18-49	110 (64.0%)
• 50-64	43 (25.0%)
• 65-79	16 (9.3%)
• 80 and above	2 (1.1%)
Sex	
• Male	84 (48.8%)
• Female	88 (51.2%)
Historical of COVID-19 case contact	
• Absent	74 (43%)
• Present	98 (57%)
Obesity	
• Absent	168 (98 %)
• Present	4 (2%)
Smoking behavior	
• Absent	168 (98%)
• Present	4 (2%)

Personal factors among COVID-19 positive patients	N (%)
Region	
• Ayeyarwady	4 (2.3%)
• Bago	6 (3.5%)
• Kachin	3 (1.7%)
• Magway	8 (4.7%)
• Mandalay	48 (27.9%)
• Mon	1 (0.6%)
• Nay Pyi Taw	3 (1.7%)
• Sagaing	14 (8.1%)
• Shan	8 (4.7%)
• Tanintharyi	3 (1.7%)
• Yangon	74 (43.0%)
SPO2 and hypoxia	
• Normal	87 (50.6%)
• Mild hypoxia	27 (16.7%)
• Moderate hypoxia	8 (4.7%)
• Severe Hypoxia	2 (1.2%)
Unknown	48 (27.9%)

Presence of Comorbidities among COVID-19 positive patients at telemedicine service

Table 3 describes the comorbidities which are present among COVID-19 positive patients at telemedicine service. Most of the COVID-19 positive patients (88%) reported to be absent of Diabetes Mellitus. Hypertension was also not reported among most of the COVID-19 positive patients (85%). The majority of the COVID-19 positive patients (93%) reported to be absent of heart disease as well. For Chronic lung disease, only 1% of the COVID-19 positive patients reported to have presence and for chronic kidney disease, all of the COVID-19 positive patients were absent of it. Cerebrovascular disease was also present in 1% of the COVID-19 positive patients. There were no reports of immunosuppression and cancer among COVID-19 positive patients at telemedicine service.

Table 3: Presence of Comorbidities among COVID-19 positive patients at telemedicine service (N=172)

Comorbidities among COVID-19 positive patients	N (%)
Diabetes Mellitus	
• Absent	151 (88%)
• Present	21 (12%)
Hypertension	
• Absent	147 (85%)
• Present	25 (15%)
Heart disease	
• Absent	160 (93%)
• Present	12 (7%)
Chronic Lung Disease	
• Absent	171 (99%)
• Present	1 (1%)
Chronic Kidney Disease	
• Absent	172 (100%)
• Present	0 (0%)
Cerebrovascular disease	
• Absent	170 (100%)
• Present	2 (1%)
Immunosuppression	
• Absent	172 (100%)
• Present	0 (0%)
Cancer	
• Absent	172 (100%)
• Present	0 (0%)

Symptoms and signs among COVID-19 positive patients at telemedicine service

Table 4 describes the symptoms and signs which are reported by the COVID-19 positive patients and telemedicine service. Fever and cough present in around two thirds of the patients with 64% and 72% respectively. The presence of sore throat (16%), nasal congestion (13%), shortness of breath (15%), fatigue (27%), myalgia (19%), headache (11%), anorexia (8%), nausea and vomiting (6%), diarrhoea (12%) and loss of taste (13%) are relatively low compared to two major symptoms: fever and cough. However, loss of smell was present in one third of the patients with 56%. There were no cases with sensorium change.

Table 4: Symptoms and signs among COVID-19 positive patients at telemedicine service (N=172)

Symptoms and signs among COVID-19 positive patients	N (%)
Fever	
• Absent	62 (36%)
• Present	110 (64%)
Cough	
• Absent	49 (28%)
• Present	123 (72%)
Sore Throat	
• Absent	145 (84%)
• Present	27 (16%)
Nasal Congestion	
• Absent	149 (87%)
• Present	23 (13%)
Shortness of breath	
• Absent	146 (85%)
• Present	26 (15%)
Fatigue	
• Absent	126 (73%)
• Present	46 (27%)
Myalgia	
• Absent	139 (81%)
• Present	33 (19%)
Headache	
• Absent	153 (89%)
• Present	19 (11%)
Anorexia	
• Absent	158 (92%)
• Present	14 (8%)
Nausea and vomiting	
• Absent	162 (94%)
• Present	10 (6%)
Diarrhoea	
• Absent	151 (88%)
• Present	21 (12%)
Loss of smell	
• Absent	116 (67%)
• Present	56 (33%)
Loss of taste	
• Absent	150 (87%)
• Present	22 (13%)
Sensorium change	
• Absent	172 (100%)
• Present	0 (0%)

Treatment outcomes and association with factors present in COVID-19 positive patients

In personal factors, for both obesity and smoking, there were only 4 patients in each. This data on its own cannot conclusively identify obesity and smoking as sole predictors of worse outcomes in COVID-19 patients.

Figure 2 shows the treatment outcomes of COVID-19 positive patients who have comorbidities which can be related to COVID-19.

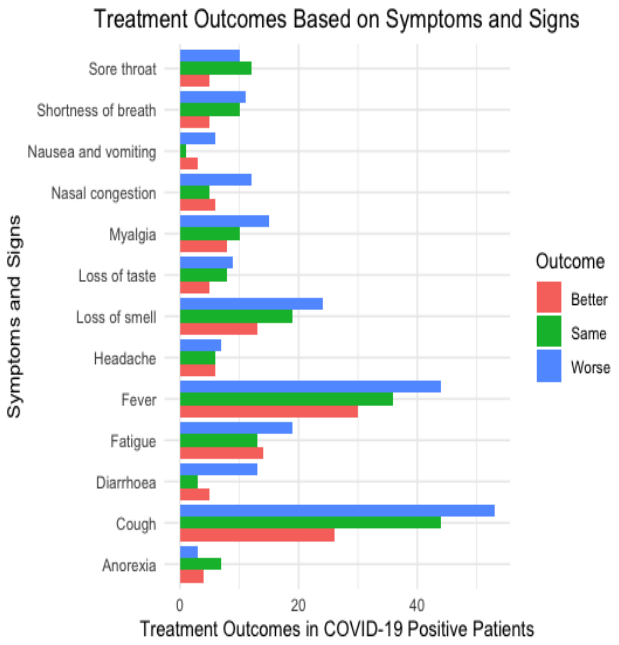

Figure 2: Treatment outcomes based on comorbidities

present in COVID-19 patients

For patients with Diabetes, we notice a slight trend towards stable outcomes. Among diabetic patients, *7* had worse outcomes, which is comparable to the *5* that had better outcomes, while *9* individuals experienced no change.

Hypertension among patients reveals a similar trend with 9 patients experiencing worse outcomes, while an equal number of patients (9) showed improvement in their health, and 7 patients remaining stable.

As for Heart Disease, the data shows an even distribution between those whose condition improved (3 patients) and those whose condition worsened (3 patients). Six patients saw no change in their health status.

Notably, patients with Chronic Lung Disease and Cerebrovascular Disease are significantly fewer, with each group having just one or two individuals. Hence, drawing concrete conclusions from this limited data wouldn't be appropriate.

To summarize, amongst COVID-19 patients with comorbidities like Diabetes, Hypertension, and Heart Disease, there appears to be a trend towards stable outcomes with almost similar numbers of patients experiencing better and worse outcomes. For Chronic Lung Disease and Cerebrovascular Disease, the patient numbers are too limited to draw definitive conclusions. However, it is crucial to understand that these comorbidities should not be considered in isolation as sole predictors of outcomes in COVID-19 patients and must be evaluated in conjunction with other personal and clinical factors. This data should be used as a steppingstone for further in-depth research.

Figure 3 shows the treatment outcomes of COVID-19 positive patients who have symptoms and signs which can be related to COVID-19.

In the context of symptoms and signs among COVID-19 patients, varying trends are observed. The majority of the symptoms like fever, cough, and loss of smell seem to exhibit a trend towards worse outcomes. For instance, among the individuals displaying the symptom of fever, 44 experienced worse outcomes post-treatment as compared to 30 that had better outcomes and 36 that stayed the same. Similarly, for cough, 53 had worse outcomes, while 26 improved and 44 remained the same. This trend was also observed in the loss of smell category.

However, some symptoms such as anorexia and diarrhoea had an even distribution of outcomes or trend towards other outcomes. We can see this in anorexia, sore throat where the trend is towards the same outcome and in headache where the outcomes are nearly equal distributed.

In summary, while certain symptoms tend to be associated with worse outcomes, this is not uniformly the case across all symptoms. It's crucial to take these observations in context with other relevant factors such as the patient's overall health condition, the severity of the disease, and the treatment modalities used. This data alone does not conclusively establish a direct causative link between the presence of a specific symptom and the eventual treatment outcome.

Inferential Findings

Treatment outcome and Statistical Significance of each factor

Table 5, 6 and 7 describes the treatment outcome and statistical significance of each factor (personal factors, comorbidities and symptoms and signs) found in COVID-19 positive patients. In the analysis of treatment outcomes in COVID-19 positive patients following

telemedicine consultation, the results varied across different patient factors. Fisher's exact test was applied for all the findings.

Among all factors, the presence of fever was significantly associated with treatment outcome (p = 0.047). Patients with fever were more likely to have a 'worse' outcome compared to those without fever. However, other factors such as sex, age group, SpO2 level, and all the other factors of COVID-19 positive patients did not exhibit a significant association with the treatment outcome. For instance, presence of sore throat in patients did not have a significant effect on treatment outcomes (p = 0.611), suggesting that both who had sore throat and who did not have responded similarly to the telemedicine consultations. Similarly, patient age also did not significantly affect the outcomes (p = 0.260), implying that the efficacy of telemedicine consultations did not vary significantly across different age groups.

We excluded chronic kidney disease, cancer, immunosuppression and sensorium change from Fisher's test because of there was no COVID-19 positive patient present with those factors.

Table 5: Treatment outcome and Statistical Significance of personal factors (n=172)

Factors among COVID-19 positive patients	Outcome of telemedicine consultation			p- value
	Better (n= 37)	Same (n=61)	Worse (n=74)	
Age (in years)				0.2601
• 0-17	0	0	1	
• 18-49	22	37	51	
• 50-64	13	17	13	
• 65-79	2	5	9	
• 80 and above	0	2	0	
Sex				0.5344
• Male	15	31	38	
• Female	22	30	36	
Obesity				0.1516
• Absent	36	58	74	
• Present	1	3	0	
Smoking behaviour				0.2708
• Absent	36	61	71	
• Present	1	0	3	
SPO2 and hypoxia				0.5738
• Normal	18	33	36	
• Mild hypoxia	8	9	10	
• Moderate hypoxia	1	1	6	
• Severe Hypoxia	1	1	0	
• Unknown	9	17	22	

Table 6: Treatment outcome and Statistical Significance of comorbidities (n=172)

Factors among COVID-19 positive patients	Outcome of telemedicine consultation			p- value
	Better (n= 37)	Same (n=61)	Worse (n=74)	
Diabetes Mellitus				0.5713
• Absent	32	52	67	
• Present	5	9	7	
Hypertension				0.1749
• Absent	28	54	65	
• Present	9	7	9	
Heart disease				0.3961
• Absent	34	55	71	
• Present	3	6	3	
Chronic Lung Disease				0.5698
• Absent	37	60	74	
• Present	0	1	0	
Cerebrovascular disease				0.1697
• Absent				
• Present	37	59	74	
	0	2	0	

Table 7: Treatment outcome and Statistical Significance of symptoms and signs (n=172)

Factors among COVID-19 positive patients	Outcome of telemedicine consultation			p- value
	Better (n= 37)	Same (n=61)	Worse (n=74)	
Fever				0.0471
• Absent	7	25	30	
• Present	30	36	44	
Cough				1.00
• Absent	11	17	21	
• Present	26	44	53	
Sore throat				0.6106
• Absent	32	49	64	
• Present	5	12	10	
Nasal congestion				0.3215
• Absent	31	56	62	
• Present	6	5	12	
Shortness of breath				0.9258
• Absent	32	51	63	
• Present	5	10	11	
Fatigue				0.2016
• Absent	23	48	55	
• Present	14	13	19	
Myalgia				0.7716
• Absent	29	51	59	
• Present	8	10	15	
Headache				0.5455
• Absent	31	55	67	
• Present	6	6	7	
Anorexia				0.2232
• Absent	33	54	71	
• Present	4	7	3	
Nausea and vomiting				0.1739
• Absent	34	60	68	
• Present	3	1	6	
Diarrhea				0.0607
• Absent	32	58	61	
• Present	5	3	13	
Loss of smell				0.9132
• Absent	24	42	50	
• Present	13	19	24	
Loss of taste				1.00
	32	53	65	
	5	8	9	

CONCLUSION

This study examined Myanmar's COVID-19 knowledge and telemedicine use during political and public health instability. The complete study of telemedicine efficacy determinants, including person characteristics, concurrent medical problems, and clinical manifestations, shed light on virtual pandemic management.

Our research showed that telemedicine is used more by younger people and women. To fully utilise telemedicine, all demographic subgroups, especially men and older people, must improve their internet literacy.

Obesity and smoking did not statistically affect telemedicine outcomes. Diabetes, hypertension, and cardiovascular disorders were associated with worse outcomes. The above underlined the importance of customised care solutions for pre-existing medical disorders.

Symptoms affected patient outcomes. Fever correlated with patient outcomes, but cough and sore throat did not, underlining the complexity of the illness and the need for symptom-specific care.

Telemedicine's success in Myanmar's instability is significant. Telemedicine proved its value as a remote COVID-19 management tool despite internet outages and curfews. The presentation showed how technology can overcome geographical and political barriers to provide healthcare.

The study also discussed telemedicine's limitations and ways to improve it, such as bridging the digital divide, overcoming language barriers, and ensuring reliable internet access. Telemedicine would become a long-term solution after the epidemic if these challenges were overcome.

Our study showed the importance of telemedicine in fighting the COVID-19 outbreak in Myanmar, a politically unstable country. Telemedicine can transform healthcare despite its challenges. These discoveries and advances must be used to build a better healthcare system in the future.

LIMITATIONS

The study used telemedicine data, which may not reflect those without digital literacy or technology. This may limit the applicability of findings. Despite attempts to address language obstacles, there may still exist individuals whose linguistic preferences were not accommodated. This constraint has the potential to impact their health-seeking behaviors and treatment outcomes.Patients' self-reported data was used in the study. Patients may have underreported or overreported symptoms or health behaviors, skewing the results. The study captured telemedicine use and outcomes at a specified time. Telemedicine's long-term efficacy and consequences were not tracked. The study examined several key characteristics, although income, education, and occupation were not. These factors may affect telemedicine use and outcomes.

RECOMMENDATIONS

Our study offered insight into Myanmar's telemedicine ecosystem, but it was a snapshot. Telemedicine's effects and efficacy might be better understood with longitudinal studies on the same patients. Telemedicine use, patient use, and political and societal changes could be examined in such studies.

Age, sex, area, and a few clinical characteristics determined telemedicine utilization and outcomes in our study. Future research could examine more social determinants of health. Education, income, and occupation may affect telemedicine use. These factors may affect patients' health outcomes, telemedicine efficacy, and digital literacy.

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WILLINGNESS TO PAY FOR ROTAVIRUS VACCINATION AMONG GUARDIANS OF CHILDREN AGED UNDER 5 YEARS OLD IN VIENTIANE CAPITAL, LAO PDR

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ABSTRACT

Rotavirus is responsible for 56% of all diarrhea cases in children under 5 years, according to estimates in Vientiane, Lao PDR, and the rotavirus vaccine can reduce the burden of infection by 28%. However, factors associated with WTP for this vaccine have remained a concern.

This study aims to determine the willingness to pay (WTP) for rotavirus vaccination and factors associated with WTP among guardians of children aged under 5 years old in Vientiane Capital, Lao PDR.

This quantitative cross-sectional study was conducted among guardians of children under 5 (≥18 years) at Vientiane Capital, Lao PDR. Data was collected by simple random sampling based on a purposive sample hospital-based with a children's ward. A total of 417 completed questionnaires and 322 were analyzed in data analysis. Moreover, a chi-square and multiple logistic regression were performed.

The results found that 70.8% of guardians WTP for rotavirus with the maximum amount of money to pay for the rotavirus vaccine is 300.000 LAK ($17.70) (IQR: $4.22–$56.36). The multiple logistic regression results showed that the number of children in the family (AOR: 0.42, 95% CI: 0.20–0.89), household monthly income (AOR: 0.35, 95% CI: 0.19–0.62) and level attitude toward (AOR: 0.28, 95% CI: 0.16-0.47) were significantly associated with WTP for rotavirus vaccine (p-value < 0.05).

Almost half of the children have rotavirus infection meanwhile, unvaccinated children against rotavirus is high in Vientiane Capital. Thus, based on the WTP, the government can implement the rotavirus vaccination program through appropriate cost sharing options for different income group children.

Keywords: Willingness to pay, Rotavirus Vaccination, Children under 5, Lao PDR

INTRODUCTION

Rotavirus poses a significant health risk to children below the age of five, resulting in substantial morbidity and mortality (1). The primary mode of transmission is through the fecal-oral route, involving direct contact with contaminated objects, surfaces, or food and manifesting clinical symptoms such as watery diarrhea, vomiting, fever, and abdominal pain; in severe cases, children may necessitate hospitalization due to dehydration (2). Alarmingly, in low-income economies, due to dehydration and a lack of medical care, rotavirus can lead to death, making it a major contributor to the high burden of diarrhea (1).

Prior to introduction of the vaccine, it was estimated that globally, rotavirus gastroenteritis caused approximately 450,000 deaths annually in this age group (3). In 2016, rotavirus infection accounted for 258 million cases of diarrhea and 1,537,000 hospitalizations among children under five (4). The burden of rotavirus-related diarrhea remains high in children under five in the Asia-Pacific region (5). The prevalence of the rotavirus infection in Lao PDR is 29 per 100,000 individuals (6). The implementation of vaccines encounters obstacles such as limited surveillance data, safety concerns regarding intussusception, inadequate knowledge about rotavirus disease and vaccines among healthcare professionals, decision-makers, and parents, insufficient cost-effectiveness analyses, and challenges related to vaccine affordability and political support (7). Additionally, poor hand hygiene, exemplified by the lack of soap in hand-washing facilities, has been linked to an increased risk of diarrhea among children under five in Lao PDR (8).

Previous studies conducted in Vientiane Capital revealed that rotavirus was responsible for 54-56% of diarrhea cases in children under five (9). The treatment approach is cost-effective, simple, and accessible (10). However, the effectiveness of treatment may be influenced by socioeconomic factors, such as household income, and the recovery period can be protracted. Fortunately, the availability of rotavirus vaccines presents a promising means to reduce child mortality rates and the burden of hospitalizations among children under five (10).

The WHO recommended the inclusion of rotavirus vaccinations in national immunization programs (NIP) in 2009 (11). However, certain countries, particularly in Asia, have not yet integrated the rotavirus vaccine into their NIP (12); Although NHIB intends to cover all types of vaccine for children under 5 years, the rotavirus vaccine is not included.

In Lao PDR, the estimated incremental cost-effectiveness ratio considering parameter uncertainty and socioeconomic subpopulations is $140/DALY (13). The introduction of a rotavirus vaccine is expected to reduce infant mortality by 28% annually in the country (13). Contingent valuation studies employing the willingness to pay method have been used to estimate the monetary benefits of vaccines, particularly in healthcare research (14). The ability of individuals to pay for the rotavirus vaccine serves as an indicator of its value, facilitating cost-benefit analysis for vaccination programs (14).

The willingness and ability to pay for vaccines vary among countries. Developed countries often assign a higher monetary value to the vaccine compared to its

current price, indicating a net benefit of vaccination programs (15). In contrast, low-income countries tend to place a lower monetary value on the vaccine relative to its actual price. Currently, there is no specific study regarding WTP for rotavirus vaccine in Lao PDR. Hence, examining the affordability and variables impacting payment for rotavirus disease treatment and prevention in urban areas is crucial since the National Health Insurance does not currently cover rotavirus vaccination. It is necessary to assess individuals' WTP and the factors influencing their payment decisions because this information can be utilized as future policy guidance in making decisions related to rotavirus vaccination.

METHODOLOGY

Study design

A quantitative cross-sectional study was conducted in Vientiane Capital, Lao PDR. The study was based on a hospital-based purposive sample with children's wards in four hospitals: Lao-Korea Children Hospital, Mahosot Hospital, Mother and Child Central Hospital, and Setthathirath Hospital. The estimated sample size by Cochran's formula was 417 including 10% non-response rate.

Study population

The guardians who have children under 5 years of age (≥18 years old) were selected from hospital-based children's wards. Out of 417 guardians were contacted for interview through face-to-face interviews; 322 participants who never had rotavirus vaccines were included in the data analysis.

Research instrument

The questionnaire was developed from literature reviews and verified by the three experts with public health backgrounds from AIHD regarding the content. The questionnaire was divided into five sections: 1) socio-demographic characteristics of the guardians, such as age, sex, marital status, education, occupation, household monthly income, and family size; 2) motivation; 3) knowledge; 4) opportunity; 5) willingness and ability to pay for the rotavirus vaccine. Internal consistency of the questionnaire measured by the pre-test showed a Cronbach's alpha value > 0.7.

The conceptual framework for the study was based on Ability-Motivation-Opportunity (AMO) theory. The AMO model is a theoretical framework used to explain and predict human behavior in various contexts, including health behavior, workplace behavior, and consumer behavior. According to the three complements of the AMO model, ability refers to individuals' knowledge, skills, and access to information about vaccines. Motivation refers to an individual's desire or willingness to get vaccinated. Opportunity refers to the availability and accessibility of vaccines.

Data collection procedures

Data collection was conducted after approval by the Ethical Committee of the Mahidol University IRB, with approval number 2023/056.1804. The researcher asked for permission for data collection from the director of hospitals. Next, the questionnaire was distributed to the respondents by the interviewer and recorded on paper based from April to May 2023.

Data analysis

The descriptive analysis was performed to identify socio-demographic factors such as knowledge, motivation, opportunity, willingness, and ability to pay (WTP and ATP). In analyzing the WTP using the open-ended questions, the ATP was calculated using the median cut-off point of the maximum amount of ATP for the rotavirus vaccination. Additionally, the study used a chi-square test to identify the association between the independent variable and the WTP. The variables with a p-value of < 0.25 in the binary logistic regression were selected for the multiple logistic regression to identify the predictors of WTP. A p- value < 0.05 was considered statistically significant.

RESULTS

The guardians who had children under 5 years of age and never got a rotavirus vaccination were 77.2%(Table 1).

Table 1: Frequency and percentage of guardians in the domain

Domain	Frequency	percentage
Had a rotavirus vaccination	95	22.8
Never got a rotavirus vaccination	322	77.2
Total	417	100

Most respondents were female (91.3%) and the average age of the respondents was 30 years, ranging from 18 to 58 years (SD = 6.15) (Table 2). More than 55% of the respondents had monthly income less than or equal to 3 million LAK, the results revealed that 70.8% of guardians of children under 5 years of age were willing to pay (WTP), while the maximum amount of ATP for rotavirus vaccine (2 doses) was 300,000 LAK (17.70 USD).

Table 2: Frequency and percentage of guardian's variables (n=322)

Variables	Frequency	Percentage
socio-demographic factors		
Age group (year)		
≤ 30	186	57.8
> 30	136	42.2
Mean=30.16, SD=6.15, Min=18, Max=58		
Sex		
Female	294	91.3
Male	28	8.7
Marital Status		
single	1	0.3
Married	318	98.8
Widowed	3	0.9
Relationship with children		
Mother	288	89.4
Father	28	8.7
Caretaker	5	1.6
Other	1	0.3
Education		
Primary school	12	3.7
Lower secondary school	30	9.3
Upper secondary school	80	24.8
Vocational education	77	23.9
Bachelor's degree	114	35.4
Graduate and above	9	2.8
Occupation		
No job	8	2.5
Private employee	48	14.9
Government employee	53	16.5
Labor	28	8.7
Housewife	78	24.2
Farmer	8	2.5
Vender	92	28.6
Other	7	2.2

Variables	Frequency	Percentage
Family Size		
≤ 4	204	63.4
> 4	118	36.6
Mean=4.36, SD=1.57, Min=1, Max=11		
Number of children under 5 in the family		
1	240	74.5
2	78	24.2
3	4	1.2
Household monthly income		
≤ 3 million LAK	182	56.5
> 3 million LAK	140	43.5
Median=3,000,000, QD=1,250,000, Min=1,000,000, Max=70,000,000		
Motivation factors		
Level of perceived susceptibility of rotavirus infection		
Poor Perception	191	59.3
Good Perception	131	40.7
Mean=3.16, SD=1.12, Min= 0, Max= 5		
Level of attitude toward rotavirus vaccine		
Poor Perception	214	66.5
Good Perception	108	33.5
Median=18, QD: 0.5, Min= 11, Max=25		
Knowledge factors		
Level of knowledge of rotavirus and vaccine		
Good	197	61.2
Moderate	69	21.4
Poor	56	17.4
Mean= 17.47, SD=4.35, Min=6, Max=22		
Opportunity factors		
the health care facilities they provide the rotavirus vaccine		
No	171	53.1
Yes	151	46.9

Variables	Frequency	Percentage
Distance from house to health care facilities nearest that they provide the rotavirus vaccine		
≤8	172	53.4
>8	150	46.6
Median=8, QD= 2.25, Min=0, Max=100		
Allocate time to tasking vaccine		
No	29	9.0
Yes	293	91.0
Source information about the rotavirus vaccine		
Family	30	9.3
Neighbor	55	17.1
Friends	71	22.0
Other (Doctor, nurse, pediatrician)	166	51.6
Encourage to get the rotavirus vaccine		
Family	36	11.2
Neighbor	69	21.4
Friends	53	16.5
Other (Doctor, nurse, pediatrician)	164	50.9
WTP and ATP		
WTP for rotavirus vaccine (2 doses)		
No	94	29.2
Yes	228	70.8
Maximum amount of ATP for rotavirus vaccine (2 doses)		
≤300,000 LAK (17.70 USD)	193	59.9
>300,000 LAK (17.70 USD)	129	40.1
Median=300,000, QD=300,000, Min=0, Max=1,500,000		

The results in table 3 showed the final model of multiple logistic analysis which have three independent variables significantly associated with WTP for the rotavirus vaccine (p-value <0.05). The number of children under 5 in the family (AOR: 0.42, 95% CI: 0.20-0.89), Household monthly income (AOR: 0.35, 95% CI: 0.19-0.62), and level of attitude toward rotavirus vaccine (AOR: 0.28, 95% CI: 0.16-0.47).

Table 3: Predictors of statement association between independent variables and WTP for rotavirus vaccine by multiple logistic regression

Independent Variables	Willingness to pay	
	AOR (95% CI)	P-value
Number of children under 5 in the family (>1=Ref)		
≤ 1	0.42 (0.20, 0.89)	0.02
Household monthly income (>3 million LAK =Ref)		
≤ 3 million LAK	0.35 (0.19, 0.62)	<0.001
Level of attitude toward rotavirus vaccine (Poor perceived= Ref)		
Good perceived	0.28 (0.16, 0.47)	<0.001

DISCUSSION

This study aimed to determine the ability to pay for rotavirus vaccination among guardians of children under 5 years of age and to identify associated variables with the willingness to pay (WTP) for rotavirus vaccine. The study found that 77.2% of the guardians had never received a rotavirus vaccination for the children. These results indicate a low overall vaccination coverage in the target population. Thus, it is necessary to improve vaccine uptake and increase awareness of the importance of rotavirus vaccination (16). In the assessment of the

Guardians children under 5 years of age, the result show that 70.8% of the samples willing to pay for rotavirus vaccine and the maximum amount of ability to pay was approximately 300,000 LAK (17.70 USD). In Nigeria, the childbearing mothers demonstrated strong acceptance and willingness to pay (82.2%) out of their own pockets for the rotavirus vaccine (17). Dias-Godói et al (2022) assessed acceptability and willingness to pay for vaccine in Brazil, 50% of the interviewees were willing to pay (18). Further, these findings suggest that there is a willingness to pay for vaccines against various infectious diseases and caregiver has different preferences regarding the amount of money to pay for the vaccines.

Socio-demographic factors might influence the willingness to pay for rotavirus vaccination. In this study, the majority of respondents were female, highlighting the role of mothers as primary caregivers and decision-makers regarding their children's health. This finding aligns with existing literature that emphasizes the influence of maternal factors on childhood immunization. Furthermore, the average age of respondents was 30 years, reflecting the younger age group commonly associated with having children under 5 years old. Meanwhile, age, sex, marital status, relationship with children in this study has no significant association with WTP which in line with previous study that revealed there was no significant association between key findings with ATP and WTP for the vaccine (19).

It found that the education, occupation and family size were not significantly associated with WTP, on the contrary, previous study found that those variables were associated with WTP. Ajagu et al (2022) found that education was significantly associated to the awareness of rotavirus infection and its symptoms, and has associated with WTP for Rotavirus Vaccine in Nigeria (17). The study found that more than half of respondents had a monthly income of less than or equal to 3 million LAK. The median cutoff point for monthly income is then used to divide the two groups for analysis. This finding indicates that the respondent face financial challenges and potential barriers to access vaccines. Lower income has been consistently identified as a hindrance to vaccine uptake in numerous studies so that interventions should be focused on the group who has poor financial accessibility. In China, the reason for parents' WTP because of the parents believe that vaccine is of high value in preventing diseases infection (20).

The study identified the number of children under 5 in the family as a significant predictor of WTP for the rotavirus vaccine. The greater the number of children under 5 in the family, the lower willingness to pay. This finding suggests that guardians with larger families may face additional financial constraints when considering vaccination expenses. These findings are consistent with previous research highlighting the economic burden of vaccinating multiple children and the need to provide affordable vaccination options for families with multiple dependents (15).

Another influential factor on WTP was the level of attitude toward the rotavirus vaccine. Guardians with a positive attitude demonstrated a higher likelihood of expressing willingness to pay for the vaccine (21). This underscores the importance of addressing vaccine hesitancy and misconceptions surrounding rotavirus vaccination. Efforts to improve knowledge, highlight the benefits of vaccination, and enhance trust in the vaccine's safety and efficacy are crucial for promoting positive attitudes and increasing vaccine acceptance.

As the recommendation, improving rotavirus vaccine uptake can be done as a strategy which should focus on addressing financial barriers, particularly for guardians with lower incomes and larger families. Enhancing the understanding and knowledge of rotavirus vaccination benefit should be prioritized to improve guardian's attitudes and perceptions. In terms of future research, diverse populations to validate the identified predictors of WTP and longitudinal studies exploring the impact of interventions targeting knowledge, attitudes, and financial accessibility should be done to assess the effectiveness of strategies aimed at improving rotavirus vaccine uptake.

The limitations of the study where the research was conducted within a specific geographical region and with a relatively small sample size, which may limit the generalizability of the findings. Therefore, the results may not fully represent the socio-demographic characteristics, knowledge, attitudes, and willingness to pay of guardians in other areas of Lao PDR.

CONCLUSION

In conclusion, the study highlights the low vaccine coverage and the significant influence of socio-demographic factors and attitudes on the willingness to pay for rotavirus vaccination. Addressing financial

barriers, improving knowledge, and fostering positive attitudes are crucial for promoting vaccine acceptance and achieving higher coverage rates among guardians of children under 5 years of age. At prices lower than the profile price, there was a considerable increase in willingness to purchase the vaccine. As a result, policymakers should consider price sensitivity before establishing the price of the vaccination. Thus, based on the ability to pay, the government can implement the rotavirus vaccination program through appropriate cost sharing options for different income group children.

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FACTORS ASSOCIATED WITH ASYMPTOMATIC MALARIA INFECTION AMONG RESIDENTS IN NGA PYIN INN RURAL HEALTH CENTER, MYANMAR

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ABSTRACT

Although efforts and implementations of control campaigns on malaria have been made, it remains a substantial public health concern in the Greater Mekong Subregion (GMS). The prevalence of asymptomatic infections may contribute to the persistence of malaria. Asymptomatic malaria infections pose a considerable public health obstacle in eliminating malaria from the GMS, especially since they cannot be detected by routine diagnostic methods like microscopy and rapid diagnostic tests (RDTs). Therefore, this study aimed to identify asymptomatic malaria and its associated factors among the residents in low malaria-endemic villages using the gold-standard polymerase chain reaction (PCR) method. Therefore, the main objective of the study was to determine the prevalence and identify associated factors of asymptomatic malaria infection among residents in Nga Pyin Inn Rural Health Center, Singu Township, Myanmar in 2018

Secondary data analysis was used from the "New surveillance tool for malaria elimination in Myanmar" study, conducted from February to December 2018. A total of 3,433 participants were obtained from the primary survey in which a multi-stage sampling technique was applied. Asymptomatic malaria was identified from filter paper blood samples using the ultrasensitive polymerase chain reaction (usPCR). Descriptive statistics, the Chi-square test, and multiple logistic regression were used to identify the statistically significant factors related to asymptomatic malaria. The prevalence of asymptomatic malaria infection was confirmed to be 0.8% through usPCR. Plasmodium vivax infection accounted for most (69.2%) of these infections. The variables 'type of occupation', 'attending crops/farming' and 'trips to forest' were associated with asymptomatic malaria infection in the Chi-square test. However, multiple logistic regression indicated that only 'trips to the forest' [AOR=2.80, 95%CI=1.21-6.47, P=0.016] had a significant association with asymptomatic malaria infection.

Based on the evidence from this study, forest workers present a significant risk group for asymptomatic malaria infection in Myanmar. As such, the 'National Malaria Control Program in Myanmar' should prioritize interventions among forest workers. This could substantially contribute to the country's malaria elimination efforts, reducing the burden of malaria on vulnerable populations and preventing its further transmission.

Keywords: Asymptomatic infection, ultrasensitive polymerase chain reaction, prevalence, malaria, Myanmar

INTRODUCTION

Malaria is a dangerous and infrequently fatal disease caused by *Plasmodium* parasites transmitted to humans by the bites of infected female *Anopheles* mosquitos (1, 2). Globally, there were approximately 241 million malaria cases in 85 malaria-endemic countries in 2020, up from 227 million in 2019 (mainly in the African Region). Malaria fatalities, on the other hand, declined progressively from 896,000 in 2000 to 558,000 in 2019. Malaria cases in South-East Asia have reduced by 78%, from 23 million in 2000 to around 5 million in 2020, while malaria fatalities have decreased by 75%, from approximately 35,000 in 2000 to 9,000 in 2020 (3).

In Myanmar, malaria mortality (62% reduction from 37 in 2015 to 14 in 2019) and morbidity (incidence decreased by 72% from 3.60 per 1,000 people in 2015 to 1.01 per 1,000 population in 2019) are on a downward trend. Malaria morbidity and mortality in Myanmar have decreased due to increased access to early diagnosis and effective treatment (4), as well as the free provision of malaria testing and treatment in all public health institutions and the community. The country distributes long-lasting insecticide-treated nets, the national malaria program, and partners (4). Malaria prevalence in Singu Township dropped (0.1%) in 2019 compared to 2015 (0.5%) (5). Singu Township is located in the Mandalay Region, one of the malaria elimination target states/regions with the lowest malaria load (6).Research done in Laiza City in 2011-12 found that malaria infection was associated with younger age groups, males, soldiers, and a history of prior malaria infection (7). Another research conducted in communities and IDP camps in Laiza Township in 2015 mentioned that men, younger age groups, not sleeping beneath bed nets, no use of IRS, living in wood or bamboo homes, and living distant from the nearest clinic were risk factors for asymptomatic malaria (8). In Vietnamese research, forest workers, a history of fever, a history of malaria infection, and treatment were associated with malaria cases (9).

Antimalarial drug resistance has increased in the Greater Mekong Subregion during the last ten years, posing a threat to worldwide malaria reduction efforts (1). *P. falciparum* genetically determined artemisinin resistance initially found at the Thailand-Myanmar border in 2004, and it has since increased dramatically (10). Furthermore, *P. falciparum* infections are said to have evolved artemisinin resistance in southern Myanmar (11).

Malaria has three types of clinical presentation: asymptomatic, uncomplicated or mild, and severe (12). Asymptomatic malaria infection is increasingly a significant public health issue. Microscopy and RDT cannot identify this sort of infection. Furthermore, malaria transmission may still occur due to this (13, 14).

As a result, molecular diagnostic tools (PCR technique) can be utilized to identify asymptomatic cases for malaria elimination initiatives (13).

Eliminating P. falciparum from the GMS is likely the only way to halt the spread of multidrug resistance and avoid the emergence of untreatable malaria. Adequate malaria case-based surveillance and investigation are required to achieve elimination. Myanmar intends to eliminate Plasmodium falciparum malaria by 2025 and all malaria by 2030 (6). As conventional RDT sensitivity is insufficient to identify low-density

malaria (15), this study uses the gold standard PCR method to determine the prevalence and identify associated factors of asymptomatic malaria infection among residents in Nga Pyin Inn Rural Health Center, Singu Township, Myanmar, in 2018.

METHODOLOGY

Research Design

This is a secondary data analysis of data from the "New surveillance tool for malaria elimination in Myanmar" research. The latter was a cross-sectional observational study funded by the Bill & Melinda Gates Foundation to provide evidence of the prevalence and distribution of sub-patent malaria infection and examine the feasibility of innovative molecular surveillance tools.

Study Area

The study data were collected in Singu Township, in Mandalay Region, one of Myanmar's target states/regions for malaria elimination. The data from Singu township were collected from 18 villages belonging to 12 Sub-Centers (SC) and 'Nga Pyin Inn' Rural Health Center (RHC).

Study Population

The population for this study was the residents of 18 selected villages included in the malaria high-risk stratum in Singu Township, Mandalay Region, Myanmar. In general, the total population of Singu Township was approximately 149,099 in 2018, and the total population of 18 selected villages was 9,696 (5).

Sample Size

The total sample obtained from the original cross-sectional study was 3,435 participants from 18 villages in Singu Township in 2018. After eliminating participants with missing outcome data, only 3,433 participants remained for this secondary data analysis.

Sampling Technique

In the primary study, multi-stage sampling was used as a sampling technique with three steps. In step one, villages were selected with the help of the Vector-Borne Disease Control (VBDC) Team, and the sample size per village was determined. In step two, the household selection was conducted using the household list as a sampling frame. In step three, participants were randomly selected using the "Random Order" mobile application. For this secondary data analysis, all participants from the data collection in Singu Township were included except those with missing outcome data.

Study Period

This study lasted from October 2022 through June 2023. The initial project's research period lasted from February through December of 2018.

Measurement Tools and Data Collection

A structured questionnaire was developed for data collection in the "New surveillance tool for malaria elimination in Myanmar" study. The face-to-face interview using a structured questionnaire was conducted in the primary research after obtaining the signed informed consent from participants.

Data Analysis

Double data entry and validation were performed using EpiData 3.1 software. In this study, data were cleaned and analyzed using Stata 16 software. The prevalence of malaria infection among participants in Singu Township was calculated as the number of PCR-positive samples divided by the total number of samples tested

successfully in 2018. For descriptive statistics, frequency and percentage were presented for categorical variables, and mean and standard deviation (SD) for numerical variables. Bivariate analysis using the Chi-squared test was conducted to determine the association between independent variables and dependent variable. Regarding multivariable analysis, logistic regression was performed since the type of the dependent variable was categorical data. The risk factors of asymptomatic malaria infection were determined. A p-value less than 0.05 was considered statistically significant. The adjusted odds ratio (AOR) and 95% confidence interval (CI) were reported.

Ethical Consideration

This study was submitted to the Research Ethics Review Committee for Research Involving Human Research Participants, Group 1, Chulalongkorn University, for ethical review, and the certificate of approval (COA No. 106/66) was received from that committee on 22 May 2023. The ethical approval for the original study was obtained from the Institutional Review Board (IRB), Duke University Health System, USA, and Institutional Review Board (IRB), Department of Medical Research, Myanmar. For this study, the participants' information was kept confidential by using the ID code for each participant, and the study data were held on the password-protected laptop.

RESULTS

In this study, the total number of study participants was 3,433. This study's outcome or dependent variable was asymptomatic malaria infection by usPCR result. Table 1 displays the prevalence of asymptomatic malaria infection by usPCR. The total number of usPCR-positive participants was 26, and the prevalence of usPCR-positive was 0.76%. Among the usPCR-positive participants, *Plasmodium vivax* was the most commonly found malaria parasite (69.2%).

Table 1: Prevalence of asymptomatic malaria infection by usPCR

Type of Malaria Parasites	Number N=3433	Percentage
All positive	26	0.76
Pf Positive	7	0.20
Pv Positive	18	0.52
Mixed Positive	1	0.03

Table 2 describes the descriptive analysis of factors potentially associated with asymptomatic malaria by usPCR among residents in 'Nga Pyin Inn' Rural Health Center. More than half of the participants were young persons (16-30 years old) (27.2%) and children (under 16 years old) (26.9%). Among all participants, female participants (55.7%) were more than males. Regarding 'type of occupation', more than half of the participants (59.8%) had an indoor occupation. Concerning 'mosquito exposure' activities, nearly one-fourth of the participants (23.3%) attended crops or farming, only 7% of the participants worked at plantations, and about one-fifth of the participants (19.4%) did household chores that involved trips to forest in last three months. The majority of participants slept under a mosquito net last night (88.4%) and used mosquito net regularly (89.8%). Almost all participants (97.4%) answered they did not receive a malaria test in the past two months.

Table 2: Descriptive analysis of factors potentially associated with asymptomatic malaria by usPCR among residents in 'Nga Pyin Inn' Rural Health Center (N=3433)

Variables	Number N=3433	Percentage
Age Group		
Under 16	924	26.9
16 to 30	935	27.2
31 to 45	758	22.1
46 to 60	575	16.8
61 and above	241	7.0
Age (mean (SD))	30.6	18.71
Gender		
Female	1913	55.7
Male	1520	44.3
Type of occupation		
Indoor occupation	2053	59.8
Outdoor occupation	1380	40.2
Mosquito exposure		
Attending crops/farming		
No	2634	76.7
Yes	799	23.3
Working at plantations		
No	3195	93.1
Yes	238	6.9
Trips to the forest		
No	2767	80.6
Yes	666	19.4
Utilization of mosquito net		
Sleeping under a mosquito net last night		
No	345	10.1
Yes	3034	88.4
Using mosquito net regularly		
No	297	8.7
Yes	3082	89.8
Received malaria test and test results in the past two months		
Not receiving	3345	97.4
Receiving a test with a negative result	81	2.4
Receiving a test with a positive result	2	0.1

Table 3 demonstrates the bivariate analysis of factors potentially associated with asymptomatic malaria by usPCR among residents in 'Nga Pyin Inn' Rural Health Center. The chi-squared test was conducted to determine the association between independent and dependent variables (PCR results of asymptomatic malaria infection). Among independent variables, "type of occupation" (p-value=0.001), "attending crops or farming" (p-value=0.006), and "trips to forest" (p-value<0.001) were significantly associated with the dependent variable.

Table 3: Bivariate analysis of factors potentially associated with asymptomatic malaria by usPCR among residents in 'Nga Pyin Inn' Rural Health Center (N=3433)

Factors from Socio-demographic characteristics	usPCR		p-value (Pearson Chi-square)
	Positive n (%) N = 26	Negative n (%) N = 3407	
Age Group			0.096*
Under 16	3 (11.5)	921 (27.0)	
16 to 30	8 (30.8)	927 (27.2)	
31 to 45	5 (19.2)	753 (22.1)	
46 to 60	9 (34.6)	566 (16.6)	
61 and above	1 (3.9)	240 (7.0)	
Gender			0.075*
Female	10 (38.5)	1903 (55.9)	
Male	16 (61.5)	1504 (44.1)	
Type of occupation			**0.001****
Indoor	7 (26.9)	2046 (60.1)	
Outdoor	19 (73.1)	1361 (39.9)	
Attending crops/ farming			**0.006****
No	14 (53.9)	2620 (76.9)	
Yes	12 (46.1)	787 (23.1)	
Working at plantations			0.089*
No	22 (84.6)	3173 (93.1)	
Yes	4 (15.4)	234 (6.9)	
Trips to forest			**<0.001*****
No	13 (50.0)	2754 (80.8)	
Yes	13 (50.0)	653 (19.2)	
Sleeping under mosquito net last night			0.382
Yes	22 (84.6)	3012 (89.8)	
No	4 (15.4)	341 (10.2)	
Using mosquito net regularly			0.619
Yes	23 (88.5)	3059 (91.2)	
No	3 (11.5)	294 (8.8)	
Received malaria test and test results in the past 2 months			0.876
Not receiving	25 (96.2)	3320 (97.6)	
Receiving test with negative result	1 (3.8)	80 (2.3)	
Receiving test with positive result	0 (0.0)	2 (0.1)	

*p<0.2, **p<0.05, ***p<0.001

Table 4 shows a multivariable analysis of factors potentially associated with asymptomatic malaria infection among residents in 'Nga Pyin Inn' Rural Health Center. Participants who took trips to the forest had 2.8 times higher odds of asymptomatic malaria infection than those who did not [AOR=2.8, 95%CI=1.21-6.47, p-value=0.016] when all other independent variables are held constant.

Table 4: Multivariable analysis of factors potentially associated with asymptomatic malaria infection among residents in 'Nga Pyin Inn' Rural Health Center

Potential risk factors	AOR	95% CI		p-value
		Lower	Upper	
Age group				
61 and above	1			
Under 16	1.02	0.10	10.32	0.989
16 to 30	1.24	0.15	10.42	0.842
31 to 45	0.97	0.11	8.63	0.975
46 to 60	2.57	0.32	21.04	0.379
Gender				
Female	1			
Male	1.47	0.64	3.37	0.368
Type of occupation				
Indoor	1			
Outdoor	2.06	0.68	6.29	0.203
Attending crops/farming				
No	1			
Yes	1.32	0.56	3.15	0.528
Working at plantations				
No	1			
Yes	1.33	0.43	4.08	0.621
Trips to forest				
No	1			
Yes	2.80	1.21	6.47	**0.016****
Sleeping under mosquito net last night				
Yes	1			
No	1.60	0.30	8.56	0.582
Using mosquito net regularly				
Yes	1			
No	0.72	0.11	4.77	0.735
Receiving malaria test and test results in the past 2 months				
Not receiving	1			
Receiving test with negative result	1.72	0.22	13.16	0.604
Receiving test with a positive result	-	-	-	-

AOR=adjusted odds ratio, CI=confidence interval, **p<0.05 Pseudo R2 = 0.0798 = 7.98%

DISCUSSION

The prevalence of asymptomatic malaria infection was investigated using ultrasensitive polymerase chain reaction (usPCR). The findings revealed a relatively low overall prevalence of 0.76% among the study participants compared with other studies (8, 16). Notably, *Plasmodium vivax* emerged as the most frequently detected malaria parasite, accounting for 69.2% of the usPCR positive cases. These findings highlight the importance of recognizing asymptomatic individuals as possible reservoirs for malaria transmission, particularly with the predominance of *P. vivax*. This emphasizes the need for targeted interventions to control and eliminate malaria in affected regions effectively.

This study emphasizes critical demographic characteristics of the study population. The findings indicate that a substantial number of participants consisted of young individuals aged between 16 and 30 (27.2%) and children under 16 (26.9%). Additionally, the study observed a higher representation of female participants (55.7%) than males. Male sex and age 15-19 years were associated with a greater chance of asymptomatic malaria parasitemia in research done in northwest Ethiopia (17). In terms of occupation, the majority of participants (59.8%) were engaged in indoor work. According to Indonesian research, military personnel, forest workers, and miners are at a greater risk of contracting imported malaria (18). These demographic patterns shed light on potential risk factors associated with asymptomatic malaria infection, implying that targeted interventions should take the specific age groups, gender distributions, and occupational settings into account to prevent and control malaria transmission within these populations effectively.

This study also provides insights into various aspects related to mosquito exposure and preventive measures. According to the findings, many participants were involved in activities associated with mosquito exposure, such as attending crops or farming (23.3%) and working at plantations (7%). Furthermore, a sizable proportion of participants reported engaging in household chores, including forest trips in the past three months (19.4%). These activities often involve spending extended periods outdoors, increasing the risk of exposure to malaria-carrying mosquitoes (19, 20). However, most participants reported positive behavior regarding malaria prevention, as they slept under mosquito nets the previous night (88.4%) and used mosquito nets regularly (89.8%). Promoting regular and frequent use of mosquito nets throughout the year is crucial in reducing asymptomatic malaria infection and the overall burden of the disease (21, 22). Surprisingly, a high percentage of participants (97.4%) stated that they had not received a malaria test in the past two months. These findings underscore the importance of targeted interventions focusing on individuals involved in mosquito-exposure activities and enhanced access to regular malaria testing to effectively detect and treat asymptomatic malaria cases in the community.

Bivariate analysis employing the Chi-squared test revealed that some independent variables had significant relationships with the dependent variable. The "type of occupation," "attending crops or farming," and "trips to the forest" were identified as statistically significant variables

associated with asymptomatic malaria infection. These findings show that occupation and participation in farming and forest expeditions may increase the likelihood of asymptomatic malaria infection in the study population. To mitigate this risk, individuals involved in these activities should be urged to use insecticide-treated bed nets, mosquito repellents, and other preventative measures (23).

The study's findings from the multivariable analysis show a significant association between going to the forest and the risk of asymptomatic malaria infection. This finding emphasizes the significance of forest-related activities as a possible risk factor for developing asymptomatic malaria. It implies that preventive measures aimed at people taking part in forest trips, such as the correct use of mosquito repellents and bed nets, might be critical in lowering the burden of asymptomatic malaria infection in the study population (23).

CONCLUSION

Finally, this study provides valuable insights into the factors associated with asymptomatic malaria in the studied population. Plasmodium vivax was shown to be the most frequent malaria parasite among asymptomatic malaria infections identified by ultrasensitive polymerase chain reaction (usPCR). Furthermore, age and gender distribution, as well as occupational variables, were found as possible contributors to asymptomatic malaria infection. The study emphasizes the importance of forest trips as a risk factor, with individuals who went on such trips having significantly higher odds of contracting asymptomatic malaria. These findings highlight the necessity of targeted interventions, such as malaria testing, mosquito control measures, and preventative education, particularly for persons involved in forest-related activities. Considering these variables is crucial in attempts to control and reduce the burden of asymptomatic malaria infection in the study population and similar contexts for malaria elimination.

RECOMMENDATION

Several recommendations may be made based on the key findings of this study to address and decrease the risk of asymptomatic malaria effectively. Firstly, targeted interventions should be established to address the identified high-risk groups, such as young people and children। Secondly, individuals involved in employment involving forest visits and farming activities should be encouraged to take preventative measures since they were significantly associated with asymptomatic malaria infection. This might include encouraging people to use mosquito nets, repellents, and proper clothing for protection regularly and consistently. Improving access to frequent malaria testing for the general population, particularly those at higher risk, is also essential to early diagnosis and treatment of asymptomatic cases. Finally, health education programs targeting high-risk populations and the general community should be designed and executed to promote knowledge about risks and preventative actions related to asymptomatic malaria. It is conceivable to reduce malaria transmission and the burden of asymptomatic infections in the research region and similar settings by applying these suggestions.

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BURNOUT AND ASSOCIATED FACTORS AMONG NURSES IN CENTRAL DIVISION, FIJI DURING COVID-19 PANDEMIC

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ABSTRACT

Burnout is a global occupational health problem which is a concern. Burnout is impacting staff welfare, management cost, and quality of patient care. During the COVID-19 pandemic, healthcare professionals who worked on the frontline of patient care have led to increased psychological distress. Nurses are challenged with carrying out immense work, not only in increased volume and intensity but also coping with the new regulations, especially in Fiji where the number of nurses is limited. This study aimed 1) to investigate the prevalence of burnout among nurses in central division of Fiji during the COVID-19 pandemic and 2) to find the factors associated with burnout among nurses in Fiji.

A cross-sectional study involving 20 - 60 years old nurses from hospital and public health settings in the central division of Fiji. A self-reported online questionnaire in English was used to collect data on demographics, lifestyle factors, work factors, COVID-19 exposure during pandemic, and burnout measure using the 19-item full Copenhagen Burnout Inventory (CBI). Data analysis was performed using SPSS 28.0.

A total of 170 responses were received, where 27(15.9%) males and 143 (84%) females. Public health nurses were 96 (56.5%) and hospital nurses were 74 (43.5%). The average age of respondents was 35.95$\pm$7.17 years. The prevalence of burnout by each subscale in CBI were 62.4% in personal burnout, 64.1% for work-related burnout and 22.9% in client-related burnout. In general, there is 53.8% burnout in central nurses. The factors significantly associated for burnout $p<.001$ were age, sleep disorders, perceived workload and teamwork while at level of $p<.05$, marital status, rest hours, physical activity, and shift hours were associated.

The study highlights the need for targeted interventions and support systems to address burnout among nurses. The findings also provide for future research and offer suggestions for improving nursing practice and promoting effective workplace by improving work environment.

Keywords: Nurses, Burnout, COVID-19 Pandemic, Fiji.

INTRODUCTION

Nurses by their nature, the sense of responsibility during pandemic or epidemic, is heightened due to their dedication, commitment to the profession, and personal sacrifice (1). World Health Organization (WHO) declared coronavirus disease 2019 a pandemic on 11 March 2020. Around the globe, nurses are burdened with substantial number of deaths, infection and socio-economic disruptions (2) increasing their vulnerability to occupational burnout due to high adversities, workload, and stress (3).

Burnout is an occupational phenomenon as identified by the World Health Organization in the 11th Revision of the International Classification of Diseases (ICD-11) , a syndrome resulting from chronic exposure to workplace stress that has not been successfully managed. (4). The three dimensions of burnout by Copenhagen Burnout Inventory are: (i) personal burnout- Personal burnout is a state of prolonged physical and psychological exhaustion.(ii) work-related burnout- is a state of prolonged physical and psychological exhaustion, which is perceived as related to the person's work.(iii) is a state of prolonged physical and psychological exhaustion, which is perceived as related to the person's work with clients/patients (5).

Burnout has not been reported among nurses in Fiji according to the search engines PubMed, Scopus, Science Direct and Google Scholar. However, one study among surgeons had revealed significant burnout. Nurses play a crucial role in providing healthcare services, especially during the challenging times of pandemic. The demanding nature of their work, combined with the unprecedented circumstances can contribute to significant levels of burnout, psychological pressure, or even mental illness. Few factors found to be associated with development of burnout in nurses in other countries are age, and years of experience (6), excess workload and extended shifts (7), lack of social support and direct contact with COVID-19. Other individual factors include gender, age, and marital status (8).

This research studied on burnout and its associated factors among nurses working in public health and hospital settings in the Central Division of Fiji during the COVID-19 pandemic. Nurses were at the forefront of managing the healthcare needs of the population, it was essential to investigate the prevalence of burnout and identify the associated factors affecting nurses in both public health and hospital settings. *There is two domains of nurses in Fiji, namely public heath that works in community setting to provide preventative care to individual and community while hospital nurses look after in-patients or those admitted under care (curative services).*This research sought to understand the extent of burnout experienced by nurses, explored the factors contributing to its development, and identified potential strategies to mitigate burnout and enhance the well-being of nurses in this challenging environment. *Also compare if there is any different burnout among the two group of nurses*. By addressing this problem, healthcare organizations and policymakers can develop targeted interventions to support nurses and improve their overall job satisfaction, retention, and quality of patient care.

METHODOLOGY

This study was a cross-sectional study conducted during month of June 2023 among nurses who were working in central division of Fiji, extending from Navua to Korovou medical area. All

nurses were recruited to this study using snowball sampling method following inclusion criterias; working for Fiji MHMS *in central division during COVID 19 pandemic*, aged between 20-60 years, licensed, had internet access and willing to participate.

The online questionnaire was developed using Kobo Toolbox. First part, self-reported questionnaire was used to collect personal information, lifestyle factors, work factors, and covid 19 factors. In second part, a full 19 -item Copenhagen Burnout Inventory (CBI), a standardized tool was used to measure burnout. *It is divided into three subscale and has 19 questions on a 5 point likert scale. Score ranging from 0 – 100, where always is 100 and 0 is never. The average of all score is than categorise as 0-50 No-burnout and score > 50 is Burnout (9).The participant information on questionnaire specified to nurses to fill the survey in context of COVID 19 pandemic experience.* CBI has been used in various social science research, validated and reliable tool(5).

For data analysis, K-S test was used to test the normal distribution of continuous data. Descriptive statistics was used to analyze data such as mean, median, standard deviation for the continuous variables. Varaible were than categorized into dichotomous variables for statistical analysis using chi-square.

This study was approved by the Fiji Human Health Research and Ethics Review Committee Ref No. 14/2023 for data collection.

RESULTS

A total of 170 responses were received, where 27 (15.9%) males and 143 (84%) females. Public health nurses were 96 (56.5%) and hospital nurses were 74 (43.5%). The average age of respondents was 35.95±7.17 years therefore age was categorized into ages below 36 years and age above 36 years respectively. There were 99(58.2%) below 36years and 71(41.8%) above the age of 36. A high proportion of nurses have bachelor's degree 117(68.8%)and 53(31.2%) had some postgraduate and master's degree. Less survey participants were single 30(17.6%)and high number were married n divorced, 140(82.4% . The annual income of nurses were categorized using mean salary in US dollars is shown in table 1. For underlying disease, 24 (14.1%) suffered from some medical condition while 145 (85.9%) did not have a disease. The lifestyle factors of nurses reveal, not many are smokers, 112(65.9%) never smoked, while 58(34.1%) currently smoke. Alcohol consumption is 94(55.3%) drinkers and 76(44.1%) don't take alcohol. Many nurses seem to have adequate rest of 6-8 hours, 118(69.4%) but 52(32.6%) have inadequate rest.

Table 1: Characteristic of Respondent (N=170)

Variable	%(n)
Age	
Below 36 years	58.2(99)
Above 36years	41.8(71)
Mean ($\bar{x}$ ±SD)	35.95 ±7.1
Min	24
Max	55
Sex	
Male	15.9(27)
Female	84.1(143)
Ethnicity	
Itaukei	58.8(100)
FID &Others	41.2(70)
Marital Status	
Single	17.6(30)
Married &Divorced	82.4(140)
Education	
Bachelor's Degree	68.8(117)
Post Graduate Course	31.2(53)
Annual Income (USD)	
Below 13000USD	60.6(103)
Above 13000USD	39.4(67)

Characteristics of Work Factors

Public health nurses were 96 (56.5%) while hospital nurses were 74 (43.5%). Details below in table 2.

Table 2: Description *of Work factors(N=170)*

Variable	%(n)
Work Domain	
Hospital Nurses	56.5(96)
Public Health	43.5(74)
Perceived Workload	
Average/Fair Workload	31.2(53)
Heavy Workload	68.8(117)
Shift Hours	
8 hours	57.1(97)
12 hours	42.9(73)
Work Hours/Fortnight	
74 hours	44.1(75)
>74 Hours	55.9(95)
Team Leader Support	
Yes	53.5(91)
No	46.5(79)
Teamwork	
Yes	58.8(100)
No	41.2(70)

Characteristics of COVID 19 Factors

Among COVID 19 factors, 100% respondents were fully vaccinated with more than 2 doses as it was mandatory for practice. However, infection rate among nurses was high.

Table 3: Characteristics of COVID Factors

Variable	%(n)
Vaccination	
2 Doses	25.9(44)
>2 Doses	74.1(126)
Mental Health Issues	
Yes	33.1(57)
No	66.9(113)
COVID Infection	
Yes	76.5(130)
No	23.5(40)
Covid-19 Care	
Yes	34.1(58)
No	65.9(112)
Difficulty Social distancing	
Yes	87.1(148)
No	12.9(22)

Statistical Analysis

The chi-square significance test was used for statistical analysis. The Kolmogorov–Smirnov test was used to check the normal distribution of the sample. The significant different burnout between the public health and hospital nurses were also tested with chi-square. The results of the normality test using the Kolmogorov-Smirnov test, p value was > 0.05, suggesting sample data was normally distributed. Therefore, rejected the null hypothesis. Ho – there was no association between IV and burnout (DV).

Burnout Prevalence

The prevalence of burnout was calculated among the 3 sub-scales of burnout, the personal burnout prevalence is 62.4% (n= 106), prevalence of work-related burnout subscale was 64.1% (n = 109) and client related burnout prevalence was 22.9% (n = 39). While prevalence of total burnout was 53.5% (n= 91). In addition, work-related burnout and personal burnout was significantly higher among nurses who were young. A 62.9% burnout is seen in young nurses compared to older nurses p <.002.

Burnout Association

A Pearson's chi-square test was done to check for association between variables of interest. Independent variables that were significant at p< 0.05 among the different subscale of burnout were recorded. There was a statistically significant association between age and total burnout and personal burnout p< .001 than client related burnout and work-related burnout. Those associated are seen in table below, the other independent variables were not significant for burnout.

Table 4: Chi Square Test Results and Association of factors between burnout subscale

	Personal			Work-Related			Client-Related		
	Burnout	No Burnout	*p*	Burnout	No Burnout	*p*	Burnout	No Burnout	*p*
Age									
<36	27(42.2%)	72(67.9%)	.001**	72(66.1%)	27(44.3%)	.006*	28(71.8%)	71(54.2%)	.05*
>36	37(57.8%)	34(32.1%)		37(33.9%)	34(55.7%)		11(28.2%)	60(45.8%)	
Marital status									
Single	22(20.8%)	8(12.5%)	.171	22(20.2%)	8(13.1%)	.246	13(33.3%)	17(13%)	.003*
Married	84(79.2%)	56(87.5%)		87(79.8%)	53(86.9%)		26(66.7%)	114(87%)	
Rest Hours									
<6hours	39(36.8%)	13(20.3%)	.024*	40(36.7%)	12(19.7%)	.021*	18(46.2%)	34(26%)	.016*
>6Hours	67(63.2%)	51(79.7%)		69(63.3%)	49(80.3%)		21(53.8%)	97(74%)	
Sleep disorders									
Yes	72(67.9%)	27(42.2%)	.001**	70(64.2%)	29(47.5%	.034*	29(74.4%)	70(53.4%)	.02*
No	34(32.1%)	37(57.8%)		39(35.8%)	32(52.5%)		10(25.6%	61(46.6%)	
Physical Activity									
Yes	21(19.8%)	6(9.4%)	.07	21(19.3%)	6(9.8%)	.107	11(28.2%	16(12.2%	.016*
No	85(80.2%)	58(90.6%)		88(80.7%)	55(90.2%)		28(71.8%	115(87.8%)	
PerceiveWorkload									
Fair Workload	28(26.4%)	25(39.1%)	.08	27(24.8%)	26(42.6%)	.01*	4(10.3%)	49(37.4%)	.001**
Heavy Workload	78(73.6%)	39(60.9%)		82(75.2%)	35(57.4%)		35(89.7%)	82(62.^%)	
Shift Hours									
8hours	59(55.7%)	38(59.4%)	.63	56(51.4%)	41(67.2%)	.045*	15(38.5%)	82(62.6%)	.008*
12Hours	47(44.3%)	26(40.6%)		53(48.6%)	20(32.8%)		24(61.5%)	49(37.4%)	
Teamwok									
Yes	52(49.1%)	48(75%)	.001**	53(48.6%)	44(72.1%)	.008*	17(43.6%)	83(63.4%)	.028*
No	54(50.9%)	16(25%)		56(51.4%)	17(27.9%)		22(56.4%)	48(36.6%)	

*P<0.05, **p<0.001. Colum Total = 100 percent.

To test for significant difference in burnout between the two groups of nurses in central division, chi square test was performed which suggest that there is no significant difference in burnout between public health and hospital nurses.

Nursing Domain * Total Burnout Crosstabulation

			Total Burnout		
			No Burnout	Burnout	Total
Nursing Domain	Hospital	Count	32_a	42_a	74
		Expected Count	34.4	39.6	74.0
		% within Total Burnout	40.5%	46.2%	43.5%
	Public Health (HC/NS)	Count	47_a	49_a	96
		Expected Count	44.6	51.4	96.0
		% within Total Burnout	59.5%	53.8%	56.5%
Total		Count	79	91	170
		Expected Count	79.0	91.0	170.0

Each subscript letter denotes a subset of Total Burnout categories whose column proportions do not differ significantly from each other at the .05 level.

DISCUSSION

Nurses' have worked around the clock understanding their responsibility and obligation to screen, diagnose, save, and care for the COVID-19 during pandemic. They have stood strong as the backbone of the Ministry of Health and Medical Services, during pandemic response and suffered fatigue silently.

The findings of this study reveal the prevalence of personal burnout score (PBS) and work-related burnout score (WBS) and client-related burnout scores (CRB) are 62.4%, 64.1%, and 22.9%respectively. A study in Denmark among mental health professionals found high personal and work-related burnout than client related burnout and indicated patients play minor role in burnout among professionals(10) similar to the findings in this study. While another comparison Taiwan regional hospital found highest burnout among nurses than other professionals at 66%(11) on CBI tool. The findings of Labanese HCWs in a burnout study revealed 86.3% for personal burnout, 72.2% for work-related and 83.3% for client-related burnout (12) Factors associated to burnout are age and marital status.

A study among Wuhan and Shanghai nurses' had higher burnout among young, less experienced (13) and longer shift time nurses (14). This is a similar finding as young nurses were pushed to work in isolation due to less commitment home, young age and less experience (15) had increased burnout. Increased workload and emotional support have been found to be predictive of burnout (16) but in this study perceived workload is a definite predictor with teamwork and sleep disorders among nurses.

Public health nurses provide preventative service while hospital nurses provide curative service in an inpatient facility doing rotating shifts mainly. The study wished to compare if there is any different burnout between two groups of nurses. Burnout was at its worst or highest among HCWs in hospitals looking after COVID-19 compared to others who worked in regular wards(17, 18). However, this is not prevalent in this study. Nurses in central division does not show any different burnout be. tween public health and hospital services.

CONCLUSION AND RECOMMENDATION

The study provides insights into the impact of the COVID-19 pandemic on nursing staff and identifies areas where interventions can be implemented to address burnout and improve the well-being of nurses. The findings reveal nurses in Fiji also suffer burnout and the prevalence is 62- 64% in each subscale while general burnout is 53.5%. The factors associated with burnout at , p <.001 are age, marital status, teamwork and perceived workload. Developing policies on nurse patient ratio and improving on team bonding activities would help reduce burnout. Having mental health support group and bringing positive changes to work environment is way forward.

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DETERMINANTS OF COMPLIANCE WITH NATIONAL HEALTH INSURANCE CONTRIBUTION PAYMENT AMONG INFORMAL WORKERS IN INDONESIA

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ABSTRACT

Known as one of the often-used methods to provide affordable health care services and achieve universal health coverage (UHC) in low- and middle-income countries, contribution-based social health insurance (SHI) has been hindered by the non-compliance of informal workers in paying the contribution. In Indonesia, 54% of informal workers who participate in the national health insurance (NHI) did not comply with contribution payments by 2021, which resulted in an increase in the economic burden of the social security agency for health (SSAH). This study aims to investigate the determinants of informal workers' compliance with the NHI contribution payment in Indonesia.

A cross-sectional study among 418 informal workers who participate in the NHI in Bogor Regency, Indonesia, was conducted through questionnaires. A list of informal workers members with their NHI membership status was provided by the SSAH office. To identify the determinants of informal workers' compliance, chi-square tests and multivariate logistic regression analyses were performed.

The results found that female respondents, having secondary education or below, earning monthly income less than or equal to IDR 6 million, feeling healthy, having a poor attitude towards and knowledge of NHI, ever experienced financial difficulties, and utilizing fewer outpatient services were the determinants of payment compliance among the respondents. Household's monthly income was noted as the best predictor of the respondent's non-compliance with paying the NHI contribution. It might cause an unaffordable NHI contribution rate.

It can be suggested that the government should re-analyse the contribution rate, enhance people's knowledge of the NHI, and improve people's understanding of the risk-sharing concept of the NHI through enormous health insurance education in every segment of the population to promote people's compliance with NHI contribution payments.

Keywords: Informal workers, national health insurance, payment compliance.

INTRODUCTION

In order to increase access to health care and lower the cost of care, low- and middle-income nations highly prioritize on universal health coverage (UHC) (1). These countries experienced a financial burden from catastrophic illnesses as a result of out-of-pocket (OOP) charges, which accounted for 30% to 85% of the entire health care cost (2). Of note, by 2017, there were 505 million people shoved or extremely shoved into uncommon poverty as a result of OOP health spending, which mostly comes from lower-middle-income countries as well as from Africa and Asia (3). People often delay getting treatment because they lack health insurance, even if the situation is an emergency (4).

Social health insurance (SHI) is one of the often-used financing methods to expand the UHC, which has been adopted by several countries around the world based on the risk pooling concept and has already achieved UHC using this system (5). Positive effects are seen from increased health care utilization (6), improved health quality (7), and decreased OOP (4). However, the contribution scheme in the SHI might pose several challenges, such as low enrolment (8), adverse selection (9), and non-compliant participants in paying the premium, particularly informal workers (10).

Indonesia, as a lower-middle income country with a total of 59.3% informal workers among the working population, has faced challenges in extending universal health coverage (UHC) since 2002 and implementing the SHI called National Health Insurance (NHI) since 2014 (10), which is managed by the Social Security Agency for Health (SSAH). By 2019, the population coverage of NHI was 83.61% with a total revenue of 7.62 billion USD, followed by an increase in total health care spending up to 7.83 billion USD in 2019 (11, 12).

However, the rise in health-care spending was accompanied by an increase in the number of informal workers who did not pay contributions. Where the percentage of informal workers enrolled was around 13.11 percent, 54% of them did not comply with paying the contribution in 2021 (12). The imbalance of total revenue collected and increased health care spending placed SSAH in deficit for years (13). Many studies found reasons given to non-complying participants. For instance, lack of money to pay the premium (10), negative attitude towards NHI, and poor knowledge of NHI (14). Besides, most previous studies did not consider factors related to family risks. Whereas the scheme is family-based, the decision to maintain the NHI membership status might be due to the other family members health status.

Even though the government has regulated some policies to educate the non-compliant participants and provide conveniences so that they can pay the arrears, these have not much affected them. Seeing the serious challenges faced by the government in expanding the coverage of UHC in Indonesia and maintaining the financial sustainability of NHI, a study related to the determinants of compliance with contribution payment among informal workers in Indonesia is needed. Hence, this research will investigate the

determinants of compliance with NHI contribution payments among informal workers, and the findings are expected to provide some recommendations to assist the government and SSAH in developing appropriate policies to maintain population coverage.

METHODOLOGY

Participants and data collection

A cross-sectional study among informal workers (aged 18 years old or older) who participated in the NHI in Bogor Regency (rural and urban), Indonesia, was conducted by questionnaire during April–May 2023. Figure 1 describes the sampling method of the study. Java Island was selected purposefully, and Bogor Regency was reported to have the highest number of non-complying NHI participants on Java Island. To gather the list of informal worker members who participate in the NHI in the study area, a data request support letter was issued to the BPJS Kesehatan as the SSAH. After that, an instruction letter for data support was issued to the SSAH branch office at Bogor Regency, and the list of informal workers members data was provided.

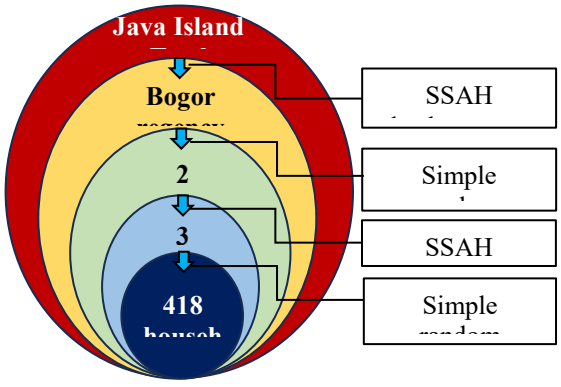

Figure 1: Sampling Frame of the Study

Research Instruments

The conceptual framework of the current study (Figure 2) was developed based on the Motivation-Opportunity-Ability (MOA) theory proposed by Folke Olander and John Thogersen (15) and designed based on the basic physiologic concepts of motivation (encouragement towards a behaviour), ability (qualities and knowledge required for behavioural performance), and opportunity (context- and situation-specific limitations that affect how the behaviour is performed) (16). This is a suitable framework for the investigation of consumer behaviour that affects the environment (15) and currently, as an often-used method for behavioural change interventions (17).

The questionnaire was adapted from the previous study (10, 14, 18). Face validity was used to validate the questionnaire. A pre-test of 30 informal workers in the Bekasi Regency was performed before collecting the data. Sections of the questionnaire comprise socioeconomic and demographic characteristics of the respondents, perceived health risks faced by the family members, perceived quality of services of the providers (Cronbach alpha = 0.89), attitude towards NHI (Cronbach alpha = 0.91), knowledge of NHI, income stability, accessibility of health facilities, and utilization of health care services. The NHI's payment compliance was evaluated using a closed-ended binary question and synchronized with the SSAH database. To measure the perceived quality of services provided by providers and their attitudes towards NHI, a Likert scale of 1 to 5 (strongly disagree to strongly agree) was presented.

For the self-rated health status, each family member's health status was measured, and the mean score was used to categorize them as having good health status or poor health status. This was based on the consideration that the respondent's payment compliance might be influenced by the health status of other family members, as the NHI was family-based, which in the previous study mostly only measured the self-rated health status of the respondent, might not reflect the health status of family members, and might not be appropriate with family-based health insurance.

Data Analysis

The completed questionnaires of a total of 418 respondents were analyzed using SPSS version 21. To determine the associations between the dependent variable and each independent variable, Chi-square tests were performed with a significance level of $p \leq 0.05$, and binary logistic regression was performed to predict the likelihood. Variables with a $p < 0.25$ were included in the multivariate logistics regression analysis to identify the determinants. By measuring the coefficient value of the Spearmen correlation test, multicollinearity among independent variables was evaluated.

RESULTS

Figure 3 presents the respondent's NHI payment compliance. Around 51.7% of the respondents reported not complying with paying the NHI contribution, while another 48.3% reported complying with paying the NHI contribution.

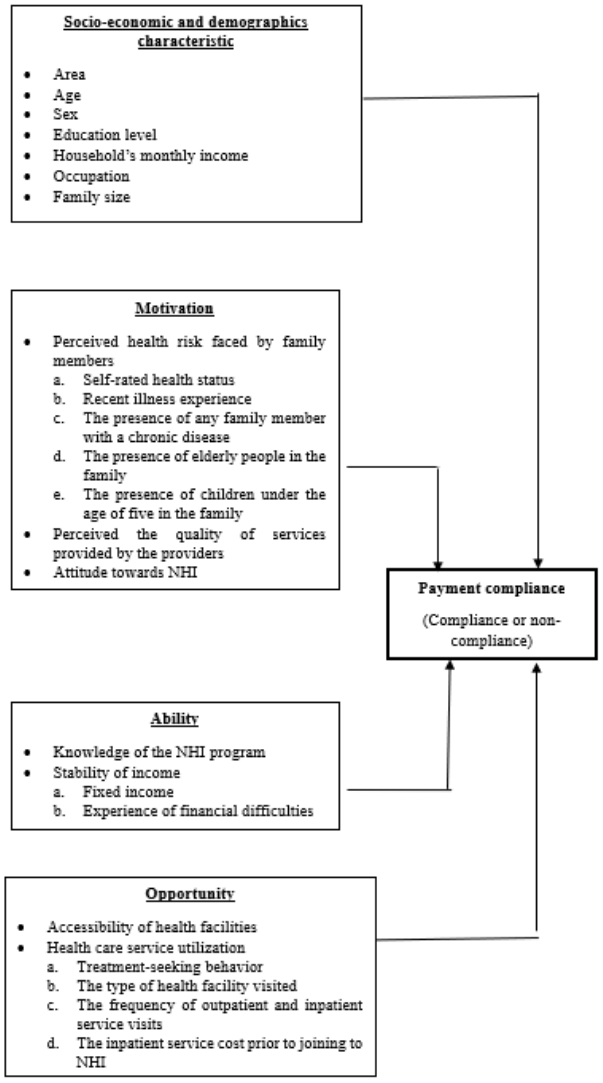

Figure 2: Conceptual Framework of the Study

The respondent's compliance with paying the NHI contribution was reflected in their NHI membership status. Active NHI membership status was considered complied respondents, and non-active NHI membership status was considered non-complied respondents.

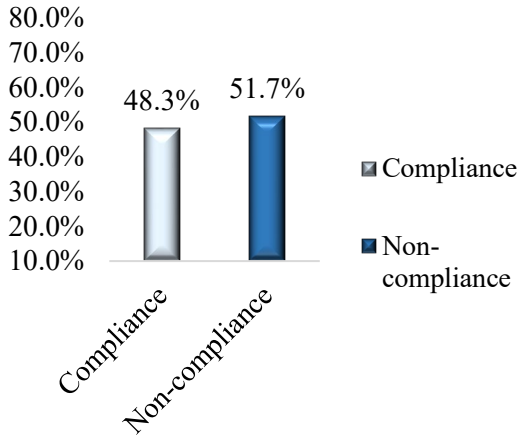

Figure 3: Payment Compliance of the Respondents (n = 418)

Table 1 illustrates the socio-economic and demographic characteristics of the respondents. About 211 (50.5%) of the respondents lived in rural areas, and 207 (49.5%) lived in urban areas. Most of the respondents were in the 36–45 age group (38.5%). Male proportions (62.9%) were higher than female proportions (37.1%). In addition, more than two-thirds of the respondents completed higher than secondary education (71.3%). Most of the respondents earned a monthly income less than or equal to IDR 2 million (35.6%) and worked in service sectors (46.7%). Further, more than half of the respondents have a family size equal to four family members or above (58.1%).

In the Chi-square tests, education level and the household's monthly income were recategorized subsequently. As results, age, sex, education level, households' monthly income, self-rated health status, having a history of chronic disease, having elderly people and children under five years of age in the family, perceived quality of services of the providers, attitude towards NHI,knowledge of NHI, fixed income, experience of financial difficulties, distance of health facilities, treatment seeking behaviour, type of health facilities visited by the respondents, and outpatient and inpatient service utilization were significantly associated with the respondent's payment compliance ($p \leq 0.05$). Details are shown in the table below (Table 2).

Table 1: The socio-economic and demographic characteristics (n = 418)

Characteristics	Frequency (n)	Percentage (%)
Area		
Rural	211	50.5
Urban	207	49.5
Age		
18-35 years	100	23.9
36-45 years	161	38.5
>45 years	157	37.6
Sex		
Male	263	62.9
Female	155	37.1
Income level		
≤ IDR 2 million	149	35.6
> IDR 2 million-6 million	133	31.8
> IDR 6 million	136	32.5
Occupation		
Industry	60	14.4
Service	195	46.7
Others	163	39.0
Education level		
No schooling	3	<1
Primary education	51	12.2
Secondary education	66	15.8
Higher education	298	71.3
Family size		
< 4 members	175	41.9
≥ 4 members	243	58.1

Table 2: Associations between independent variables and NHI contribution payment compliance

Variable	Payment compliance		Pearson Chi-square	P value
	Compliance	Non-compliance		
Area				
Rural	93 (44.1)	118 (55.9)	3.081	0.079
Urban	109 (52.7)	98 (47.3)		
Age				
18-35	32 (32.0)	68 (68.0)		
36-45	90 (55.9)	71 (44.1)	14.807	**0.001
> 45	80 (51.0)	77 (49.0)		
Sex				
Male	173 (65.8)	90 (34.2)	86.525	***< 0.001
Female	29 (18.7)	126 (81.3)		
Education level				
Secondary education or below	7 (5.8)	113 (94.2)	121.704	***< 0.001
Higher than secondary	195 (65.4)	103 (34.6)		
Income level (IDR)				
≤ 6 million	101 (32.4)	211 (67.6)	125.397	***< 0.001
> 6 million	101 (95.3)	5 (4.7)		
Occupation				
Industry	35 (58.3)	25 (41.7)		
Service	99 (50.8)	96 (49.2)	5.723	0.057
Others	68 (41.7)	95 (58.3)		
Family size				
< 4 members	83 (47.4)	92 (52.6)	0.097	0.756
≥ 4 members	119 (49.0)	124 (51.0)		
Self-rated health status				
Poor	93 (82.3)	20 (17.7)	71.587	***< 0.001
Good	109 (35.7)	196 (64.3)		
Recent illness experience				
No	174 (47.2)	195 (52.8)	1.728	0.189
Yes	28 (57.1)	21 (42.9)		
The presence of family member with a chronic disease				
No	146 (43.5)	190 (56.5)	16.287	***< 0.001
Yes	56 (68.3)	26 (31.7)		
The presence of elderly people				
None	198 (52.1)	182 (47.9)	23.916	***< 0.001
One or several	4 (10.5)	34 (89.5)		
The presence of children under the age of five				
None	166 (51.9)	154 (48.1)	6.887	**0.009
One or several	36 (36.7)	62 (63.3)		
Perceived quality of service provided by the providers				
Poor	39 (29.1)	95 (70.9)	29.178	***< 0.001
Good	163 (57.4)	121 (42.6)		

Variable	Payment compliance		Pearson Chi-square	P value
	Compliance	Non-compliance		
Attitude towards NHI				
Negative	63 (32.5)	131 (67.5)	36.425	***< 0.001
Positive	139 (62.1)	85 (37.9)		
Knowledge of NHI				
Poor	19 (14.3)	114 (85.7)	90.511	***< 0.001
Good	183 (64.2)	102 (35.8)		
Fix income				
No	199 (53.1)	176 (46.9)	32.816	***< 0.001
Yes	3 (7.0)	40 (93.0)		
Experienced financial difficulties				
No	79 (84.0)	15 (16.0)	61.953	***< 0.001
Yes	123 (38.0)	201 (62.0)		
Distance to reach the health facilities				
< 30 minutes	174 (55.1)	142 (44.9)	23.543	***< 0.001
≥ 30 minutes	28 (27.5)	74 (72.5)		
Treatment-seeking behavior				
No	13 (20.3)	51 (79.7)	23.747	***< 0.001
Yes	189 (53.4)	165 (46.6)		
The type of health facilities visited by the respondents				
Public	159 (67.9)	75 (32.1)	81.973	***< 0.001
Others	43 (23.4)	141 (76.6)		
Frequency of health facility visits in the last 12 months				
Outpatient service				
Never or once	74 (29.4)	178 (70.6)	91.349	***< 0.001
More than once	128 (77.1)	38 (22.9)		
Inpatient services				
Never	169 (45.4)	203 (54.6)	11.347	**0.001
Once or more	33 (71.7)	13 (28.3)		
Inpatient services spending prior to joining NHI (IDR)				
≤ 1 million	184 (49.2)	190 (50.8)	1.083	0.298
> 1 million	18 (40.9)	26 (59.1)		

*Notes: n = 418, *p ≤ 0.05, **p < 0.01, ***p < 0.001*

The multicollinearity of the significant variables was assessed by measuring the coefficient value of the Spearmen correlation test, the coefficient value should not exceed 0.75. Consequently, none of the variables were found that had a coefficient value of more than 0.75.

In the final model of multivariate logistic regression, nine variables were indicated as determinants of the payment compliance of the respondents and are presented in Table 3. In summary, being female (AOR 6.56, 95% CI 2.59-16.61), having secondary education or below (AOR 7.52, 95% CI 2.39-23.57), earning monthly

income less than or equal to IDR 6 million (AOR 16.81, 95% CI 4.15-68.02), having a good health status (AOR 5.18, 95% CI 1.55-17.30), having a negative attitude towards NHI (AOR 2.66, 95% CI 1.00-7.11), having poor knowledge of NHI (AOR 4.94, 95% CI 1.66-14.67), ever experienced financial difficulties (AOR 5.11, 95% CI 1.63-15.98), preferred to go to the other health facilities (private, traditional medicine, and drug stores) besides the public ones (AOR 4.55, 95% CI 1.92-10.77), and never or only once per year utilizing outpatient services (AOR 8.35, 95% CI 3.02-23.06) were the determinants of payment compliance of the respondents.

Table 3: Bivariate and multivariate analysis of determinants of the NHI contribution's payment compliance (n = 418)

Variable	COR (95% CI)	P value	AOR (95% CI)	P value
Age (years)				
18-35	2.69 (1.59-4.54)	**0.001		
36-45	1	***< 0.001		
> 45	1.22 (0.78-1.898)	0.377		
Sex				
Male	1		1	
Female	8.35 (5.18-13.46)	***< 0.001	6.56 (2.59-16.61)	**< 0.001
Education level				
Secondary education or below	30.56 (16.67-68.00)	***< 0.001	7.52 (2.39-23.57)	**0.001
Higher than secondary level	1		1	
Income level				
IDR ≤ 6 million	42.00(16.67-106.82)	***< 0.001	16.81 (4.15-68.02)	**< 0.001
IDR > 6 million	1		1	
Self-rated health status				
Poor	1		1	
Good	8.36 (4.88-14.30)	***< 0.001	5.18 (1.55-17.30)	**0.007
The presence of family member with a chronic disease				
No	2.80 (1.67-4.68)	***< 0.001		
Yes	1			
The presence of elderly people				
None	1			
One or several	9.24 (3.21-26.56)	***< 0.001		
The presence of children under the age of five				
None	1			
One or several	1.85 (1.16-2.95)			
Perceived quality of the services of the provider				
Poor	3.28 (2.11-5.09)	***< 0.001		
Good	1			

Variable	COR (95% CI)	P value	AOR (95% CI)	P value
Attitude towards NHIS				
Poor	3.40 (2.27-5.09)	***< 0.001	2.66 (1.00-7.11)	*0.050
Good	1		1	
Knowledge of NHIS				
Poor	10.76 (6.25-18.52)	***< 0.001	4.94 (1.66-14.67)	**0.004
Good	1		1	
Fix income				
No	1			
Yes	8.60 (4.74-15.61)	***< 0.001		
Experienced in financial difficulties				
Yes	8.60 (4.74-15.61)	***< 0.001	4.64 (1.59-13.56)	**0.005
No	1		1	
Distance of health facilities (minutes)				
< 30	1			
≥ 30	3.23 (1.98-5.27)	***< 0.001		
Treatment-seeking behavior				
No	4.49 (2.36-8.55)	***< 0.001		
Yes	1			
The type of health facilities visited by the respondents				
Public	1		1	
Others	6.95 (4.48-10.77)	** 0.001	4.55 (1.92-10.77)	**0.001
Outpatient services utilization				
Never or once per year	8.10 (5.15-12.73)	***< 0.001	8.35 (3.02-23.06)	***< 0.001
More than once per year	1		1	
Inpatient services utilization				
Never	3.04 (1.55-5.97)	***< 0.001		
Once or more	1			

*Notes: n = 418, COR = crude odd ratio, CI = confidence interval, N.E = not in the equation, *p ≤ 0.05, **p < 0.01, ***p < 0.001*

DISCUSSION

The results showed that females were 6.56 times ($p < 0.001$) more likely to not comply with paying the NHI contribution compared to males, which was inconsistent with the finding from a study done in northwest Ethiopia that showed females, as the vulnerable group, were more likely to comply with paying the NHI contribution (19). Nonetheless, other factors might influence the difference in financial behaviour between males and females. Roy and Jain found that women's' financial literacy was dissatisfying, which might be due to the lack of precision in insurance, saving, and investment (20) that might impact their financial behaviour in paying the NHI contribution. Moreover, respondents who completed secondary education or below were more likely to not comply with paying the NHI contribution by about 7.52 times ($p < 0.001$), which is similar to findings from a study conducted in southwest Ethiopia. A higher education level might generate a higher income, easier access to gather information, and a deeper

understanding of the benefits of health insurance (21). Respondents whose monthly income was equal to or below IDR 6 million were more likely to not comply with paying NHI contributions by 16.81 times ($p < 0.001$) compared to respondents whose monthly income was more than IDR 6 million. Previous studies argued that it might be due to their hardship in meeting their daily needs, making the contribution unaffordable (8, 14). Of note, respondents who considered themselves and their family healthy were 5.18 times more likely to pay the NHI contributions ($p = 0.007$), which was consistent with findings from Ghana.

For those who had poor health status, the national health insurance system considerably decreased out-of-pocket expenses and increased access to formal care (22). In addition, respondents whose attitude towards NHI was poor were 2.66 times more likely to comply with paying the NHI contribution compared to their counterparts ($p = 0.05$). This finding was comparable with a previous study done in Ethiopia (14). Understanding the importance of health insurance and believing in well-managed health insurance might influence their attitude towards health insurance to be positive and might affect positive behaviour (23). Besides, having poor knowledge of the NHI made respondents 4.94 times more likely to be non-compliant with NHI contribution payments than those who understood the NHI well ($p = 0.004$). This might be caused by the fact that those who are well-versed in the CBHI scheme may have a clearer understanding of its guiding principles and benefits package, as well as the advantages of keeping their health insurance scheme membership active (14).

Respondents who experienced financial difficulties were 4.64 times more likely to not comply with the NHI contribution payment than those who never experienced the same situation ($p = 0.005$). A previous study agreed with this finding (10). The possible explanation is that financial difficulties will make the fulfilment of daily needs a priority, and they also highlighted that it might be related to the uncertainty of income among informal workers.

Preferred to go to the other health facilities (private, traditional medicine, and drug stores) rather than the public ones influenced the respondent's non-compliance with the NHI contribution payment, which was about 4.55 times higher than those who preferred the public health facility. Likewise, a study by Sharma et al. discovered similar findings. People who registered in private health facilities as the first contact had a higher probability of not complying with the SHI. Feeling dissatisfied with the private health facilities' service could be the reason supporting their decision to discontinue their SHI (24).

Lastly, respondents who utilized outpatient health services less than or equal to once per year were 8.56 times more likely to not comply with paying the NHI contribution compared to their counterparts ($p < 0.001$). Those who utilized the health care services more might have the chance to discover and comprehend the importance of having health insurance (25). In contrast, the perceived quality of services provided by the providers was found to be insignificantly associated with payment compliance among the respondents.

CONCLUSION AND RECOMMENDATIONS

This research revealed that female respondents with an income ≤ IDR 6 million, having secondary education or below, feeling healthy, having poor attitude and knowledge, having experienced financial difficulties, and utilizing fewer outpatient services were predictors of non-compliance in paying the NHI contribution, which indicated economics and a poor understanding of the risk sharing concept as important factors to be considered. It can be suggested that the government should re-analyze the contribution rate, enhance people's knowledge of the NHI, and improve people's understanding of the risk-sharing concept of the NHI through enormous health insurance education in every segment of the population to promote people's compliance with paying the contribution by considering the characteristics of the respondents. Coming from secondary education or below with low- and middle-income households, face-to-face education might be more convenient for them compared to the artificial intelligence that is currently implemented by the SSAH in providing the knowledge of the NHI program. Hence, expanding the role of NHI's cadres as the ones who have direct contact with the participants, from simply collecting contributions to also educating them, should be considered.

STUDY LIMITATIONS

Concerning the diversity of population characteristics in Indonesia, the results of the study were unable to be generalized. Besides, recall bias in the utilization of health care services might appear due to the self-reported method. Thus, further analysis from various regions using a large sample size in Indonesia is needed. Preliminary data related to health service utilization in the study area provided by the SSAH office might be useful to reduce recall bias.

ETHICAL DECLARATION

The Committee for Research Ethics of the Mahidol University Social Science Independent Review Board (MUSSIRB) has approved the study (COA No. 2023/059.1904). On the introduction page of the questionnaire form, the objective of the study and the confidentiality policy were clearly described.

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BARRIERS OF WILLINGNESS TO ENROLL INTO NATIONAL HEALTH INSURANCE PROGRAM AMONG HOUSEHOLD OF PARSA DISTRICT, MADHESH PROVINCE OF NEPAL

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ABSTRACT

The National Health Insurance Program NHIP) in Nepal plays a crucial role in providing secondary and tertiary healthcare as part of the social health protection framework. However, the enrollment rate in NHIP is significantly low in Madhesh Province, with only 3.8% enrolled in the fiscal year 2021-22. This low enrollment adversely affects the overall performance of universal health coverage (UHC) and social health protection (SHP) in the country. This study aims to identify the determinants of willingness to enroll in NHIP using the Ability-Motivation-Opportunity (AMO) theory in Parsa district, Madhesh Province.

The objective of this study was to determine the willingness of household heads to enroll in NHIP in Parsa district, Madhesh Province of Nepal and its association with socio-demographic factors, perceived severity of health problems, cues to enroll and ability to pay.

A cross-sectional study was conducted, involving face-to-face interviews with 319 household heads in Parsa district using a structured questionnaire. The questionnaire was validated by experts, translated into the Bhojpuri language, and tested for reliability using Cronbach's alpha during pretesting. Descriptive statistics and logistic regression analysis were performed.

The results revealed that 258 (80.9%) out of 319 respondents were willing to enroll in NHIP. Household heads in Birgunj metropolitan city showed a higher willingness compared to those in rural areas. The presence of elderly members was observed among 22% of the households and 58% of the respondents had high perceived severity of health problems. More than 75% of the respondents expressed their ability-to-pay NPR 2,500 or less which is NPR 1,000 lower than the premium. Perceived severity of health problems (OR: 2.00, 95% CI: 1.13-3.50), and ability to pay (OR: 3.35, 95% CI: 1.38-8.10) were significantly associated with the willingness to enroll in NHIP among household heads in Parsa district, Madhesh Province of Nepal.

The perceived severity of health problems and ability to pay were positively associated with willingness to enroll in NHIP. However, lower ability-to-pay among more than three-fourth of the household may be the barrier of enrollment in the NHIP. Addressing this barrier is essential to improve the enrollment rates which can furthermore, improve the UHC in Parsa district, Madhesh Province of Nepal.

Keywords: Ability-to-pay, National Health Insurance Program, Willingness to enroll, Social Health Protection.

INTRODUCTION

Effective social health protection (SHP) framework of any country plays important role in ensuring access to the healthcare services while avoiding financial hardship (1). SHP emphasizes the importance of upholding individuals' rights to affordable and effective healthcare, removing barriers to access, and providing adequate financial protection (2). Although the SHP system in Nepal has a comprehensive design, universal health coverage (UHC) has not been achieved. According to the World Health Organization (WHO), UHC service coverage index of Nepal in the year 2019 was 53 out of 100 compared to the global average of 63.

The disability adjusted life years (DALY) per 100,000 population in Nepal was 35,952.94 in the year 2019, slightly less than India (37,843.33) (3). Likewise, the multi-dimensional poverty incidence is also very high, and 17.4 % of people in Nepal live below the poverty line (4). High burden of disease, higher poverty rates and lower UHC, together have led to high Out-of-Pocket Expenditure (OOPE) in Nepal. According to World bank 2019 data, 57.91% of total health expenditure in Nepal was OOPE (5). It has been estimated that around half a million people are impoverished each year due to health expenditure in Nepal (6).

To address this issue, national health insurance program (NHIP) was incorporated into the SHP framework in the year 2015. There were three different schemes in the SHP prior to NHIP introduction: 1) Basic Health Services (BHS), 2) Free Health Service Program (FHSP), 3) Social Security Scheme (SSS). The BHS, FHSP and SSS are funded by the government through taxes, NHIP through contribution from insured households and private health services through out-of-pocket expenditure (OOPE) (7).

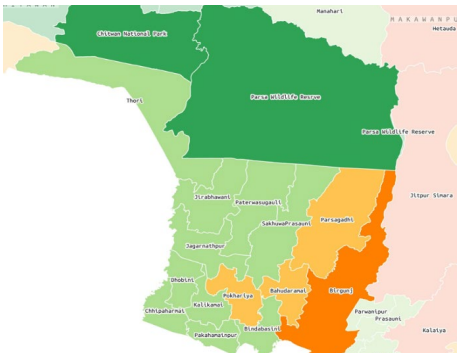
By the end of year 2020-21, the enrollment of households into NHIP was confined to 18.87% (7). Maximum coverage was observed in Koshi province (30.37%) while the minimum coverage was seen in Madhesh province (3.36%) (8). Although the program offers tertiary medical care worth NPR 100,000 (approximately US$ 770) at a fair premium price of NPR 3,500 (approximately US$ 27), majority of households in the province are not enrolled into the program. Very low enrollment status in the province has affected the overall UHCand SHP performance of the country while making vast majority of people in the province subjected to impoverishment due to medical cost.

The present research uses the ability, motivation and opportunity (AMO) theory as a theoretical framework. According to the theory, people's behaviors are the outcome of their motivation, opportunity and ability. Motivation influences behavior, whereas opportunity and ability are moderating factors (9). Previous studies have shown that one's willingness to enroll into social health insurance was influenced by perceptions about severity of health-related conditions (motivation domain). People with high perceived severity of health-related conditions, and cues to enroll are more

likely to have higher willingness to enroll into social health insurance (10). Situations relating to local context (opportunity domain) (11), ability to pay premium (ability domain) (12) and socio-economic conditions like age, level of education, presence of elderly or household size influence one's willingness to enroll into social health insurances (13-15).

Previous research in the context of Nepal have explored the factors associated with enrollment or non-enrollment (16) in Nepal but the willingness to enroll in NHIP has not been studied. This study aimed to determine the association of sociodemographic variables, perceived severity of health problems, cues to enroll, ability to pay, and perception about health care available in India, with willingness to enroll into the NHIP among household heads of Parsa district, Madhesh Province of Nepal.

FIGURE 1: POLITICAL MAP OF PARSA DISTRICT



SOURCE: EHRP NEPAL

METHODOLOGY

Study area

The study area was Parsa district which is one of the 8 districts of Madhesh province. There are 14 local levels: one metropolitan, three municipalities and ten rural municipalities that includes 93, 719 houses with 115,149 households and majority population is of Madhesi race (4).

Study design and data source

This cross-sectional study was performed through face-to-face interviews of 319 household heads in five randomly selected local levels: Birgunj metropolitan city, Parsa Gadhi Municipality, Pokhariya Municipality, Bindhyabasini Rural Municipality and Thori Rural Municipality. Household heads who were citizens of Nepal and, households where the head of household or their spouse were present during the interview were eligible for the study. Households that were already enrolled as active members into the NHIP were excluded from the study. Simple random sampling based on probability proportionate to sample size was utilized to select households for the interview. A total of218 household heads from 47,218 households in the metropolitan city; 62 household heads from 13506 households in 2 municipalities; and 39 household heads from 8738 households in the 2 rural municipalities were interviewed.

Instrument

The questionnaire constituted of five sections: 1) willingness to enroll into NHIP, 2) socio-demographic, 3) motivation domain, 4) opportunity domain and, 5) ability domain.

Independent variables

Part 1: Sociodemographic variables:

Respondent's place of residence, age, sex, education level and presence of elderly person above 70 years of age in the household were recorded for the socio-demographic survey.

Part 2: Motivation, Ability and Opportunity variables

Perceived severity of health problems and cues to enrollment were variables in motivation domain; ability to pay was part of ability domain while perceived healthcare in India was opportunity domain variable in the study. Five items of five-points Likert scale (5= strongly agree to 1=strongly disagree) were used to rate each of the variables.

Dependent variable

Willingness to enroll into NHIP

In this study, responses to willingness to enroll into NHIP was recorded using a single item of nominal scale. The respondents were asked if they were willing to enroll into the NHIP and their responses were recorded as 'yes' or 'no'.

Ethical approval

Ethical approval for the research was taken from the committee for research ethics (Social Science), Mahidol University (2023/060.1904). Respondents were orally and in writing informed about the autonomy, data management, and withdrawing before enrolling. Informed consent was provided by each respondent before completing the data collection.

Statistical analysis

Descriptive statistics was performed to examine the respondents' characteristics. Furthermore, bivariate logistic regression analysis was performed to see significant association between independent variables and willingness to enroll.

RESULTS

Socio-demographic profile of the study households

A total of 319 household heads were included in the study, and 93.7% of them were male, the median household size was 5 with minimum of 3 people and maximum of 9 people while 22% had elderly members in their household (Table 1).

Perceived Severity of health problems

In the study, 58% of the household heads perceived high severity of health problems. The mean score was 16.36 (SD±3.27) whereas the minimum and maximum score were 5 and 24 respectively.

Cues to Join

The majority of the households had low cues to join the NHIP (69.0%). The mean score for cues was 12 (SD±4.86) while the minimum and maximum scores were 6 and 25 respectively.

Ability to pay

The median ability to pay was NPR 2500. Majority of the respondents (76.5%) expressed their ability to pay equal to or less than NPR 2500. This amount was NPR 1000 less than the premium set for the NHIP.

Health care in India

Over half of the respondents (51.7%) responded that the healthcare in India was better than in Nepal. The mean score was 20.33 (SD±2.83). The minimum and maximum scores were 19 and 22 respectively.

Willingness to join NHIP

Majority of the household's heads (80.9%) were willingness to enroll into the NHIP.

Factors associated with willingness to enroll into the NHIP

The variables: perceived susceptibility to health problems, and ability to pay were significantly associated with the willingness to enroll into NHIP in the bivariate logistic regression analysis. Household heads who expressed high perceived severity of health problems were two times more likely to have high willingness to join the NHIP (95% CI:1.13-3.50, p-value: 0.017). Household heads who shared their ability-to-pay an amount more than NPR 2,500 were 3.35 times more likely to enroll into the NHIP compared to household heads whose ability to pay was equal to or less than NPR 2,500 (Table 2)

Table 1: Characteristics of respondents

Variables	Number	Percentage
Age of household head (years)		
≤45	180	43.6
>45	139	56.4
Median=45, QD=8.0, Minimum=28, Maximum=70		
Sex of household head		
Male	299	93.7
Female	20	6.3
Education of household head		
Bachelor's degree or above	36	11.3
High school	68	21.3
Basic	182	57.1
Illiterate	33	10.3
Household size		
≤ 5	168	52.7
>5	161	47.3
Median=5, QD=0.5, Minimum=3, Maximum=9		
Presence of Elderly in the household		
No	217	68.0
Yes	102	22.0
Perceived Severity of health problem		
Low (score 5-16)	134	42.0
High (score 17-25)	185	58.0
Mean ± SD = 16.36 ± 3.27, Minimum=5, Maximum=24		
Cues to Enroll into NHIP		
Low (score 5-12)	220	69.0
High (score 13-25)	99	31.0
Mean ± SD = 12.54 ± 4.86, Minimum=6, Maximum=25		
Capacity to pay (NRP)		
≤ 2,500	244	76.5
>2,500	75	23.5
Median=2500, QD=500, Minimum=1,000, Maximum=4,000		
Medical Care in India		
Not better than Nepal (score 5-20)	154	48.3
Better than Nepal (score 21-25)	165	51.7
Mean ± SD = 20.33 ± 2.83 Minimum=19, Maximum=22		
Willingness to enroll		
No	61	19.0
Yes	258	80.9

Table 2: Bivariate logistic regression for factors associated with willingness to enroll into NHIP

Variables	Category	Willingness to join NHIP		OR (95% CI)	p-value
		No (%)	Yes (%)		
Local level	Others	22 (21.8)	79 (78.2)	1	0.412
	Birgunj Metropolitan	39 (17.9)	179 (82.1)	1.28(0.71-2.30)	
Age of household head	≤45 years	32 (17.8)	148 (82.2)	1	0.488
	>45years	29 (20.9)	110 (79.1)	0.82(0.47-1.44)	
Sex of household head	Female	4 (20.0)	16 (80.0)	1	0.918
	Male	57 (19.1)	242 (80.9)	0.94(0.30-2.93)	
Household size	≤ 5	36 (21.4)	132 (78.6)	1	0.270
	>5	25 (16.6)	126 (83.4)	1.38(0.78-2.42)	
Presence of Elderly	No	43 (19.8)	174 (80.2)	1	0.646
	Yes	18 (17.6)	84 (82.4)	1.15(0.63-2.12)	
Perceived severity of health problems	Low	34(25.4)	100(74.6)	1	**0.017***
	High	27(14.6)	158(85.4)	2.00(1.13-3.50)	
Cues to Enroll into NHIP	Low	38 (17.3)	182 (82.7)	1	0.212
	High	23 (23.2)	76 (76.8)	0.69(0.39-1.24)	
Ability to pay (NPR)	≤ 2,500	55 (22.5)	189 (77.5)	1	**0.008****
	>2,500	06 (8.0)	69 (92.0)	3.35(1.38-8.12)	
Medical Care in India	Not better than Nepal	30 (19.5)	124 (80.5)	0.96(0.55-1.67)	0.875
	Better than Nepal	31 (18.8)	134 (81.2)	1	

*OR= Crude odds ratio; ***=p-value<0.001, **=p-value<0.010 and *=p-value<0.050*

DISCUSSION

Our study showed that there is a higher demand for social health insurance in the district. This outcome is similar to another study from urban Bangladesh (17) and Southwest Ethiopia (18) where the researchers revealed that around 80% of the household heads were willing to enroll into social and community health insurance.

Perceived severity of health problems was significantly associated with willingness to enroll into NHIP. This result is similar to another study from Nepal (19) and Burkina Faso (20). This result can be linked to risk aversion tendency creating higher demand for health insurance (21, 22).

Household size did not show any significant relationship with willingness to enroll in this study. The outcome is comparable to another study from Nepal where the researchers did not find any significant association with households enrollment status in the NHIP (16). However another study from

Ethiopia showed that higher household size was a significant barrier to enrollment into social health insurance (23).

In this study, 70% of the household heads showed low cues to enroll into the NHIP. Cues play an important role as behavioral recommendations to engage into health behaviors (24). However, the variable 'cues to enroll into the NHIP' was not significantly associated with willingness to enroll unlike other studies that show a significant relationship of cues with health insurance enrollment (10, 25). This result is because majority of households are not enrolled in the NHIP, depicting lesser opportunity of motivation from relatives or neighbors regarding health or financial benefits of enrolling into the NHIP.

The median ability to pay was NPR 2,500 (USD 19) which is NPR 1,000 (USD 8) less than the premium set for a household of five members. The ability to pay premium was significantly associated with willingness to enroll into the NHIP. This result is similar to another study done in Nepal (19) however, the amount was NPR 1,000 less than the median amount found in this study. More than three-fourths of the household heads proposed a premium amount equal to or less than NPR 2,500. The constitution of Nepal guarantees free basic health services to its citizens, which may explain the intention of the household heads to pay lower amount as premium.

More than half of the household heads reported that medical care in India was better than Nepal however, it was not significantly associated with willingness to enroll into NHIP in this study. A qualitative study done in one of the districts in Madhesh province highlights close proximity to Indian cities, recommendation from elderly, belief that healthcare services offered in India was of higher quality and provided faster relieve from illness, drive more people from rural areas in district to India for medical care (26). People of all classes in the district utilized public healthcare service during the covid-19 pandemic which must have created a level of belief in the public healthcare system making the association insignificant.

LIMITATION

Despite an attempt to maintain the quality of the research, the findings are not without limitations. Cross-sectional nature of the study is not strong enough to explore the causal relationship between willingness to enroll and the independent variables. The other bias may be respondents bias for certain variables like 'ability to pay'.

CONCLUSION

It was found that majority of the respondents showed willingness to enroll motivated by high perceived severity of health problems. Likewise, in the ability domain, lower ability to pay among majority of respondents was a barrier for enrollment into the NHIP.

RECOMMENDATION

The results of this study highlighted the need for raising awareness about NHIP and its benefits among the public to increase participation. Likewise, to address household's ability to pay, premium rates need adjustment based on household income. Future research should focus on system level challenges in increasing participation into NHIP.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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ASSOCIATING SOCIAL FACTORS OF WOMEN'S DESIRE TO HAVE ADDITIONAL CHILDREN IN THE TWO LARGEST CITIES IN NORTH AND SOUTH VIETNAM

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ABSTRACT

Fertility has been decreasing in Vietnam. Vietnam's total fertility rate (TFR) has maintained replacement fertility. However, TFR was not uniform in this country. For the two largest cities in Vietnam, Hanoi's TFR was above replacement level, while Ho Chi Minh has the lowest TFR in the country. Besides, fertility desire has a committed relationship with fertility behavior.

The aim of this study was to explore a prevalence of the desire for additional children among women aged 15-49 who have at least one child and identify factors influencing their desire for more children in Hanoi and Ho Chi Minh.

This study used secondary data from Vietnam Multiple Indicator Cluster Surveys 2020-2021 with a section for women aged 15-49. The target population focused on married women aged 15-49 with at least one child, excluding pregnant women and those unable to conceive. The conceptual framework of this study was constructed based on the Theory of Planned Behavior. The sample size was 1177 women (614 women from Hanoi and 563 from Ho Chi Minh). Binary logistic regression was used to examine the relationship between women's desire to have additional children and social factors.

The desire for additional children among women in the two cities was 18.9%. The factors associated with desired additional children in Hanoi were age, number of children (OR= 0.0716, 95%CI=0.0421-0.1217), and sex composition of children (OR= 4.73, 95%CI=1.97-11.33 for "all daughters" compared to "all sons") while in Ho Chi Minh were age, age of first married, urban (OR=0.47, 95%CI=0.22-1.01) and the number of children (OR=0.07, 95%CI=0.03- 0.17).

This study found that age and number of children impact women's desire for more children in both cities. In Hanoi, the preference for sons for cultural reasons influenced the desire for more children. The age of marriage predicted late childbearing and urban residence which shows the impact on fertility by the busy lifestyle in Ho Chi Minh.

Keywords: fertility desire, women, desired additional children, Vietnam

INTRODUCTION

The Population and Family Planning Policy in Vietnam, which has limited the maximum number of children per couple to two since 1988, has significantly contributed to the decline in the country's Total Fertility Rate (TFR) over the past three decades (1, 2). From approximately four births per woman in the 1990s, the TFR has dropped to an average of two births per woman in the 2000s (1). This decline can be attributed to successful family planning programs and socio-economic changes. Family planning interventions have emphasized the importance of reproductive health, reduced population growth, and improved individual and family well-being (3).

The small family norm of two children per couple remains the recommended guideline in Vietnam (4). This recommendation is rooted in the aspiration for sustainable population growth and the promotion of individual and family well-being. However, the implementation of the policy has led to an imbalance in the sex ratio at birth. The sex ratio at birth in Vietnam has risen from approximately 107 male births per 100 female births to 111.5 male births per 100 female births (5). The United Nations Population Fund has reported that Vietnam's sex ratio at birth is lower than that of China and India, the two most populous countries in the world (6). The high sex ratios in Vietnam have been the subject of international concern due to the consequences they pose for social and demographic stability (7).

The challenges associated with a rapidly aging population are becoming evident in Vietnam. The combination of declining fertility rates and increasing life expectancy has led to a demographic shift. The country transitioned into an aging society in 2015, and by 2035, it is projected to become an aged society, with a significant proportion of the population aged 65 and above (8).

Despite Vietnam's overall close-to-replacement fertility rate, regional variations in TFR exist. Notably, Hanoi has a TFR slightly above the replacement level (2.24), while Ho Chi Minh has the lowest TFR in the country (1.39) (5). Hanoi and Ho Chi Minh are the two largest cities in Vietnam, with Hanoi located in the North and Ho Chi Minh in the South. There is a significant difference in the birth rate between the two cities, and this may be influenced by social factors that differ between the North and South regions (5).

Desired family size is a significant determinant of actual fertility rates (9). Understanding trends in desired family size can guide policymakers in formulating effective population and family planning policies. According to the Theory of Planned Behaviour (TPB) and previous research, fertility desire of women were associated with demographic factors, attitude, social norms and perceived behavioral control (10, 11). However, there is a research gap in examining the desire for additional children among women in Hanoi and Ho Chi Minh, the two largest cities in Vietnam.

The objective of this study was to explore the prevalence of the desire to have additional children among women of reproductive age (15-49) in Hanoi and Ho Chi Minh, who have at least one child, are not pregnant, and exclude cases of infertility and identify the social factors influencing women's desire for more children in these urban settings.

By understanding the factors that influence women's desire for additional children, policymakers can develop targeted interventions and initiatives that address the unique dynamics and challenges faced by women in Hanoi and Ho Chi Minh. This research can contribute to formulating effective population and family planning policies that align with the aspirations and needs of individuals and couples in these areas.

METHODOLOGY

This study utilized secondary data from the Vietnam Multiple Indicator Cluster Surveys (MICS6) 2020-2021. The target population consisted of 2,320 married women aged 15-49 residing in Ha Noi and Ho Chi Minh. The inclusion criteria required women to have at least one child, be non-pregnant during the time of the survey, and excluded cases of women unable to conceive due to factors such as menopause, never experiencing menstruation, hysterectomy, infertility, or female sterilization. Weighted methods were applied to account for the complex survey design and sampling weights in the analysis, ensuring the results are representative of the target population. The final sample size for analysis was 1,177 (Ha Noi: 614 women; Ho Chi Minh: 563 women).

The dependent variable is women's desire for additional children. The independent variables areage, age at first marriage, education level, residence, household wealth index, sex composition of children, and number of surviving children. The study employed a conceptual framework based on The Theory of Planned Behavior. Binary logistic regression analysis was applied in this study.

RESULTS

Table 1 provides an overview of the background characteristics of women in Ha Noi, Ho Chi Minh, and the total sample. In terms of age, the majority of women in both cities were in the age groups of 30-39 (Ha Noi: 42.5%, Ho Chi Minh: 47.9%) and 40-49 (Ha Noi: 37.5%, Ho Chi Minh: 33.5%), representing women in their middle to late reproductive years. Regarding the age of first marriage, a considerable proportion of women in both Ha Noi and Ho Chi Minh got married between the ages of 20-25. However, the percentage of women marrying below the age of 20 was slightly higher in Ha Noi (23.2%) compared to Ho Chi Minh (20.9%). In terms of education, a higher proportion of women in Ha Noi (46.1%) had attained a university degree compared to Ho Chi Minh (29.0%). In contrast, a larger percentage of women in Ho Chi Minh had completed only lower secondary education (41.1%) compared to Ha Noi (27.0%). Analyzing the household wealth index, the majority of women in Ha Noi (62.2%) fell into the richest wealth category, while in Ho Chi Minh, a higher percentage of women fell into the middle and lower wealth categories (Ha Noi: 16.98%, Ho Chi Minh: 39.6%). Examining the residence variable, a higher proportion of women in Ha Noi resided in rural areas (51.6%) compared to Ho Chi Minh (23.5%), while a larger percentage of women in Ho Chi Minh lived in urban areas (76.5%) compared to Ha Noi (48.4%). Regarding the sex composition of children, a mixed gender composition was more prevalent in both cities (Ha Noi: 52.6%, Ho Chi Minh: 35.1%), followed by having all sons (Ha Noi: 28.8%, Ho Chi Minh: 36.0%) or all daughters (Ha Noi: 18.6%, Ho Chi Minh: 28.9%). Analyzing the number of children per woman, the majority of women in both Ha Noi and Ho Chi Minh had two children (Ha Noi: 84.4%, Ho Chi Minh: 66.1%).

Table 1: *The Social Factors of Women with at least one child in Ha Noi and Ho Chi Minh*

Characteristics	Ha Noi		Ho Chi Minh		Total sample	
	N	%	N	%	N	%
Age of women						
15 – 29	123	20.0	105	18.6	228	19.4
30 – 39	261	42.5	270	47.9	531	45.1
40 – 49	230	37.5	188	33.5	418	35.5
Total	**614**	**100**	**563**	**100**	**1177**	**100**
Mean	36.6		36.3		36.4	
SD	7.2		6.9		7	
Age at first married						
below 20	143	23.2	118	20.9	261	22.1
20 – 25	375	61.1	262	46.5	637	54.1
above 25	96	15.7	183	**32.5**	279	23.8
Total	**614**	**100**	**563**	**100**	**1177**	**100**
Mean	22.3		23.4		22.8	
SD	3.5		4.3		3.9	
Women's Education						
Secondary and lower	166	27.0	231	41.1	397	33.7
Upper secondary	165	26.9	168	29.9	333	28.3
university/college/higher	283	46.1	164	29.0	447	38.0
Total	**614**	**100**	**563**	**100**	**1177**	**100**
Household Wealth Index						
Middle and lower	104	17.0	223	39.6	327	27.8
Rich	128	20.8	162	28.8	290	24.7
Richest	382	62.2	178	31.6	560	47.5
Total	**614**	**100**	**563**	**100**	**1177**	**100**
Residence						
Rural area	317	51.6	132	23.5	449	38.1
Urban area	297	48.4	431	76.5	728	61.9
Total	**614**	**100**	**563**	**100**	**1177**	**100**
Sex composition of children						
All sons	177	28.8	203	36.0	380	32.3
All daughters	114	18.6	163	28.9	277	23.5
Mixed gender	323	52.6	197	35.1	520	44.2
Total	**614**	**100**	**563**	**100**	**1177**	**100**
Number of children						
Had one child	96	15.6	191	33.9	287	24.4
Had two children	518	84.4	372	66.1	890	75.6
Total	**614**	**100**	**563**	**100**	**1177**	**100**
Mean	2.14		1.78		1.96	
SD	0.7		0.68		0.7	

Table 2 present the frequencies and percentages of women with one child and women with two or more children in Ha Noi and Ho Chi Minh City. Overall, the majority of women in both cities did not desire to have any more children (Ha Noi: 81.5%, Ho Chi Minh: 80.7%). A smaller proportion of women expressed a desire for additional children (Ha Noi: 18.5%, Ho Chi Minh: 19.3%). Specifically, among women with one child, 25.4% in Ha Noi and 49.3% in Ho Chi Minh desired no more children. The majority of women with one child in both cities indicated desire for additional children (Ha Noi: 74.6%, Ho Chi Minh: 50.7%). For women with two or more children, a higher percentage in Ha Noi (91.9%) did not desire more children compared to Ho Chi Minh (96.8%). A smaller proportion in Ha Noi (8.1%) expressed a desire for more children, while in Ho Chi Minh, only 3.2% wanted additional children.

Table 2: *Women's desire to have additional children in Ha Noi and Ho Chi Minh by number of children*

Desired additional children	Ha Noi		Ho Chi Minh		Total	
	N	%	N	%	N	%
Women's desire to have additional children						
No more	500	81.5	454	80.7	954	81.1
Yes	114	18.5	109	19.3	223	18.9
Total	**614**	**100**	**563**	**100**	**1177**	**100**
Women who had one child						
No more	24	25.4	94	49.3	118	41.3
Yes	72	74.6	97	50.7	169	58.7
Total	**96**	**100**	**191**	**100**	**287**	**100**
Women who had two or more children						
No more	476	91.9	360	96.8	836	94.0
Yes	42	8.1	12	3.2	54	6.0
Total	**518**	**100**	**372**	**100**	**890**	**100**

Based on the correlation analysis, it found that the independent variables in both the Ha Noi and Ho Chi Minh data subsets had correlations below 0.65, indicating minimal multicollinearity.

The results from Table 3 shed light on the factors associated with the desired additional children of women in Ha Noi and Ho Chi Minh. Binary logistic regression were conducted separately for Ha Noi and Ho Chi Minh. In Ha Noi, the social factors related to women's desire to have additional were age of women, sex composition of children and number of children. And associated factor of the desired additional children in Ho Chi Minh was age of women, age at first marriage and number of children. Analyzing the age of women, women aged 30-39 in both Ha Noi and Ho Chi Minh had significantly lower odds of desiring additional children compared to women aged 15-29 (Ha Noi: AOR=0.34, 95%CI=0.15-0.74; Ho Chi Minh: AOR=0.51, 95%CI=0.24-1.09). Women aged 40-49 exhibited the lowest likelihood of desiring additional children, with significantly decreased

odds compared to women aged 15-29 in both cities (Ha Noi: AOR=0.02, 95%CI=0.00-0.07; Ho Chi Minh: AOR=0.02, 95%CI=0.00-0.12). Regarding the age at first marriage, the odds ratio for the desire to have a child of women who married at an age above 25 in Ho Chi Minh was 2.61 times higher compared to those married at an age under 20 (95%CI=0.93-7.29). In contrast, age at first marriage was not associated with desired more children in Ha Noi. In term of residence, In Ho Chi Minh, women living in an urban area had significantly lower odds of the desired additional children compared to those living in a rural area (AOR = 0.47, 95% CI: 0.22-1.01). But the residence was not associated with desired more children in Ha Noi. Regarding the sex composition of children, women in Ha Noi with all daughters had a significantly higher likelihood of desiring additional children compared to those with all sons (AOR=4.73, 95%CI=1.97-11.33). However, in Ho Chi Minh, no significant association was observed between the sex composition of children and the desire for additional children. Lastly, the number of children already borne by women was strongly associated with their desire for more children. In both cities, women who had two or more children exhibited a significantly lower likelihood of desiring additional children compared to those with only one child (Ha Noi: AOR=0.02, 95%CI=0.01-0.07, Ho Chi Minh AOR= 0.07, 95%CI=0.03-0.17). The result found no statistically significant differences in the desired additional children across education and household wealth index categories in both Ha Noi and Ho Chi Minh.

Table 3: Binary Logistic Regression of Social Factors Associated with Women's desire to have additional children

Variable	Ha Noi	Ho Chi Minh
	Adjusted OR (95% CI)	
Age of women		
15-29	Ref.	Ref.
30-39	0.34 (0.15-0.74)***	0.51 (0.24-1.09)*
40-49	0.02 (0.00-0.07)***	0.02 (0.00-0.12)***
Age at first marriage		
Under 20	Ref.	Ref.
20-25	1.18 (0.53-2.64)	1.29 (0.48-3.44)
Above 25	0.39 (0.10-1.51)	2.61 (0.93-7.29)*
Household Wealth Index		
Middle and lower	Ref.	Ref.
Rich	1.16 (0.38-3.51)	0.58 (0.26-1.30)
Richest	1.83 (0.60-5.61)	1.36 (0.53-3.50)
Education		
Secondary and lower	Ref.	Ref.
Upper secondary	1.40 (0.53-3.69)	0.88 (0.38-1.99)
University	0.88 (0.30-2.52)	0.63 (0.24-1.65)
Residence		
Rural	Ref.	
Urban	1.14 (0.58-2.22)	0.47 (0.22-1.01)*
Sex composition of children		
All sons	Ref.	
All Daughters	4.73 (1.97-11.33)***	1.33 (0.69-2.57)
Mixed gender	1.04 (0.47-2.34)	0.28 (0.05-1.48)
Number of children		
Have one child	Ref.	Ref
Have two or more children	0.02 (0.01-0.07)***	0.07 (0.03-0.17)***
Constant	4.29 (1.41-13.06)**	2.50 (0.94-6.59)*
Pseudo R-squared	0.48	0.44
N	614	563

Noted: ***p<0.01; **p<0.05; *p<0.1

DISCUSSION

The study reveals significant variations in fertility preferences between the two cities, indicating potential implications for future population trends in Vietnam. Among women in both cities, only 58.7% of those with one child desired more children, while a mere 6.0% of women with two or more children expressed the same desire. These findings highlight a lower fertility desire among women with one child compared to previous studies conducted in Vietnam (4). This raises concerns about declining fertility rates in Vietnam and underscores the need to address the issue of low fertility in developing countries. These trends align with the demographic transition observed in other countries, where fertility rates have fallen below replacement levels (12, 13).

This study provides valuable insights into the factors influencing women's desire for additional children in Ha Noi and Ho Chi Minh City. The age of women, age of first marriage, number of children, residence, and the sex composition of children were identified as significant factors associated with reproductive preferences. Women aged 30-49 showed a stronger lower desire for additional children compared to younger women aged 15-29 in both cities. Delayed marriage in Ho Chi Minh, particularly above the age of 25, was associated with a higher likelihood of desiring more children. Notably, in Ho Chi Minh City, women who married later in life exhibited a significantly stronger desire for additional children compared to those who married at a younger age. These findings highlight the influence of age and marital timing on women's reproductive preferences in Ho Chi Minh.

A significant finding of this study was the negative relationship between the desire for additional children and the number of living children from two or more in both cities. This finding is in line with Vietnam's one-or-two-child policy implemented in 1988, which aimed to restrict fertility among certain groups (such as couples working in government entities or the Communist party) (14). It mandated that couples could have no more than two children, with exceptions made for ethnic minority women. As a result, having two children has become the prevailing norm in Vietnam, leading to a lower desire for additional children among women with two or more children. These findings are consistent with previous research on fertility desires and reproductive capacity of Vietnamese women (4, 14, 15). The result highlights the lasting impact of the family planning policy on Vietnam's population and the influence it has had on women's reproductive preferences. Furthermore, it underscores the importance of considering policy interventions and their long-term effects on fertility patterns and preferences.

Another finding of this study was the positive relationship between the desire for additional children and having only daughters (compared to women who already had sons) in Ha Noi, while no such relationship was observed in Ho Chi Minh. This discrepancy may be attributed to cultural influences prevalent in these localities. In Ha Noi, deeply influenced by Chinese culture, the birth of a son is highly valued for carrying on the family lineage. The cultural emphasis on male succession and the desire for a male heir could explain why women in Ha Noi, who have only daughters, expressed a higher desire for additional

children. This finding is consistent with previous research on the desire for sons among Vietnamese women and in countries with similar cultural systems (3, 16, 17). The preference for male offspring can stem from several factors, including traditional gender roles, inheritance patterns, and cultural expectations (6, 18). On the other hand, Ho Chi Minh City exhibits a stronger influence on Western culture, which may prioritize individualism and personal success over traditional gender roles. Consequently, the desire for additional children in Ho Chi Minh City does not show a significant association with the gender composition of existing children (16). They provide insights into the diverse cultural landscape within Vietnam, with Ha Noi embracing traditional values and customs, and Ho Chi Minh City representing a blend of Western influences and modernity.

The study's limitations should be acknowledged, including the use of secondary data that restricted the availability of certain variables. Information on factors such as desired number and gender of children, women's health, husbands' and relatives' perspectives, and societal norms were not included. These factors play a crucial role in shaping fertility desire but were not captured in the analysis. Despite these limitations, the study provides insights into social factors influencing women's desire for additional children in Vietnam. Further research using more comprehensive data and qualitative approaches is necessary to enhance our understanding of fertility desire in the country.

CONCLUSION

This study offers valuable insights into the determinants of women's desire for additional children in the two largest cities of North and South Vietnam. The findings highlight the significance of several factors in shaping women's reproductive preferences, including age, age of first marriage, number of children, residence, and the sex composition of children.

ETHICAL CONSIDERATIONS

The necessary permissions to access the datasets of MICS6 for Vietnam were duly granted by the UNICEF MICS Team. An ethical review by the Institutional Review Board of the Institute for Population and Social Research of Mahidol University (COE. No. 2023/04-104).

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THE DETERMINANTS OF CONTINUITY OF CARE & ITS EFFECT ON TYPE 2 DIABETES MELLITUS PATIENTS' HEALTH OUTCOMES IN INDONESIA: ANALYSES USING THE NATIONAL HEALTH INSURANCE DATABASE

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ABSTRACT

The prevalence of Non-Communicable Diseases has been burdening healthcare systems around the world and Diabetes Mellitus prevalence in Indonesia has been ranked 1st in South-East Asia and 5th in the world. Continuity of care has been associated with improved chronic disease health outcomes and has been implemented in Indonesia since 2008. Although it has been implemented since 2008, there has been a knowledge gap about continuity of care and health outcomes, particularly using National Database in Indonesia. Therefore, this study sought to identify the determinants of continuity of care and its effect on type 2 diabetes mellitus patients' health outcomes in Indonesia.

A retrospective cohort study using Indonesia NHI database was conducted. The study population was all T2DM patients (age ≥ 18 years old) registered to continuity of care program in 2015 extracted from the NHI database (N=127,244; n=116,986). This study adapted Salisbury model longitudinal continuity (2009) with theory from Goldberg et al (1985) and apply Usual Provider Continuity Index (UPC Index) measuring Continuity of Care. This study has 2 observation periods. First, people's continuity of care during 2016-2017 was explored, and the determinants of continuity of care were analysed by performing multiple logistic regression analyses. Second, the associations between continuity of care and health outcomes during 2018-2019 were analysed by using chi-square and independent samples t-test.

The result showed that 51.89% of study population achieved high UPC Index (≥ 0.75). The first period of the study with multiple logistic regression showed that adult age (AOR= 1.34, 95% CI: 1.28, 1.40), female (AOR= 1.12, 95% CI: 1.09, 1.15), NHI Class-type III (AOR= 1.29, 95% CI: 1.24, 1.35), >1 year duration of relationship to a PCU (AOR= 1.25, 95% CI: 1.22, 1.28), Private PCU (AOR= 2.77, 95% CI: 2.47, 3.10), Rural PCU (AOR= 1.35, 95% CI: 1.32, 1.39), 1 Doctor in a PCU (AOR= 1.27, 95% CI: 1.19, 1.35) were significantly associated with continuity of care.

The second period of this study with chi-square test showed that people with high UPC Index has a significant association with no DM Complications and Mild DM Severity Level of Disease ($p<0.05$). It was also found that an average direct health care cost of respondents with high UPC Index was significantly lower than health care cost of respondents with low UPC Index.

The study showed more than half study population was categorized as high UPC Index. In addition, high UPC Index significantly associates with the adult age group, females, NHI Class-type III, longer duration of the relationship to a PCU, Private PCU, Rural PCU, and 1 doctor in a PCU for continuity of care determinant factors. Furthermore, higher UPC Index associates with No DM complications, mild DM severity level of disease, and significantly lower mean difference of direct health care cost in Indonesia. This study recommends health sector stakeholders in Indonesia to improve continuity of care program related to the determinants of continuity of care as one of the preventive approaches in primary health care management. Further research related to other dimensions of continuity of care in Indonesia needs to be conducted.

Keywords: Continuity of Care, UPC Index, Diabetes Mellitus, Health Outcomes, National Health Insurance (NHI).

INTRODUCTION

The Non-Communicable disease has been a burden on the health system in many countries. Indonesia has been ranked 1st Diabetes Mellitus prevalence in South-East Asia Region (1) and also 5th in the world (2). Management of type 2 diabetes mellitus by optimizing primary healthcare facilities is considered important (3, 4). The role of primary care has been highlighted to achieve optimal outcomes for chronic disease and long-term person-focused care is one of the main attributes of primary care-oriented service (5, 6, 7). Continuity of care can be defined as a long-term relationship between physicians and patients (8, 9), which furthermore help prevent developing disease and reduce medical cost for diabetic patients (10, 11).

The continuity of care program has been implemented in Indonesia since 2008 within *PT. ASKES* period of social health protection. Furthermore, BPJS Health as the Social Security Administrator of Health was appointed as the organizer of continuity of care program in 2013 (12). The Indonesia National Health Insurance scheme had divided the participants into 3 class-type related to the premium contributory. The Class-type I represented high income people (premium contributory $5.52/person/month), class-type II represented middle income people (premium contributory $3.52/person/month), and class-type III represented low income people (premium contributory $1.76/person/month) (13). Ministry of Health strengthened continuity of care program with regulation No 28 in 2014, which stated continuity of care program define as the extent series of discrete health care events experienced by people as coherent and interconnected over time, which include patient refer-back and chronic disease management activities in the primary care level. Diabetes mellitus was 1 of the 9 chronic diseases include in the program (14). The latest report showed the trend of type 2 diabetes mellitus patients' hospital admission was increase during 2014 – 2018 and from December 2020 to December 2022 at any level of healthcare facilities (15, 16). Although the number of continuities of care program participants reported increasing every year, it also followed by increasing visits of diabetes mellitus patients to the hospital in terms of medically need specialist treatment at the hospital (17).

This study adapted Salisbury continuity of care framework as longitudinal continuity with the measurement of repeated visits to the physicians and create a connection between the healthcare provider and the patient (18). This study model also adapts the theory from Goldberg et al which measure continuity of care by dividing into patient's and physician characteristics, and also regulation applied in National Health Insurance Scheme in Indonesia (19). This study will identify the determinants of continuity of care and its effect on diabetes mellitus patients' health outcomes in Indonesia using the National Health Insurance database. This objective is important because prevalence of diabetes mellitus increase every year, and despite continuity of care program has begun long time ago, there has been a gap study in continuity of care and its effect on health outcomes in Indonesia particularly using national database. This study was

different from the previous research that did not consider severity level status of diabetes and chronic disease medicine cost while diabetes is well known as a chronic disease that can impact for a long period of time for health conditions and health care cost.

METHODOLOGY

Study Population & Design

A retrospective cohort quantitative study design was conducted in this study. The study population was all Type 2 DM patient's registered in continuity of care program in Indonesia during 2015 (20). This study was conducted in 2 observation period. First, people continuity of care observation period, data taken on period of 2016-2017 to identify the continuity of care determinants (21). This period analyzed association between independent variables which include socio-demographic (age, sex, NHI class-type), Patient's longitudinal continuity (patient's duration of relationship to a Primary Care Unit/PCU), Provider's longitudinal continuity (PCU Ownership, PCU Location, Number of doctors in a PCU) with Continuity of Care (22, 23, 24, 25, 26). Usual Provider Continuity Index (UPC Index) was chosen for its simplicity and matched Indonesia NHI settings that required 1 participant register to 1 PCU (14, 27, 28). UPC indices scored within 0-1 whereas larger score described greater continuity of care, 0 UPC Index means no regular physician visit and 1 UPC Index means all visits made to the regular physician (10, 29). The UPC index categorized into two categories, low UPC index for the result of calculation <0.75 and high UPC index for the result of calculation ≥0.75 (10, 25, 30). This period was analyzed by performing chi-square, bivariate and multiple logistic regression analyses. Second, the contribution of continuity of care to health outcomes period analyses by performing chi-square and independent t-test. Data taken on period of 2018-2019 to identify the associations between continuity of care and DM patients' health outcomes which include DM complication (Y/N), severity level of disease and direct healthcare cost (31, 32, 33). DM complication and DM severity level of disease in this study classified by data record on The National Health Insurance Database that using INA-CBGs (Indonesia Case-Based Groups) system. INA-CBGs was a case mix system modified from the DRG method (Diagnosed Related Group), along with the change of grouper from 3M grouper to UNU (United Nation University) grouper and implemented since January 2014 since the implementation of The National Health Insurance program. INA-CBGs identified DM complication and DM severity level of disease by using ICD 10th version of 2010 (34, 35).

Data Collection Procedure

This study used national data extracted from Indonesia National Health Insurance database administered by BPJS Health. After certificate approval of ethical consideration was obtained from Mahidol University Social Science Independent Review Board (MUSSIRB), researcher propose formal data request to BPJS Health in April 2023. A meeting held with Secretary of BPJS Health and Directorate of Data Management & Information (DMI) in BPJS Health Head Quarters Office, Jakarta, Indonesia. During data collection, all individual data

variables were extracted. Furthermore, after granted data collection formal approval, a team consisting of 4 people including the researcher was formed to conduct data extraction and enhance coordination for this study.

Data analysis procedure and statistic

To begin the study analyses, UPC Index was calculated to measure continuity of care program in study population. UPC Index was calculated as n/N in the 2 years following the diagnosis of incident diabetes; where n was the number of primary care level visits from an individual's most responsible health care provider and N was the total number of primary and specialist health care visits. Patients with UPC Index measured ≥0.75 defined as high continuity of care (10, 36, 37, 38). For continuity of care observation period, measured association between independent variables and UPC Index with chi-square analyses, bivariate analyses, and multiple logistic regression analyses. For contribution continuity of care to health outcomes period measured association between UPC Index and health outcomes variables with chi-square analyses and independent t-test. The reference groups for data analysis in this study was selected based on the group within the variables that had the lowest percentage of high UPC index groups. All statistical analyses processed using SPSS version 21.

Ethical consideration

Ethical approval was obtained from the Mahidol University Social Science Independent Review Board (MUSSIRB) in Thailand: Certificate of Approval Number: 2023/006.2103. Due to data confidentiality of National Health Insurance regarding concerns over study subjects' anonymity, the dataset used for this study is only accessible when the specific authorized request letter approved. The dataset for this study given via e-mail with password encrypted.

RESULT

Dataset for this study population were N= 127,244 individual data. Data cleansing processed for missing value and possibility of administrative error. Furthermore, after exclusion criteria applied, n= 116,986 individual datasets gained for analyses. UPC Index calculation resulted 51.89% of study population categorized as high UPC Index, 45.43% categorized as low UPC index, and 2.67% categorized as missing value. Description of socio-demographic variables showed 46.14% were in pre-elderly age between 46-59 years. Majority of study population were female 60.80% and registered as NHI Class-type I 46.94%.

Analysed in continuity of care observation period and health outcomes period did not include UPC Index missing value (n= 113,859). Chi-square analysis and bivariate analyses were conducted, and the result showed that socio-demographic, patient's longitudinal continuity variable and provider's longitudinal continuity variables had significant association with UPC Index. Therefore, all variables remained for multiple logistic regression.

Table 1: Determinants of UPC Index.

Independent Variables	UPC Index Final Model AOR (95% CI)
Age *(Ref: ≥60)*	
18-45	1.34 (1.28-1.40)*
46-59	1.10 (1.07-1.13)*
Sex *(Ref: Male)*	
Female	1.12 (1.09-1.15)*
Class-type *(Ref: I)*	
II	1.22 (1.19-1.26)*
III	1.29 (1.24-1.34)*
Duration of Relationship to a PCU *(Ref: ≤1 year)*	
>1 year	1.25 (1.22-1.28)*
PCU Ownership *(Ref: Army/Police)*	
Government	1.69 (1.51-1.89)*
Private	2.77 (2.47-3.10)*
PCU Location *(Ref: Urban)*	
Rural	1.35 (1.32-1.39)*
Number of Doctor in a PCU *(Ref: 0)*	
1	1.27 (1.19-1.35)*
>1	1.13 (1.05-1.20)*

*Note: Ref= Reference, N.E.= Not in the Equation, *p-value <0.01*

AOR: Adjusted odd ratio, CI= Confidence interval, n= 113,859

Chi-square analyses were conducted to analyse the association of UPC Index with DM complication (Table 2), and UPC Index with severity level of disease (Table 3). The result showed that there were significant associations between high UPC Index with no DM Complication and mild Severity Level of Disease.

Table 2: Association between UPC Index and DM Complication.

Continuity of Care Index	DM Complication		Pearson Chi-square	p-value
	No Complication n (%)	With Complication n (%)		
UPC Index			984.84	0.000*
Low	44,774 (84.2)	8,378 (15.8)		
High	54,878 (90.4)	5,829 (9.6)		

Note: n= 113,859. p-value<0.05

Table 3: Association between UPC Index and Severity Level of Disease.

Continuity of Care Index	Severity Level of Disease			Pearson Chi square	p-value
	Mild	Moderate	Severe		
	n (%)	n (%)	n (%)		
UPC Index				1361.79	0.000*
Low	45,325 (85.3)	5,315 (10.0)	2,512 (4.7)		
High	55,941 (92.1)	3,253 (5.4)	1,513 (2.5)		

Note: n= 113,859. p-value<0.05

Independent t-test was conducted to analyse association between UPC Index with direct healthcare cost (Table 4). Independent t-test chosen despite non-normally distributed of variables was because the group test had large number with ratio scale, and parametric method had advantage that can observe mean difference between two groups (39). The result showed that there was significantly mean difference of direct health care cost between low UPC Index (*M*= $1007.53, *SD*= $1997.72) and high UPC Index (*M*= $338.72, *SD*= $951.00), t(73791)= 70.505, p= 0.000.

Table 4: Difference in Direct Health Care Cost of Respondents with High and Low UPC Index.

	UPC Index	N	Mean	SD	t	p-value
Direct HCC USD	Low UPC Index	53152	1007.5298	1997.72	70.505	0.000*
	High UPC Index	60707	338.7247	951.00		

DISCUSSION

The study found that more than 50% of population categorized as high UPC Index. The missing values of UPC Index resulted because that people only had one physician visit during continuity of care period in any physician level, so that the indices could not be calculated (40). To begin with continuity of care observation period, this study found that adult people aged 18-45 year and pre-elderly people aged 45-59 year were more likely to have high UPC Index compared to elderly people aged 60 years. These finding were different from previous study (25, 40, 41), however, the study result from Kohnke and Zielinski (2017) found that with increased age, the number of visit to emergency department (ED) increased, alongside with the increased number of chronic diagnoses (23). It possibly explained this study result, since in Indonesia ED facility majority operates at the hospital and only 35.2%-39.9% of PCU provide ED facility during 2017-2019 (42). Therefore, older people will possibly have lower UPC Index since higher hospital visit will result to lower UPC Index. In addition, this study found females were more likely to have high UPC Index than males. This finding consistent with previous study from Nutting, P.A. et al (2003) that found female were more likely to value continuity of care at any age group because they reported greater satisfaction and quality of care

when they achieve continuity with physician (43). Then, the study also found that people categorized as Class-type III and II were more likely to have high UPC Index than to Class type I. This result could explain by study from Johnston, et al (2020) that found patients with more individual social risk factor such as lower income had better continuity of care because that patients were less likely to access a specialist related to fewer resources at individual level (24).

The association between patient's duration of relationship to a PCU with high UPC Index was found significant on patient that had more than 1-year duration of relationship. This finding was similar with previous study that resulted patient with longer relationship with their physician were significantly associated with high continuity of care and were less likely to be hospitalized (38, 41).

In terms of provider's longitudinal continuity, this study found that patient registered to private PCU were more likely to have high UPC Index than other PCU. This result was similar with Darden, et al study (2001) that explained private PCU probably provide more patient, physician and staff satisfaction, and also increased compliance with appointments and medications (26). Then, patient registered to PCU located in rural were more likely to have high UPC Index than urban. This result similar study from Howard M., et al (2022) that explains lack of access to specialists in rural areas, may decrease the likelihood of receiving care from different physicians' level. The relatively increased treatment care by general physicians may also implement a palliative approach themselves rather than referring to a palliative care specialist, which may partially explain greater continuity in rural area (24). Lastly, PCU with single doctor and more than 1 doctor more likely to had significant association than PCU with no doctor. PCU with single doctor had more likely to had significant association than PCU with more than 1 doctor. This result similar with previous study from Barker, et al (2017) that stated patients who saw the same general practitioner have a greater proportion of time experienced and resulted better continuity of care, while in larger practices patients were deliberately managed by several general practitioners working in a small team (44).

Furthermore, for health outcomes period, this study found that high UPC Index were significantly associated with no DM complications and mild severity level of disease. These findings in line with previous study that mentioned higher index of continuity of care significantly associates with lower DM complication (11, 41), and lower severity level of disease (21, 24, 45). Lastly, this study found significant mean difference of direct health care cost between high UPC Index (*M*= $338.72, *SD*= $951.00) and low UPC Index (*M*= $1007.53, *SD*= $1997.72) that were similar to previous studies (46, 47, 48, 49).

CONCLUSION

This study found that predictive factor of continuity of care in Indonesia were significantly related to adult age, female, NHI Class-type III, patients that had more duration of relationship to a PCU, Private PCU, Urban PCU and Single doctor in a PCU. Furthermore, high UPC Index in Indonesia were

significantly associated with no DM complications, mild severity level of disease and significantly lower mean difference of direct health care cost. This study recommends improving continuity of care program to the health sector stakeholders such as Ministry of Health and BPJS Health in area related to continuity of care determinants to optimize the program as one of the preventive approaches in primary health care management. Lastly, further research regarding other dimension of continuity such as relational continuity, informational continuity and team management continuity need to conduct that were still had a gap in Indonesia.

LIMITATION

This study used secondary data that might have a limitation on quality and accuracy of the data. However, researcher work in a team that closely monitoring data extraction to optimize control the reliability and validity data for this study question and objectives. In addition, this study explored longitudinal continuity measured by The National Health Insurance database, the continuity observation might not uncertainly reflect the condition of the patient-doctor relationship, such as interpersonal continuity. Therefore, further research needs to conduct. Despite the limitations of this study variables and design due to the nature of National Health Insurance Cohort data, there would be no difficulty in generalizing the results.

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THE IMPACT OF MOTHERS' CHARACTERISTICS ON THE DISPOSAL METHODS OF CHILDREN'S STOOLS IN MYANMAR

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ABSTRACT

Children need the care of their mothers, especially younger children. The role of mothers is crucial to the health of their children. Unsafe disposal of children's stools has been an unhindered part of public health problems primarily in low and middle-income countries.

The objective of this study was to identify the association between the characteristics of mothers' and children's stool disposal methods in Myanmar

The 2015-2016 Myanmar Demographic and Health Survey is the main source of data for this secondary data analysis. Mothers were asked how they disposed of their children's stools the last time. Safe disposal of children's stools of children is to use the toilets by themselves, and in the case of infants and toddlers, to rinse the stool into a toilet or burying in an appropriate way. Any other methods are regarded as unsafe disposal methods according to World Health Organization. The data were cleaned, recoded, and analyzed in STATA (v.14). Descriptive statistics were analyzed and for analytic analysis, bivariate analysis using simple logistic regression (p-value ≤0.20) was followed by multivariable logistic regression (p-value ≤0.05) to investigate the association between the disposal methods and mother characteristics.

A total of 4189 data were used for data analysis. Approximately 41% of mothers practiced unsafe disposal methods while 59% practiced safe disposal methods within the household. We found that residential area, type of toilet facility, higher educational level, exposure to mass media: television at least once a week, age of the child and number of under 5 children in the family were statistically significantly associated with children's stools disposal methods (p-value ≤0.05).

The results indicate that the characteristics of the mothers were highly associated with the disposal methods of children's stools in Myanmar. It highlights the role and impact of mothers in a child's care and health. Programs to enhance mothers' awareness of safe disposal methods are needed, particularly initiatives to educate the mothers about the importance of safe disposal methods for the children's stools, including the primary caregivers for better children's health. Further studies should have a more confined focus on the structural and behavioral barriers instead of focusing on the disposal methods alone.

Keywords: Mother's characteristics, stool disposal methods, Myanmar Demographic and Health Survey, Child's health

INTRODUCTION

After going unnoticed for a number of decades, the need for proper sanitation for all individuals is finally being recognized as a crucial element of Universal Health Coverage (UHC) (1). Sanitation is defined as "access to and use of facilities and services for the safe disposal of human urine and faeces (2)." However, in order to achieve the Sustainable Development Goals (SDGs), safe, sustainable, and well-managed systems must be employed in addition to toilets.

The implementation of safe sanitation practices is crucial in mitigating the spread of diarrheal diseases and other infections. Thus far, most of the attention in the eradication of open defecation has been directed towards adults, with limited attention to children. In addition, sanitation initiatives and interventions aimed at improving household sanitation have shown limited attention to the management of faecal waste from young children based on the premise that the faecal matter of children is less infectious than that of adults (3).

As a result of a misunderstanding among parents, the disposal of children's stools is often neglected and mishandled (4). Safe disposal of faeces for children who are below the age of five should be encouraged to utilize a toilet or a latrine. In the case of young children, it is possible to dispose of excrement by either burying it or flushing it down the toilet. Other methods are considered unsafe methods (5). The transmission of faecal pathogens to humans can occur through various environmental media as a result of unsafe practices (6, 7).

The improper disposal of children's stools has emerged as a major public health concern worldwide specifically in many Low and Middle-Income Countries (LMICS). Due to their higher susceptibility to gastrointestinal diseases, research shows that children's faeces are a more substantial source of environmental pollution than those of adults (8). Children who do not properly dispose of their waste are more likely to have diarrheal infections, with the risk rising by about 23% (9, 10). In Myanmar, where there are 50 deaths per 1,000 live births, diarrhea stands as the fourth greatest cause of under-five mortality, accounting for one-fourth of all childhood deaths globally. Along with the obvious and immediate impacts of diarrhea, inappropriate disposal of children's faeces can have serious long-term consequences on a child's health, including poor growth and impaired cognitive development (1, 9, 11).

To improve the disposal of children's stools in a proper and safer manner, it is essential to understand the determinants of unsafe stool disposal. Previous studies in India (12-14), Bangladesh (12) and Ethiopia (15) have investigated to identify the factors influencing the children's stools disposal. The significant factors in the proper management of child faeces consist of individual, maternal, and environmental factors in the household and environment.

However, little research has been done on how to properly dispose of children's faeces in Myanmar. Little focus was on children under 5 years of age as most of the studies focused on children

under 3 years of age. By utilizing data from the Myanmar Demographic and Health Survey 2015–2016, we aimed to identify the association between mothers' characteristics and children stool disposal methods in Myanmar (16). The results of this study are anticipated to be used in the development of policies and programs for the safer and correct disposal of children's faeces in order to lower the incidence of diarrhea in children under the age of five and to promote the health and well-being of children and the community.

METHODOLOGY

Study Design and Data Source

This cross-sectional secondary data analysis was conducted using secondary data from the Myanmar Demographic and Health Survey 2015-2016, which was conducted by the Ministry of Health and Sports (MOHS) with financial support from the United States Agency for International Development (USAID) and the Three Millennium Development Goal Fund (3MDG) (13). This survey is the latest national representative demographic and health survey in Myanmar. DHS data are available online to everyone and can be obtained by requesting to ICF with research purposes. Mothers who have responded to the outcome variable were included in the study. Missing data were excluded from the study. The questionnaire was used to assess the mother's characteristics. The outcome of disposal methods was assessed through the question "How did they dispose of the last-timed passed faeces of the youngest child?".

Operational Definition

Safe child faeces Disposal Method : Disposal methods are defined as safe "when a child using a toilet or latrine by him or herself. In case of young children, putting or rinse the faeces into a toilet or latrine or burying."Unsafe child faeces Disposal Method: It is considered as unsafe when it is disposed as follows:"putting/washing/rinsing into open drains or ditch, throwing into the garbage, rinsing Away, left in the open/not disposing of at all and others."

Study population : The study population for this study is the mothers of 15-49 years of age who are taking care of a child under 5 years old. Only mothers who responded to the outcome variables were included in this study with a total of 4189 mothers.

Statistical Analysis

Data cleansing procedures were conducted according to the DHS guidelines. KR file of MDHS was the main file for the data analysis. For descriptive analysis, weighted frequency and percentage (Descriptive summaries) were used to explain the characteristics of mothers in this study.

For analytic analysis, bivariate analysis using simple logistic regression (cut-off p-value ≤ 0.20) was followed by multivariable logistic regression (cut-off p-value ≤ 0.05) to investigate the association between the disposal methods and mother characteristics. The adjusted odds ratio (AOR) with a 95% confidence interval (95% CI) was used to present the final results. STATA (v.14) was used for the data analysis.

Ethical consideration

Ethical approval for this study was obtained from the Office of the Research Ethics Review Committee for Research Involving Human Subjects regulations of the Review Boards of the Ethical Committee, Chulalongkorn University on 15th May 2023 with COA 101/66.

RESULTS

Children's Stool Disposal Methods practiced for last time passed faeces in Myanmar

In Figure 1, 41% of mothers practiced safe disposal methods while 59% practiced unsafe disposal methods. The most common disposal method used by the primary caregiver is putting or rinsing in a toilet or latrine constituting about 35.52 % (n=1488). However, total number of 546 were left in the open or not disposed of at all (Figure 2).

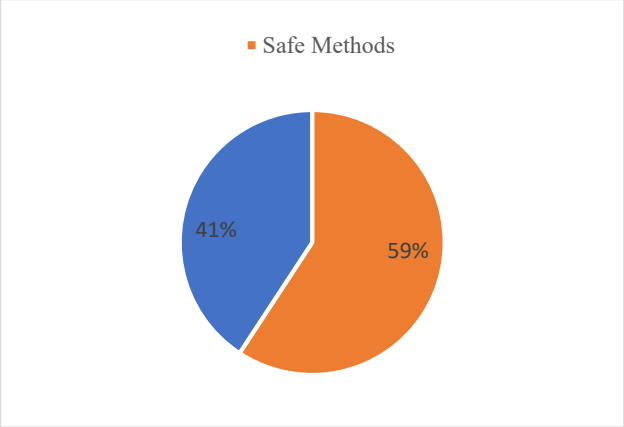

Figure 1: Percentage of Safe and Unsafe Methods of Last Time Passed Children's Stools

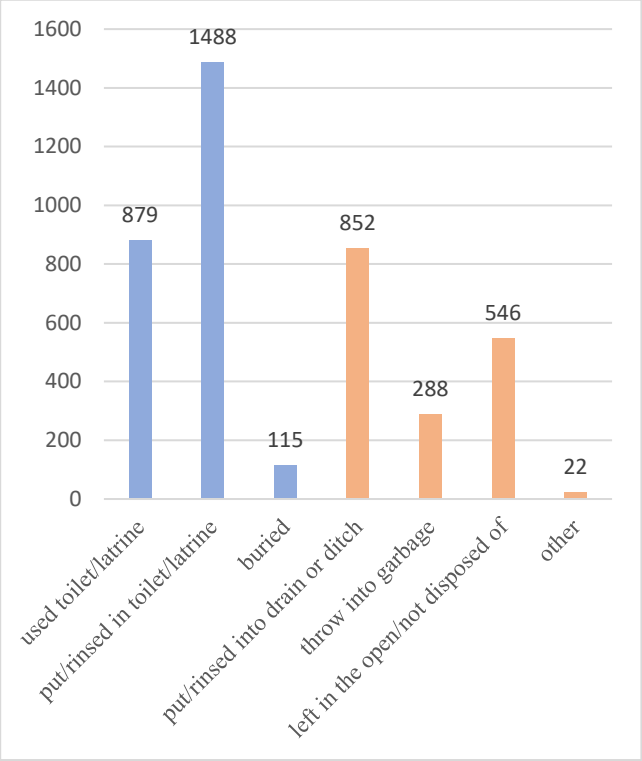

Figure 2: Children's Stool Disposal Methods in Myanmar

Table 1: Distribution of Characteristics of Mothers (N=4189)

Characteristics of Mothers	Categories	Frequency	Percentage (%)
Sex of the household head	Male	3514	83.90
	Female	675	16.10
Residential Area	Rural	3255	77.71
	Urban	934	22.29
Age	<18	13	0.30
	18-35	3169	75.66
	>35 years of age	1007	24.04
Educational Level	No education	765	18.25
	Primary	1921	45.85
	Secondary	1187	28.35
	Higher	316	7.55
Working Status* (n=4186)	Do not work	1849	44.16
	Working	2338	55.84
Exposure to Mass Media			
Newspaper	Not at all	2775	66.24
	Less than once a week	1002	23.93
	At least once a week	412	9.83
Radio	Not at all	2653	63.34
	Less than once a week	751	17.92
	At least once a week	785	18.74
Television	Not at all	1313	31.35
	Less than once a week	760	18.14
	At least once a week	2116	50.51
Type of Toilet Facility	No toilet Facilities	586	14
	Unimproved	1489	35.54
	Improved	2114	50.47
Age of Child	<12 months of age	806	19.24
	12-24 months of age	928	22.15
	25 months and above	2455	58.61
Number of <5 Children in the family	0-1	2585	61.72
	2-3 Children	1555	37.11
	>4 children	49	1.17

**Variables with Missing Data*

Association between Characteristics of Mothers and Children's Stools Disposal Methods

Bivariate Logistic Regression was followed by Multivariable Logistic Regression to determine the association between mothers' characteristics and children's stool disposal methods in Myanmar. In Table 2, the results of the bivariate logistic regression analysis were presented. In the multivariable logistic regression model, the odds of unsafe disposal were higher in rural residential areas [AOR: 1.43, 95% CI: 91.11-1.83)] and in mothers with more than one child in the family [AOR: 1.90, 95% CI: 1.55-2.33]. The odds of unsafe disposal were 70% lower in mothers with unimproved and improved toilet facility, 43% lower in mothers with higher educational level [AOR: 0.57, 95% CI: 0.36-1.05] and 35% lower in mothers who watched television at least once a week [AOR: 0.65, 95% CI: 0.51-0.82]. Lower odds of unsafe disposal were also seen in mothers with children aged between 12-24 months of age and 25 months and above compared to children under 12 months of age (Table 2).

Table 2: Association between Characteristics of Mothers and Children's Stools Disposal Methods (N=4189)

Characteristics	COR	95% CI		P-value	AOR	95%CI		P-value
		L	U			L	U	
Sex of the household head								
• Male	ref							
• Female	0.93	0.74	1.18	0.571				
Residential Area								
• Urban	ref				ref			
• Rural	2.10	1.67	2.65	<0.001	1.43	1.11	1.83	0.006
Type of Toilet Facility								
• No toilet Facilities	ref				ref			
• Unimproved	0.24	0.18	0.33	<0.001	0.30	0.16	0.58	<0.001
• Improved	0.22	0.16	0.29	<0.001	0.30	0.15	0.60	0.001
Age								
• <18	ref				ref			
• 18-35	0.30	0.10	0.87	0.027	0.43	0.14	1.30	0.134
• >35	0.24	0.08	0.72	0.011	0.41	0.14	1.26	0.120
Educational Level								
• No Education	ref				ref			
• Primary	0.61	0.46	0.81	0.001	0.79	0.59	1.05	0.098
• Secondary	0.46	0.35	0.63	<0.001	0.77	0.56	1.05	0.096
• Higher	0.25	0.17	0.38	<0.001	0.57	0.36	1.05	0.016
Working Status* (n=4186)								
• Do not work	ref				ref			
• Working	0.73	0.61	0.87	<0.001	0.91	0.74	1.10	0.321
Exposure to Mass Media								
Newspaper								
• Not at all	ref				ref			
• Less than once a week	0.65	0.53	0.79	<0.001	0.86	0.69	1.07	0.180
• At least once a week	0.44	0.32	0.60	<0.001	0.80	0.56	1.15	0.221
Radio								
• Not at all	ref				ref			
• Less than once a week	0.92	0.74	1.15	0.486	0.99	0.78	1.24	0.912
• At least once a week	0.81	0.64	1.03	0.082	0.96	0.75	1.23	0.775
Television								
• Not at all	ref				ref			
• Less than once a week	0.91	0.71	1.17	0.452	1.19	0.90	1.58	0.223
• At least once a week	0.41	0.33	0.52	<0.001	0.65	0.51	0.82	<0.001
Age of Child								
• <12 months of age	ref				ref			
• 12-24 months of age	0.47	0.38	0.59	<0.001	0.45	0.35	0.59	<0.001
• 25 months and above	0.25	0.21	0.30	<0.001	0.21	0.17	0.27	<0.001
Number of <5 Children in the family								
• 0-1	ref				ref			
• 2-3 Children	2.23	1.86	2.67	<0.001	1.90	1.55	2.33	<0.001
• >4 children	4.89	1.67	14.37	0.004	4.10	0.89	18.94	0.071

*Variables with Missing Data

DISCUSSION

The study revealed that residential area, type of toilet facility, higher educational level, exposure to mass media: television at least once a week, age of the child and number of under 5 children in the family were statistically significantly associated with children's stools disposal methods in Myanmar. Three out of five mothers had used safe disposal of children's stools. This study's proportion was lower than studies conducted in various ASEAN nations, including Indonesia (48%), the Philippines (77%), India (84%) and Bangladesh (88%) according to World Bank data. But compared to Tanzania, Haiti, and Senegal, there were more cases of unsafe disposal methods. A possible explanation for this may be due to differences in sample size selection and cultural differences.

First of all, the residential area associated with the unsafe disposal of children's stools. The prevalence of unsafe disposal methods as well as poverty is significantly higher in rural areas. Additionally, poor people's population is 6.7 times higher in rural areas (17). Due to poverty, the households in rural areas had limited access to toilets, and basic sanitation. This coincides with similar reports (7, 18, 19). Studies conducted in Ethiopia, Bangladesh (12, 15) and Kenya (20) also stated the urban-rural differences in the disposal of children's stools. However, one in two households had access to improved toilet facilities. The likelihood of safe disposal is higher in both households with unimproved and improved sanitation. The results of this study were consistent with those done in India (13), Indonesia (12), South Africa(21), Ethiopia(15), Malawi(22) and Nigeria (23) respectively with similar socio-economic status.

According to the data presented in (24), approximately twelve per cent of men and thirteen per cent of women aged 15-49 have not received any formal education. Relatively small subset of mothers had achieved a higher level of education in our study. Despite that small percentage, the safe disposal of children's stool was found in mothers with higher educational level. Similarly, the findings in Malawi (25) and Nigeria (23) indicated a positive correlation between higher levels of education and the likelihood of engaging in safe disposal behaviors.

In Myanmar, mass media outlets, including newspapers, radio, and television, disseminate health-related information during intervals between programs. It is noteworthy that 50% of the participants reported watching television on a weekly basis. It has been observed that primary-care givers acquire health knowledge and relevant health information from various media sources to a certain degree. The observed outcome is an elevated level of awareness among mothers has led to safe disposal practices within households. The results are in line with studies done for sub-Saharan countries (26) Ethiopia (27) and in Malawi(22).

As the children get older, the shift in safe disposal from unsafe disposal is seen. Correspondingly, unsafe disposal methods are seen among younger children under the age of 12 months. This is in line with the studies done by (12, 28-30). This could be explained by some contextual misconceptions. Firstly, faeces from younger children's stools are considered to be non-infectious and less harmful as they only have breastmilk with some supplemental foods (31). Secondly, older children were able to take care of themselves. Mothers tend to have a great interest in potty training as that

habit could reduce their care burden and the financial burden of using tons of diapers.

Lastly, large families with more under-five children in the family are likely to practise unsafe disposal methods(17). This is in accordance with studies done in Orissa, Rural India (32) and Ethiopia (27). Children are in need of care of the adults. Having one under- five child in a family is enough to make the family members feel burdened regarding with childcare. Moreover, having more than 2 children in a family could lead to an extra burden to mothers. Overall, this has led families with more children to practise unsafe disposal methods.

STRENGTHS AND LIMITATIONS

Firstly, through the application of the nationally representative survey, the findings could be generalized to all the mothers in Myanmar. Normally, DHS data are updated every four years. However, due to political instability in Myanmar, Myanmar Health System has been downgraded to some extent. MDHS being the latest survey, it could still reflect the real sanitation situation in Myanmar although there may be changes overtime. The studies design is a cross-sectional study, so this study makes it difficult to establish a causal relationship between the predictor variables and the outcome. Secondly, the outcome variable, children's stool disposal was collected on reported practice instead of the actual observation which could lead to recall bias. Overreporting of the child stool disposal methods could lead to reporting bias. Lastly, people tend to alter their answers and actual behaviors while they are aware of being interviewed about sensitive topics(33). By asking the disposal methods practiced for last-passed faeces, the reporting bias is reduced to a certain extent.

CONCLUSION

The findings of this study emphasized the need to shift focus on the behavior of the mothers to curb the significant burden of unsafe disposal of children's stools in Myanmar. This study highlighted the importance of sanitation and access to sanitation, specifically access to toilet facilities to be the first step to consider while implementing sanitation projects and programs In addition to sanitation coverage, behavioral changes of the mothers to encourage cleaning their children after passing stool, transporting the children's faeces to sanitation facility using proper methods, and training the child for potty training at an early appropriate age should be taken into great consideration as child faeces management interventions. Finally, in areas with no sanitation facilities, mothers are suggested to use shared toilets to practice safe disposal methods and use proper transport of children's stools to the toilets. Further studies should have a more confined focus on the structural and behavioral barriers instead of focusing on the disposal methods alone.

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PREVALENCE AND ASSOCIATED FACTORS OF STRESS AMONG HEALTHCARE PROFESSIONALS IN YANGON, MYANMAR

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ABSTRACT

Mental health problems in Myanmar are serious, and there are insufficient mental health professionals to care for the population. The largest healthcare crisis in Myanmar's history occurred in 2021, during the covid-19 third wave, because of a lack of essential medical supplies such as supplemental oxygen and drugs. Working in such a stressful environment would cause stress among healthcare professionals.

This study aimed to assess the association between demographic and occupational characteristics and stress levels among healthcare professionals in Yangon, Myanmar.

A cross-sectional study was conducted among 445 healthcare professionals in Yangon, Myanmar, using an online survey distributed via online and social media platforms. The survey questionnaire was constructed, including demographic and occupational characteristics, and the Perceived Stress Scale -10 questionnaire. Descriptive statistics and the Chi-square, Fisher exact tests, and multiple logistic regression were used to assess the association between demographic and occupational characteristics and stress levels.

The study's findings reveal that around 50.79% of the participants reported a high-stress level, with doctors saying the highest stress level among other professions at 64.60%. This is evidenced by a stress score greater than 13 out of 40. Conversely, 49.66% of the participants exhibit a low level of stress.

The study findings indicate that sociodemographic and occupational factors, including work department (e.g., medical ward, surgical ward, etc.), education level, family arrangement, employment status, and work for covid-19 significantly correlate with stress level. It is crucial that healthcare institutions, policymakers, and stakeholders in Yangon, Myanmar recognize the importance of addressing stress among healthcare professionals. By prioritizing the well-being of these individuals, we can improve the overall quality of healthcare delivery and create a supportive and sustainable work environment for the region's healthcare professionals.

Keywords: healthcare professional, stress, Yangon, Myanmar

INTRODUCTION

The phenomenon of stress is a globally pervasive issue that has a substantial impact on peoples' physical and mental health all over the world (1).

The largest city in Myanmar, Yangon, serves as the main center for the country's economic and cultural activity (2). The city has seen major changes that have had a perceptible impact on the daily experiences of its residents considering contemporary tendencies towards urbanization and modernization. Rapid urbanization, combined with changing socioeconomic dynamics and greater work demands, has been linked to elevated stress levels among Yangon healthcare professionals.

The emergence of COVID-19 pandemic can be traced back to the identification of SARS-CoV-2, a novel coronavirus, in Wuhan, Hubei, China in late 2019 (3). The novel coronavirus strain SARS-CoV-2 caused the 2019 coronavirus disease (COVID-19), which was declared a global public health emergency by the World Health Organization on January 30, 2020. The virus has been observed to have a significant impact on the physical health of a vast number of individuals, with millions having already been affected. Additionally, researchers are concerned about the potential for the virus to pose a substantial threat to global mental health (4).

There was a dramatic increase in the number of new cases and fatalities in Myanmar during the second wave of COVID-19. From the very beginning to December 29, 2022, it reported 633,647 cases, 19490 deaths, and 608,288 recoveries (5).

According to recent research, mental health concerns in the South East Asia region accounted for 18.6% of years lived with disability (YLDs), while in Myanmar, they accounted for 14.2% [6]. Furthermore, it has been observed that mental distress, encompassing symptoms of anxiety and depression, is one of the prevalent mental health issues among the top ten primary causes of Disability-Adjusted Life Years (DALYs) in Myanmar (6).

Stress refers to any type of change that exerts pressure on the body, mind, or emotions. Your body responds to anything that requires your attention or action. (WHO 2021)

The consequences of any factor that provides a substantial threat to the maintenance of homeostasis are commonly referred to as "stress." The stress response refers to the physiological and psychological reactions exhibited by the body when exposed to a stressor, which might be an actual or perceived threat to the well-being of the organism. Selye observed that prolonged and intense stress reactions had the potential to induce tissue damage and sickness, notwithstanding the fact that stress responses initially evolved as adaptive processes (1).

Acute and chronic stress responses, which can adversely affect a person's health, are the two forms of stress responses.

The presence of acute stress triggers a cascade of physiological responses in several bodily systems, including the neurological, cardiovascular, endocrine, and immunological systems. term. The stress response is a set of physiological and psychological changes that occur in the body when faced with a challenging or threatening situation. These adjustments, sometimes referred to as the stress response, typically confer advantages, particularly in the immediate timeframe (7). In the same way, the activation of the acute stress response that is either excessive or chronic can have adverse effects on one's

health, including the development of cardiovascular disease (1).

Yangon has many public and private hospitals that provide emergency, surgical, and specialized care, including Yangon General Hospital, North Okkalapa General Hospital, Pun Hlaing Siloam Hospital, and Asia Royal Hospital. A large number of physicians, nurses, and other medical personnel reside in Yangon. The current political unrest and instability in Myanmar have affected the healthcare system and its capacity to serve the population (8).

It is essential to understand the prevalence of stress among healthcare professionals to maintain the highest quality of care for the population. We conducted a cross-sectional survey to determine the stressors and prevalence of stress among healthcare professionals in Yangon, Myanmar.

METHODOLOGY

Study design

A cross-sectional survey was conducted from 15th to 30th June 2023 to assess the stress levels of healthcare professionals in Yangon, Myanmar.

Study population and sampling technique

The study included a total of 445 participants who met the inclusion criteria below.

1) above 18 years of age

2) employed in both the public and private sectors across Yangon's four major districts (North, East, South, West)

3) a minimum of two years of experience as a healthcare professional

4) participate voluntarily in the study

Four screening questions were given to participants before they were allowed to participate in the study, and those who failed to meet the criteria were excluded. The PSS10 survey was used to gather information on stress levels. The Kobo Toolbox form was used to distribute a self-administered survey over numerous social media networks, including Facebook, Messenger, Viber, and Telegram. Nearly 600 people filled out the questionnaire; 445 were included for the study after data cleaning and incomplete responses were removed. The purposive sampling technique was used to collect the data.

Data analysis

After data collection, responds will be cleaned and coded in Microsoft Excel. The Excel data will be imported into Chulalongkorn University's licensed SPSS Version 28. A bivariate Chi-square test will determine the association between all independent factors, such as sociodemographic characteristics and work-related characteristics, and the dependent variable, 1) Stress (yes/no). Fisher's exact test results will be reported if the Chi-square test presumption fails. Statistical significance is 0.05.

After the Chi-square test, independent variables with p-values <0.05 will be analyzed using multiple logistic regression. After a literature review, independent variables will be selected from the bivariate analysis to calculate the adjusted odd ratio (AOR) and 95% confidence intervals. All statistical studies will use Chulalongkorn University's licensed SPSS Version 28 software.

Ethical approval

Ethical consideration was approved by the Ethics Review Committee of Chulalongkorn University for the research involving humans (COA No. 126/66).

RESULTS

The ages of the participants ranged from 18 to 80. 233 (55.21%) of the sample's participants, or the vast majority, were under 30. The remaining participants were distributed according to age, with 189 (44.79%) being at least 31 years old.

The bulk of the population under study, or 93.26 percent of the sample, is Buddhist, according to the survey's findings. According to religion demography, 3.15, 1.35, and 2.25 percent of people practice Christianity, Hinduism, and Islam, respectively.

The bulk of the population, 48.31%, had a bachelor's degree. People with a Master's degree, a doctorate, additional academic credentials, and a diploma or certificate made up the remainder of the sample.

The findings demonstrate the wide ethnic diversity of Myanmar. The "Burma" ethnic group included roughly 370 persons or 83.15 percent of the population. Additionally, there were 20 members of the "Shan" ethnic group or 4.49 percent of the population. The "Rakhine" ethnic group comprised 16, or 3.60 percent, of the total population. Twelve people, or 2.70 percent of the total population, identified as "Mon" ancestors. Additionally, just 3 and 7, respectively, of the respondents identified as "Kayin" (1.57%) or "Chin" (0.67%). The percentages of the population that belonged to the ethnic groups "Kachin," "Kayah," and "mixed race" were, respectively six (1.35%), one (0.22%), and ten (2.25%).

The study's findings revealed some intriguing patterns in the prevalence of marital status among the participants. Of all participants, 290 persons (65.17%) self-identified as single, making up the majority. In contrast, 155 participants—or 34.83 percent of the sample—self-reported being married or divorced.

177 individuals, or 397.80% of the sample population, stated that they lived alone. About 48.99% of the population, or 218 people, resided in residences that nuclear families primarily occupied. Forty-seven respondents, or 10.56 percent of the total population surveyed, stated that they lived with their parents, siblings, grandparents, or other non-parental family members. Three individuals, or 0.67% of the sample group, were from a "skipped generation family."

Of the overall sample size of 236 people, a statistically significant majority (53.3%) stated that their principal residence was their home. This survey showed that 130 respondents, or 29.21% of the entire sample, stated that their job provided their current domicile. Forty-nine respondents to the study who said they lived in rental homes were also included, making up 11.01 percent of the sample. Thirty-eight participants, or 6.74 percent, of the study participants reported living in non-considered houses, according to the study's findings. According to the study's findings, a substantial fraction of the sample population (71,91%) worked full-time in 2021. 17.75% of respondents claimed they had part-time jobs and worked fewer hours. It was discovered that 10.34% of the sample population was unemployed.

Many persons, specifically 329 participants (73,93%), have stated that they are currently employed full-time. This demonstrates that a sizeable portion of people are used during regular business hours. Fifty-five people, or 12.36% of the sample, acknowledged working part-time. 13.71 percent of the sample population, or 61 persons, reported not having a job.

56 individuals (12.58%) who said they had dependents responded in the affirmative. On the other hand, a substantial portion of research participants—in particular, 389 people (87.42%)—said they did not have a dependency.

Doctors made up 292 (65.62%) of the participants, making up most of the sample, followed by nurses (29; 6.52%) and chemists (79; 17.75%). The remaining 45 participants (10.11%) were designated as other healthcare professionals. The next text distinguishes and establishes the current operational departments.194 people (43.60%) of the total sample were assigned to the medical ward, while 51 people (11.46%) said they worked in the surgical community.

According to the data, just a small percentage of professionals (10), or precisely 2.25%, were said to work in emergency medicine. The number of experts working in intensive care was reported to be slightly greater, at 19, or 4.27%. According to a recent survey, 10 healthcare professionals, or 2.25% of the total, work in obstetrics and gynecology, while 20 professionals, or 4.49% of the total, work in pediatrics. 141 professionals made up the "clinic/general practitioner" category, or 31.69% of the sample. 242 (54.38%) had fewer than six years of work experience, while 203 (45.62%) had more than six years. The public sector employed 142 professionals (31.91%) of the sample. Private hospitals, clinics, and healthcare institutions employed 260 professionals (58.43%) of the sample. However, 43 professionals (9.66%) were affiliated with NGOs and INGOs. In a survey of 445 professionals, 306 (68.76%) worked 8-hour shifts, while 139 (31.24%) worked continuous shifts. 301 people (67.64%) reported working 8 hours each day, the normal office hours. 144 respondents (32.36%) reported working more than eight hours. 236 people (53.3%) worked on weekends during the epidemic in 2021, while 209 did not. 266 people, or 59.78% of the population, worked as front-line healthcare providers during the pandemic, with 179 representing 40.22% of the participants.

Sociodemographic characteristics of the participant

Table 1 presents an overview of the participants' general characteristics, covering sociodemographic and work-related information. These factors were considered as possible associations with the participants' stress levels.

Table 1: Sociodemographic and work-related characteristics of the participant (n=445)

Sociodemographic characteristics	Number	Percentage
Age		
31 year and below	242	54.38
Above 31 year	203	45.62
Mean = 30.73 (Min - Max) 18 - 64		
Gender		
Male	220	49.44
Female	225	50.56
Religion		
Buddha	415	93.26
Christian	14	3.15
Hinduism	6	1.35
Islam	10	2.25
Education level		
Diploma/Certificate	29	6.52
Bachelor	215	48.31
Master	181	40.67
Doctoral	20	4.49

Sociodemographic characteristics	Number	Percentage
Ethnicity		
Kachin	6	1.35
Kayah	1	0.22
Kayin	7	1.57
Chin	3	0.67
Burma	370	83.15
Mon	12	2.70
Rakhine	16	3.60
Shan	20	4.49
Mixed racial (Burmese-Chinese, Shan-Chinese etc.)	10	2.25
Marital Status		
Single/Separated	290	65.17
Married	155	34.83
Family Arrangement		
Living alone	177	39.78
Nuclear family	218	48.99
Extended family	47	10.56
Skipped generation family	3	0.67
Housing Status		
Individual residence	236	53.03
Staff housing	130	29.21
Rent accommodation	49	11.01
Friend's/Relatives' home	38	6.74
Employment Status (2021)		
Full-time	320	71.91
Part-time	79	17.75
Unemployed	46	10.34
Employment Status (Present)		
Full-time	329	73.93
Part-time	55	12.36
unemployed	61	13.71
Monthly Status		
Below 876370.8 MMK	285	64.06
Above 876370.8 MMK	160	35.96
Mean = 876370.8 (Min - Max) 70000 - 7800000 MMK		
Dependent Person		
Yes	56	12.58
Children under 18-year-old	28	39.29
Elderly over 60-year-old	22	50.00
Disabled person	6	10.71
No	389	87.42
Work-related characteristics	Number	Percentage
Profession		
Doctor	292	65.62
Nurse	29	6.52
Pharmacist	79	17.75
Pharmacy assistant/Nurse aide	45	10.11
Work Department		
Medical ward	194	43.60
Surgical ward	51	11.46
Emergency ward	10	2.25
Obstetrics and Gynaecology ward	10	2.25
Paediatrics ward	20	4.49
ICU (Intensive Care Unit) ward	19	4.27
Clinic (General Practitioner)	141	31.69
Work Experience		
6 year and below	242	54.38
Above 6 year	203	45.62
Work Sector		
Public	142	31.91
Private	260	58.43
NGOs/INGO	43	9.66
Work Schedule		
Alternate	306	68.76
Continuous	139	31.24
Daily working hour		
8 hour and below	301	67.64
Above 8 hour	144	32.36
Covid work on weekend		
Yes	236	53.03
No	209	46.97
Covid work		
Frontline	266	59.78
Non-frontline	179	40.22

Stress level of the participant

The study involved 445 participants who completed the survey and provided valid responses, which is illustrated in table 2. The findings suggest that a significant proportion of the sample population exhibited a low stress level, with 219 individuals (49.21%) reporting such a state. The study findings indicate that a considerable proportion of participants experienced moderate stress (n = 196, 44.04%).

In this study, a stress score of 14 or higher, indicating moderate stress levels and higher, was utilized to determine the presence of stress, as outlined in Table 3.

Table 3: Stress category of the participant

Stress category	Number	Percentage
Low stress level	219	49.21
Moderate to high stress level	226	50.79

The data indicates that a minority of the participants (n = 30, 6.74%) reported experiencing high stress levels

Table 2: Stress level of the participant (n=445)

Stress level of the participant	Number	Percentage
Low Stress Level	219	49.21
Moderate Stress Level	196	44.04
High Stress Level	30	6.74

hi-square and Fisher's exact tests

The statistical methods of Chi-square and Fisher's exact were utilized to evaluate the association between the stress levels and the sociodemographic and work-related characteristics of the study participants. The test results were shown in table 4. The significant (p value < 0.05) variables; education level, family arrangement, employment status (2021), work department and work for covid-19 were selected for multiple logistic regression.

Table 4: Chi-square and Fisher's exact tests

Sociodemographic characteristics	Low stress level		Mod to high stress level		P value
	n	Percentage	n	Percentage	
Age					0.332
31 year and below	114	47.11	128	52.89	
Above 31 year	105	51.72	98	48.28	
Gender					0.65
Male	118	53.64	102	46.36	
Female	101	44.89	124	55.11	
Religion					0.62
Buddha	207	49.88	208	50.12	
Christian	6	42.86	8	57.14	
Hinduism	3	50.00	3	50.00	
Islam	3	30.00	7	70.00	

Sociodemographic characteristics	Low stress level		Mod to high stress level		P value
	n	Percentage	n	Percentage	
Education level					0.005*
Diploma/Certificate	8	27.59	21	72.41	
Bachelor	107	49.77	108	50.23	
Master	88	48.62	93	51.38	
Doctoral	16	80.00	4	20.00	
Ethnicity					0.859
Kachin	4	66.67	2	33.33	
Kayah	0	0.00	1	100.00	
Kayin	3	42.86	4	57.14	
Chin	1	33.33	2	66.67	
Burma	186	50.27	184	49.73	
Mon	4	33.33	8	66.67	
Rakhine	8	50.00	8	50.00	
Shan	9	45.00	11	55.00	
Mixed racial (Burmese-Chinese, Shan-Chinese etc.)	4	40.00	6	60.00	
Marital Status					0.65
Single/Separated	145	50.00	145	50.00	
Married	74	47.74	81	52.26	
Family Arrangement					0.016*
Living alone	103	58.19	74	41.81	
Nuclear family	95	43.58	123	56.42	
Extended family	19	40.43	28	59.57	
Skipped generation family	2	66.67	1	33.33	
Housing Status					0.644
Individual's residence	114	48,31	122	51.69	
Staff housing	67	51.54	63	48.46	
Rent accommodation	26	53.06	23	46.94	
Friend's home/relatives' home	12	40.00	18	60.00	
Employment Status (2021)					0.03*
Full-time	159	49.69	161	50.31	
Part-time	45	56.96	34	43.04	
Unemployed	15	32.61	31	67.39	
Employment Status (Present)					0.593
Full-time	163	49.54	166	50.46	
Part-time	26	42.27	29	52.73	
unemployed	30	49.18	31	50.82	

Sociodemographic characteristics	Low stress level		Mod to high stress level		P value
	n	Percentage	n	Percentage	
Monthly Salary					0.805
Below 876370.8 MMK	142	49.65	144	50.35	
Above 876370.8 MMK	77	48.43	82	51.57	
Dependent Person					0.192
Yes	23	41.07	33	58.93	
No	196	50.39	193	49.61	
Work-related characteristics					
Profession					0.484
Doctor	146	50.00	146	50.00	
Nurse	11	37.93	18	62.07	
Pharmacist	37	46.84	42	52.16	
Pharmacy assistant/Nurse aide	25	55.56	20	44.44	
Work Department					0.001*
Medical ward	117	60.31	77	39.69	
Surgical ward	22	43.14	29	56.86	
Emergency ward	6	60.00	4	40.00	
Obstetrics and Gynaecology ward	4	40.00	6	60.00	
Paediatrics ward	7	35.00	13	65.00	
ICU (Intensive Care Unit) ward	11	57.89	8	42.11	
Clinic (General Practitioner)	52	36.88	89	63.12	
Work Experience					0.261
6 year and below	125	51.65	117	48.35	
Above 6 year	94	46.31	109	53.69	
Work Sector					0.253
Public	72	50.70	70	49.30	
Private	131	50.38	129	49.62	
NGOs/INGO	16	37.21	27	62.79	
Work Schedule					0.486
Alternate	154	50.33	152	49.67	
Continuous	65	46.76	74	53.23	
Daily working hour					0.234
8 hour and below	154	51.16	147	48.84	
Above 8 hour	65	45.14	79	54.86	
Covid work on weekend					0.175
Yes	109	46.19	127	53.81	
No	110	52.63	99	47.27	

Sociodemographic characteristics	Low stress level		Mod to high stress level		P value
	n	Percentage	n	Percentage	
Covid work					0.001*
Frontline	148	55.64	118	44.36	
Non-frontline	71	39.66	108	60.34	

*p value < 0.05

Multiple logistic regression between independent variables and stress level

Table 5 shows the comparison to diploma/certificate holders, healthcare personnel with a doctoral degree were 89% less likely to experience stress (AOR = 0.11, 95% CI = 0.03 – 0.44, p = 0.001). Those living in a nuclear family were 1.67 times more likely to experience stress than those living alone (AOR = 1.67, 95% CI = 1.09 – 2.55, p = 0.019). Compared to healthcare personnel who worked on a medical ward, those who worked on a surgical ward or as a general practitioner were 2.08 and 2.06 times more likely to experience stress (AOR = 2.08, 95% CI = 1.09 – 3.97, p = 0.026 and AOR = 2.06, 95% CI = 1.04 – 4.08, p = 0.039, respectively).

Table 5: Multiple logistic regression between independent variables and stress level

Characteristics	AOR	[95% Conf. interval]		P value
		Lower bound	Upper bound	
Education level				
Diploma/Certificate	Ref			
Bachelor	0.47	0.19	1.19	0.113
Master	0.45	0.18	1.15	0.096
Doctoral	0.11	0.03	0.44	0.002*
Family arrangement				
Living alone	Ref			
Nuclear family	1.67	1.09	2.55	0.019*
Extended family	1.61	0.80	3.24	0.178
Skipped generation family	0.27	0.01	4.08	0.342
Employment Status (2021)				
Full-time	Ref			
Part-time	0.80	0.47	1.36	0.41
unemployed	1.71	0.84	3.46	0.137

Characteristics	AOR	[95% Conf. interval]		P value
		Lower bound	Upper bound	
Work Department				
Medical ward	Ref			
Surgical ward	2.08	1.09	3.97	0.026*
Emergency ward	0.87	0.23	3.35	0.842
Obstetrics and Gynaecology ward	2.76	0.66	11.46	0.162
Paediatrics ward	2.26	0.72	7.08	0.162
ICU (Intensive Care Unit) ward	0.79	0.26	2.43	0.682
Clinic (General Practitioner)	2.06	1.04	4.08	0.039*
Covid work				
Frontline	Ref			
Non-frontline	1.40	0.72	2.73	0.315

*p value < 0.05

DISCUSSION

This study sought to determine the relationship between stressors, sociodemographic factors, and factors connected to the workplace and the amount of stress experienced by healthcare workers.

According to a prior study on the pre-pandemic state, healthcare workers from Myanmar who were exposed to the disease are now experiencing stress due to the demanding working conditions (9). Due to the lower-middle income status of Myanmar, inadequate pay for healthcare professionals has a severe psychological impact. These financial difficulties combine to produce a stressful job that puts the mental health of healthcare professionals at considerable imminent risk.

The study had 445 participants: 225 women (50.56%) and 220 men (49.44%). Healthcare experts from Yangon made up all the attendees. The participants' ages ranged from 18 to 80; as expected, 233 (or 54.38%) of the total participants were 30 or younger. 45.62 percent of all people were over the age of 31, which was the total population. With 292 (65.62%) of the total population, physicians make up most professions.

The study found that stress prevalence was high among 226 individuals (of a total of 445 participants), accounting for (50.79%) of the total population. The result was quite high compared to the findings of a study carried out in China, where the stress level was 8.6% (10). Among the other professionals, such as nurses, pharmacists, nurse aides, and pharmacy assistants, doctors had the highest representation, with 146 individuals. Female healthcare professionals exhibited a moderate to high level of stress in comparison to their male counterparts, with a percentage of (55.11%) or 124 individuals. The observed disparities can be attributed to cultural standards, gender biases, and the unequal distribution of responsibilities within the healthcare industry. The finding incline with the study conducted

in China in which female nurses were more prone to adverse mental effect than their counterparts (11).

It was shown that participants with bachelor's degrees reported the highest levels of stress compared to those with a certificate, master's degree, or doctoral degree. Educational attainment had significant associations with stress level. More specifically, 108 participants, or 50.23% of the overall population, fell into this category in significant numbers. Additionally, those with a doctorate degree were less likely to be stressed than those with a diploma or certificate, indicating that healthcare professionals with a higher level of education are better able to manage stress. This result is consistent with a study in Brazil which found that healthcare personnel with a lower level of education were more likely to experience stress than those with a higher level of education (12).

The highest stress score, 56.42 percent, was reported by participants living in a nuclear family, which had a significant association with the stress level of the participant. In addition, those who resided with family members were more likely to be anxious than those who lived alone. The reason for this is that people who reside with their families are extremely concerned with the spread of disease and infection. It is accompanied by anxiety, regret, and social rejection, which can have devastating consequences on an individual's mental health (13, 14, 15).

In terms of employment, we gathered information on the pandemic, specifically the third wave of the COVID-19 virus, in 2021 and at the time of the study. Full-time employees reported experiencing more stress than part-time and unemployed workers, with 50.31% and 50.46%, respectively. The contemporary phenomenon of workplace stress has emerged as a significant health concern within the domain of the health industry (16, 17). Hence, it is reasonable to posit that individuals engaged in full-time employment, due to their extended presence in the workplace compared to part-time workers and the unemployed, may potentially experience heightened levels of stress in comparison to their counterparts.

In relation to work department, individuals who work in clinics as general practitioners reported with relatively higher stress than the others, accounting for 89 participants overall and 63.12% of the total. The role of a general practitioner in a clinical setting typically involves a predominantly independent approach, characterized by limited collaboration with fellow healthcare professionals. Contrast this with the hospital setting, where healthcare professionals can work together as a cohesive team and receive support from their employers or the government. Consequently, it is plausible to posit that general practitioners operating in solitary conditions amidst the ongoing pandemic may potentially encounter elevated levels of stress compared to their counterparts functioning within hospital settings (18). Additionally, General practitioners (GPs) have been found to experience challenges resulting from a health policy widely regarded as overly focused on hospital-based care. The pandemic has brought to light an already existing deficiency in communication and collaboration between general practitioners (GPs) and hospitals

(19). Furthermore, it was observed that individuals employed in the surgical unit exhibited higher stress levels than their counterparts in the medical unit. This finding is consistent with a study conducted at the University of Toronto, wherein a comprehensive analysis of stress among surgeons identified several potential triggers, encompassing physiological, cognitive, emotional, sociocultural, and environmental factors (20).

The stress level was significantly associated with work activity (frontline/non-frontline work) during the third wave of COVID-19 in 2021. The finding agrees with a study in which healthcare workers who worked as frontline workers showed a significantly high level of stress than their counterparts (21).

Given that Buddhism and Burmese are the predominant religion and ethnic groups in Myanmar, it is noteworthy to mention that both Buddhist individuals and those of Burmese descent exhibited the highest reported stress scores, amounting to 50.12% and 49.73%, respectively.

People who reported being single or separated were more stressed than those who were married, regardless of their marital status. In addition, those with lower incomes (less than 800,000 MMK, or about $250 USD) were more likely to experience stress than those with higher incomes (more than 800,000 MMK). This result is consistent with the findings of a different study in India, which found that participants with lesser incomes experienced greater stress than those with higher incomes (22).

The present study provided noteworthy findings regarding the association between the stress level and sociodemographic variables, education level, employment status, and familial arrangement, and work-related factors, specifically work department and work engagement, amidst the third wave of the COVID-19 outbreak in Myanmar in 2021.

CONCLUSION

In conclusion, the study found that doctors had the highest prevalence of stress compared to other professionals such as nurses, pharmacists, nurse aides, and pharmacy assistants, and that associated factors such as education level, family arrangement, and work department are related to the stress level of healthcare professionals.

LIMITATION

Limited Causality Inference: the study identified a high level of stress among healthcare professionals, but it cannot conclude whether their occupation causes the stress or whether stressed individuals are drawn to the profession.

Selection Bias and Generalizability: The findings of the study may not be applicable to all healthcare professionals in Yangon, as the participants may not accurately represent the complete population.

RECOMMENDATION

Our research suggests that mental health support services should be implemented at the individual and organizational levels for healthcare professionals to improve their mental health.

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SOCIOECONOMIC STATUS AND MENTAL HEALTH AMONG MYANMAR MIGRANT WORKERS IN SAMUT SAKHON PROVINCE THAILAND

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ABSTRACT

In recent years, Myanmar migrant workers influx to the Samut Sakhon province in Thailand, driven by the demand for labor in various industries. These migrant workers often face numerous challenges related to their socioeconomic status and working conditions. The socioeconomic status of migrant workers is characterized by low wages, limited educational opportunities, and precarious living conditions. These individuals often come from disadvantaged backgrounds, with limited access to resources and social support networks. Because of these conditions, migrant workers face several mental health problems including stress, depression, and anxiety. Few studies have pointed out mental health issues among migrant workers. However, limited studies were focused on mental health status after COVID-19 pandemic in Samut Sakhon province.

The objective of this study is to find an association between socioeconomic status and level of depression, anxiety, and stress among Myanmar migrant workers in Samut Sakhon Province, Thailand.

A cross-sectional survey was conducted in January 2023. 140 migrants who met the inclusion and exclusion criteria were recruited. A structured self-reported questionnaire was utilized to collect information from migrant workers. Socioeconomic status including age, gender, education, income, and ethnicity were collected. Stress, depression, and anxiety were assessed by Depression, Anxiety, and Stress Scale-21 (DASS-21) standard questionnaire. Frequency, percentage, median and interquartile range were reported. Chi-square was analyzed to find the association between socioeconomic status and mental health.

In this study, there are 140 migrant workers with a median (IQR) age of 27.5 (11), ranging 18 to 51. Most participants are low-educated (78.54%) and Myanmar ethic group (87.14%). Their income is less than 10,000 baht per month (64.29%). Depression, anxiety, and stress were measured using DASS-21. The participants who exhibited moderate depression, anxiety, and stress were 36.43%, 65%, and 14% respectively. Extremely depressed, anxiety, and stress were 5%, 15%, and 1.44% respectively. Socioeconomic status was not associated with depression, anxiety, and stress among migrant workers (p-value >0.05).

The study finding revealed that significant proportions are non-educated and have low-income. They also have mental health problems (Depression, anxiety and stress). The findings point out the need for focused interventions to enhance their quality of life and mental health outcomes among migrant workers.

Keywords: Socioeconomic, Migrant workers, Stress, Anxiety, Depression

INTRODUCTION

In Thailand, the country's workforce is made up of migrant workers (Myanmar, Loa, Cambodia, and Philippine). Among them, Myanmar Migrant workers are the main portions. According to the United Nations Development Program (UNDP), they are the second largest group of migrant workers in the country. They are approximately 2.6 million Myanmar migrant workers in Thailand, which is equivalent to around 10 percent of the country's workforce (1). Most workers are employed in the agricultural sector, followed by the construction and manufacturing industries. While most Myanmar migrant workers in Thailand are employed in low-skilled jobs, there is an increasing number of white-collar workers who are employed in the IT and service industries. The inflow of Myanmar migrant workers into Thailand has increased significantly in recent years, due to the ongoing political and economic instability in Myanmar due to military coup in 2021.

Migrant workers are a vulnerable population that often faces numerous challenges related to their socioeconomic status and working conditions. The Samut Sakhon province in Thailand has seen a significant influx of Myanmar migrant workers in recent years, driven by the demand for labor in various industries. However, these workers often face low wages, limited educational opportunities, and precarious living conditions, which can have a detrimental impact on their mental health. Studies have shown that migrant workers experience higher levels of stress, depression, and anxiety compared to the general population.(2).

Despite this, there is a lack of research specifically focusing on the mental health status of migrant workers in the Samut Sakhon province, particularly after the COVID-19 pandemic. Therefore, this study aims to investigate the association between socioeconomic status and mental health problems, including stress, depression, and anxiety, among Myanmar migrant workers in Samut Sakhon Province, Thailand. The study's findings can inform policymakers, organizations, and healthcare providers in developing targeted interventions and support systems to address the mental health needs of migrant workers in the region, ultimately improving their overall well-being and quality of life.(3). there are some indications that Samut Sakhon province has a significant population of migrant workers from Myanmar, particularly in the seafood processing industry(4). This concentration of migrant workers in the province could be one reason for selecting it as the study area.

Depression, anxiety, and stress are three different mental health problems that can have a significant impact on the well-being of migrant workers. While they share some common symptoms, they are different in terms of their severity and specific symptoms. Depression is a mood disorder that causes a persistent feeling of sadness and loss of interest, while anxiety is characterized by excessive worry and fear. Stress is a response to a challenging situation that can manifest as physical, emotional, or behavioral symptoms. Studies have shown that migrant workers experience higher levels of depression, anxiety, and stress compared to the general population, and these mental health problems are often exacerbated by the challenging socioeconomic conditions and limited access to resources and social support networks that they face.(3, 5)

The mental health of migrant workers has been a growing concern in recent years. Myanmar migrant

workers in Samut Sakhon province, Thailand, face unique challenges due to their socioeconomic status and undocumented status(6). The COVID-19 pandemic and the recent coup d'état in Myanmar have further exacerbated their situation(2). The mental health status of Myanmar migrant workers in Thailand has deteriorated following the COVID-19 pandemic, as reported by more than half of the online survey participants(2). The major mental health issues reported by the study participants were depression, generalized anxiety disorder, frustration, stress, and panic disorder(2). The study also found that the coping strategies of these workers included coping at a personal level and coping at a social level. This thesis aims to explore the relationship between socioeconomic status and mental health among Myanmar migrant workers in Samut Sakhon province, Thailand.. The study will also examine the sociodemographic characteristics of the participants that contribute to their mental health condition. By shedding light on this issue, this thesis hopes to contribute to the development of policies and interventions that can improve the mental health and well-being of Myanmar migrant workers in Samut Sakhon province, Thailand.

METHODOLOGY

The study used a cross-sectional survey design to investigate the association between socioeconomic status and mental health among Myanmar migrant workers in Samut Sakhon province, Thailand. The study population was recruited from the Migrant Worker Right Networks (MWRN), a membership-based organization for Myanmar migrant workers in the province. The inclusion criteria were Myanmar migrant workers aged 18 to 50 years, currently working in the study area for more than six months, working in manufacturing factories, and able to read and write Myanmar language. The exclusion criteria were those who were unable to answer the questions and those with serious physical and/or mental illness. The study used a convenient sampling technique to recruit participants due to the limited data available for the population distribution of Myanmar migrant workers.Our team explained the purpose of the thesis and the meaning of the research questions. And then we gave the researcnh questions written in Myanmar language to all participants .We let them read these questions and answer these questions.

Therefore, using a convenient sampling technique may help to overcome some of these barriers and facilitate the recruitment of study participants, and it is feasible and Cost and time effective.

The sample size was calculated by the following equation;

$$n = \frac{Z^2 pq}{d^2}$$

N = Sample size

Z = 1.96

p = Prevalence of mental health among migrants

A study of prevalence of common mental health issues among migrant workers: A systematic review and meta-analysis reported that the overall prevalence of depression was 38.99%. (7)

q = 1-p

d = 0.1

From the calculation, the sample size was 92 migrant workers. 20% of the sample size was added to the total samples. Therefore, this study required 111 migrant workers to participate.

This study used Self-reported structured questionnaire. The recruitment startedfrom the

Migrant Workers Right Network (WMRN) which is located in the Samut Sakhon Province. This non-government organization (NGO) recruited the participants from different workers who are eligible for this study.

For assessment tool

Socioeconomic status

Age, Sex, Education, Level, Ethnicity, Monthly Income, Marital Status, and Duration of currently staying in Thailand

The Depression, Anxiety, and Stress Scale (DASS-21)

DASS-21 is a self-report questionnaire that measures the severity of symptoms related to depression, anxiety, and stress. The DASS-21 consists of 21 items, with seven items assessing each of the three subscales. Each item is scored on a four-point Likert scale ranging from 0 (did not apply to me at all) to 3 (applied to me very much, or most of the time). The total score for each subscale is obtained by summing the scores for the items in that subscale. It was chosen because it is a widely used depression screening measure that covers the core symptoms of depression and anxiety and has been proven to have adequate psychometric properties.

The structured questionnaires in the English language will be reviewed for contents validity by 3 external expertise and scored for each question (+1/ 0/ -1). The Index of Item-Objective Congruence (IOC) was conducted and if the score is less than 0.7, that question was adjusted or revised or deleted accordingly. Questionnaires written in English were translated into Myanmar Language by the respective expert and then translated again to English by another expert. After that, this English one will be cross-checked with the original one as a back-translation to avoid discrepancies between the translations and to agree on a common translation to ensure symmetry between words of Myanmar and English.

Thirty respondents were pre-tested with a questionnaire in another region with similar settings and Cronbach's Alpha coefficient of the questionnaires were used for reliability and it has to be equal to or greater than 0.7. To test the internal consistency of the questions with dichotomous choices, Kuder-Richardson formula 20 (KR20) will be considered as satisfactory. The questionnaire were revised after testing reliability and validity.

The significant level of this study was set at p-value = 0.05 and will be analyzed using SPSS software version 22.

Descriptive statistics was performed to describe the variable distribution among respondents. Mean and standard deviation was displayed for normally distributed continuous variables, while median and interquartile range for the non-normal distribution of continuous variables. Frequency and percentage was used to describe the categorical variables.

Chi-square or Fisher exact was used for bivariate analysis to analyze whether the association exists between the variables.

RESULTS

In this study, data were collected from a total 140 migrant workers from Samut Sakhon Thailand. The total sample size needed was 111.

Part 1: Descriptive Findings

Socio-economic Characteristics

The Table 1 illustrates the socioeconomic characteristics of the study population. The mean age

of the participants was 28.93 years, with a standard deviation (SD) of 7.97. A significant majority of participants (78.54%) had an education level below high school, while a smaller proportion (21.43%) had at least a high school education.The majority of participants (87.14%) identified as Myanmar ethnicity, while the remaining participants (12.86%) belonged to other ethnicities.Female participants accounted for the majority (66.43%), while male participants represented 33.57% of the sample.The mean monthly income among the participants was 10,569 units, with a standard deviation of 2,569.4.The participants were almost evenly distributed between married (47.86%) and other marital status (52.14%).Participants had an average current stay in Thailand of 4.99 years, with a standard deviation of 3.969. The majority of participants (56.43%) had a stay of less than 5 years, while 43.57% had been in Thailand for 5 years or more.

Table 1: Socioeconomic Characteristics

	n	%	Mean	SD
Age(years)			28.93	7.97
<=28	74	52.86		
>28	66	47.14		
Education level				
< high school	110	78.54		
>= high school	30	21.43		
Ethnicity				
Myanmar	122	87.14		
Others	18	12.86		
Sex				
male	47	33.57		
female	93	66.43		
Monthly Income(baht)			10569	2569.4
<=10000	90	64.29		
>10000	50	35.71		
Marital status				
Married	67	47.86		
Other	73	52.14		
Current stay in Thailand (years)			4.99	3.969
<5yr	79	56.43		
>=5yr	61	43.57		

Table 2 presents mental health of Myanmar migrant workers in Samut Sakhon. The majority of respondents fell into the categories of mild (40.71%) and moderate (36.43%) depression. A smaller percentage of respondents reported severe (7.14%) and extreme (5%) levels of depression. A significant percentage of respondents, 65%, fell into the moderate anxiety category. Additionally, 13.57% of respondents reported severe anxiety, while 15% reported extreme anxiety. The majority of respondents, 71.22%, fell into the normal stress category. However, it is noteworthy that a sizeable percentage of participants reported mild (12.23%), moderate (10.07%), and even severe (5.04%) levels of stress.

Table2: Mental Health using DASS21

Depression	N(number)	Percentage
normal	15	10.71
mild	57	40.71
mod	51	36.43
severe	10	7.14
extreme	7	5
Anxiety		
normal	1	0.71
mild	8	5.71
mod	91	65
severe	19	13.57
extreme	21	15
Stress		
normal	99	71.22
mild	17	12.23
mod	14	10.07
severe	7	5.04
extreme	2	1.44

Part2: Inferential Statistic

Association between Socioeconomic Factors and Depression

The association between socioeconomic factors and depression was examined in this study. The results showed that age, education level, ethnicity, sex, monthly income, marital status, and current stay in Thailand were not significantly associated with the severity of depression.

Table3: Association between socioeconomic factors and Depression

	Depression			
	Normal to Mild	**Moderate to severe**	**Chi-square**	**p-value**
Age			0.102	0.749
<=28	52.70%	47.30%		
>28	50.00%	50.00%		
Education Level			3.549	0.06
< high school	47.27%	52.73%		
>= high school	66.67%	33.33%		
Ethnicity			1.3003	0.254
Myanmar	53.28%	46.72%		
Other	38.89%	61.11%		
Sex			1.8795	0.17
Male	59.57%	40.43%		
Female	47.31%	52.69%		
Monthly income			0.6507	0.42
<=10000	48.89%	51.11%		
>10000	56%	44%		
Marital status			0.741	0.389
Married	55.22%	44.78%		
Other	47.95%	52.05%		
Current stay in Thailand			0.046	0.83
<5yr	50.63%	49.37%		
>=5yr	52.46%	47.54%		

Association between socioeconomic factors and Anxiety

The study found that age, education level, ethnicity, sex, monthly income, marital status, and current stay in Thailand were not significantly associated with the severity of anxiety among the participants. The chi-square test showed that none of these sociodemographic factors were statistically significant in predicting the severity of anxiety

Table 4: Association between socioeconomic factors and Anxiety

	Anxiety			
	Normal to Mild	**Moderate to severe**	**Chi-square**	**p-value**
Age			0.2732	0.601
<=28	5.41%	94.59%		
>28	7.50%	92.42%		
Education Level			0.0036	0.952
< high school	6.36%	93.64%		
>= high school	6.67%	93.33%		
Ethnicity			0.0262	0.871
Myanmar	6.56%	93.44%		
Other	5.56%	94.44%		
Sex			0.0002	0.988
Male	6.38%	93.62%		
Female	6.45%	93.55%		
Monthly income			2.5359	0.111
<=10000	8.89%	91.11%		
>10000	2%	98%		
Marital status			0.2284	0.633
1.Married	7.46%	92.54%		
2.other	5.48%	94.52%		
Current stay in Thailand			0.41	0.522
<5yr	7.59%	92.41%		
>=5yr	4.92%	95.08%		

Association between socioeconomic factors and Stress

The study found that age, education level, ethnicity, sex, monthly income, marital status, and current stay in Thailand were not significantly associated with the severity of stress among the participants. The chi-square test showed that none of these sociodemographic factors were statistically significant in predicting the severity of stress.

Table 5: Association between socioeconomic factors and Stress

	Stress			
	No	**Yes**	**Chi-square**	**p-value**
Age			0.0624	0.803
<=28	71.62%	28.38		
>28	69.70%	30.30%		
Education Level			1.589	0.207
< high school	66.18%	31.82%		
>= high school	80%	20%		
Ethnicity			1.5883	0.208
Myanmar	68.85%	31.15%		
Other	83.33%	16.67%		
Sex			0.4814	0.488
Male	74.47%	25.53%		
Female	68.82%	31.18%		
Monthly income			0.0621	0.803
<=10000	70%	30%		
>10000	72%	28%		
Marital status			0.3634	0.547
Married	73.13%	26.87%		
Other	68.49%	31.51%		
Current stay in Thailand			0.1048	0.746
<5yr	69.62%	30.38%		
>=5yr	72.13%	27.87%		

DISCUSSION

The study shows that the majority of the respondents were aged 28 years or younger, had an education level below high school, were of Myanmar ethnicity, were female, had a monthly income of less than 10,000 baht, and were married. The mean current stay in Thailand was 4.99 years.

Previous studies have also examined the sociodemographic characteristics of Myanmar migrant workers in Thailand. For example, a study on health risk behaviors among Myanmar migrant workers in Samut Sakhon Province found that the majority of the respondents were female, aged between 18 and 29 years, and had a low level of education (8). Another study on acculturation and its

effects on health risk behaviors among Myanmar migrant workers in Chiang Mai, Northern Thailand, found that the majority of the respondents were male, aged between 18 and 29 years, and had a low level of education (9). These studies suggest that Myanmar migrant workers in Thailand are a vulnerable population with limited access to education and health services.

The study provides important information on the sociodemographic characteristics of Myanmar migrant workers in Samut Sakhon. The findings from previous studies are consistent with the findings presented in this study, which suggest that Myanmar migrant workers in Thailand are a vulnerable population with limited access to education and health services(8) (9) (10). These findings highlight the need for policies and interventions that address the social and economic determinants of health among migrant workers in Thailand.

The present study provides insight into the association between sociodemographic factors and depression among migrant workers in Thailand. The findings suggest that there is no significant association between age, education level, ethnicity, sex, monthly income, marital status, and current stay in Thailand with depression. This may indicate that other factors, such as work-related stressors, social support, and cultural differences, may play a more significant role in the development of depression among migrant workers in Thailand.

Previous research has shown that migrant workers are at increased risk of mental health problems, including depression(11, 12). The study by Nadim et al. (2016) found that depression was prevalent among migrant workers in Saudi Arabia, and Qiu et al. (2011) reported a high prevalence of depression among internal migrant workers in China. Similarly, a study by Webster et al. (2022) reported high prevalence rates of depression among Southeast Asian populations during the COVID-19 pandemic.

However, the present study did not find a significant association between sociodemographic factors and depression, which differs from some previous studies. This may be due to differences in the study population, sample size, and measurement tools used.

In conclusion, the present study highlights the need for further research to explore the unique challenges faced by migrant workers in Thailand and develop culturally appropriate interventions to address mental health disparities, including depression.

Future research should continue to explore the underlying mechanisms of depression among migrant workers in Thailand and develop interventions to improve mental health outcomes among this population. Additionally, future studies should consider using standardized measurement tools and larger sample sizes to improve the generalizability of the findings.

The findings of this study are consistent with some previous research on the relationship between socioeconomic factors and anxiety among migrant workers. For example, a study conducted in Thailand found that sociodemographic factors such as age, sex, and education level were not significantly associated with anxiety among migrant workers(6). However, the

findings of this study are inconsistent with other studies that have found a significant association between sociodemographic factors and mental health among migrant workers(2, 13). The inconsistency in findings may be due to differences in study populations, sample sizes, or study designs.

The lack of significant association between sociodemographic factors and anxiety in this study may be due to the specific characteristics of the study population or the relatively small sample size. Future research should aim to replicate these findings in larger and more diverse samples and explore the effectiveness of different interventions in improving the mental health and well-being of migrant workers.

The findings of this study are consistent with some previous research on the relationship between socioeconomic factors and stress among migrant workers. For example, a study conducted in Thailand found that sociodemographic factors such as age, sex, and education level were not significantly associated with stress among migrant workers(6). However, the findings of this study are inconsistent with other studies that have found a significant association between sociodemographic factors and mental health among migrant workers(2, 14). The inconsistency in findings may be due to differences in study populations, sample sizes, or study designs.

The lack of significant association between sociodemographic factors and stress in this study may be due to the specific characteristics of the study population or the relatively small sample size. Future research should aim to replicate these findings in larger and more diverse samples and explore the effectiveness of different interventions in improving the mental health and well-being of migrant workers.

CONCLUSION

In this study, the researcher explored the sociodemographic characteristics and their association with mental health outcomes among Myanmar migrant workers in Samut Sakhon, Thailand. The findings revealed that the majority of participants were young, had a low level of education, were of Myanmar ethnicity, and had a low monthly income. The study also examined the association between sociodemographic factors and depression, anxiety, and stress. The results indicated that age, education level, ethnicity, sex, monthly income, marital status, and current stay in Thailand were not significantly associated with the severity of depression, anxiety, or stress among the participants.

These findings suggest that other factors, such as work-related stressors, social support, and cultural differences, may have a more significant impact on the mental health of migrant workers. It highlights the need for further research to explore these factors and develop culturally appropriate interventions to address mental health disparities in this vulnerable population.

Overall, this study contributes to the growing body of knowledge on the mental health of migrant workers and emphasizes the importance of addressing their unique challenges and promoting their well-being. By recognizing and addressing the factors that influence mental health outcomes, policymakers, healthcare providers, and relevant stakeholders can work towards creating a more inclusive and supportive

environment for migrant workers in Thailand and beyond.

RECOMMENDATION

There is a need to develop and implement mental health support programs specifically tailored to the needs of migrant workers. Efforts should be made to improve migrant workers' access to affordable and quality healthcare services, including mental health services. Creating social support networks within migrant worker communities can be beneficial for their mental well-being. Enhancing educational opportunities for migrant workers can have a positive impact on their mental health. Policymakers should consider the unique challenges faced by migrant workers and incorporate mental health concerns into labor and immigration policies.

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DENTAL HEALTH EXPENDITURE AND ASSOCIATED FACTORS AMONG ELDERLY PATIENTS IN FACULTY OF DENTISTRY,CHULALONGKORN UNIVERSITY

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ABSTRACT

Increasing dental expenditure can significantly impact the dental health and overall quality of life of elderly patients. Financial constraints often create obstacles that impede older individuals from accessing the necessary dental treatments they require, which can result in the development of more severe oral diseases. Consequently, many older adults may postpone or even forgo these essential services due to the high costs involved. Moreover, there is a paucity of studies focusing on dental health expenditures among elderly patients attending a tertiary care institution.

This study aimed to identify the factors associated with dental health expenditure among the elderly, which could be developed to the related policies.

This retrospective descriptive study using secondary data analysis was conducted between February and March, 2023. The data of independent variables were extracted from an initial telephone-based survey, and the dependent data on dental health expenditure was retrieved from the record system of the University Dental Hospital. Descriptive statistics: median, range, and quartile were used to present age and dental health expenditure. Frequencies and percentages were used to present categorical variables (sex, age group, marital status, employment, health insurance status, income, educational level, systemic disease, activity of daily living, payment method, oral health-related behaviors, dietary habits, drinking and smoking behaviors, subjective oral function, and self-rated oral health). Inferential statistics: Pearson's Chi-squared test was analyzed to assess the association between categorical variables.

367 elderly participants were included in this study. The median dental expenditure was 4,750 THB (136 USD). More than half of participants were female (59.9%) and aged 61–69 years (55.6%). The average age of participants was 69.59 years. Pearson's chi-squared test revealed statistically significant associations between dental health expenditure and education level (p=0.032), monthly income (p=0.003), and self-rated oral health (p=0.017).

Higher expenditure on dental health among the elderly was associated with higher educational level, higher income, and good/fair self-rated oral health. Our findings show that elderly patients with poor self-rated oral health were more likely to have lower dental health expenditures, reflecting fewer dental visits. Therefore, self-rated oral health and regular dental check-ups should be urgently promoted among Thai elderly.

Keywords: Geriatric dentistry, elderly, dental expenditure, oral health, university dental hospital.

INTRODUCTION

The increase in dental health expenditures among the elderly is one of the main barriers to elderly patients' access to dental services. Older patients who have less income, lack dental insurance coverage, have poor self-rated oral health, and have high dental treatment costs are more likely to avoid visiting dentists, which also affects the frequencies of dental visits (1-3). Financial factors can affect older patients' access to dental care. A previous study reported that some elderly patients decided to postpone dental visits due to the cost of treatment (4). Consequently, delays or absence in dental visits could increase the incidence of other severe dental diseases (5). Severe disabilities can result in expensive treatments. For instance, periodontitis patients who postpone maintenance visits may experience dental calculi recurrence and tooth loss, requiring costlier prosthodontic treatments to preserve their masticatory and speaking abilities (6). Although they have dental insurance, some insurance schemes do not cover some expensive and specialized treatments (7). The studies conducted in Thailand demonstrated that older people with more natural teeth and posterior occluding pairs reported better oral health-related quality of life (8). Moreover, functional units and the present teeth were related to the nutritional status and also chewing comfortability (9-10).

A previous study conducted in Bangkok reported that dental care costs were associated to the utilization of dental services by elderly patients at the No.54 health center in Bangkok, Thailand. Those who could afford the fees visited the center more often (11). However, the No. 54 Bangkok Health Center mostly provides health care for most of the patients living in Thung Kru district area.

Nonetheless, there is a paucity of studies focusing on dental health expenditures and related factors among elderly attending a tertiary care institution. Our University Dental Hospital is a dental hospital located at Chulalongkorn University in Bangkok, Thailand, serves elderly patients from diverse backgrounds seeking dental care for multiple reasons.

This study aims to identify the factors associated with dental health expenditure among the elderly who attended dental care services at the University Dental Hospital. Our hypothesis is that there is a statistically significant association between independent variables (general characteristics, oral health-related behaviors, self-rated oral health, and subjective oral function) and dental health expenditure.

METHODOLOGY

Study Design, Period, and Setting

This retrospective descriptive study was conducted between February15, 2023 and March 30, 2023, at the dental hospital of the Faculty of Dentistry, Chulalongkorn University (a University Dental Hospital). The secondary data analysis was performed using secondary data from a telephone-based cross-sectional survey (12) and data on dental health expenditures between 2019 and 2020 from the electronic dental record system of the University Dental Hospital. This study was conducted, and the

manuscript was written according to Strengthening the Reporting of Observational Studies in Epidemiology' (STROBE) statement. The study protocol and the consent form were approved by the Ethics Review Committee of the Faculty of Dentistry of Chulalongkorn University (HREC-DCU 2021-039).All participants in the initial study gave their verbal informed consent before the telephone interview (12).

Study Participants, Inclusion Criteria, and Exclusion Criteria

The study participants were enrolled using the population frame of the initial telephone-based cross-sectional survey study (12), which was conducted among patients aged above 60 years who had visited the dentist at the University Dental Hospital between January 1 and December 31 of the year 2020. In the present study, we included participants who completed the initial survey study (12), and their data on dental health expenditure were recorded in the electronic record system of the Dental Hospital. Those who did not complete the dental health expenditure data recorded were excluded.

Study Variables

The independent variables were obtained from the initial cross-sectional survey study (12). These variables included (1) general characteristics (age, sex, marital status, employment, income, payment methods, educational levels, systemic disease, adequate dental health insurance, and activities of daily living), (2) oral health-related behaviors (tooth brushing habits and oral health-related behaviors, dietary habits, and oral health risk behaviors), (3) self-rated oral health, and (4) subjective oral function (chewing and speaking ability). The dependent variable was the recorded dental health expenditure calculated as the total dental health expenditure over 2019–2020.

Data Measurements and Bias Reduction

Independent variables data were collected using a modified telephone questionnaire. The questionnaire's validity was determined with an acceptable Item-Objective Congruence Index (0.77). Internal consistency reliability, assessed by Cronbach's alpha coefficient, also yielded an acceptable value (0.70) (12). Recorded dental expenditure data from 2019-2020 reduced recall bias among participants.

Sample Size and Sampling Technique

The sample size in this study was calculated by estimating a population proportion with specified absolute precision using the following formula,

$$n = \frac{Z^2_{1-\alpha/2}P(1-P)}{d^2}$$

The Z-value is the confidence interval and the tail in hypothesis testing. P is the proportion of elderly people who utilize dental services in this study, which was 38.1% according to the 8th National Survey. d is the margin of error, which was set to 5% here (14). Based on all these parameters, this study required at least 363 participants.

The purposive sampling method was used. Dental health expenditure data between 2019 and 2020 were extracted from the dental record system for secondary data analysis.

Data analysis

All secondary data were analyzed using SPSS software (version 28). 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 dental expenditure), which were found to be non-normally distributed.

Descriptive statistics

The median, range, and quartile were used to present continuous variables (age and dental health expenditure). Frequencies and percentages were used to present categorical variables (other independent variables).

Inferential statistics

Pearson's Chi-squared test was analyzed to assess the association between categorical variables.

RESULTS

Socio – Demographic Characteristics of the Study Participants

Table 1 shows the distribution of the outcome and all independent variables. The average age of elderly patients who visited the dentists at the University Dental Hospital, was 69.59 years, which is similar to the median age (69 years). Our study participants were aged 61–94 years. The median dental health expenditure over two years was 4,750 THB (136 USD)). The Kolmogorov–Smirnov normality test revealed the non-normal distributions of both age and total dental health expenditure (p<0.001). Therefore, we categorized the ages of our participants into two groups (61–69 years and >69 years). Similarly, dental health expenditure was categorized into two groups as follows: 0–4,750 THB and >4,750 THB.

Table 1: General characteristics of the study participants (N = 367)

Variables	Number	Percentage
Total dental health expenditure over 2 years: (between 2019 and 2020)		
≤4,750 THB (136 USD)	184	50.1
>4,750 THB	183	49.9
Age: years		
61–69	204	55.6
>69	163	44.4
Sex:		
Female	220	59.9
Male	147	40.1
Marital Status:		
Married	238	64.9
Others	129	35.1
Employment:		
Employed	139	37.9
Unemployed	227	61.9
Educational level:		
>Primary education	310	84.5
≤Primary education	57	15.5
Income per month:		
≥15,000 THB (429 USD)	210	57.2
<15,000 THB	157	42.8
Adequate dental health insurance:		
Yes	277	75.5
No	90	24.5
Payment methods:		
Insurance	143	39.0
Cash	224	61.0

Variables	Number	Percentage
Having systemic diseases:		
No	94	25.6
Yes	273	74.4
Activities of daily living:		
Independent daily living	345	94.0
Need help sometimes	22	6.0
Toothbrushing frequency:		
≥twice daily	341	93.9
<twice daily	22	6.1
Toothbrushing duration:		
≥2 minutes	292	80.4
<2 minutes	71	19.6
Toothbrushing before bedtime:		
Yes	344	94.8
No	19	5.2
Types of toothbrush bristle:		
Soft/Medium	344	91.0
Hard	29	9.0
Use of additional oral cleaning devices (dental floss, proxabrush)		
Yes	243	66.9
No	120	33.1
Sweet consumption:		
≤Once a day	282	76.8
>Once a day	85	23.2
Vegetables and fruits consumption:		
5–7 days a week	293	79.8
0–4 days a week	74	20.2
Regular dental visits:		
Yes	276	75.2
No	91	24.8
Smoking:		
Never	359	97.8
Sometimes/Daily	8	2.2
Drinking alcohol:		
Never	328	89.4
Sometimes/Daily	39	10.6
Chewing ability:		
Comfortable/Fair	348	94.8
Uncomfortable	19	5.2
Speaking ability:		
Comfortable/Fair	366	99.7
Uncomfortable	1	0.3
Self-reported oral health:		
Good/Fair	323	88.3
Poor	43	11.7

Abbreviations: N, number; THB, Thai baht; USD, The United States dollar

Factors Associated with Dental Health Expenditure

Table 2: Factors associated with dental health expenditure

Variables	Dental health expenditure Number (Percentage)		P-value
	0 - 4,750 THB (0-136 USD)	Over 4,750 THB (>136 USD)	
Age: years			0.105
61–69	110 (53.9)	94 (46.1)	
>69	74 (45.4)	89 (54.6)	
Sex:			0.430
Female	114 (51.8)	106 (48.2)	
Male	70 (47.6)	77 (52.4)	
Marital Status:			0.772
Married	118 (49.6)	120 (50.4)	
Others	66 (51.2)	63 (48.8)	
Employment:			0.451
Employed	66 (47.5)	73 (52.5)	
Unemployed	117 (51.5)	110 (48.5)	
Educational level:			0.032
>Primary education	148 (47.7)	162 (52.3)	
≤Primary education	36 (63.2)	21 (36.8)	
Income per month:			0.003
≥15,000 THB (429 USD)	91 (43.3)	119 (56.7)	
<15,000 THB	93 (59.2)	64 (40.8)	
Adequate dental health insurance:			0.649
Yes	137 (49.5)	140 (50.5)	
No	47 (52.2)	43 (47.8)	
Payment methods:			0.717
Insurance	70 (49.0)	73 (51.0)	
Cash	114 (50.9)	110 (49.1)	
Having systemic diseases:			0.787
No	46 (48.9)	48 (51.1)	
Yes	138 (50.5)	135 (49.5)	
Activities of daily living:			0.670
Independent daily living	172 (49.9)	173 (50.1)	
Need help sometimes	12 (54.5)	10 (45.5)	
Toothbrushing frequency:			0.386
≥Twice daily	169 (49.6)	172 (50.4)	
<Twice daily	13 (59.1)	9 (40.9)	
Toothbrushing duration:			0.525
≥2 minutes	144 (49.3)	148 (50.7)	
<2 minutes	38 (53.5)	33 (46.5)	

Variables	Dental health expenditure Number (Percentage)		P-value
	0 - 4,750 THB (0-136 USD)	Over 4,750 THB (>136 USD)	
Toothbrushing before bedtime:			0.102
Yes	169 (49.1)	175 (50.9)	
No	13 (68.4)	6 (31.6)	
Types of toothbrush bristle:			0.635
Soft/Medium	165 (49.4)	169 (50.6)	
Hard	17 (58.6)	12 (41.4)	
Use of additional oral cleaning devices:			0.795
Yes	123 (50.6)	120 (49.4)	
No	59 (49.2)	61 (50.8)	
Sweet consumption:			0.371
≤Once a day	145 (51.4)	137 (48.6)	
>Once a day	39 (45.9)	46 (54.1)	
Vegetables and fruits consumption:			0.310
5–7 days a week	143 (48.8)	150 (51.2)	
0–4 days a week	41 (55.4)	33 (44.6)	
Regular dental visits:			0.123
Yes	132 (47.8)	144 (52.2)	
No	52 (57.1)	39 (42.9)	
Smoking:			0.470
Never	181 (50.4)	178 (49.6)	
Sometimes/Daily	3 (37.5)	5 (62.5)	
Drinking alcohol:			0.123
Never	169 (51.5)	159 (48.5)	
Sometimes/Daily	15 (38.5)	24 (61.5)	
Chewing ability:			0.487
Comfortable/Fair	173 (49.7)	175 (50.3)	
Uncomfortable	11 (57.9)	8 (42.1)	
Speaking ability:			0.318
Comfortable/Fair	183 (50.0)	183 (50.0)	
Uncomfortable	1 (100.0)	0 (0.0)	
Self-rated oral health:			0.017
Good/Fair	155 (48.0)	168 (52.0)	
Poor	29 (67.4)	14 (32.6)	

Notes: [a] P-value from Pearson's chi-squared test

Abbreviations: THB, Thai baht; USD, The United States dollar

Table 2 shows the factors associated with dental health expenditure among our study participants (N = 367) using Pearson's Chi-squared test. There were statistically significant associations between dental health expenditure and education level (p=0.032), monthly income (p=0.003), and self-rated oral health (p=0.017). On the other hand, no significant association was found between dental health expenditure and other factors.

DISCUSSION

In this study, we found that higher dental expenditure was associated with higher educational level, higher income, and positive self-rated oral health.

According to Table 1, most of the participants were less than 70 years old, females, had attained beyond primary education, earned greater than or equal to 15,000 THB and reported good or fair self-rated oral health.

According to Table 2, educational level was significantly associated with dental health expenditure. Similarly, there was a study found that lower dental health expenditure related to lower educational levels (15). Some studies about dental utilization among elderly in Thailand also showed that the elderly receiving higher than primary education were more likely to use dental services (16, 17). However, some studies also reported no association between them (18).

Participants who earned at least 15,000 THB per month were more likely to have dental health expenditures. Similar results were reported in several studies (18, 19). Our findings were also consistent with those of several studies conducted in Thailand, which reported that elderly people with higher income were more likely to use dental services. (11,17). These studies supported our finding that income was the most important determinant influencing access to dental treatment in Thailand.

Elderly people who reported good and fair self-rated oral health were more likely to have higher dental health expenditure. A similar result was found in the study conducted among Chinese adults, revealing that participants in the low-income group with poor self-reported oral health were tended to spend less on dental health (20). However, it was reported in studies from France and Canada that patients with poor self-reported oral status tended to avoid dental check-ups, despite the increased dental fees in next visits due to progressive diseases. (19, 21).

Nevertheless, the current study could not find a significant association between dental health expenditure and other general characteristics, subjective oral functions and all oral health-related behaviors.

Strengths and Limitations of the Study

This study directly investigates the association between dental health expenditure and general characteristics, oral health behaviors, and self-rated oral health among elderly patients at the University Dental Hospital in Bangkok, Thailand. The main limitation of this study is the inability to include out-of-pocket expenditure data due to the limitation of the recorded system of the University Dental Hospital.

GENERALIZABILITY OF THE STUDY

Regarding its generalizability, this study used the proportion of elderly patients who utilized dental services in Thailand and modified questionnaire in the initial survey (12) from the 8th Oral Health National Survey (13). Therefore, the results of this study can be generalized, especially in Thailand and other similar countries. However, the out-of-pocket expenditure and the factors associated with it should be explored in future studies.

CONCLUSION

Higher dental health expenditure among the elderly was associated with higher educational level, higher income, and good/fair self-rated oral health. Therefore, the dental health provider should consider providing oral health promotion among the early old age to maintain positive self-rated oral health and limit the progression of oral diseases. Furthermore, policymakers must find ways of reducing financial restrictions on dental care services among elderly in Thailand.

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BREAKING THE SILENCE: EXPLORING PERCEIVED SOCIAL NORMS AND KNOWLEDGE REGARDING SEXUAL AND REPRODUCTIVE HEALTH AMONG ADOLESCENT STUDENTS IN MONASTIC SCHOOLS, MYANMAR

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ABSTRACT

Silence-cultural practices, social and gender norms significantly impact the sexual and reproductive health (SRH) of adolescents in Myanmar, especially among marginalized adolescent girls, including in religious institutions. Understanding social norms among adolescents in monastic schools is critical for effectively accelerating SRH programs and policies. This study, therefore, aimed to explore perceived social norms and knowledge of SRH among students in monastic schools in Magway region, Myanmar.

This study applied the baseline survey collected by the Burnet Institute in Magway Region, Myanmar, 2016. A total of 870 students aged 11-18 in eight monastic schools were selected for this study. This study applied descriptive and injunctive norms, measured from individuals' attitudes or beliefs towards SRH, with higher scores indicating more unfavorable social norms. Descriptive analysis and ANOVA were performed to examine the relationship between perceived social norms and independent variables.

Among students, 60.3% were female and 39.7% were male. The mean score of perceived social norms related to SRH was 33.9, indicating lower scores meant more positive social norms. About 51.1% had sufficient SRH knowledge (above the mean scores). Understanding of puberty information was reported by 56.2%, while 54.1% had insufficient knowledge of HIV and pregnancy prevention. ANOVA results showed novice students had significantly higher perceived social norms scores than lay students, ($F(1, 868) = 3.94$, $p = 0.036$). Students receiving SRH education from peer educators had lower perceived social norms scores, ($F(1, 868) = 5.14$, $p = 0.024$). Students with sufficient SRH knowledge had lower perceived social norms scores than those with insufficient knowledge, but the finding was not statistically significant.

Students' sufficient SRH knowledge influences positive perceived social norms, necessitating further investigation of additional factors to fully understand the intricate SRH knowledge-social norms relationship.

Keywords: Adolescent students, Monastic schools, Perceived social norms, Sexual and reproductive health

INTRODUCTION

Social norms, which encompass an individual's perception of typical behavior exhibited by others in a given situation and their understanding of socially acceptable actions, are powerful drivers of behavior among adolescents (1). In recent years, there has been a significant increase in research that investigates the relationships between social norms and sexual and reproductive health (SRH) (2). Understanding the relationship between individual, social, and community factors and social norms is crucial for effective SRH programs and driving necessary changes in institutions, systems, and resources.

Monastic schools in Myanmar play a vital role in bridging educational gaps and fulfilling the basic educational needs of the country, particularly for children from rural and remote areas, offering primary and middle education (3). They rely on community donors and support to provide free education to children, many of whom come from low socio-economic backgrounds or are orphans. However, monastic schools were found in poor coordination and collaboration for integrated school programs (4). Consequently, adolescents in monastic schools face challenges in accessing comprehensive SRH information and services, leading to marginalization and limited utilization of SRH programs.

According to existing literature, considering social norms and cultural influences is crucial when providing SRH information to adolescents (5). In Myanmar, community and cultural factors, including social and gender norms, have a significant impact on adolescent SRH. However, comprehensive studies on adolescent SRH in diverse social groups are scarce. Understanding social norms among adolescents in monastic schools is critical for effectively accelerating SRH programs and policies.

This study, therefore, aimed to explore social norms and SRH knowledge among students in monastic schools in Magway region of Myanmar, focused on addressing two research questions: What are the prevailing social norms related to SRH? What is the level of SRH knowledge and sources of information among students in these schools?

METHODOLOGY

Study Location and Population

This study utilized the baseline survey collected by the Burnet Institute Myanmar for the Integrated Multi-sectoral Approach project. The original baseline study was conducted across eight monastic schools (five post-primary and three middle monastic schools) covering grades 5 to 10 in Magway Region. The monastic schools were selected based on accessibility, engagement, and support from school principals, using purposive sampling method.

Regarding the original baseline survey's selection criteria, all students aged 11 years or older and enrolled in Grade 5 or above in the eight targeted monastic schools were eligible and invited to participate. In total, 1,428 students aged 11 to 18 years were involved in the survey depending on the number of students present on the day of data collection.

Students from the selected schools anonymously completed a self-administered questionnaire. The original survey administered a modified version of the questionnaire to students in Grades 5 and 6, not including questions related to sex and reproduction based on the Myanmar Ethics Review Board (6). The target population for this study comprised adolescent students aged 11 to 18 years enrolled in grades 7 to 10, were present at the eight monastic schools on the day of data collection and completed all the questionnaires addressed in the baseline survey. Therefore, those students from grades 5 and 6, not answering sexual and reproduction-related questions were excluded from the analysis of this study. In summary, from the original baseline survey, a total of 870 adolescent students who completed all the questionnaires were selected to be part of the final sample size in this study. The study received ethical approval from the Institutional Review Board of the Institution for Population and Social Research at Mahidol University (COA). No. 2023/04-076.

Measures

Perceived Social norms

This study's focus on examining adolescents' perceived social norms regarding SRH closely aligns with the original survey's broader objective of comprehending attitudes and beliefs concerning SRH among adolescents. The conceptual congruence between the original baseline survey's intent and the objectives of this study reinforces the validity of utilizing the secondary data for analysis. Moreover, in line with the approach detailed in Mackie et al.'s working paper on measuring social norms, innovative and appropriate methods were employed to construct social norms when direct measurement was unavailable. One such approach involves utilizing individuals' subjective beliefs regarding social acceptability or common behaviors, referred to as perceived social norms (7). For the assessment of reliability, formal testing procedures were not conducted due to the limitations of the available secondary data. While the original survey instrument was developed by experts and adhered to established international standards and guidelines, the absence of direct access to the survey respondents prevented the implementation of traditional reliability tests. Instead, this study focused on utilizing the meticulously designed original survey instrument and emphasizing the consistency of the underlying construct in the context of the available data.

Drawing insights from related research findings and recommendations, and considering the study's objectives and available data, this study applied both descriptive and injunctive norm perspectives. These perspectives were measured through individuals' attitudes or beliefs concerning SRH-related information, thus capturing perceived social norms at the individual level. Notably, this study did not measure any norms existing at the community or society level. A set of 32 contextually relevant items was used, concerning relationships (13 items), contraception (13 items), and HIV/AIDS (6 items). The response options were grouped for positive items into agree=0, don’t know =1 and disagree =2, for negative items, it applied a reverse-

coding system as agree =2, don't know =1, and disagree=0, to reflect higher scores as more unfavorable social norms, ranging from 0-64.

Level of SRH knowledge

This study assessed the level of SRH knowledge and focused on six constructs: puberty, reproductive organs, pregnancy prevention, contraception, HIV, and STIs. Each item in the assessment had three response options, "true", "false", and "don't know". One score was provided for correct answers and zero for incorrect/don't know. For contraceptive knowledge, the score was converted into (2= heard of and know how to use, 1= heard of but don't know how to use, and 0= never heard of). SRH knowledge levels were classified as sufficient (above mean score) or insufficient (below mean score) (8).

Data Analysis

Descriptive analysis was conducted to identify individual characteristics, SRH knowledge, and perceived social norms. ANOVA was employed to investigate the relationship between perceived social norms and independent variables. To address violations of the homogeneity assumption, robust tests (Welch ANOVA) were used. Post-hoc tests were performed to determine significant differences between mean pairs and their impact on the overall results. A sensitivity analysis was carried out to assess the reliability of the findings while imputing missing values (9). The missing data primarily pertained to the types of SRH educators and SRH topics learned at monastic schools. In managing the missing values, two approaches were taken. First, missing values were imputed by generating plausible values based on observed patterns within the dataset. For instance, missing values were imputed as "no teachers," "no health care providers," or "no peer educators," as appropriate. Secondly, an additional assumption was made by excluding cases with missing values of the types of SRH educators from the analysis. By exploring these different variations, the sensitivity analysis assessed the influence of these assumptions on the overall results. In summary, the sensitivity analysis results indicated no significant differences in mean scores between the groups, excluding missing values and imputing values. The analyses were performed using SPSS (version 18).

RESULTS

Based on Table 1, the perceived social norms related to SRH were assessed using a scale. Lower scores on the scale indicated more positive social norms. The overall mean score for perceived social norms related to SRH was 33.9 (SD = 5.3), ranging from 17 to 50. Among the sub-scales, the highest mean score percentage was observed for relationships (58.5%), followed by contraception (50.4%) and HIV/AIDS (46.7%) (Figure 1).

Table 1 presents the scores for perceived social norms related to SRH, including sub-scales. The relationship sub-scale, with scores ranging from 4 to 24 and a mean of 15.2 (SD = 2.9). The contraception sub-scale, with scores ranging from 3 to 22 and a mean of 13.1 (SD = 3.1). The HIV/AIDS sub-scale, with scores ranging from 0 to 12 and a mean of 5.6 (SD = 2.7).

Table 1: Perceived Social Norms Score

Scale	Number of items	Range	Mean ± SD
Relationships	13	4 – 24	15.2±2.9
Contraception	13	3 – 22	13.1±3.1
HIV/AIDS	6	0 – 12	5.6±2.7
Perceived Social Norms related to SRH	32	17 – 50	33.9± 5.3

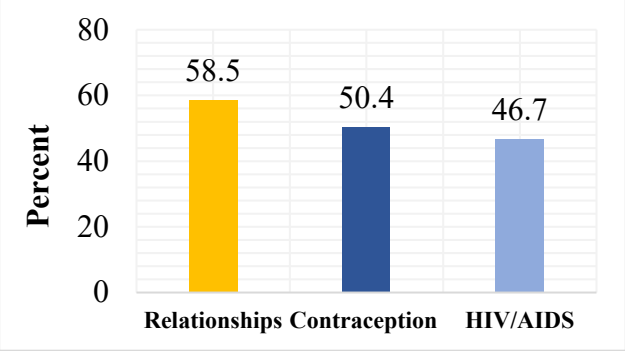

Figure 1: Mean Score Percentage in sub-scales of Perceived Social Norms

Table 2 presents the descriptive statistics and frequency distributions of the characteristics of study population. The study included a total of 870 students, aged 11-18 years. The mean age was 14.4 years. Among the students, 60.3% were female students, while 39.7% were males. Regarding educational level, the study comprised the students in the following proportions: 27.7% from Grade 7, 24.6% from Grade 8, 26.3% from Grade 9, and 21.4% from Grade 10. The majority of students were identified as lay students (74.7%), while 25.3% were novice students (monks or nuns). In terms of living arrangements, the majority of students (67.9%) attended monastic schools from the community, while 32.1% were boarder students who were residing on the compound of those monasteries. Among the students, 13.7% had at least one form of difficulty.

Table 2: Individual Characteristics of Study Population (N=870)

Variables	Frequency	%
Average age		
Mean ± SD (min-max)	14.4 ± 1.43 (11-18)	
Gender		
Male	345	39.7
Female	525	60.3
Education level (Grade)		
Grade 7	241	27.7
Grade 8	214	24.6
Grade 9	229	26.3
Grade 10	186	21.4
Types of students		
Novice (monks or nuns)	220	25.3
Lay students	650	74.7
Students' living status		
Student live at boarder in monastery	279	32.1
Student attend from community	591	67.9
Disability status		
No	751	86.3
At least one form of difficulties	119	13.7
Residence		
Magway	439	50.5
Myothit	35	4.0
Pakkoku	396	45.5

Figure 2 presents the students' level of SRH knowledge by calculating scores for each component and aggregating them. The study findings indicate that 56.2% of students had a good understanding of puberty information, while knowledge of HIV and pregnancy prevention was insufficient for 54.1% of students. Only 45.9% of students demonstrated sufficient knowledge of HIV transmission, signs and symptoms, and prevention. Overall, 51.1% of students had a sufficient SRH knowledge, while 48.9% had insufficient in this area.

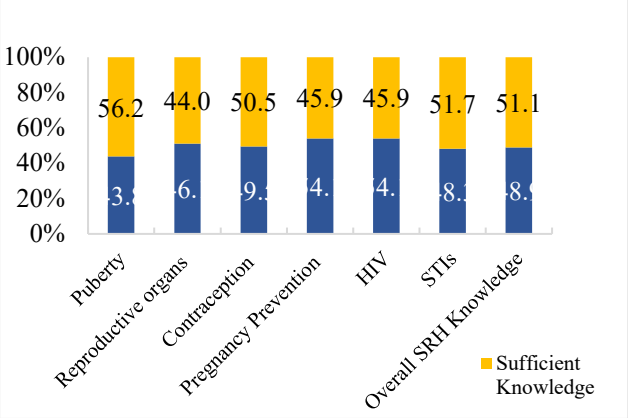

Figure 2: Level of SRH Knowledge among Students from Monastic Schools

Table 3 presents the disaggregation of perceived social norms and other independent variables. The mean score of perceived social norms related to SRH for female students (M=34.12, SD = 4.99) was slightly higher than for males (M= 33.59, SD = 5.72). However, the ANOVA result did not reveal significant gender differences. There was a significant variation in the scale of perceived social norms among the education level, (F(3, 866) = 2.993, p = 0.030). Post-hoc tests using the Tukey HSD test indicated that students from grade 7 have significantly higher perceived social norms compared to those in grade 8. However, grades 9 and 10 did not have significant differences in perceived social norms scale. Among the students, novice students had significantly higher mean scores of perceived social norms compared to lay students, (F(1, 868) = 3.94, p = 0.036). Further, students who reported at least one form of difficulty had significantly higher mean score of perceived social norms, (F(1, 868) = 18.324, p = 0.000).

In ANOVA result, students who reported receiving SRH education from peer educators (M =32.78, SD =5.26) had significantly lower mean scores of perceived social norms than students who did not receive SRH education from them (M =34.30, SD= 5.30), (F(1, 868) = 5.14, p = 0.024) (Table 3). There were no significant differences in mean scores between age, student's living status, and SRH topics learned in the life skills class.

Table 3: Association between independent variables and Perceived Social Norms related to SRH

Variables (N=870)	Mean ± SD	*p-value*
Individual Characteristics		
Age (years)	- 0.030 [a]	0.363
Gender		
Male	33.59 ± 5.72	0.156 [†]
Female	34.12 ± 4.99	
Education level (Grade)		
Grade 7	34.72 ± 4.91	0.030*
Grade 8	33.30 ± 4.99	
Grade 9	33.84 ± 5.62	
Grade 10	33.66 ± 5.62	
Type of Students		
Novice (monk or num)	34.52 ± 4.83	0.036*
Lay students	33.70 ± 5.43	
Students' living status		
Student live at boarder in monastery	34.14 ± 5.23	0.390
Student attend from community	33.81 ± 5.32	
Disability status		
No	33.61 ± 5.21	0.000***
Yes, at least one form of difficulties	35.82 ± 5.44	
Types of SRH educators [b]		
Teachers		
Yes	34.02 ± 5.44	0.382
No	33.68 ± 4.96	

Variables (N=870)	Mean ± SD	*p-value*
Health care providers		
Yes	34.31 ± 5.45	0.368
No	33.85 ± 5.27	
Peer educators		
Yes	32.78 ± 5.26	0.024*
No	34.06 ± 5.29	
No one to teach SRH education		
Yes	33.46 ± 4.97	0.140
No	34.07 ± 5.41	
SRH Topics learning from monastic schools		
Puberty		
Yes	34.15 ± 5.38	0.133
No	33.60 ± 5.18	
Reproduction and Pregnancy		
Yes	34.02 ± 5.68	0.721 †
No	33.87 ± 5.15	
Contraception		
Yes	34.37 ± 5.57	0.344
No	33.85 ± 5.36	
Relationships		
Yes	34.51 ± 5.24	0.065
No	33.73 ± 5.31	
Sexual Health		
Yes	34.32 ± 5.80	0.277 †
No	33.80 ± 5.15	
HIV & STIs		
Yes	34.07 ± 5.49	0.369
No	33.74 ± 5.08	
Frequency of SRH education in the class		
No SRH education	33.46 ± 4.97	0.052
Rarely	33.51 ± 5.12	
Regular	34.36 ± 5.53	

† Robust test was used due to homogeneity violated

[a] correlation coefficient

[b] multiple responses

*p-value<0.05, **p-value<0.01, ***p-value<0.001

Based on Table 4, the ANOVA results showed that students with insufficient knowledge of HIV had higher mean scores of perceived social norms compared to those with sufficient knowledge, although it was not statistically significant. Overall, the mean score of perceived social norms among students with insufficient SRH knowledge (M = 34.08, SD = 4.90) was slightly higher than that of students with sufficient SRH knowledge (M = 33.75, SD = 5.65), but the difference was not statistically significant.

Table 4: Association between Level of SRH Knowledge and Perceived Social Norms related to SRH

Level of SRH knowledge (N=870)	Mean ± SD	*p-value*
Puberty		
Insufficient	33.99 ± 5.01	0.683
Sufficient	33.85 ± 5.51	
Reproductive organs		
Insufficient	33.94 ± 4.97	0.848 †
Sufficient	33.87 ± 5.67	
Contraception		
Insufficient	33.84 ± 4.97	0.693 †
Sufficient	33.98 ± 5.61	
Pregnancy		
Insufficient	33.83 ± 5.22	0.632
Sufficient	34.01 ± 5.39	
HIV		
Insufficient	34.10 ± 5.19	0.244
Sufficient	33.68 ± 5.41	
STIs		
Insufficient	33.83 ± 5.12	0.656
Sufficient	33.99 ± 5.46	
Overall level of SRH knowledge		
Insufficient	34.08 ± 4.90	0.358 †
Sufficient	33.75 ± 5.65	

† Robust test was used due to homogeneity violated

DISCUSSION

The study indicated that the majority of students displayed an acceptance of unhealthy practices in relationships and contraception, such as agreement in the statements that a boy's respect for a girl diminishes if she willingly consents to engage in sexual activity with him or forcing a girl to have sex is justified if the boy loves her, or carrying condom/prevent pregnancy is the women's responsibility. These findings are similar with Berhane et al. (2019)'s finding of more unfavorable responses regarding women's right in relationships and contraception usage among adolescent girls in Ethiopia (10). Consequently, these social norms reinforce power imbalances between male and female, lack of consent, and the objectification of women. It is important to address such gender norms to promote healthy and respectful relationships based on equality, consent, and mutual respect.

There are areas of concern regarding knowledge about HIV and pregnancy prevention. The study findings suggest that the majority of monastic schools focus more on teaching basic foundation knowledge rather than advanced topics, such as sexual health, HIV/STIs, and relationships. Comprehensive sexuality education is meant to be taught in schools in Myanmar, including monastic schools. However, cultural and social norms significantly influence sexuality education preferences in school settings, with findings indicating a preference for an abstinence-only approach among parents and teachers (11). Studies conducted in Nigeria and Indonesia supports the consistent finding that higher SRH knowledge is associated with positive attitudes and adherence to socially normative behaviors (12, 13). Overall, this study suggests the value of continued efforts to strengthen and expand comprehensive SRH education programs in monastic schools, with a focus on addressing specific knowledge gaps and fostering a more comprehensive understanding of SRH topics.

The bivariate analysis showed that novice students had significantly higher mean scores of perceived social norms compared to lay students. One article conducted in Zimbabwe stated that some nuns were hesitant and discomfort when discussing SRH information (14). When following the monastic discipline, discussing and talking about SRH may be seen as a violation of Buddhist moral codes (15). However, as novices in the monastic life may eventually transition back into a lay person life (16), it becomes essential for them to have access to comprehensive SRH information and services. Returning novices may navigate relationships, marriage, and reproductive choices. It is necessary to establish inclusive SRH programs tailored to their needs and to promote positive sexual practices.

In the bivariate result, students who reported receiving SRH education from peer educators had significantly lower mean scores of perceived social norms. A similar result were found in Nigeria that the peer education sessions resulted in notable and positive transformations in knowledge and attitudes concerning STIs, HIV anti-stigma, and condom usage among adolescent and young persons (17). The present study highlights that sustained exposure to well-designed peer education sessions can contribute

to the holistic improvement of SRH knowledge and promote positive shifts in opinions and behaviors among adolescents.

Overall, the findings of this study contributes to the existing literature by shedding light on the potential influence of SRH knowledge and community factors on shaping students' perceived social norms related to SRH. These findings underscore the importance of comprehensive sexuality education programs that address social norms and promote accurate SRH knowledge among students, regardless of their education level or setting.

CONCLUSION

To gain a comprehensive understanding between SRH knowledge and perceived social norms, it is essential to investigate additional factors that may contribute to shaping social norms regarding SRH. Future research should explore factors that might influence perceived social norms related to SRH and investigate the potential impact of comprehensive SRH education programs on shifting these norms. By addressing and challenging unfavorable social norms, interventions can create a supportive environment that encourages positive attitudes and healthy SRH practices among adolescents from marginalized groups.

LIMITATION

This analysis had some limitations. The study applied the cross-sectional design with self-report measures, which may limit the generalizability and reliability of the findings. Further research employing longitudinal designs and objective measures would be valuable in strengthening the understanding of complex interplay between perceived social norms, individual characteristics, community factors, and SRH knowledge.

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CHARACTERIZATION OF N-TERMINAL EXTENSION DOMAIN OF THE UBIQUITIN-RELATIVE HUB1 IN *CRYPTOCOCCUS NEOFORMANS*

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ABSTRACT

Pre-mRNA splicing is a process that removes intron (a protein non-coding sequence) from transcript by the spliceosome. Any defect in pre-mRNA splicing may lead to an abnormal protein, which contributes to development of diseases and affects the viability of organisms. Hub1 (homologous to ubiquitin-1) protein is highly conserved and essential in most eukaryotes because it plays an important role in controlling pre-spliceosome assembly and fidelity of splicing. Most organisms have 73-amino-acid long Hub1 protein, harboring only ubiquitin-like domain. However, Hub1 in some organisms has an additional uncharacterized N-terminal extension of unknown function, which is enriched with serine, arginine, and aspartate. This feature is similar to that of the RS domain of serine/arginine-rich proteins, which control alternative splicing in higher eukaryotes. The model organism in this study was *Cryptococcus neoformans,* a pathogenic budding yeast that causes cryptococcal meningitis in immunocompromised patients. Nowadays, *C. neoformans* has already developed mechanism resistant to current drugs.

The objective of this research is to study the N-terminal extension domain (NTD) of Hub1 in the pathogenic yeast *Cryptococcus neoformans* using bioinformatics and biochemical analyses.

First, we compared Hub1 of *C. neoformans* (CnHub1), human, and yeast *Saccharomyces cerevisiae* by using BLAST and CLUSTALω. The CnHub1 structure was predicted by AlphaFold algorithm. In addition, *C. neoformans HUB1* gene was cloned, and CnHub1 protein variants were recombinantly expressed and purified in order to investigate the liquid-liquid phase separation (LLPS) properties of CnHub1.

Hub1 of *C. neoformans* (CnHub1) contains NTD different to human and yeast. Furthermore, our bioinformatic analyses showed that the NTD of CnHub1 is intrinsically disordered and may undergo LLPS to form membrane-less organelles. Light microscopy indicated that CnHub1 can indeed undergo LLPS and form liquid droplets *in vitro*.

This study revealed that CnHub1 contains NTD different from other organisms and can indeed undergo LLPS and form liquid droplets *in vitro*. We conjecture that this phenomenon may help control pre-mRNA splicing in *C. neoformans* and anticipate that understanding the feature and function of CnHub1 NTD will be beneficial for drug development against this pathogenic yeast in the future.

Keywords: Hub1, Pre-mRNA splicing, Cryptococcus neoformans, Liquid-liquid phase separation

INTRODUCTION

Pre-mRNA splicing, a critical post-transcriptional step in eukaryotic cells, occupies the spliceosome to remove intron sequences from the transcript (1, 2).The spliceosome comprises five smalls nuclear RNAs (U1, U2, U4, U5, and U6 snRNAs) combined with various proteins to become small nuclear ribonucleoproteins (snRNPs) (1). The order of assembly of snRNP on the pre-mRNA is important for catalysis of the intron removal, then protein-coding exons eventually join together to form a mature mRNA (1). In addition to the spliceosome, serine/arginine-rich (SR) proteins can regulate and enhance splicing by binding to splicing regulatory elements and recruiting spliceosome complex to the transcript (3). Defects in the pre-mRNA splicing may contribute to the development of certain diseases and affect the viability of organisms (3).

While Hub1 (homologous to ubiquitin-1/UBL5) is similar to ubiquitin and other ubiquitin-like modifiers (UBLs), it differs from other UBLs in that its C-terminus is di-tyrosine (YY) instead of di-glycine (GG) (4-6). Hub1 is essential in most eukaryotes and plays a critical role in controlling pre-mRNA splicing by enhancing and controlling the fidelity of the splicing (4, 6). Hub1 can bind to the Hub1-interaction domain (HIND) element of Snu66 protein and DEAD-box helicase Prp5 in order to regulate pre-spliceosome assembly (4, 6). The lack of Hub1 in most organisms has an impact on their viability (4, 7). Most organisms have 73-amino-acid long Hub1 protein, harboring a ubiquitin-like (UBL) domain (5), but we observed that Hub1 in some organisms (e.g., *Cryptococcus neoformans*) has an additional uncharacterized N-terminal extension domain (NTD) that is enriched with serine, arginine, and aspartate that is similar to the RS domain of SR proteins. Thus, we hypothesized that the NTD may function as the SR proteins in order to control pre-mRNA splicing. Here, we study the NTD of Hub1 in the pathogenic yeast *Cryptococcus neoformans* using bioinformatics and biochemical analyses. *Cryptococcus neoformans* is a pathogenic budding yeast that causes cryptococcal meningitis in immunocompromised patients (8, 9). A mortality caused by *C. neoformans* infection is estimated to be 181,000 per year (10). Nowadays, *C. neoformans* has already developed mechanism resistant to current drugs including fluconazole, amphotericin B, and flucytosine (10). We expect that the understanding the feature and function of NTD of Hub1 will be beneficial for drug development against this pathogenic yeast in the future.

Here, we showed that the NTD of *C. neoformans* Hub1 (CnHub1) is predicted to be intrinsically-disordered regions (IDR). Several previous research have reported that the IDR plays an important role to drive liquid-liquid phase separation (LLPS) of several molecules (11, 12). LLPS-driven biomolecular condensates serve several functions to maintain cellular homeostasis (13). Thus, we hypothesized that CnHub1 may undergo LLPS to form liquid droplets, which may help control pre-mRNA splicing in *C. neoformans*. Light microscopy indicated that CnHub1 can indeed undergo LLPS and form liquid droplets *in vitro*. We conjecture that this phenomenon may help control pre-mRNA splicing in *C. neoformans.*

METHODOLOGY

BLAST

Hub1 homolog sequences in various organisms were identified using the BLAST, which is a quick tool that can be used to compare sequences of each organism with the databases in order to identify similar nucleotide or amino acid sequences (14). The E value cut-off that is used in this study is 10-5, which is the criteria to select Hub1 homolog in each organism (15).

Multiple sequence alignment

The CLUSTALω is a quick and accurate tool for alignment abundant sequences based on their evolution, structure, and function (16, 17). Using the CLUSTALω tool (BioEdit), 3 amino acid sequences of Hub1 derived from human, *S. cerevisiae*, and *C. neoformans* were aligned. Furthermore, the conserved sequence of Hub1 in each organism were labeled by BioEdit.

CnHub1 structure prediction

Structure of CnHub1 was predicted by AlphaFold, a high accuracy algorithm that can predict three dimensional (3D) structural protein from amino acid sequence base on their evolutionary and physical interaction (18).

In vivo cloning of recombinant DNA

Different variants of *CnHUB1* gene, which are full-length (FL) and N-terminal extension domain (NTD) were cloned into plasmid vector pMAL-c5X using co-transformation assay (19). The vector pMAL-c5X consists of maltose-binding protein (MBP) gene for tagging protein of interest, ampicillin-resistant gene, and Factor Xa cleavage site. First, FL and NTD of *CnHUB1* genes were amplified from plasmid pREP81-*CnHUB1_FL* template (Chanarat et al, unpublished) using PCR. The vector backbone of pMAL-c5X also was amplified by PCR. One µL of Dpn1 was added into all PCR products and incubated at 37ºC for 1 hour in order to remove methylated plasmid DNA template. The FL, NTD, and vector backbone DNA fragments (derived from PCR) were mixed with XL10-gold *E. coli* competent cells and incubated on ice for 25 minutes. Subsequently, cells mixed with DNA were heat-shocked at 42ºC for 1 minute and immediately incubated on ice for 3 minutes. The cells were collected by centrifugation at 5,000 rpm for 1 minute. After supernatant is removed, 100 µL LB medium (0.5 g yeast extract, 1 g peptone, 1 g sodium chloride, in distilled water) without any antibiotic was added. *E. coli* cells were cultured at 37ºC for 60 minutes in a shaker incubator. After incubation, all solution were plated on LB agar containing 100 µg/ml ampicillin and incubated at 37ºC overnight.

After transformation, recombinant plasmid DNA of FL and NTD constructs were extracted from each colony of *E. coli* using minipreparation kit (FavorPrep™ Plasmid Extraction Mini Kit; FAVORGEN) and further cut-checked by restriction enzymes BamHI and PstI to examine whether the plasmid has the FL and NTD of CnHub1 insertion. All DNA bands were analyzed by agarose-gel electrophoresis. Expected size of DNA products of vector, FL, and NTD after cut by enzymes are 5,664, 813, and 591 bp, respectively.

All recombinant plasmid DNA of FL and NTD constructs were transformed into BL21 (DE3) *E. coli* for protein expression. The plasmid construct of FL and NTD were mixed with BL21 (DE3) *E. coli* competent cells and following the step of heat shock method as previously described.

Recombinant protein expression

BL21 (DE3) *E. coli* cells, which contain plasmid pMAL-c5X constructs of FL and NTD were cultured in 5 mL LB medium with 100 µg/ml ampicillin at 37ºC in a shaking incubator overnight (20). Then, cells were diluted in a 5 mL LB medium with 100 µg/ml ampicillin (OD at 600 nm equal to 0.2) and cultured cells at 37ºC in a shaking incubator until OD at 600 nm equal to 0.6-1 (approximately 3 hours of incubation). To induce protein expression, 0.01 or 0.1 mM IPTG was added and cells were incubated at 16ºC and 25ºC for 24 h and 4 h, respectively (20). Each tube, which contained *E. coli* cells, was left on ice for 10 minutes in order to stop protein induction. After protein induction was inhibited, cells were transferred to 1.5 mL tubes and collected by centrifugation at 5,000 rpm, 4ºC, for 1 minute. After supernatant was discarded, cell pellet was resuspended with 1x PBS (0.137 M sodium chloride, 0.0027 M potassium chloride, 0.01 M sodium phosphate dibasic, 0.0018 M potassium phosphate monobasic, pH 7.4). Subsequently, cells were disrupted by sonication twice with 50% amplitude, pulse on 10 seconds, pulse off 10 seconds, for 1 minute. Subsequently, 1% TritonX-100 was added into the lysate and incubated on ice for 20-30 minutes. Then, the solution was centrifuged at max speed, 4ºC for 15 minutes in order to separate lysate and cell pellet fraction. The lysate, which contains protein of interest, was transferred to a new 1.5 mL tube. Finally, 10% glycerol was added into the lysate, which was frozen with liquid nitrogen and stored at -80ºC until use.

Sodium Dodecyl Sulfate Polyacrylamide Gel Electrophoresis (SDS-PAGE)

To check protein expression using SDS-PAGE (21), 10 µL of lysate and cell pellet were mixed with 4x and 1x SDS loading buffer, respectively. Proteins in lysate and cell pellet were denatured by heating at 90ºC for 5 minutes before loading into the well of 7.5% polyacrylamide gel. Proteins were separated on the gel at 200 V, 400 mA, for 45-50 minutes. Then, gel with separated proteins was stained with Coomassie blue. After gel was destained, proteins that were separated on the gel were scanned by a scanner (Epson Perfection V600 Photo). Size of proteins was compared with the marker Unstrained Protein Standard, Broad Range 10-200 kDa (BioLabs). Expected sizes of protein MBP, MBP-FL, and MBP-NTD, are 43, 75.5, and 65.5 kDa, respectively.

Protein purification

Before loading soluble proteins into the Poly-Prep chromatography column (Bio-Rad), the column with 2 mL (1 CV) amylose beads (Expedeon) was washed with 10 mL type I water and followed by 10 mL washing buffer (20 mM Tris-HCl, pH 7.5, 200 mM NaCl, 1 mM EDTA, 1 mM DTT). The lysate containing protein MBP-FL or MBP-NTD was centrifuged at max speed, at 4ºC for 10 minutes before loading onto the column, which contained amylose beads. The proteins of interest that were tagged with MBP can bind to the beads whereas other non-specific *E. coli* proteins were washed by adding 10 mL washing buffer (20 mM Tris-HCl, pH 7.5, 200 mM NaCl, 1 mM EDTA, 1 mM DTT) into the column. The proteins MBP-FL and MBP-NTD were eluted into each 1.5 mL tube using elution buffer (20 mM Tris-HCl, pH 7.5, 200

mM NaCl, 1 mM EDTA, 1 mM DTT, and 10 mM maltose). Then, the protein was frozen in liquid nitrogen and stored at -80°C until use (22).

In vitro characterization of LLPS assay

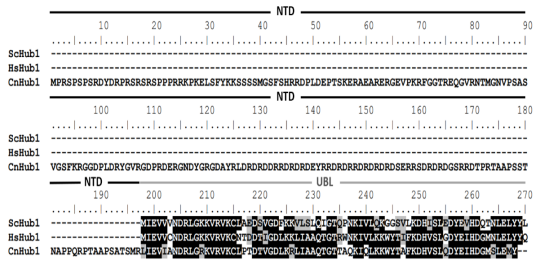
To induce LLPS, full-length CnHub1 which is tagged with MBP (MBP-FL) was incubated in a buffer containing 20 mM Tris-HCl, 100 mM NaCl, 1 mM EDTA, 1mM DTT, pH 7.5 with or without 20% polyethylene glycol (PEG) (13). Subsequently, proteins were incubated at room temperature (23-25°C) for 24 hours before observed the droplets formation under light microscope with 400x magnification.

RESULTS

Hub1 of C. neoformans containing N-terminal extension domain and is predicted to be an intrinsically-disordered region

To compare Hub1 of pathogenic yeast *C. neoformans* with other organisms, BLAST analysis was used to identify Hub1 homolog sequence in each organism. Initial criteria of selection of amino acid sequences of Hub1 in each organism was the E-value cut-off at 10^{-5}. Hub1 amino acid sequence of *C. neoformans* (CnHub1), *S. cerevisiae* (ScHub1), and human (HsHub1), that were derived from BLAST, were then further selected for alignment by CLUSTALω (BioEdit). The result showed that *C. neoformans* contains additional uncharacterized domain at N-terminus of Hub1, termed N-terminal extension domain (NTD), which is different from *S. cerevisiae* and human while the ubiquitin-like domain (UBL) is conserved **(Figure 1A)**. Remarkably, the NTD of CnHub1 is enriched with serine, arginine, and aspartate **(Figure 1A)**, which are similar to the RS domain of SR protein. This led to the hypothesis that the NTD may function as a conventional SR protein to control the pre-mRNA splicing. Furthermore, three-dimensional (3D) structure of CnHub1 was predicted by AlphaFold algorithm and showed that NTD of CnHub1 is intrinsically-disorder region (IDR) **(Figure 1B)**. Several previous researches have reported that the IDR plays an important role to drive liquid-liquid phase separation (LLPS) of several molecules (11, 12). Thus, we hypothesize that the CnHub1 may undergo LLPS to form liquid droplets, which may help control pre-mRNA splicing in *C. neoformans.*

A



B

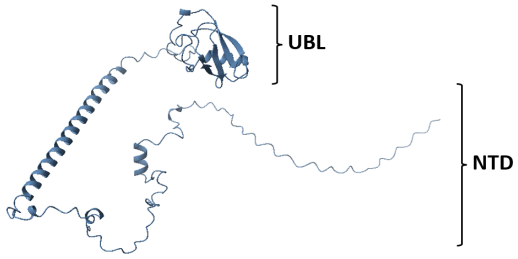


Figure 1: Hub1 of C. neoformans (CnHub1) contains the N-terminal extension domain (NTD), predicted to be an intrinsically-disordered region (IDR). (A) Multiple sequence alignment of Hub1 amino acid sequence of C. neoformans (CnHub1), S. cerevisiae (ScHub1), and human (HsHub1). (B) A structure model of CnHub1 predicted by the AlphaFold algorithm.In vivo cloning of CnHUB1 gene with different variants into E. coli.

To study LLPS of CnHub1 *in vitro*. Initially, the *CnHUB1* gene with different variants, which are full-length (FL) and NTD, were cloned into plasmid pMAL-c5X, which contains maltose binding protein (MBP) gene for tagging protein of interest **(Figure 2A)**. All 2 variants of *CnHUB1* genes and vector backbone of pMAL-c5X were amplified using PCR procedure **(Figure 2A and 2B)**. The PCR products of *CnHUB1* FL, NTD, and vector backbone, with sizes of 807, 585, and 5,677 bp, respectively, were observed on the agarose gel **(Figure 2B)**. All PCR products were then transformed into XL10-gold *E. coli* via the heat shock method (**Figure 2A**). After transformation, each *E. coli* colony containing recombinant plasmid DNA of FL and NTD was extracted and cut-checked by restriction enzymes BamHI and PstI to examine whether the plasmid had the *CnHUB1* FL and NTD insertion. The result showed that *CnHUB1* FL plasmid construct extracted from *E. coli* colony number 1 and 2 had *CnHUB1* FL gene insertion because after the plasmid was cut by restriction enzymes, it appeared as plasmid vector and *CnHUB1* FL bands with expected sizes of 5,664 and 813 bp, respectively **(Figure 2C)**. The plasmid construct of NTD, which was extracted from *E. coli* colony number 1 and 2 also appeared band of vector and NTD insertion with size of 5,664 bp and 591 bp, respectively, after restriction enzymes cutting **(Figure 2C)**. Then, all plasmid constructs containing FL or NTD were transformed into BL21(DE3) *E. coli* for protein work.

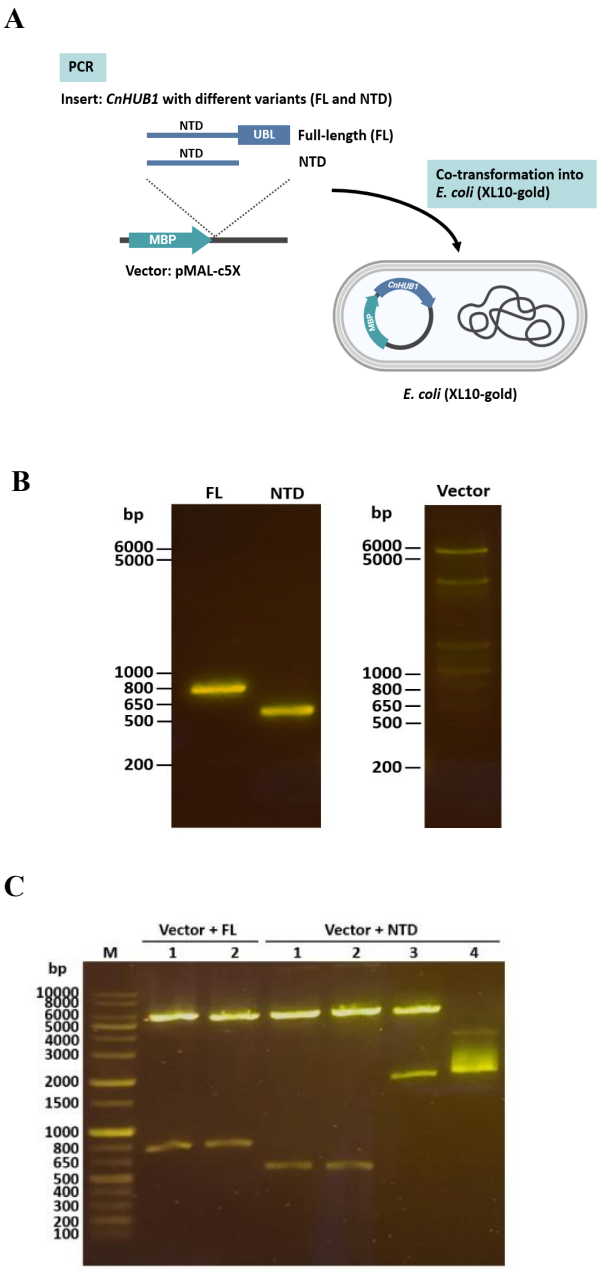


Figure 2: CnHUB1 variants (FL and NTD) were cloned into pMAL-c5X plasmid and transformed into E. coli. **(A)** Diagram of cloning *CnHUB1* gene variants into XL10-gold *E. coli* via heat-shock. **(B)** DNA fragments of *CnHUB1* FL, NTD, and pMAL-c5X vector after amplified by PCR. **(C)** The recombinant plasmid pMAL-c5X of *CnHUB1* FL and NTD were cut-checked by BamHI and PstI.

Expression and solubility of MBP-FL and MBP-NTD were induced with appropriate conditions

To optimize the appropriate condition for inducing the expression of proteins MBP-FL and MBL-NTD. IPTG with different concentration at 0.01 and 0.1 mM were added to BL21(DE3) *E. coli* cells cultured and cells were incubated at 16°C and 25°C for 24 and 4 hours, respectively. The result showed that 0.01 mM IPTG cannot induce the expression of MBP-FL and MBP-NTD proteins while 0.1 mM IPTG was sufficient to induce these proteins expression found in both cell pellet and supernatant fractions **(Figure 3)**. However, the proper condition for inducing expression and increasing the solubility of both protein MBP-FL and MBP-NTD was incubating cells with 0.1 mM IPTG at 16°C for 24 hours because the expression of MBP-FL and MBP-NTD was found higher in supernatant than in cell pellet **(Figure 3)**.

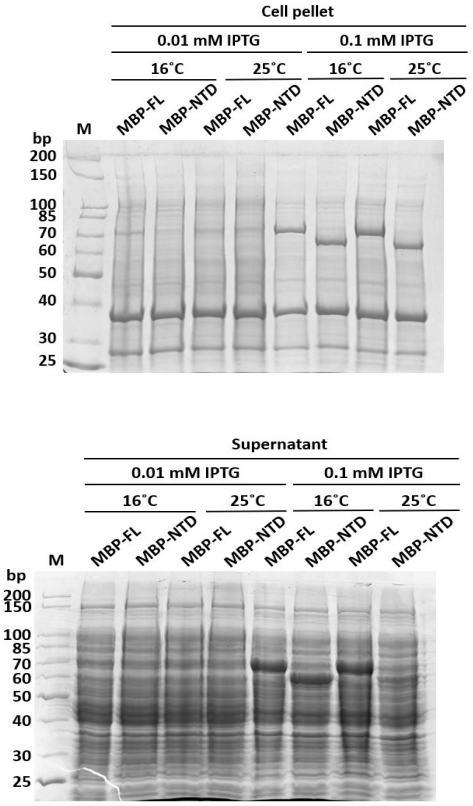


Figure 3: Expression of proteins MBP-FL and MBP-NTD. SDS-PAGE showed the expression of MBP-FL and MBP-NTD proteins (in supernatant) increasing in condition of incubating cells with 0.1 mM IPTG at 16°C for 24 hours. Expected size of MBP-FL and MBP-NTD are 75.5 and 65.5 kDa, respectively.

The purification of MBP-FL and MBP-NTD

Since the lysate contains additional proteins produced from *E. coli* cells in addition to the proteins of interest, the proteins of interest (MBP-FL and MBP-NTD) were then purified using affinity chromatography. Firstly, the lysate of MBP-FL and MBP-NTD was flowed through an affinity column containing amylose beads, which can trap the MBP-tagged protein. The column was then washed using washing buffer (20 mM Tris-HCl, pH 7.5, 200 mM NaCl, 1 mM EDTA, 1mM DTT) to remove non-specific binding proteins. Proteins were eluted into elution 1 to 5 (E1 to E5) using elution buffer containing 10 mM maltose (20 mM Tris-HCl, pH 7.5, 200 mM NaCl, 1 mM EDTA, 1 mM DTT, and 10 mM maltose). The result showed that MBP-FL and MBP-NTD can be purified and most of them were eluted into E1 **(Figure 4)**. However, there were many unknown bands appeared on the gel, suggesting that these bands may be caused by protein degradation

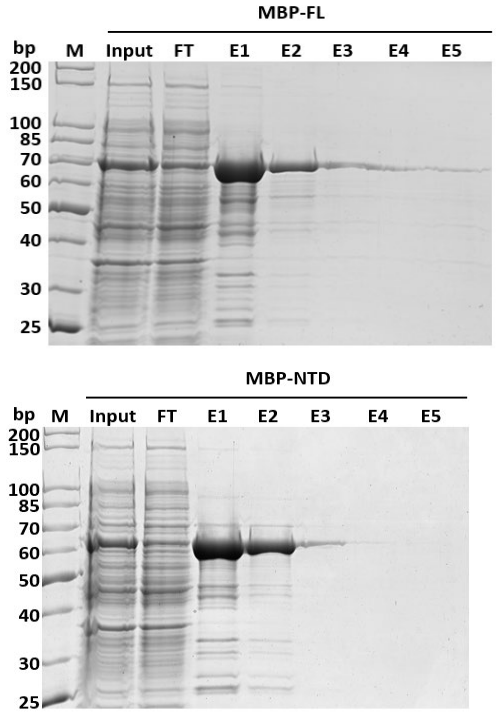


Figure 4: Purification of MBP-FL and MBP-NTD proteins using affinity chromatography. Input represents proteins before purification. FT represents flowthrough of lysate after purification. Proteins were eluted into elution 1 to elution 5 (E1 to E5).

MBP-FL CnHub1 tends to undergo LLPS to form liquid droplets

To investigate the LLPS of CnHub1, full-length CnHub1 tagged with MBP (MBP-FL) was incubated in a LLPS-inducing buffer (20 mM Tris-HCl, pH 7.5, 100 mM NaCl, 1 mM EDTA, 1 mM DTT) with or without 20% PEG 8000 at 25ºC for 24 hours. Polyethylene glycol (PEG) is a molecular crowding agent, which has been reported to induce LLPS of some molecules (13, 23). The result showed that in the presence or absence of 20% PEG 8000, 8 µM and 16 µM MBP-FL can undergo LLPS to form droplets observed under light microscope (Figure 5).

However, we noticed that the formation of MBP-FL CnHub1 droplets increased in the presence of 20% PEG 8000. These results indicated that CnHub1 tends to undergo LLPS to form liquid droplet in vitro, which may help control pre-mRNA splicing in C. neoformans in vivo.

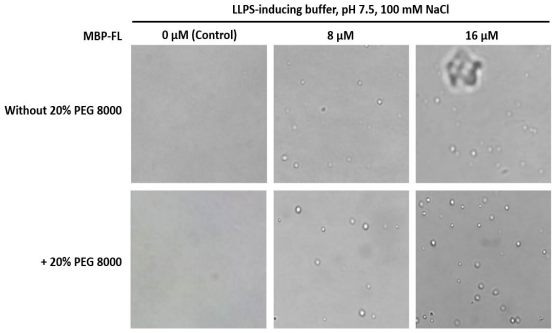


Figure 5: Full-length CnHub1 (MBP-FL) undergoes LLPS to form liquid droplets. MBP-FL at 8 µM and 16 µM was incubated in LLPS-inducing buffer (20 mM Tris-HCl, pH 7.5, 100 mM NaCl, 1 mM EDTA, 1 mM DTT) with or without 20% PEG 8000 at 25oC for 24 hours. The droplets formation of MBP-FL was detected using a light microscope.

DISCUSSION

Hub1 plays a crucial role in controlling pre-spliceosome assembly and fidelity of splicing (4, 6). The lack of Hub1 affects the viability of various organisms (4, 7). Most organisms have 73-amino-acid long Hub1 protein, harboring only ubiquitin-like domain (UBL). However, we discovered that Hub1 of pathogenic yeast *C. neoformans* (CnHub1) has an additional uncharacterized N-terminal extension domain (NTD) that differs from other organisms including human and yeast *S. cerevisiae*.

Furthermore, the feature of NTD is enriched with serine, arginine, and aspartate that similar to RS domain of serine/arginine-rich (SR) proteins, which control alternative splicing in higher eukaryotes. Thus, we hypothesized that the NTD may function as an SR protein in order to control the pre-mRNA splicing. From this perspective, the NTD might be used as a new pharmacological target to treat *C. neoformans* infection since this yeast has developed resistant mechanisms to current medications such as fluconazole, amphotericin B, flucytosine (10). Here, we also demonstrated that the NTD of CnHub1 is predicted to be an intrinsically-disordered region (IDR). Several studies show that the intrinsically-disordered proteins can undergo liquid-liquid phase separation (LLPS), which is crucial for controlling several biochemical processes inside cells (11-13, 23). Hence, we hypothesized that CnHub1 may undergo LLPS to form liquid droplets, which may help control pre-mRNA splicing in *C. neoformans*. Interestingly, our results revealed that CnHub1 can indeed undergo LLPS to form liquid droplet under light microscope. However, the function of CnHub1 NTD remains unknown and further investigations are required to confirm this phenomenon.

CONCLUSION

Here, we demonstrated that Hub1 of pathogenic yeast Cryptococcus neoformans (CnHub1) has an additional uncharacterized N-terminal extension domain (NTD) different from human and yeast S. cerevisiae using bioinformatic-based analyses. In addition, the NTD of CnHub1 is predicted to be an intrinsically-disordered region. Thus, we hypothesized that CnHub1 may undergo LLPS to form liquid droplet in order to control pre-mRNA splicing. To verify the hypothesis, CnHUB1 variants (full-length and NTD) were cloned, expressed, and purified. The result revealed that MBP-CnHub1 can undergo LLPS to form liquid droplets in vitro. We suggested that the formation of CnHub1 droplets via LLPS may help control pre-mRNA splicing in C. neoformans. We believe that understanding the feature and function of CnHub1 NTD will be beneficial for drug development against this pathogenic yeast in the future.

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FACTORS ASSOCIATED WITH THE UTILIZATION OF PREVENTIVE DENTAL TREATMENTS AMONG ELDERLY PATIENTS IN FACULTY OF DENTISTRY, CHULALONGKORN UNIVERSITY

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ABSTRACT

Preventive dentistry is dental care that helps maintain good oral health throughout life. However, limited research has focused on utilization of preventive dental services among older patients.

This study aimed to explore factors associated with utilization of preventive dentistry among elderly patients attending a university dental hospital at faculty of dentistry, Chulalongkorn university, Bangkok, Thailand.

This study was conducted between February 15, 2023 and March 30, 2023, using secondary data from the dental hospital resource system. Independent variables were collected from a previous telephone survey among elderly patients who visited the university dental hospital between January 1, 2020, and December 31, 2020. Dependent variable (utilization of preventive dental services) has already been recorded in the dental register system resource between 2019 and 2020. We used secondary data to reduce recall bias among the study participants. Descriptive statistics, number and percentage were analyzed to describe categorical variables (age, sex, marital status, employment, education, income, adequate dental health insurance, systemic diseases, sctivities of daily living, toothbrushing behaviors, sweet consumption, vegetables and fruits consumption, regular dental visits, smoking habit, drinking habit, and preventive dental utilization). Pearson's Chi-squared test was analyzed to assess the association between independent and dependent variables.

There were 367 participants in this study. Most of the characteristics of all the participants were under 70 years old (55.6%), female (59.9%), married (64.9%), educational level higher than primary education (84.5%), income greater than 15,000 THB (437 USD) (57.2%), having adequate dental health insurance (75.5%), having regular dental visits (75.20%). Pearson's Chi-squared test showed associations between utilization of preventive dental services and adequate dental health insurance (0.015) and regular dental visits (0.020).

This study found that the utilization of preventive dental services was associated with having adequate dental health insurance and having regular dental visits. Therefore, the policy maker should increase the use of preventive dental care among the older patients by promoting regular dental visits among the early aging.

Keywords: geriatric dentistry, utilization of preventive dental services, oral health, oral health promotion, the elderly

INTRODUCTION

Preventive dentistry is dental care that helps maintain good oral health as a part of general health. It comprises various procedures used by dentists. In this study, we would classify it according to the type of preventive treatment offered by our university dental hospital regulations. There are four categories 1) Dental prophylaxis refers to cleaning teeth, including the removal of plaques, calculus, and external stains to prevent dental caries, gingivitis, and periodontal disease. 2) An oral examination and a dental check-up refer to any investigation or inspection made for diagnosis. 3) Dental radiographs and bite wings: Dental radiography is a diagnostic procedure that allows dentists to examine dental structures that are not easily seen with a standard visual inspection. It can also detect cavities, bone loss in teeth and jawbones, and masses (benign or malignant) within the mouth. 4) Fluoride treatment or sealant: Fluoride treatment is a professional treatment that contains high concentrations of fluoride. Dental sealants are dental treatments that prevent teeth from decomposition.

The main goal of preventive dentistry is to maintain healthy teeth, gums, and oral hygiene so that this can reflect good general health. This includes preventing all dental problems, such as tooth decay, gum disease, weakening of the enamel of the teeth, tooth loss, and teeth injuries. Moreover, there are also physical conditions that are linked to oral health, such as heart disease, lung infections, and diabetes. Consequently, maintaining good oral health is important in order to improve the overall health of the system by regularly performing dental examinations. On the contrary, oral health conditions can also affect general health, such as effective oral hygiene in the elderly can prevent pneumonia (1-3).

In geriatric dentistry, preventive dentistry is still important for both those who have teeth and those who do not have teeth. The main concerns for those who have teeth are the prevention of new or recurrent caries, as well as the preservation of supporting tissue such as the gums through regular dental services. Maintenance of denture function and denture cleanliness becomes the counterpart for those who do not. Although oral health is essential for the general health and well-being of the elderly, many elderly people face significant challenges in accessing dental care. Many factors influence access to dental care, including both facilitators and barriers to care (4).

The number of people in older age groups will increase, evidence indicated that people who still have teeth also growth (5). This change has boosted the interest of older people in oral health, attitudes toward dental care and the use of dental services (6).

However, many publications suggest that not all elderly people regularly visit dentists to undergo dental examinations. For example, a study conducted in the United States found that not all citizens had adequate access to dental care, and not all people with dental insurance were able to seek routine dental care (7). Minorities and people with low socio-economic status visit dentists less often than others. Men and elderly people are also less likely to visit dentists than women and young people (8). Several studies suggested that dental treatment costs, the lack of

perception of the need for treatment, transportation problems, and fear are obstacles to treatment (7, 9-13). Social groups with the lowest financial opportunity for dental treatment are the most likely to suffer from oral disease and disability. People with disabilities, such as frail people, and those with economic and social disadvantage, are more likely to lose their teeth, have untreated dental decay, and experience periodontal illnesses (7)

After reviewing the dental literature on the access and use of preventive dental care services for Thai elderly people, we have not found published studies dealing with the associated factors that can affect access to preventive dentistry and the use of preventive dentistry services in Thai elderly people. Recent research has been published in Bangkok, Thailand, on factors related to the use of dental services that are not specifically preventive dental care (14). Therefore, this study is intended to determine the relationship between preventive dentistry and associated factors among older patients in a university dental hospital at faculty of dentistry, Chulalongkorn university, Bangkok, Thailand.

METHODOLOGY

Research design and study period

This observational descriptive study was conducted between February15, 2023 and March 30, 2023, using secondary data from the dental hospital resource system. Independent variables were collected from a previous telephone survey among the elderly patients who visited the university dental hospital between January 1, 2020, and December 31, 2020. Dependent variable (utilization of preventive dental services) has already been recorded in the dental hospital resource system between 2019 and 2020.

Ethical considerations

This study is a part of a previous telephone survey.[15] The study protocol and consent form were approved based on the Declaration of Helsinki and the ICH Good Clinical Practice Guidelines by the Ethics Review Committee of faculty of dentistry, Chulalongkorn university (HREC-DCU 2021-039). This study was conducted, and the manuscript was written according to the Strengthening the Reporting of Observational Studies in Epidemiology' (STROBE) statement.

Sampling technique and Eligibility criteria of the study participants

We used the purposive sampling method to select the study population. This study included the secondary data of men and women over 60 years of age, who had hospital numbers (HNs) to identify patients over the age of 60 who visited the faculty of dentistry, Chulalongkorn university between January 1, 2020, and December 31, 2020.

Study Variables

Independent variables were general characteristic variables (age, sex, marital status, employment, education, income, Adequate dental health insurance, Systemic diseases, Activities of daily living, Toothbrushing behaviors, Sweet

consumption, Vegetables and fruits consumption, Regular dental visits, Smoking habit, Drinking habit).

Dependent variable is total of the utilization of preventive dental visits (routine dental prophylaxis, regular check-up, consultation, routine radiographs, Fluoride treatment or sealant). The total of preventive dental visits will be categorized into two groups whether patients utilize preventive dental services more than 2 visits (higher preventive dental services) or less than 2 visits (lower preventive dental services).

Measurement tools and reducing bias

The independent variables were collected using a validated questionnaire from the previous study (15). The dependent variable (utilization of preventive dental services) was extracted from the dental register system resource between 2019 and 2020.

We used secondary data for reducing recall bias among the study participants.

Sample size calculation

The sample in this study was calculated by estimating a population proportion with specified absolute precision. According to the 8th National Survey, 38.1% of Bangkok's older people used dental care (16) Therefore, the minimum sample required for this study was 363 participants.

Data Analyses

Descriptive Statistics: Number and percentage were analyzed to describe categorical variables.

Inferential Statistics: Pearson's Chi-squared test was analyzed to assess the correlation between independent and dependent variables.

RESULTS

Figure 1 shows the distribution of outcome and all independent variables among 367 participants. Most characteristics of all participants were less than 70 years old (55.6%), female (59.9%), married (64.9%), unemployed (61.9%), educational level more than primary education (84.5%), income over 15,000 THB (57.2%), having adequate dental health insurance (75.5%), having systemic diseases. (74.4%) and independent daily living (94.0%)

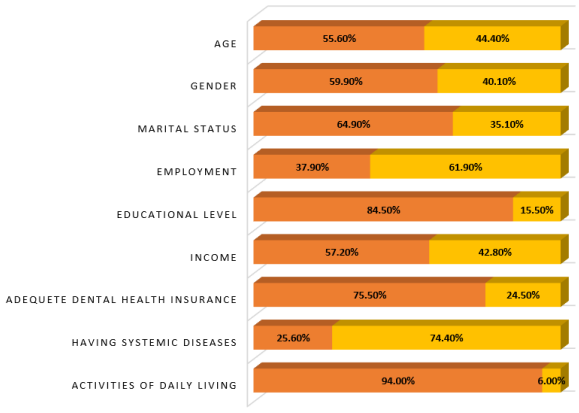

Figure 1: General characteristics of the study participants

Figure 2 shows the distribution of oral health-related behaviors. Most behaviors of all participants were toothbrushing frequency at least twice a day (93.9%), brushing teeth at least duration 2 minutes (80.4%), brushing teeth before bedtime (94.8%), using soft/ medium type of toothbrushing bristle (92.0%), use of additional oral cleaning devices (68.3%), sweet consumption at least once a day (76.8%), vegetables and fruits consumption 5-7 days a week (79.8%), having regular dental visits (77.6%), never smoking (97.8%) and never drinking (89.4%)

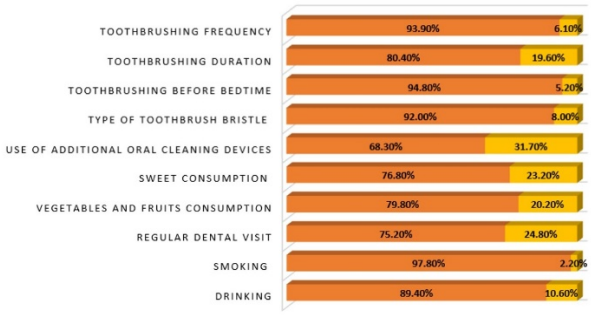

Figure 2: Oral health-related behaviors of the study participants

Table 1 showed the factors associated with the utilization of preventive dental services of the study participant (N=367) using Person's Chi-squared test. The statistical association between some variables and the utilization of preventive dentistry were revealed, including having adequate dental insurance (p-value=0.015) and having regular dental visit (p-value=0.020). Nevertheless, the significant association were not found between the utilization of preventive dentistry and Age, Sex, Marital Status, Employment, Education, Income, Systemic diseases, Activities of daily living, Toothbrushing behaviors, Sweet consumption, Vegetables and fruits consumption, smoking habit, Drinking habit.

Table 1: Factors associated with utilization of preventive dental services (N = 367)

Variables	Preventive dental utilization Number (%)		p-value [a]
	< 2 visits	>= 2 visits	
Age: years			0.223
< 70	70 (34.3)	134 (65.7)	
≥ 70	66 (40.5)	97 (59.5)	
Gender:			0.745
Female	83 (37.7)	137 (62.3)	
Male	53 (36.1)	231 (62.3)	
Marital Status:			0.189
Married	94 (39.5)	144 (60.5)	
Others	42 (32.6)	87 (67.4)	
Employment:			0.416
Employed	48 (34.5)	91 (65.5)	
Unemployed	88 (38.8)	139 (61.2)	
Educational level:			0.391
> Primary education	112 (36.1)	198 (63.9)	
≤ Primary education	24 (42.1)	33 (57.9)	
Income per month:			0.538
≥ 15,000 THB ($475)	75 (35.7)	135 (64.3)	
< 15,000 THB	61 (38.9)	96 (61.1)	
Adequate dental health insurance:			**0.015**
Yes	93 (33.6)	184 (66.4)	
No	43 (47.8)	47 (52.2)	
Having systemic diseases:			0.967
No	35 (37.2)	59 (62.8)	
Yes	101 (37.0)	172 (63.0)	
Activities of daily living:			0.700
Independent daily living	127 (36.8)	218 (63.2)	
Need help sometimes	9 (40.9)	13 (59.1)	
Toothbrushing frequency:			0.200
≥ twice daily	124 (36.4)	217 (63.6)	
< twice daily	11 (50.0)	11 (50.0)	
Toothbrushing duration:			0.208
≥ 2 minutes	104 (35.6)	188 (64.4)	
< 2 minutes	31 (43.7)	40 (56.3)	
Toothbrushing before bedtime:			0.974
Yes	128 (37.2)	216 (62.8)	
No	7 (36.8)	12 (63.2)	
Types of toothbrush bristle:			0.753
Soft / Medium	125 (37.4)	209 (62.6)	
Hard	10 (34.5)	19 (65.5)	
Use of additional oral cleaning devices:			0.313
Yes	86 (35.4)	157 (64.6)	
No	49 (40.8)	71 (59.2)	
Sweet consumption:			0.898
≤ Once a day	105 (37.2)	177 (62.8)	
> Once a day	31 (36.5)	54 (63.5)	
Vegetables and fruits consumption:			0.671
5-7 days a week	107 (36.5)	186 (63.5)	
0-4 days a week	29 (39.2)	45 (60.8)	
Regular dental visits:			**0.020**
Yes	93 (33.7)	183 (66.3)	
No	43 (47.3)	48 (52.7)	

Variables	Preventive dental utilization Number (%)		p-value [a]
	< 2 visits	>= 2 visits	
Smoking:			0.475
Never	134 (37.3)	225 (62.7)	
Sometimes / Daily	2 (25.0)	6 (75.0)	
Drinking alcohol:			0.213
Never	118 (36.0)	210 (64.0)	
Sometimes / Daily	18 (46.2)	21 (53.8)	
Self-reported oral health:			0.291
Good / Fair	116 (35.9)	207 (64.1)	
Poor	19 (44.2)	24 (55.8)	

Note:

[a] p-value from Pearson's chi-squared test

DISCUSSION

This study found that the utilization of preventive dental services was associated with having adequate dental health insurance and having routine dental visits.

Most characteristics of all participants were less than 70 years old, female, married, educational level more than primary education, monthly income over 15,000 Thai Baht, having adequate dental health insurance and having regular dental visits.

Participants, who had adequate dental health insurance, tended to have utilization of preventive services than participants, who had inadequate dental health insurance. The positive association between adequate dental health insurance and utilization of preventive dentistry is similar to the results from the following previous studies.

A study from Moeller et al., furthermore, had a similar result, showing positive relationship. They found that patients with adequate dental health insurance were more likely to use preventive dentistry than the other group. Those who had adequate dental health insurance tends to use preventive dentistry about 1.71 times than those who had inadequate dental health insurance. Moreover, there was an association between employment and utilization of any dental use. Preventive dentistry is used 3.82 times more frequently by people with adequate dental insurance than by those with insufficient insurance (17) Another study from the US, conducted by Manski et al. in 2016 showed that when compared to not visiting the dentist at all, having dental insurance considerably improves the likelihood of at least one visit (18).

A cross-sectional study conducted by Harirungsakul et al. from Thailand in 2021 studied on subjects who are older than 60 years old to investigate the relation between dental attendance and types of Thai social welfare. This study found that older adults with CSMBS (Civil Servant Medical Benefit Scheme) were significantly, 1.3-fold, more likely to use oral health services than those of UCS (Universal coverage scheme). However, this was not a direct association between adequate dental health insurance and utilization of preventive dentistry. Besides, the study did not focus on whether participants had adequate insurance or not (19).

Participants, who regularly go to dental office, tended to have utilization of preventive services than participants, who had irregular dental attendance. The positive association between regular dental attendance and utilization of preventive dentistry is similar to the results of a previous study. A study by Moeller et al. also found a significant relationship.

They found that participants, who did not regularly go to dental checkups twice a year were more likely to use less preventive dentistry than their counterpart. The study separated the participant age into 4 groups, which are 1) Twice a year or more, 2) Once a year, 3) Less than once a year 4) Never goes to dentist. The participant who had dental checkups twice a year tend to use preventive dentistry about 3.45 times than those who had dental checkups once a year, 6.67 times than those who had dental checkups less than once a year and 6.67 times than those who never went to dentist (20).

STRENGTHS AND LIMITATION

There were only a few literacies that focus on preventive dental services utilization and general characteristics among the elderly. In addition, there was no study investigating the relation between utilization of preventive dental cares and general characteristics among the elderly in Thailand before, hence, this is the strength of our study. However, this study has potential limitations. The data was gathered from medical record resources. Some of the information was incomplete due to imperfect data management. These limitations can impede the generalization of the findings and should be addressed in future studies.

CONCLUSION

Those patients who do not regularly use dental visit, and do not have adequate dental health insurance are associated with lower utilization of preventive dentistry than their counterparts. Therefore, the policy maker should find solutions to increase the use of preventive dental care among the elderly by promoting regular dental visits among the elderly.

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FACTORS ASSOCIATED WITH LUNG CANCER KNOWLEDGE AMONG LUNG CANCER HIGH-RISK GROUP AT GUANGMING ROAD COMMUNITY, GOLMUD CITY, QINGHAI PROVINCE, CHINA

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ABSTRACT

Early detection of lung cancer patients can effectively improve treatment and survival rates, and in China, the lung cancer screening rate for high-risk populations is only 17%. In the city of Golmud, which is located in a remote area, the lung cancer screening rate for high-risk populations is lower than the national average. Many lung cancer patients are diagnosed with late-stage lung cancer when they arrive at the hospital.

This study aimed to identify risk factors related to lung cancer knowledge in high-risk groups and to provide a basis for subsequent lung cancer screening education.

This study was a cross-sectional study. An online questionnaire was collected in June 2023. A total of 365 participants aged 18 years or older with a high risk of lung cancer had lived in the Guangming Road community of Golmud for more than 5 years. The validity of the questionnaire was assessed by three experts. The reliability was tested with Cronbach's alpha, which is greater than 0.6. Descriptive and correlation analyses were performed by SPSS.

Most participants (70.4%) have low knowledge of lung cancer screening; a small number of participants (23.6%) have moderate knowledge of lung cancer screening; and a very small number of participants (6.0%) have high knowledge of lung cancer screening. Almost half of the participants (43.8%) were smokers. Among the smokers, 54.3% smoked for 10–20 years, and 52.4% smoked 10–20 cigarettes per day. The majority of participants (62.5%) had no long-term exposure to secondhand smoke. A small proportion of participants (24.1%) consumed alcohol. The majority had poor knowledge about the population at risk for lung cancer (65.2%). According to chi-square analysis, long-term smokers were significantly associated with lung cancer screening knowledge, with a p-value of 0.029.

The high smoking prevalence in Golmud City is due to participants' lack of relevant knowledge and limited awareness of smoking-related health risks, especially in low-income or educated groups.

The findings revealed that those at high risk of lung cancer who have risk behaviors in Golmud still have poor knowledge (65.2%) of lung cancer screening, with only 34.8% having good knowledge of lung cancer screening. Therefore, medical institutions and communities should increase health education courses for participants at high risk of lung cancer, which can help participants to prevent and treat lung cancer properly and protect their health.

Keywords: Lung cancer screening; High-risk groups of lung cancer; Guangming Road community

INTRODUCTION

Lung cancer is one of the most prevalent malignancies in the world. It is also the leading cause of cancer-related mortality globally. Incidence and death rates for lung cancer differ by location and nation (1, 2). According to data given by China's National Cancer Center, the country has one of the highest incidences and mortality rates of lung cancer in the world, with an estimated 828,000 new cases and 657,000 deaths in 2022, greater than the global incidence rate (3). In China, lung cancer incidence and death rates have been rising over time, particularly in certain industrialized towns and rural regions like Golmud, China. Golmud is a city located in the northwest of Qinghai Province. Residents in this area experience a variety of health issues as a result of their geographic location and climate, the most serious of which is lung cancer. Moreover, the cancer incidence and mortality rates in Golmud are higher than the national average, especially for lung cancer, which is a major cancer in Golmud. High-risk groups for lung cancer include long-term smokers (more than 15 years)(4, 5). Chronic drinkers (more than 15 years), and secondhand smokers(6). There are many reasons for the high incidence of lung cancer in Golmud; air pollution and smoking are the main reasons. In addition, the high number of smokers and the long smoking age of smokers are two of the main reasons for the high incidence of lung cancer in Golmud (6).

Lung cancer screening in people at high risk of lung cancer can detect lung cancer at an early stage before symptoms appear. The treatment cost of early lung cancer is lower than that of advanced lung cancer, the success rate of early treatment is higher, and the survival rate is significantly higher than that of advanced lung cancer(7). China has begun to promote low-dose CT lung cancer screening and incorporate it into the national cancer screening program. However, due to the high cost of screening, low-dose CT lung cancer screening has not yet been popularized in China, and residents in many areas have not yet received relevant screening (8). In addition, the knowledge of lung cancer among residents is relatively low; the lung cancer screening rate among high-risk groups in China is only 17%(8). Even though most smokers are interested in lung cancer screening since they know more about it, they are more inclined to have a test after a doctor's recommendation than a test by themselves (9).

There are many reasons for the high incidence of lung cancer in Golmud City; among these, air pollution and smoking are the main reasons. (8, 10).

Golmud has not yet launched a large-scale low-dose CT lung cancer screening project. In addition, the population's awareness of health and cancer prevention is low, and the lung cancer screening rate may be lower than the national level. This study aimed to identify the association between risk behaviors and knowledge about lung cancer risk among high-risk groups.

METHODOLOGY

Study Design

The cross-sectional study was conducted in Guangming Road Community, Golmud City, Qinghai Province, China, in June 2023. 365 high-risk participants, aged 18 and above, who lived in

the Guangming Road Community of Golmud City for more than 5 years, were investigated via an online questionnaire. High-risk groups for lung cancer included long-term smokers (more than 15 years) (12), chronic drinkers (drinking more than 15 years), and people who have been exposed to second-hand smoke for a long time (more than 15 years)(13, 14).

The sample size was calculated according to the data from the National Bureau of Statistics, Guangming Road Community. The calculated sample size was 329 people, and an additional 10% of the sample was included to compensate for incomplete or missing data in the questionnaire. There were 363 participants in the overall sample.

Measurement tool

All participants must complete a screening questionnaire to meet the criteria. The questionnaire was divided into two sections. The first part determined risk behaviors (including smoking behavior, secondhand smoke, and alcohol behavior), and the second part was a lung cancer screening survey.

Item Objective Consistency (IOC) was used to determine the validity of the questionnaire and analyzed on a small scale with a total sample size of 10% before the trial to verify the reliability of the questionnaire. The IOC value is 0.9, and the Cronbach's alpha coefficient is 0.608, indicating that the questionnaire can be used. Bloom's cutoff was used to classify the level of knowledge about lung cancer: those scoring 0–60% had low knowledge, 60–80% had moderate knowledge, and 80–100% had high knowledge.

The SPSS program was used to analyze the dataset for this research. Descriptive statistics are presented as frequencies and percentages (categorical data), means and standard deviations (normally distributed continuous data), medians, and quartiles (nonnormally distributed continuous data). For continuous data (age, BMI, smoking age, drinking age, average daily smoking, average daily drinking) that were tested by the K-S test, if it was a normal distribution, it was presented as the mean and standard deviation. However, for continuous data, if it was not a normal distribution, it was presented as the median, and the interquartile range was used to present it. Association was presented by the chi-square test, and a p-value < 0.05 was considered statistically significant.

Ethical Consideration

This study was submitted to the Research Ethics Review Committee for Research Involving Human Research Participants, Group I, Chulalongkorn University (NO. 130/66).

RESULTS

Table 1 shows that of the 365 participants, 164 (44.9%) were smokers and 201 (55.1%) were non-smokers. The 164 participants who smoke were divided into 4 groups by duration of smoking: 1–15 years, 16–20 years, 21–30 years, and >30 years. The median smoking age of participants was 20, and the percentile was 15–30. The mean smoking age of the participants was 20.85. The 164 participants who smoke were divided into 3 groups by daily cigarette intake: 1–10, 11–20, and >20. Among them, there were 61 participants (37.2%) in the 1–10 group, 86 participants (52.4%) in the 11–20 group, and 17

participants (10.4%) in the >20 group. The median daily cigarette intake of the participants was 20, with a percentile range of 10–20. The mean daily cigarette intake of the participants was 16.35. Duration of second-hand smoking (year): Among the 365 participants, 137 (37.5%) had exposure to secondhand smoke, and 228 (62.5%) were not exposed to secondhand smoke.

Alcohol drinking status: Among the 365 participants, 88 (24.1%) were drinkers, 275 (75.3%) were non-drinkers, and 2 (0.5%) had quit drinking. Duration of drinking: The 90 participants who drink alcohol were divided into 3 groups by duration of drinking: 1–15 years, 16–20 years, and >20 years. Among them, there were 45 participants (50.0%) in the 1-155 years' group, 6 participants (6.7%) in the 16-20 years' group, and 39 participants (43.3%) in the >20 years' group. The median drinking age of the participants was 15, with a percentile range of 15–20. The mean drinking age of the participants was18.51. The data was unnormal, K-S test < 0.05.

Table 1: Risk behavior information of participants

Study participants Characteristics		No.	(n=) %
Smoking Status	Yes	164	44.9%
	No	201	55.1%
Duration of smoking	1-15	55	33.54%
(Year)	16-20	50	30.49%
N=164	21-30	45	27.4%
	>30	14	8.5%
	Median (Percentiles)	20	15-30
	Mean (SD)	20.85	7.86±0.61
	K-S test P-value	0.000	
Daily cigarettes intake	1-10	61	37.2%
N=164	11-20	86	52.4%
	>20	17	10.4%
	Median (Percentiles)	20	10-20
	Mean (SD)	16.35	7.87±0.61
	K-S test P-value	0.000	
Smoking index	<200(Mild Smoking)	62	37.8%
(several cigarettes	200-400	59	36.0%
smoked per day ×the	(Moderate Smoking)		
number of years of	>400(Heavy Smoking)	43	26.2%
smoking)	Median (Percentiles)	300	200-600
N=164	Mean (SD)	364.1	289.7±22.62
	K-S test P-value	0.000	
Second-hand smoker?	Yes	137	37.5%
	No	228	62.5%
Alcohol drinking	Yes	90	24.7%
status	No	275	75.3%
Duration of drinking	1-15	45	50.0%
(Year)	16-20	6	6.7%
N=90	>20	39	43.3%
	Median (Percentiles)	15	15-20
	Mean (SD)	18.51	7.88±0.83
	K-S test P-value	0.000	
Daily Alcohol Intake	<38.63	49	54.4%
(Gram)	38.63-96.57	21	23.3%
N=90	>96.57	20	22.2%
	Median (Percentiles)	38.63	38.63-96.57
	Mean (SD)	78.98	74.81±7.89
	K-S test P-value	0.000	

Table 2 shows the knowledge level of lung cancer screening. Participants were categorized into three groups based on their combined hearing about lung cancer screening (1 score), knowledge of high-risk groups, and methods for lung cancer (1 score). 2. chronic drinkers 3. people with a family history of lung cancer. 4. people with chronic lung disease, immune diseases, and metabolic diseases. 5. People who are over 50 years old 6. people who have recovered from previous cancer and have not recurred within 5 years. 7. people who have been exposed to second-hand smoke for a long time. 8. People who have been exposed to radioactive substances for a long time 9. people who have been exposed to harmful substances for a long time. 10. people who have been exposed to minerals, metal dust, and asbestos for a long time. 11. LDCT. 12. X-ray. 13. Sputum cytology 13 scores in total) and have been screened for lung cancer (1 score).

Table 2: The score of lung cancer knowledge

The score of lung cancer knowledge		
Have you ever heard of lung cancer screening? (1 score)	Yes (1 score)	No
Do you know who needs regular lung cancer screenings? (You can choose more than one) (Total of 10 scores)		
Long-term smokers(1 score)	Chronic drinkers (1 score)	
People with a family history of lung cancer (1 score)	People with chronic lung disease, immune and metabolic diseases (1 score)	
People who are over 50 years old (1 score)	People who have recovered from previous cancer and have not recurred within 5 years (1 score)	
People who have been exposed to second-hand smoke for a long time (1 score)	People who have been exposed to radioactive substances for a long time (1 score)	
People who have been exposed to harmful substances for a long time (1 score)	People who have been exposed to minerals, metal dust, and asbestos for a long time (1 score)	
Don't know		
What lung cancer screening methods have you heard of? (You can choose more than one) (Total of 3 scores)		
LDCT (1 score) X-ray (1 score)	Sputum cytology (1 score)	Don't know
Have you ever been screened for lung cancer？ (1 score)		
Yes (1 score)	No	

Table 3 shows the association of hearing about lung cancer screening among 365 participants: 35.6% had heard about lung cancer screening and 64.4% did not. Among the 365 participants, 2.5% had been screened for lung cancer, whereas 97.5% were not screened for lung cancer. Based on Bloom's cutoff categories (15), those meeting at 12–15 scores were classified as having high knowledge, those meeting at 9–11 were classified as having moderate knowledge, and those meeting at 0–8 were classified as having low knowledge. Out of the 365 participants, 257 (70.4%) had low knowledge about lung cancer screening, 86 (23.6%) had moderate knowledge about lung cancer screening, and 22 (6.0%) had knowledge about lung cancer screening.

Table 3: Lung cancer screen knowledge information of participants

Study participants			
Characteristics		**No.**	**(n=365) %**
1.Hearing about lung cancer screening	Yes	130	35.6
	No	235	64.4
2.Have been screened for lung cancer	Yes	9	2.5%
	No	356	97.5%
3.Knowledge level (15 scores in total)	Low (0-8 scores)	257	70.4%
	Moderate (9-11 scores)	86	23.6%
	High (12-15 scores)	22	6.0%

Table 4 shows the association between behavior and lung cancer screen knowledge smoking status was significantly associated with a lower understanding of lung cancer screening (*p-value* <0.05). Out of the participants, 76.6% were non-smokers, and 62.8% were smokers who had low knowledge about lung cancer screening. There was a significant association between second-hand smoking and understanding of lung cancer screening (*p-value* <0.05). Out of the participants, 75.0% were

not exposed to second-hand smoking, and 86 (62.8%) exposed to second-hand smoking had low knowledge about lung cancer screening. For alcohol drinking status, there was not a significant association between alcohol drinking status and participants who had low knowledge about lung cancer screening (*p-value* >0.05).

Table 4: Behavior and lung cancer screen knowledge

Characteristics		Behavior and lung cancer screen knowledge				
		low	Moderate	High	Total	*P-value*
Smoking Status	Yes	103(62.8%)	50(30.5%)	11(6.7%)	164	**0.013**
	No	154(76.6%)	36(17.9%)	11(5.5%)	201	<0.05
Duration of second-hand smoking	Yes	86(62.8%)	39(28.5%)	12(8.8%)	137	**0.034**
	No	171(75.0%)	47(20.6%)	10(4.4%)	228	<0.05
Alcohol drinking status	Yes	60(66.7%)	21(23.3%)	9(10.0%)	90	0.186
	No	197(71.6%)	65(23.6%)	13(4.7%)	275	>0.05

DISCUSSION

In this study, information on the high-risk group of lung cancer patients in the Guangming Road community was collected through an online questionnaire. There were 45.9% of the participants who joined the questionnaire belonging to the high-risk group for lung cancer. The need for more targeted interventions for the high-risk group for lung cancer, such as smoking cessation programs, occupational safety measures, and awareness campaigns, may be needed in the Guangming Road community to reduce the risk and burden of lung cancer in this community compared to the national average.

The study showed that most participants fell into the <200 (mild smoking) and 200–400 (moderate smoking) groups. The high smoking prevalence in Golmud City may be due to participants' lack of relevant knowledge and limited awareness of smoking-related health risks. In addition, the low-income group or the low-educated group in Golmud City may be higher than the national average, and socioeconomic factors such as income level and education will affect the smoking rate, and the smoking rate of the low-income group or the low-educated group tends to be higher (10, 16).

There was a significant association between smoking, exposure to secondhand smoke, and knowledge levels of lung cancer screening. Different from the study by Castro et al. (13). The results of the lung cancer high-risk group in the Guangming Road community showed that knowledge of lung cancer risk was significantly associated with smoking status (17). Participants who smoked paid more attention to information about lung cancer. That would be smokers, who are directly affected by their lung cancer risk and are more likely to be aware of the negative health effects associated with smoking. They might be more aware of the potential health consequences and the importance of early detection through screening. This personal relevance can motivate them to seek information and knowledge about lung cancer screening (18).

Studies have shown that secondhand smoke is significantly associated with knowledge of lung cancer risk. Different from the study by Buhr et al. (19). Participants who were exposed to secondhand smoke had a higher level of awareness about lungcancer screening than participants who didn't smoke secondhand smoke(17). It may be that participants

who smoke secondhand smoke are more likely to notice the negative health consequences associated with secondhand smoke. They may be more aware of their potential risk of developing lung cancer (18). This increased awareness may motivate them to actively seek information about lung cancer and take preventive measures. Regarding alcohol consumption, about a quarter (24.7%) of the participants consumed less than 50 grams of alcohol

per day. No significant association was found between alcohol consumption and knowledge of lung cancer screening.

CONCLUSION

Interestingly, participants who smoked and were exposed to secondhand smoke had more knowledge about lung cancer screening. Smokers were directly affected by lung cancer risk and were more likely to be aware of the negative health effects of smoking, but they were not sufficiently motivated to stop smoking. They may be more aware of the potential health consequences of smoking and the importance of early detection through screening. This personal relevance can motivate them to seek information and knowledge about lung cancer screening.

RECOMMENDATION

Based on the presented findings, the following are some recommendations for individuals, especially smokers: Because of the association between smoking and knowledge of lung cancer screening, smokers must increase their motivation to quit(18). Smokers can seek help from health care professionals, support groups, or cessation programs for smoking cessation support. They can provide guidance, counseling, and resources to increase your chances of quitting successfully and create a reward system for quitting to keep you motivated to quit. Long-term smokers need to consider regular lung cancer screening.

Raising cigarette prices is an effective way to reduce smoking rates, especially among young participants and low-income groups that are more price-sensitive. It deters participants from smoking and motivates current smokers to quit, thereby reducing the prevalence of smoking-related diseases, including lung cancer.

LIMITATION

The online questionnaire means that individuals who do not have or have no access to a phone may not be able to complete the questionnaire. In addition, online questionnaires can create mistrust, which can exclude vigilant people.

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THE ASSESSMENT OF MOBILITY IN COMMUNITY-DWELLING OLDER ADULTS IN NAKHON RATCHASIMA PROVINCE, THAILAND

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ABSTRACT

About 3% of Thai elderly people were reported with mobility limitations in 2022. Nakhon Ratchasima province was top the list of provinces that contributed the most mobility problems. Understanding the associated factors could determine approaches to promote and prevent the risk of mobility impairments among older adults in community.

This study aimed to investigate the level of mobility and explore associated factors among community-dwelling older adults in Nakhon Ratchasima Province, Thailand.

A cross-sectional study conducted in four selected districts and multi-staged sampling villages. The older persons aged 60 – 75 years living in 15 villages were interviewed during April-May 2023. The mobility was assessed by the short physical performance battery (SPPB), which measuring by balance, gait, and chair rise test. The questionnaire was used to determine sociodemographic characteristics, physical health, physical activity, cognition, depression and anxiety, social participation and neighborhood. A Chi-square tests were used to find association between the dependent and independent variables and multiple logistics regression was used to predict dependent variable.

A total of 399 respondents were recruited. Most of them were female (61.4%) with average age as 64 years (S.D.=4.7). Two-third (67.2%) was still working as agriculture. The results of mobility level showed as that good physical mobility was 66.9%, while moderate and poor physical mobility was 33.1%. The good physical mobility associated with the older persons who were married, having high household income, no chronic diseases of arthritis disease and depression and anxiety as well as having high level of physical activity (p value<0.05). The results of multiple logistics regression revealed older persons who were no depression and anxiety, having high level of physical activity and social participation were the best predictors for good mobility in community-dwelling older in Nakhon Ratchasima province, Thailand (p-value < 0.05).

The physical mobility intervention should be promoted among older persons who living alone and having arthritis disease and depression and anxiety. The intervention should improve both physical and mental health by engagement of community stakeholders, the tailormade inventions through promote social interaction among older people and other generation.

Keywords: Mobility, arthritis, older persons

INTRODUCTION

According to the United Nation's World Population Prospects 2022, Thailand was considered as an aged society with about 20% of country's population over 60 years old (1). "Healthy ageing" is as the process of developing and maintaining the functional ability that enables wellbeing and active aging (2). The World Health Organization (WHO) defined "mobility" as moving by changing body position or location or by transferring from one place to another, by walking, running, climbing or using various forms of transportation (3) and expected that "ability to be mobile" in older people could be improved by 2030 (4).Mobility impairments can indicate the potential risk of limitations in basic activities of daily living (ADL) (5).

In Thailand, the prevalence of the elderly who aged over 60 years were limited ADL more than one activity was likely high as 21.7% and trend to increase (6). Furthermore, Thai senior who classified as house-bound (need help for some ADL), and bed-ridden (need help for most or all ADL), needs at least about 30,000 Thai Baht per month for basic care (7). Those are higher than Thai gross national income (GNI) per capita in 2021 (8). In addition, the previous studies showed that the ADL limitations in older persons were related with the social participation (9). It implied that the impacts of ADL limitations were widely to society.

Short Physical Performance Battery (SPPB) is performance-based assessment consisted of balance, strength, and gait test. It was suggested to use for mobility screening in primary care (10) with a good validity and reliability in older (11). Nevertheless, precede-proceed model (PPM) was introduced as determinant analyzing tool for improving health status, which the possible causal factors were categorized into predisposing, reinforcing and enabling factors (12). Existing evidence revealed predisposing factor such as female (13-15), single (15, 16), low income (15, 17-19), and no senior occupation (18), were associated with older mobility problem. Meanwhile, the enabling factor such as depression and anxiety (20-22), was also indicated older' mobility limitation. Furthermore, reinforcing factor such as the neighborhood green space, was significantly associated with older physical activity attendance (23).

In Thailand, Nakhon Ratchasima province was the second province that contributed the most to the elderly population who aged over 60 years old (24). It also was top the list of provinces that have a high number of mobility impairments with 11,637 elderly people were reported with mobility limitation measured by timed up and go test (TUGT) in 2022 (25). The previous study in Thailand found the relationship between elderly's well-being and participating outdoor activities (26). Moreover, the related factors were successfully investigated such as Thai dance programme (27), gender and region (28), urban public space and transportation (29). However, few studies, which explore to other determinants such as psychosocial, physical behavior and financial influences by using SPPB in rural area.

Hence, this study was conducted to investigate the mobility of community-dwelling older adults, which assessed by the SPPB (balance, gait, and chair rise) in Nakhon Ratchasima Province, Thailand and determine the association between influencing factors and mobility among those population.

METHODOLOGY

Population, sampling method and sample size

This cross-sectional study was conducted on older persons aged 60-75 years, dependently able to walk in their environments and living in 15 villages from four selected districts and multi-staged sampling villages in Nakhon Ratchasima Province, Thailand. Ban Lueam and Pak Chong districts were purposively selected with the largest ratio of mobility impairment whereas Non Thai and Bua Yai districts were purposively selected with the lowest ratio of mobility impairment. Lastly, sub-districts, villages and the elderly persons were simple randomized as estimated sample size as 399 with the Cochran formula and achieved response rate of 100%. The calculation considered 95% of confidence interval, 21% of estimated prevalence of limited ADL (6) and 4% of the accepted error.

Data collection procedure

A face-to-face individual questionnaire was performed to collect the data as research instruments. The village health volunteers who working in selected study area were recruited and trained as research assistants for data collection during April-May 2023. This research was approved by the Committee for Research Ethics (Social Science), Faculty of Social Science and Humanities, Mahidol University with certificate approval number 2023/070.2504 and MU-SSIRB number 2023/077(B2).

Research Instruments

The questionnaire in this study was developed and modified version of previous study. The pre-test process was performed in 30 elderly adults living in different province for testing validity and reliability with a 0.75 Cronbach's alpha coefficient. The mobility was assessed by the performance-based instrument with the SPPB, which measuring by balance, gait, and chair rise test. Each totaled from 0 to 4 points and categorized into poor (0–2 points) and good (3–4 points). Mobility scores were those scores timed performance on three tasks with each scored out of four, ranges from 0 to 12 points and categorized into 3 group: poor (0–6 points) , moderate (7–9 points), good (10–12 points) (30). The questionnaire was used to determine the group of associated factors as following;

1) Predisposing factors: sociodemographic characteristics (gender, age, marital status, education, household income and occupation), physical health (chronic disease: NCD), physical activity (PA), which was the self-report about number of times and hours in nine physical activities over a month (31) with the total scores as 135 points and classified into low (≤ 27 points) and high (≤ 27 points) PA, cognition which was a brief 9-item questionnaire about everyday life abilities of memory and concentration (32) with a Likert scale as Strongly Disagree = 1 and Strongly Agree = 5, the scores totaled 45 points and classified into low (≤ 35 points) and high (>35 points) cognition;

2) The enabling factors: depression and anxiety, which was a Patient Health Questionnaire : PHQ-4 consisted of 4 questions about feeling in over the last two weeks (33) with a Likert scale as Never = 0 and Every Day = 4, the scores totaled 16 points and classified into normal (≤ 2 points) and having depression and anxiety (> 2 points) and social participation, which was the self-report about number of time in 5 participation activities), the scores totaled 115 points and classified into low (≤ 11 points) and high (11 points) social participation; and

3) Reinforcing factor: neighborhood, which was feeling personal safety and green space on

neighborhood related with mobility with a Likert scale as Strongly Disagree = 1, and Strongly Agree = 5, the scores totaled 10 points classified into low (≤ 8 points) and high (> 8 points) social participation.

Statistical analysis

Descriptive statistics including percentage, median, mean and standard deviation (SD) were used for data analysis in this study. The Bivariate analysis with Chi-square tests were used to find association between the dependent and independent variables and Multivariable analysis with multiple logistic regression was used to predict dependent variable. An odds ratio of association was performed by the confidence intervals of logistic regression. SPSS software version 21 was conducted to calculate all statistical analysis with 5% significance level.

RESULTS

A total of 399 respondents were recruited. Most of them were female (61.4%) and age group of 60 – 63 years (70.9%) was largest proportion. More than half of them were currently married (63.7%) and graduated primary school (78.7%). Two-third (67.2%) was still working as agriculture with the most group of household income as higher than 8,000 Baht per month (48.1%) as shown in Table 1.

The results of mobility level showed as that good physical mobility was 66.9%, while moderate and poor physical mobility was 33.1% as shown in Table 2.

Table 1: Sociodemographic characteristics (n = 399)

Characteristics	Category	Number, (%)
Gender	Male	154 (38.6)
	Female	245 (61.4)
Age group (Years)	60 - 63 years	201 (51.4)
	63 - 75 years	198 (49.6)
Mean = 64, SD=4.7, Median= 63, Min.=60, Max.=75		
	Single	53 (13.3)
Marital status	Married	254 (63.7)
	Divorce	92 (23.0)
Education	Lower than primary school	22 (5.6)
	Primary school	314 (78.7)
	Secondary school	42 (4.0)
	Diploma degree	26 (6.5)
	Bachelor's degree or higher	21 (5.2)
Household income (Thai Baht)	≤ 4,000	116 (29.2)
	4,001 - 8,000	91 (22.8)
	> 8,000	192 (48.0)
Occupation	No job	81 (20.3)
	Agriculture	268 (67.2)
	Employee	9 (2.3)
	Business owner/ merchant	34 (8.5)
	Others	7 (1.7)

Table 2: Mobility performance (n = 399)

Results	Score(points)	Number, (%)
Mobility performance (all tests)		
Poor	0–6	39 (9.8)
Moderate	7–9	93 (23.3)
Good	10–12	267 (66.9)
Balance test		
Poor	0-1	84 (21.1)
Good	2-4	315 (78.9)
Gait test		
Poor	0-1	64 (16.0)
Good	2-4	335 (84.0)
Chair rise		
Poor	0-1	102 (25.6)
Good	2-4	297 (74.4)

Table 3 shows the characteristics of physical health that half of respondents having NCD (50.4%), but less than one of fourth (21.1%) having depression and anxiety. In addition, most of them had a high level of PA (52.9%), cognition (memory and concentration) (50.4%), social participation (54.9%) and neighborhood (safety and green space) (66.9%).

Table 3: The characteristics of physical health, physical activity, cognition, depression and anxiety, social participation and neighborhood (n = 399)

Associated factors	Number	Percentage (%)
Chronic disease		
Yes	201	50.4
No	198	49.6
Physical activity level		
Low	188	47.1
High	211	52.9
Cognition (Memory and concentration level)		
Low	198	49.6
High	201	50.4
Depression and anxiety		
No	315	78.9
Yes	84	21.1
Social participation level		
Low	180	45.1
High	219	54.9
Neighborhood (Safety and green space level)		
Low	132	33.1
High	267	66.9

Table 4 shows the results of logistic regressions model for mobility performance. A univariate analysis, the Chi-square test showed that the older persons who were currently married (COR 1.55, 95% CI 1.01-2.37)), income higher than 8,000 Thai Bath (COR 1.86 , 95% CI 1.22-2.85), no arthritis disease (COR 2.94, 95% CI 1.15-7.50) and not taking arthritis drug (COR 3.95, 95% CI 1.43-10.94), no depression and anxiety (COR 15.16 , 95% CI 8.34-27.57), and having high level of PA (COR 3.34, 95% CI 2.15-5.18) were associated with good physical mobility (p value<0.05).

Besides, multiple logistic regression revealed the strong predictor that the older persons who were no depression and anxiety (AOR 28.27, 95% CI 11.26-70.97), having high level of PA (AOR 2.12, 95% CI 1.12-4.02) as well as high level of social participation (AOR 2.70, 95% CI 1.35-5.40) were strong factors among those having good physical mobility (p value<0.05).

Table 4: Logistic regressions model for mobility performance

Factors	Mobility performance		COR[a] (95% CI)[c]	AOR[b] (95% CI)[c]
	Poor and moderate Number, (%)	Good Number, (%)		
Gender				
Female	86, (26.0)	245, (74.0)	1	
Male	46, (29.9)	108, (70.1)	1.27 (0.82-1.96)	1.15 (0.58-2.26)
Marital status				
No couple	57, (39.3)	88, (60.7)	1	
Married	75, (29.5)	179, (70.5)	1.55 (1.01-2.37)	1.31 (0.67-2.58)
Education				
Primary school and lower	116, (34.5)	220, (65.5)	1	
Secondary school and higher	16, (25.4)	47, (74.6)	1.55 (0.84-2.85)	0.53 (0.20-1.39)
Household income (Thai Baht)				
≤ 8,000	82, (39.6)	125, (60.4)	1	
> 8,000	50, (26.0)	142, (74.0)	1.86 (1.22-2.85)	1.79 (0.92-3.47)
Occupation				
Others	52, (39.7)	79, (60.3)	1	
Agriculture	80, (29.9)	188, (70.1)	1.55 (0.99-2.39)	1.12 (0.58-2.16)
Chronic disease				
Yes	71, (35.9)	127, (64.1)	1	
No	61, (30.3)	140, (69.7)	1.28 (0.85-1.95)	1.56 (0.82-2.97)
Arthritis				
Yes	11, (57.9)	8, (42.1)	1	
No	121, (31.8)	259, (68.2)	2.94 (1.15-7.50)	
Arthritis drug				
Yes	11, (64.7)	6, (35.3)	1	
No	121, (31.7)	261, (68.3)	3.95 (1.43-10.94)	
Physical activity level				
Low	88, (46.8)	100, (53.2)	1	
High	44, (20.9)	167, (79.1)	3.34 (2.15-5.18)	2.12 (1.12-4.02)
Cognition (Memory and concentration level)				
Low	70, (35.4)	128, (64.6)	1	
High	62, (30.8)	139, (69.2)	1.22 (0.81-1.86)	0.51 (0.26-1.01)
Depression and anxiety				
Yes	67, (79.8)	17, (20.2)	1	
No	65, (20.6)	250, (79.4)	15.16(8.34-27.57)	28.27(11.26-70.97)
Social participation level				
Low	68, (37.8)	112, (62.2)	1	
High	64, (29.2)	155, (70.8)	1.47 (0.97-2.24)	2.70 (1.35-5.40)
Neighborhood (Safety and green space level)				
Low	71, (53.8)	61, (46.2)	1	
High	120, (44.9)	147, (55.1)	1.43 (0.94-2.17)	1.07 (0.56-2.02)

Note: [a] COR = crude odds ratio, [b] AOR = adjusted odds ratio, and [c] 95% CI = confidence interval of 95%.

DISCUSSION

In Thailand, the prevalence of mobility impairment among elderly population was found as 3% in 2022 by TUGT and Nakhon Ratchasima province was top the list of provinces that distributed the high mobility impairments (25). In this study revealed that 9.8% of sampling was defined as poor mobility performance by the SPPB. The SPPB is likely more comprehensive since one test of balance which is not covered in TUGT, and it can be analyzed the performance by single test. In addition, it was suggested to use in WHO guidance on person-centred assessment and pathways in primary care (10). It could be beneficial to use SPPB for in-depth assessment of losing mobility among the older adults.

The marital status was sociodemographic characteristics was highlighted in this study. Similarly, married England and the USA people had better physical capability than their unmarried (16). It might be explained that the partners or the number of household members supported by older for physical movement. Also, income was socioeconomic status as known as the low level associated with increased risk of losing mobility and ADL (17-19). In this study, high household income was also significantly related to good mobility level. It cloud be explained that the financial is the key determinant to lead older access the facilities to support the good mobility, for example gym or fitness or having assistant advice to walk or mobility.

Chronic diseases such as hypertension, diabetes and lung disease were associated with impairments and disability in previous study (34). However, this study revealed that only arthritis was significantly linked to physical mobility. This is the biological change in the musculoskeletal system that related to possibility of fracture, which can have detrimental effects on mortality, diminished quality of life, and disability (35). This group could be prioritized as the risk of decline mobility.

Physical activity is one of lifestyle factors that can greatly influence overall health and well-being. It was found that PA program compared with health education program reduced major mobility disability over 2.6 years among older adults (36). Consistent with this study enlightened that high level of PA was with good mobility. It could be the key strategy to promote good mobility.

This study found that depression and anxiety associated with physical mobility. In the past, it was found that depression and anxiety increased risk for disability, which defined as receiving help from others in performing self-care (eating, dressing, bathing and toileting) in late life (21) and was a significant risk factor for the progression of physical performance (22). In addition, social participation was strong factors among those having good physical mobility. Participation in volunteering was found association with a lower diminished intellectual activity. Participating in two or more social activities was associated with 9% lower for physical inactivity (37). It could be the key strategy to promote good mobility.

In Thailand, the promoting PA policies in elderly people consists of the individual level such as the ADL assessment services and education of exercise and brain training to prevent dementia (38) and the public level, which focuses on providing and improving the environment that convenient to PA such exercise places and public transportations (39). However, the survey was found that 30% of elderly population did not have enough PA level (39). The Centers for Disease Control and Prevention (CDC) recommended to the strategies to increase PA in the community, which emphasized ecological mode consisted of individual behavior, social, family and community network, living and working conditions, and social, economic and environmental policies (40). According to these key findings, it could be applied SPPB instrument for in-depth assessment in mobility assessment services. In addition, the physical mobility intervention should be promoted among older persons who aged over 63 years old, living alone and having arthritis disease as well as depression and anxiety. The intervention should be parallelly improved physical and mental health by engagement of community stakeholders, the tailormade inventions through promote social interaction among older people and other generation.

CONCLUSION

The good level of physical mobility was majority as 66.9% in the older persons and associated with the older persons who were married, having high household income, no chronic disease of arthritis disease and depression and anxiety as well as having high level of physical activity.

RECOMMENDATIONS

The physical mobility intervention should be promoted among older persons who were oldest, living alone and having chronic disease, especially arthritis disease and depression and anxiety. The intervention should improve both physical and mental health by engagement of community stakeholders, the tailormade inventions through promote social interaction among older people and other generation. Further study should be more concentrated in sampling techniques for the representativeness of the elderly in each age group (early, mid and eldest group).

STUDY LIMITATIONS

This study was not covered subjective measurements of mobility and the other objective measurements such as ADLs. Moreover, the major of sampling were selected early elderly group and the study area was only one province.

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DEVELOPMENT AND VALIDATION OF QUESTIONNAIRE TO ASSESS QUALITY OF LIFE IN NEPALI INFERTILE PATIENTS.

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ABSTRACT

There are 10-15% infertile patients (IP) globally and 12% in Nepal. Infertility has negative impact on their lives generally and Quality of Life (QoL) particularly. QoL addresses physical, cognitive, relationship, psychological and social domains that differ by cultures and countries. Valid measurements of QoL in IP in Nepal are difficult due to lack of local comprehensive measurements. The study aims at developing a valid measurement addressing the complexity of variables affecting QOL in Nepali IP to improve their care and treatment compliance.

A wide search was done using Medline Ovid in English and Nepali, firstly to identify articles reporting predictors of IP QOL particularly from lower-middle countries and secondly to identify QOL questionnaires specifically for IP QOL. Based on the literature review (LR) results, a new questionnaire was constructed, then, adjusted qualitatively through in-depth-interviews (IDI) with two Nepali infertility experts and, finally, three different experts assessed content validity quantitatively using the index of Item-Objective Congruence Analysis.

The developed questionnaire consisted of 68 questions divided into two parts. The first one with five sections for independent variables: sociodemographic (age, gender, ethnicity, education, residence, family type); socioeconomic (employment, income, working hours, paid day-off from work, travel long duration for service, health insurance); couple characteristics (partnership duration, born children, desire for a child, partner supportiveness for infertility treatment); infertility (type, cause, duration, current treatment; desire for professional psychological support); medical history (chronic illness, medications' intake, pregnancy loss, Assisted Reproductive Technology failure, reproductive tract surgery). The second part with FertiQoL questionnaire consisted two sections for dependent variables: core (emotional, mind/body, relational, social subscales) and treatment (environment, tolerability subscales) respectively. LR has been fundamental in identifying majority of specific QoL variables. IDI in adapting sensitive, stigma related questions, fine-tuning questionnaire's translation into Nepali and advising statistical analysis. IOC further validated the questionnaire confirming the LR and IDI relevance.

The process of questionnaire development is mainly relying on extensive LR and time-consuming selection of important variables only. Qualitative in-depth interviews and quantitative IOC analysis are fundamental for adaptations of the LR to the Nepali context, as confirmed by literature on development of measurement instruments.

The three-prong LR, IDI, IOC approach is effective in developing a QoL questionnaire for Nepal.

Keywords: Infertility, Quality of Life, QoL, FertiQoL, Validation

INTRODUCTION

Infertility is the disease of the male or female reproductive system defined by the failure to achieve a pregnancy after a year or more of having regular unprotected sexual intercourse. Globally 15% of couples of reproductive ages are affected by infertility (1). In Nepal, the prevalence of infertility is estimated to be around 12% (2).

The challenges arising due to the Nepali context's social, cultural, and economic aspects have rarely been investigated. These aspects influence the QoL among infertile patients; particularly gender roles and expectations (3), social pressure on childbearing, feelings of isolation and shame, limited access to fertility treatment (especially in rural areas) (4) and to professional psychological support (5), and lack of awareness and misconceptions on infertility (4). Infertility is one of the greatest stressors and has a negative impact on their lives (6). Infertility and its treatment negatively impact on couple's marital relationship, sexual life, (7) psychological state (8)(9), and interpersonal relationships (7), thus leading to diminished quality of life. QoL assessment addresses physical, cognitive, relationship, psychological, and social domains that differ across cultures and values (10,11).

Using the keywords "Infertility" or "infertile" or "childless" AND "Quality of Life", a search was conducted in English and Nepali languages, restricted to 2000-2023, on the database Medline Ovid as it includes a vast collection of peer-reviewed, medical research journals and clinical studies. A total of 216 studies were obtained. On reviewing the titles, 112 studies were discarded because they were not relevant to our study. Out of the retained 104, 32 were conducted in low-middle income countries and provided the predictor and outcome variables for the questionnaire development. The search revealed that the FertiQoL was the measurement tool most widely used, infertility-specific, content validity, and psychometric strength tested. It also had linguistic validation (12).

Thus, another search as above described adding a keyword "FertiQoL" was conducted. Out of 104 studies, only 25 studies used disease specific FertiQoL questionnaire. Out of them 8 were conducted in low-Middle income countries, and none in Nepal.

Thus, the search identified a research gap consisting of few studies in low-middle income countries and no studies in Nepal to assess QoL among infertile patients. Hence, the study aims at adapting an internationally validated measurement tool for Nepal to address the complexity of variables affecting QoL in Nepali infertile patients. The adapted and Nepali validated tool can in future be adopted for future research and in-service delivery with improved patient care and compliance.

METHODOLOGY

Figure 1: Flowchart showing the process of development and validation of questionnaire

Literature Review

Literature Review was conducted to identify the predictor and outcome variables which have been described in the introduction above. After conducting a thorough literature review, a new questionnaire was constructed which consisted of predictor variables and the outcome variables.

Qualitative Validation through In-depth Interviews

The questionnaire thus constructed was subjected for in-depth interviews with two Nepali infertility experts for qualitative validation. Since for QoL, unlike for example, behavior change, there is no existing theory to provide the study with construct validity, the latter one was assessed seeking the opinion of two experts by two separate IDI. The two experts were four-year experienced, reproductive health service providers specialized in infertility care: the first one a qualified assisting doctor and the other one a senior nurse.

Following the IDI for questionnaire construct validity, the two experts advised to add three variables (ethnicity, travel long distance for infertility service and partner's supportiveness for fertility treatment) and deleting three variables not in line with the Nepali context namely work life balance, social support networks and fertility preservation. Finally, after the IDI, the questionnaire had 68 questions.

Quantitative Validation through Index of Item-Objective Congruence (IOC) Analysis

After in-depth interviews, the principal researcher proceeded for index of Item-Objective Congruence (IOC) Analysis. Out of the three experts involved in the content validation of the questionnaire, two, a medical doctor and a clinical embryologist, had more than five-year experience in providing infertility services, and the third one had more than seven-year experience in teaching and research. The experts assessed the questionnaire using the index of IOC procedure for content validity and to confirm whether the questionnaire assess the quality of life appropriately. IOC was used by summing up the scores from the experts. In each item, the experts were asked to determine the content validity score:

Score = 1 (for clearly measuring)
Score = -1 (for not measuring clearly) or
Score = 0 (degree to which it measures the content area is unclear)

The IOC index calculated using the scores received by the three experts, with value less than 0.66 applied to four questions on Q1.6 family members, Q. 2.6 pregnancy loss history, Q 2.9 ART history and Q2.11 general infertility treatment history. The four questions were revised in joint consultation with the three experts. Some modifications were made in the questions while some modifications were made in the categorization of answer choices to avoid confusion and easy analysis of the data,

The question Q. 1.10 "Monthly income of couples" received an IOC index of 0.66. On joint consultation, the experts advised to review categorization of monthly income of the couples through guidelines in Central bureau of statistics, Nepal. But due to no standardized scale to assess the socioeconomic status of the Nepalese population, Kuppuswamy's scale (13) was used to categorize the income category as identified in a study. (14)

For the questions on Q3 "Feeling drained and worn out?" and Q18 "Bothered by fatigue?" which received an IOC index of 0.66 were repetition questions, the experts finally agreed to retain them to psychologically test whether the respondents were attentively and correctly answering all the questions in the questionnaire. Apart from the above-mentioned questions, all the other questions received an IOC index of 1 and hence, they didn't require any modifications.

Thus, index of IOC was reviewed following discussions with the three experts for quantitative validation of the questionnaire.

RESULTS

The important characteristics were drafted from relevant studies in the literature review. The developed questionnaire consisted of two parts.

Part One: Predictor Variables

The first part consisted of predictor variables and consisted of five sections:

Sociodemographic characteristics (6 questions) - It included age, sex, ethnicity, education level, residence, and family type.

Socioeconomic characteristics (6 questions) - It included employment status, income level, travel long distance for service, working conditions and presence of Health Insurance.

Couple Characteristics (5 questions) - It included marital status, duration of partnership, number of children present, perception on need of children, partner supportiveness and approaching infertility center as couple.

Fertility-related Characteristics (7 questions) - It included type of infertility, cause of infertility, duration of infertility, duration of treatment, and type of treatment.

Medical History (8 questions)- It included the following variables: presence of chronic illness, intake of medications, history of pregnancy loss, history of ART failure, history of reproductive tract surgery and desire for professional psychological support.

Part Two: Outcome Variables

The second part consisted of FertiQoL questionnaire which is tool to assess QoL in infertile patients previously validated (Boivin et al., 2011). FertiQoL yielded six subscale (34 questions) and two additional questions which capture an overall evaluation of physical health and satisfaction with quality of life. It consisted of two sections (Core FertiQoL and Treatment FertiQoL) for outcome variables:

Core FertiQoL - This section yields four subscales and the questionnaire consisted of 24 questions:

Emotional Subscale (6 questions) – It measured the impact of negative emotions like sadness, depression, jealousy, and resentment on QoL of infertile patients.

Mind/ Body Subscale(6 questions) – It measured impact on physical health (eg. Fatigue, pain), cognition (eg. Concentration), behavior (eg. Disrupted daily activities, delayed life plans).

Relational Subscale (6 questions) – It measured the impact on marriage or partnership (eg. Sexual relationship, communication, commitment).

Social Subscale (6 questions) – It measured the impact of infertility problems on social interactions (Eg. Social inclusion, expectations, stigma, and support)

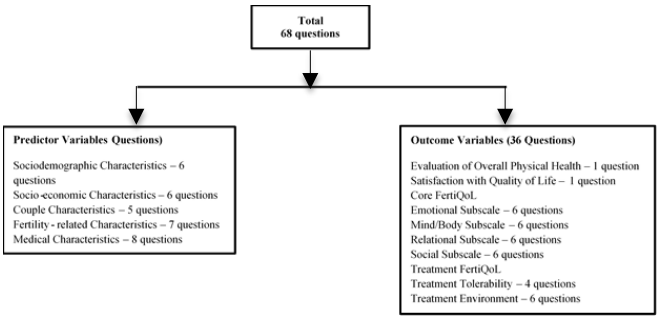

Figure 2: Showing the resulting questions including predictor variables and outcome variables.

Treatment FertiQoL - This section yielded two subscales and the questionnaire consisted of 10 items which are as such:

Treatment Environment Subscale (6 questions) - It measured the impact of accessibility and quality of treatment on QoL.

Treatment Tolerability Subscale (4 questions) - It measured the extent to which fertility medical services impact on daily life.

Translation of Questionnaires

Both parts of the questionnaires were translated in Nepali language to ensure readability and to ensure that they didn't contain complex questions. The principal researcher proficient in reproductive health and English and Nepali language translated the English version of all the above-described sections of questionnaires in Nepali. The Nepali translation was back translated by another key person who is an undergraduate in Social Sciences and have three years of experience in conducting Reproductive Health programs. The back translator did not have access to any of the above-described parts of the original questionnaires in English. The questionnaires thus translated was compared with the original English version by another reproductive health expert, working as an embryologist in an infertility center for the past seven years. The expert was proficient in both Nepali and English language. The expert found 11 questions with discrepant meanings between the two versions and then, after discussing with the first and second translator agreed on resolving the discrepancies.

DISCUSSION

The process of questionnaire development included extensive literature review, in-depth interview and IOC for the development and validation of the QOL questionnaire in infertile patients that contained five sections of predictor variables. The Socio-demographic and socio-economic characteristics are confounders in any kind of research and were included in the study. Working conditions, presence of health insurance, couple characteristics, fertility-related characteristics and medical history (16-18) were found to be QoL predictor variables through literature review and thus, these references provided most of the construct validity to the questionnaire.

The second part of questionnaire was FertiQoL questionnaire which is gold standard for assessing QoL among infertile patients, developed by a team of experts from European Society of Human Reproduction and Embryology (ESHRE) and the American Society of Reproductive Medicine in 2011. It is one of the sensitive, reliable, and valid measure of QoL among infertile patients which assesses the mind/body, relational, social, and emotional domains (19). These references provided most of the validity for the dependent variables. Additional validity for the Nepali context was provided using a complex back translation, IOC indexes and in-depth interviews with infertility experts who also helped in adapting sensitive/stigma related questions, fine-tuning sections, and planning statistical analysis.

The questionnaire differs to a standard QoL questionnaire as it measures fertility specific QoL. The specific tool captures the key domains affected by the condition unlike the generic QoL measurement tools (15) and also is more sensitive to changes in QoL related to the condition and its treatment (20).

The construct validity of the developed questionnaire is based on LR, and preliminary in-depth interview with two experts, and the content validity is provided through index of IOC by three experts. Thus, the questionnaire fully relies on three-prongs LR, IDI and IOC. However, the developed questionnaire didn't require reliability testing as it consisted of predictor variables where one variable measured one fact and for outcome variables, the reliability had already been tested and validated (15).

The adapted and validated tool developed from the study can be easily adopted to assess impact of infertility on QoL of Nepali infertile patients and thus pave a path for future research in Nepal. Hence, the developed questionnaire can be useful for service delivery with improved patient care and compliance. A limitation of the study is that the construct validity based on experts IDI is not as robust as the one on existing theoretical framework, however the latter ones do not exist for QOL measurements. Additionally, QoL is a psychological construct and is not directly observable, hence it heavily relies on subjective self-assessment which can be influenced by factors like mood, personality, and cultural background.

CONCLUSION

The process of questionnaire development mainly relied on extensive Literature Review and selection of important predictor variables and outcome variables. Qualitative in-depth interviews and quantitative IOC analysis were fundamental for adaptations of the results from the LR to the Nepali context, as confirmed by recent literature on development of measurement instruments. Hence, the three-prong Literature Review, In-depth interviews, IOC analysis approach were effective in developing a valid QoL questionnaire to assess QoL among infertile patients in Nepal.

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FACTORS ASSOCIATED WITH THE DENTAL ATTENDANCE AMONG ELDERLY PATIENTS IN FACULTY OF DENTISTRY, CHULALONGKORN UNIVERSITY: A STUDY BASED ON ANDERSON'S MODEL

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ABSTRACT

Due to the diverse patterns of dental care utilization behaviors observed in dental hospitals, some individuals visit dental services excessively while others attend infrequently. This study investigates the reasons behind the varying frequency of dental visits among the elderly population. Moreover, studies focusing on factors associated with dental attendance based on Anderson's model of health service utilization are limited.

This study aims to identify the predisposing factors, enabling factors, and need factors related to dental service utilization among elderly patients at a university dental hospital in faculty of dentistry, Chulalongkorn university, Bangkok, Thailand using the Anderson's model.

This retrospective study, conducted from 15 February to 30 March 2023, aimed to analyse secondary data obtained from a previous telephone-based survey study and dental records of a university dental hospital during January 2019 to December 2020. Inclusion criteria for this study included all data of participants among both male and female who sought dental care at the hospital in 2020 from previous study. However, individuals with severe systemic diseases and those who were unwilling to participate were excluded. The predisposing factors are age, sex, marital status and educational level. The enabling factors are income, health insurance, oral health-related behaviors (frequency of toothbrushing, duration of tooth brushing and regular dental visits). The need factor is self-rated oral health. Descriptive statistics and Pearson's chi-squared test were performed. A p-value of < 0.05 was considered statistically significant.

A total of 402 elderly patients aged 61–94 were included in the study. Most study participants were aged $\geq$ 68 years (55.2%), with a mean age of 69.18 years. The finding of this study explored that age and sex, which were predisposing factors, had a significant positive association with regular dental attendance among elderly patients.

Older female participants were more likely to receive dental services than younger participants. Healthcare providers and policymakers should make dental services more accessible and ultimately improve oral health outcomes among the elderly since the beginning of old age to reduce progressive oral diseases among the elderly.

Keywords: Anderson's model of health service utilization, dental care utilization, dental attendance, elderly, elderly patients

INTRODUCTION

The worldwide older population is expected to reach 1.5 billion by 2050. All areas will increase the number of people 65 and older between 2019 and 2050. Especially, Eastern and South-Eastern Asia are expected to have the highest rise, rising from 261 million in 2019 to 573 million people aged 65 and older in 2050. Similarly, the Thai population has a total citizen of 66.5 million people, and the number of older people has increased to 12 million, accounting for nearly 1 in 5 Thai population in 2022 (1).

Inescapably, the health burden in the older adults is a public health problem and a significant challenge. In particular, non-communicable diseases or NCDs are also rapidly becoming one of the causes of disability and mortality in the elderly (2). Chronic diseases and oral disorders often share common risk factors. Periodontal diseases, such as gingivitis and periodontitis, are frequently linked to non-communicable diseases (NCDs). Periodontitis has been associated with an increased risk of various NCDs, including diabetes mellitus, endocarditis, cardiovascular disease, and chronic kidney disease (3). Moreover, poor oral health among the elderly has been found globally in high rates of tooth loss, dental caries, and prevalence of periodontal disease, xerostomia, and oral precancer/cancer (4). Therefore, utilization of health care is a crucial way to prevent and treat health problems.

Health care utilization indicates using services by individuals for health prevention and treatment, health promotion, or getting information about the health condition and prognosis (5). Anderson provided a model explaining factors related to the use of health services. It is determined by three factors: predisposing, enabling, and need (6, 7). This model was commonly used as a theoretical framework to find factors associated with dental utilization (8-12).

Most of the people were more problem-oriented visitors than prevention-oriented visitors (13) Neglecting dental visits can result in difficult-to-treat oral problems, while regular preventive check-ups and home oral care effectively prevent oral diseases and enable early detection and treatment of oral disorders (13). Additionally, regular dental care assists in preserving existing teeth. A study demonstrates that regular participants positively impact oral health and have a lower risk of oral health problems regarding severity, incidence, and psychological consequences (14). Another study found that people who had seen the dentist the previous year believed that oral health significantly influenced their overall quality of life (15). Thus, understanding and further specification of the importance and the determinants of dental care visits in older adults are noteworthy for managing and planning the health care system.

Many studies reported that factors facilitate or deter older adults from dental attendance. Several previous studies reported significant associations between dental service utilization and some general characteristics and oral health behaviors (10). However, there was a scarcity of research examining the association between dental visits and key variables within Anderson's model of health service utilization. Furthermore, many studies in various countries rely on self-reporting questionnaires, which may overestimate dental care utilization compared to more objective data sources (insurance claims or dental records). This recall bias was likely

more prevalent among older adults compared to younger age groups (16).

This study was designed to reduce recall bias by using secondary data to provide information on the utilization of dental services among elderly patients in a university dental hospital in Bangkok, Thailand. The findings could shed light on why there is a different frequency of dental visits among older adults. To clarify, why do some elderly patients rarely attend dental clinics while others use dental services excessively?

The purpose of this study is to explore the factors associated with dental service utilization based on Anderson's model of health service utilization as a theoretical framework and using secondary data from the actual dental record of the dental hospital to prove the hypothesis that there is a potential variable related to dental service attendance among the elderly patients.

METHODOLOGY

Research design and setting

The research design is a quantitative retrospective study using secondary data sources. Independent variables were collected from a telephone-based survey (17). Dependent variables were extracted from dental resource system of a university dental hospital during January 2019 to December 2020. This study was conducted, and the manuscript was written according to Strengthening the Reporting of Observational Studies in Epidemiology' (STROBE) statement.

Eligibility criteria of study participants and sampling technique

This study used purposive sampling. Inclusion criteria for this study included all data of participants among both male and female who sought dental care at the hospital in 2020 from the initial study (17). Therefore, a total of 402 elderly patients who completed the telephone-based study (17) were included into this study. However, individuals with severe systemic diseases and those who were unwilling to participate were excluded.

Research variables

Independent variables were collected from validated questionnaires of the initial telephone-based study (17). Before data analysis, all independent factors gathered from self-report questionnaires will be reclassified into three groups based on Anderson's model of health service utilization:

1. Predisposing factors are age, sex, marital status and educational level.
2. Enabling factors are income, health insurance, oral health-related behaviours (frequency of toothbrushing, duration of tooth brushing and regular dental visits).
3. As shown in Figure 1, participants who completed the survey of previous research and whose data can be found in the dental record system were classified as regular dental attendance.
4. Need factor is self-rated oral health. *Dependent variable* on dental attendance was secondary data from the dental record system in 2019-2020.

5. Need factor is self-rated oral health.

Dependent variable on dental attendance was secondary data from the dental record system in 2019-2020.

On the other hand, those who cannot be found in the dental record system would be implied that those people were irregular dental attendance. Therefore, for data analysis, the study participants were categorized into regular dental attendance (coded=1) and irregular dental attendance (coded=0).

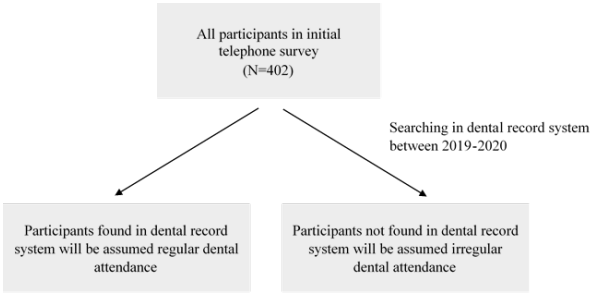

Figure 1: Flow diagram of the study participants

Measurement tools and reducing bias

The instrument used to collect data from the initial telephone-based study (17) was a validated questionnaire with acceptable validity and reliability testing. This questionnaire tool was developed from the 8th Thai national oral health survey (18).

To reduce recall bias, the dependent variable (dental attendance data between January 2019 and December 2020) was secondary data extracted from the dental system resource of the university dental hospital.

Sample Size Calculation

Specified absolute precision was used for the calculation of the sample size, according to the 8th national survey, 38.1% of the elderly in Bangkok used dental utilization in 2017 (18). Finally, the total number of minimum samples for this study is 363 subjects.

Statistical analysis

All data were analysed using SPSS software (version 28; SPSS, Inc., an IBM Company, Chicago, IL, USA). The following statistical analyses were performed.

Descriptive analysis was used to analyse the distribution of frequency and percentage of of 1) predisposing factors [age, sex, marital status and educational level] 2) enabling factors [income, health insurance, oral health-related behaviours (frequency of toothbrushing, duration of tooth brushing, brushing before bedtime and regular dental visits)] 3) need factors [self-rated oral health] and 4) the dental service utilization.

Inferential analysis, Pearson's Chi-squared test was used to find an association between each categorical independent variable and dependent variable (dental attendance). A p-value of < 0.05 was considered significant.

Ethical consideration

The research was approved based on the Declaration of Helsinki and ICH Good Clinical Practice Guidelines by the Ethics Review Committee of the DCU (HREC-DCU 2021-039). No informed consent was needed as the data collection involved secondary data and all patient identifiers, if any collected, were removed.

RESULTS

General characteristics of the study participants

Table 1 showed that 402 participants enrolled in the study, 180 (44.8%) were elderly aged less than 68 years, and 222 (55.2%) were elderly aged 68 or over. Overall, many participants were female (61.4%), married (65.4%), graduated from higher than primary school (84.1%), subjects with income equal to or more than 15,000 Baht [440.14 USD] (57.2%) and adequate dental insurance (75.6%). Furthermore, among oral health-related behaviours, there were elderly who brushed at least twice a day (94.2%), brushed at least two minutes (80.4%), having regular dental visits (74.4). Moreover, regarding need factors, most of the participants had fair self-rated oral health (55.4%). For dental attendance, 367 subjects, most elderly, had regular dental attendance (91.3%), while 35 participants had irregular dental attendance (8.7%).

Table 1: General characteristics of the study participants (N = 402)

Variables	Number	Percent
Predisposing factors		
Age: years		
< 68	180	44.8
≥ 68	222	55.2
Sex:		
Female	247	61.4
Male	155	38.6
Marital Status:		
Married	263	65.4
Others	139	34.6
Educational level:		
> Primary education	338	84.1
≤ Primary education	64	15.9
Enabling factors		
Income:		
≥ 15,000 THB	230	57.2
< 15,000 THB	172	42.8
Adequate dental Insurance:		
Yes	304	75.6
No	98	24.4
Toothbrushing frequency (N = 398):		
≥ twice daily	375	94.2
< twice daily	23	5.8
Toothbrushing duration (N=398):		
≥ 2 minutes	320	80.4
< 2 minutes	78	19.6
Regular dental visits:		
Yes	299	74.4
No	103	25.6
Need factors		
Self-perceived oral health (N=401):		
Good	128	31.9
Fair	222	55.4
Poor	51	12.7
Dental attendance		
Irregular	35	8.7
Regular	367	91.3

Factors associated with utilization of dental services

Table 2 showed factors associated with the utilization of dental services using Pearson's chi-squared test with a p-value of 0.05 considered significant. Among all factors, age ($p<0.001$) and sex ($p=0.046$) were significant associations with dental attendance. However, marital status, educational level, income, health insurance, frequency of toothbrushing, duration of tooth brushing, regular dental visits and self-rated oral health had no association with the dental utilization.

Table 2: Factors associated with dental attendance among the participants

Variable	Dental services utilization, N (%)		p-value[a]
	Irregular dental attendance	Regular dental attendance	
Predisposing factors			
Age: years			<0.001
< 68	27 (15.0)	153 (85.0)	
≥ 68	8 (3.6)	214 (96.4)	
Sex:			0.046
Female	27 (10.9)	220 (89.1)	
Male	8 (5.2)	147 (94.8)	
Marital Status:			0.434
Married	25 (9.5)	238 (90.5)	
Others	10 (7.2)	129 (92.8)	
Educational level:			0.490
> Primary education	28 (8.3)	310 (91.7)	
≤ Primary education	7 (10.9)	57 (89.1)	
Activities of daily living:			0.445
Independent	34 (9.0)	345 (91.0)	
Dependent	1 (4.3)	22 (95.7)	
Enabling factors			
Income:			0.993
≥ 15,000 THB	20 (8.7)	210 (91.3)	
< 15,000 THB	15 (8.7)	157 (91.3)	
Adequate dental Insurance:			0.826
Yes	27 (8.9)	277 (91.1)	
No	8 (8.2)	90 (91.8)	
Toothbrushing frequency (N = 398):			0.438
≥ twice daily	34 (9.1)	341 (90.9)	
< twice daily	1 (4.3)	22 (95.7)	
Toothbrushing duration (N=398):			0.950
≥ 2 minutes	28 (8.8)	292 (91.3)	
< 2 minutes	7 (9.0)	71 (91.0)	
Regular dental visits:			0.219
Yes	23 (7.7)	276 (92.3)	
No	12 (11.7)	91 (88.3)	
Need factors			
Self-perceived oral health (N=401):			0.060
Good / Fair	27 (7.7)	323 (92.3)	
Poor	8 (15.7)	43 (84.3)	

Note: [a] p-value from Pearson's chi-squared test

DISCUSSION

The finding of this study explored that age and sex which were a predisposing factor, had a significant positive association with regular dental attendance among elderly patients.

Previous studies also supported our result of an association between dental attendance and increasing age. A cross-sectional study among US elderly aged 60 or over explored that increasing age was associated with recent dental visits in the past year (19). A study in Germany reported that older age was a higher chance to utilize regular dental check-ups among the migrant group (20). The previous studies in Brazil also indicated that older adults significantly increased the likelihood of seeing a dentist in the past 12 months compared to adolescents (18-21 years) (21).

Additionally, this finding was consistent with a previous study conducted in Thailand. It also indicated that public denture utilization in Thailand during the last five years was significantly related to predisposing such as older age. Older people were more likely to attend dental service than the younger group. They explained that more youthful elderly turn into older elderly, resulting in the trend of denture services having an increased chance with older age (10). Another explanation was that problems due to missing teeth would cause receiving treatment by dental substitution. Thus, older people had a chance of having problems from loss of teeth comparing counterparts (18). Moreover, a study by Brothwell et al. confirmed that edentate elderly with oral problems was plausible to attend dental services (11).

To conclude, increasing age was significantly associated with dental services because older elderly had more oral problems than younger elderly. Therefore, older adults were necessary to receive more dental treatment than their counterparts, and it could be implied that using dental services among the elderly was driven by oral problem-oriented than prevention-oriented.

Regarding the sex variable, previous studies also supported our findings that sex was a predisposing factor related with dental utilization (8-10, 12). A finding indicated that public denture utilization during last five years in Thailand was significant related to predisposing. Female elderlies were more likely to attend dental service than male (10). Moreover, some study revealed that sex which was predisposing factor had strongly related to dental services. Older female adults had higher dental utilization than male elderly (8, 9). Besides, a systematic review also confirmed underlying factors about the inequalities of dental utilization. Male people demonstrated considerably lower consumption when comparison to female (12).

For enabling and need factors, this study indicated no association with dental attendance. Hence, dental care was a sort of health care that was more optional than necessary. Thus, need factors were not predictors for dental utilization because oral problems were not life-threatening. They suggested that the decision to seek dental care may be influenced by factors beyond the severity of one's oral health condition, such as perceived health status, socioeconomic status, and access to healthcare services.

STRENGTHS AND LIMITATIONS OF THE STUDY

This study gathered information about dental attendance from the actual record system of the university dental hospital. Thus, the dental record provided more accurate information when compared to questionnaires which leading to overestimating actual dental care consumption.

However, this study has some limitations, due to the Covid-19 pandemic, the initial survey was conducted via telephone, which limited the inclusion of clinical characteristics as independent variables. Additionally, the data on dental attendance were derived solely from the university dental hospital database, excluding information from the private sector or other public health systems.

GENERALIZABILITY AND RECOMMENDATION

The outcomes of this study should be interpreted with caution and may be generalizable to the older population in urban area. Therefore, Future research should consider dental service utilization in other public and private settings for a broader understanding.

CONCLUSION

Under the conceptual framework of the Anderson's model, this study found only two predisposing factors including age and sex. To improve oral health outcomes in the elderly, healthcare providers and policymakers should enhance dental service accessibility, particularly focusing on early old age and females to prevent the progression of oral diseases.

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ASSOCIATION BETWEEN MEDICAL SERVICES OF CHOICE AND LENGTH OF STAYS IN GREY CAMBODIAN MEDICAL TOURISTS IN THAILAND

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ABSTRACT

The medical tourism industry has been gradually growing in number and popularity worldwide. Thailand is well-known as one of the most popular medical tourism destinations among ASEAN countries. More than 11% of Thailand's GDP is attributable to tourism alone. Therefore, in many regions of the globe, the increase in the elderly population provides room for growth in inbound medical tourists. Very few studies have looked into the data of this travelers' category, including the period of time popular with each medical service type.

This cross-sectional study aims to explain the demographics as well as the relationship between the medical services selected and the duration of stay among Cambodian medical tourists aged 50 and older in Thailand.

This study used secondary data collected from a questionnaire set administered to Cambodian medical tourists who traveled to Bangkok for medical services in 2018. The questions retrieved were including participants' socio-demographic data, type of medical services, and length of stays. The data were retrieved, coded, and analyzed using the IBM SPSS Statistics program version 28.0. The statistical used to demonstrate associations was Pearson's chi-square. Binary logistic regression was applied to evaluate the magnitude of the effect, which was presented as the odds ratio with a 95% confidence interval.

Among the 127 participants, more than half of them were male (59%), aged between 50-60 years (67.7%), employed (80.3%), and had a habitat in Phnom Penh (54.3%). Factors associated with shorter length of stays (1-3 days) is coming for cancer screening (53.4%, p <0.05). After binary logistics regression analysis, the factor associated with shorter lengths of stays (1-3 days) among these tourists is coming for cancer screening.

The findings suggest that grey tourists who came for cancer screening have a 3.42 times chance of staying for a shorter period (1-3 days) than those who weren't. (OR= 3.42, 95% CI:1.07-10.93) These insights can be taken into consideration by policymakers and private organizations to implement a policy to promote facilities for shorter stays among medical tourists aged 50 and older who came for cancer screening in the future.

Keywords: medical tourism, Thailand, Cambodia, length of stays, medical services

INTRODUCTION

Medical tourism, the act of international travel for the purpose of receiving medical care(1), can be undertaken for a variety of reasons, including the desire for more affordable or specialized treatment, or the unavailability of certain procedures in an individual's home country. In the 20th century, medical tourism grew in popularity as more people from developing nations traveled to affluent nations like the USA and Germany to access services that are not available domestically (2). Three main purposes of medical tourism are for treatment, wellness, and for alternative treatments.

Nowadays medical tourism industry has been gradually growing in number and popularity across the world. According to the Medical tourism association (MTA), there are around 14 million people per year who travel globally just to get medical care. The global medical tourism market size was USD 11.56 billion in 2020 and is projected to grow to 53.51 billion in 2028 (3). Focusing on the detail of the industry, there are three main purposes: for receiving medical treatment, for wellness, and for alternative treatments.

Among the ASEAN countries, the popular destinations for medical tourism are Thailand, Singapore, and Malaysia (4). Every year, Thailand welcomes over 30 million tourists from all over the world, and the tourism industry has contributed around 11 percent of Thailand's GDP.(5) Among Thailand's visited foreigners' number, approximately 3.4 million came for medical care(6), and this number has been growing in recent years. In line with its Thailand 4.0 policy, the Thai government considers the healthcare industry to be a priority sector for investment and further development (7). The Ministry of Public Health's 2016-2025 Strategic Plan entitled "Thailand: A Hub of Wellness and Medical Services" of Asia. This encompasses strategies to build connectivity with regional economies to enhance health and service provision. The areas of the industry that the government is actively supporting are wellness, medical services, academic medical centers, and health products.

Thailand's healthcare industry is heavily reliant on medical tourism, with 64 hospitals accredited by the Joint Commission International (JCI). Which is the highest number in the Association of Southeast Asian Nations (ASEAN) region and the fourth highest in the world.(6) Medical tourists in Thailand were less likely to be from high-income countries and more likely to be from the Eastern Mediterranean or Southeast or South Asia (8).

To look only at tourism receipts from international tourist arrivals in Thailand, Cambodia ranked 9th place among Asian countries, but if focusing on only medical care expenditure, Cambodia, however, ranked 1st among every country in the world. A number of total spending in the medical care category of Cambodian tourists averaged 6,000 million USD in 2019, which accounted for 18% of total medical care spending among all the international tourists coming to Thailand (9). This trend highlights the importance of understanding the factors that

influence the decision of Cambodian citizens to seek medical care in Thailand and the impact of these factors on the healthcare system in both countries. According to the ASEAN Secretariat team, the healthcare industry in Cambodia is underdeveloped and inadequate, with limited access to medical services and technology and less than one hospital bed per 1,000 people, a much lower ratio than in neighboring countries (6). As a result, many Cambodian individuals often seek medical treatment in neighboring countries such as Thailand, Singapore, and Vietnam. Medical tourism has gained popularity in recent years due to the availability of high-quality medical care at a lower cost.

In many regions of the globe, the increase in the elderly population provides room for growth in inbound medical tourists. Studies have found that travel increases seniors' subjective well-being and degree of social participation by boosting their sense of independence, self-worth, and confidence (10). The elderly often visits various locations for medical care, disease treatment, physical activity, and spiritual comfort to support their physical and mental well-being (11). Overall, there is an increasing need to thoroughly research the aspects of this topic as the demographic landscape changes. Although the trend of grey Cambodian medical tourists seeking services in Thailand highlights the importance of this study, there is still a significant null in the literature in interaction between the medical services the tourists seek and the length of their stays. Existing research usually focuses on the overall motivations and preferences of medical tourists without exploring the specific elements that affect their choices and length of stay.

Understanding the association between medical services of choice and length of stays among these types of tourists can provide valuable insights into the motivations behind this trend and help inform healthcare policy and decision-making in both Cambodia and Thailand.

Scarce research has touched on the data of these types of tourists and how length of stays affects their medical services' choice. The purpose of this research is to study deeper into the demographics of grey Cambodian medical tourists in Thailand and look at their choice of medical treatment. The retrieved data from this research can be used by policymakers, healthcare professionals, and researchers to better understand and address the needs of grey Cambodian medical tourists in Thailand.

METHODOLOGY

Target population and setting

This study used the already retrieved data among Cambodian medical tourists in Thailand in the year 2018. The inclusion criteria for this secondary data study were medical tourists with Cambodian nationality, at least 50 years of age, came to Thailand for treatment/medical services, willing to participate in the research, and were able to communicate in Cambodia. Participants who were not able to communicate were excluded. In the data collection process, the face-to-face interview were done at 15

hotels popular with medical tourists in Bangkok. Secondary data was collected, handled, and analyzed throughout this study.

Sampling technique

At first, a cross-sectional study was performed in year 2018, using a purposive sampling technique. The rule of thumb of the multiple linear regression analysis was used to calculate the sample size (12), which set the ratio between the number of samples and the observed variables to be 5-20: 1. There were at first a total of 471 records in the dataset. Then the inclusion and exclusion criteria were applied. A final of 127 participants were included in the secondary data study.

Measurement Tools and Data collection method

The paper-based questionnaire was developed in Thai language and translated to Cambodian language. The questionnaire was revised by the experts. The pilot test on 10 Cambodian tourists were conducted before the starting of the interviews. After the secondary data were retrieved, the relevant parts were being chosen based on the literature reviewed. The chosen questionnaire were including the socio-demographic characteristics part (gender, age, occupation, habitat region), the clinical characteristics part (purpose of medical treatment in this visit: regular check-ups, cancer screening, illness treatment, and other treatment) in a Yes/No questions, and the information on their length of stays in Thailand.

Data analysis

Data were assessed using the IBM Statistical Package for the Social Sciences version 28.0. A descriptive analysis was performed to evaluate the characteristics and medical services chosen among grey Cambodian medical tourists in Thailand. Categorical variables were demonstrated as frequency and percentages. A Chi-square test was used to demonstrate the association among variables. The relationships between independent factors and the decision to revisit were evaluated using bivariate logistic regression, whose p-value measured <0.05. The unadjusted odds ratio (Unadjusted OR) was calculated with a 95% confidence interval (CI) (13-15).

RESULTS

Grey Cambodian medical tourists' characteristics

Among the 127 participants, more than half of them were male (59%), aged between 50-60 years (67.7%), employed (80.3%), and had a habitat in Phnom Penh (54.3%). These results emphasized that the participants were almost equally-distributed in terms of age and habitat region, but not occupation. The medical service of choice that were most popular among grey Cambodian medical tourists was illness treatment (74.8%) following by regular check-ups (61.4%), cancer screening (19.7%), and other treatment (11.0%). The participants mostly stayed in Thailand for 1-3 days (56.7%). (Table 1)

Table 1: Socio-demographic characteristics of grey Cambodian medical tourists (n=127)

Characteristics	Frequency	Percent (%)
Gender		
Male	75	59.1
Female	52	40.9
Age		
50-60	86	67.7
>60	41	32.3
Occupation		
Unemployed	25	19.7
Employed	102	80.3
Habitat region		
Phnom Penh	69	54.3
Others	58	45.7
Regular check-ups		
No	49	38.6
Yes	73	61.4
Cancer screening		
Yes	102	80.3
No	20	19.7
Illness treatment		
No	32	25.2
Yes	95	74.8
Other treatment		
No	113	89.0
Yes	14	11.0
Length of stay		
1-3 days	72	56.7
>3 days	55	43.3

The association between medical services of choice and length of stays among grey Cambodian medical tourists in Thailand were shown in Table 2. The medical service of choice that has an association with shorter length of stays (1-3 days) is coming for cancer screening (53.4%, p <0.05). (Table 2.) And after binary logistics regression analysis, the factor associated with shorter lengths of stays (1-3 days) among these tourists is coming for a cancer screening. (Table 3.)

Table 2: Association between medical services of choice and length of stays among grey Cambodian medical tourists in Thailand (n=127)

Medical service of choice	Total	Length of stay		*p*-value*
		1-3 days n (%)	>3 days n (%)	
Regular check-ups				0.192
NO	49	32 (65.3%)	17 (34.7.0%)	
YES	73	39 (53.4%)	34 (46.6%)	
Cancer screening				0.031
NO	102	55 (53.9%)	47 (46.1%)	
YES	20	16 (80.0%)	4 (20.0%)	
Illness treatment				0.088
NO	32	14 (43.8%)	18 (56.3%)	
YES	95	58 (61.1%)	37 (38.9%)	
Other treatment				0.268
NO	113	66 (58.4%)	47 (41.6%)	
YES	14	6 (42.9%)	8 (57.1%)	

Note: *Chi-square test.

Table 3: Association between medical service of choice and shorter length of stay (1-3 days)

Characteristics	Unadjusted OR (95% CI)	*p*-value*
Gender		0.367
Male	Ref	
Female	1.39 (0.68-2.84)	
Age (years)		0.926
50-60	Ref	
>60	1.04 (0.49-2.19)	
Occupation		0.710
Unemployed	Ref	
Employed	1.18 (0.49-2.89)	
Habitat region		0.301
Phnom Penh	Ref	
Others	1.45 (0.72-2.94)	
Regular check-ups		0.194
NO	Ref	
YES	0.61 (0.29-1.29)	
Cancer screening		0.038
NO	Ref	
YES	3.42 (1.07-10.93)	
Illness treatment		0.090
NO	Ref	
YES	0.50 (0.22-1.12)	
Other treatment		0.274
NO	Ref	
YES	1.87 (0.61-5.75)	

Note: *Chi-square test.

DISCUSSION

In this study, we aimed to explore the socio-demographic characteristics of grey Cambodian medical tourists in Thailand and identify the association between their medical services of choice and their length of stays. Our findings suggest that most grey Cambodian medical tourists in Thailand were employed and had a habitat in Phnom Penh. The information from the report on the Cambodia labour force survey 2019 (16) indicates that only 33.9% of the population lived in urban areas, which is in contrast with this study. It also indicates that about 68.5% of the total population were employed, which is in line with the information from this research. One possible explanation is that there was a limitation in generalizability of the study. Another explanation might be that Cambodian medical tourists who's able to reach medical services aboard were mostly from the urban areas. One study in China showed another aspect that elderly in the rural areas can had significant medical tourism to urban hospitals from different income groups (17).

Regarding the length of stay, the grey Cambodian medical tourists in Thailand most preferred shorter length of stays (1-3 days) (56.7%). In the previous study, there were no mentioning about period of stay among this type of tourist, only a few study among all age-group that revealed Cambodian medical tourists in Thailand and Vietnam usually stay for 3-7 days (18). Therefore, medical services most popular for grey Cambodian medical tourist was

illness treatment, which coherent with the previous studies in Thailand and Vietnam (18,19).

Although there was rarely a prior study that has given information on this type of tourist before and direct comparisons are difficult to make, this study aims to be one of the explaining data among these type of tourist for further study. Hence the essence of this study would provide more information regarding rarely mentioned topics for researchers and policymakers in the future.

CONCLUSION AND RECOMMENDATION

In conclusion, this study provides valuable insights into the demographics as well as information on the relationship between length of stays and medical services of choices in grey Cambodian medical tourists in Thailand. The findings suggest that grey medical tourists who came for cancer screening have a 3.42 times chance of staying for a shorter period (1-3 days) than those who weren't. (OR= 3.42, 95% CI:1.07-10.93) (Table 3) These insights can be taken into consideration by policymakers and private organizations to implement policies to promote facilities or packages that target grey Cambodian medical tourists who visit Thailand for cancer screening and stays for a shorter length in the future.

LIMITATION

There were potential limitations from the data collection process since the sampling technique of the first study was purposive sampling. Another limitation is the generalizability of the population since this research only includes participants aged over 50 years and only includes one study site, which is Bangkok, Thailand. Future research should consider adding additional participants, more study sites, and different participant age groups.

ETHICAL DECLARATION

This research was approved from The Research Ethics Review Committee for Research Involving Human Research Participants, Group I, Chulalongkorn University, Thailand. (COA No. 086/66)

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PREVALENCE AND ASSOCIATED FACTORS OF STRESS AMONG HIGH SCHOOL STUDENTS IN A PUBLIC SCHOOL, NAKHON RATCHASIMA PROVINCE, THAILAND

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ABSTRACT

The high school years are known for being demanding and filled with various stressors that can impact students' mental health. To develop effective interventions, it is crucial to understand the prevalence of stress and its associated factors among high school students.

Therefore, this study aimed to assess stress levels and associated factors among students in grades 10-12 at a public school in the Muang District of Nakhon Ratchasima Province, Thailand.

This was a cross-sectional descriptive study in grades 10-12 at a public school in the Muang District of Nakhon Ratchasima Province, Thailand. The study used self-administered surveys for sociodemographic data and the Stress Test-5 (ST-5) questionnaire to evaluate stress levels. Various independent variables, such as gender, age, education level, academic satisfaction, parents' marital status, parents' education and employment status, and family financial status, were considered. Descriptive statistics, chi-square test, and multiple logistic regression were employed to analyze the data and identify factors associated with severe stress.

The stress prevalence among 330 study population was classified as follows: mild stress (39.4%), moderate stress (33.6%), and severe stress (27.0%). Multiple logistic regression identified that factors associated with those who reported severe stress were academic satisfaction (AOR: 4.52, 95% CI: 1.680 - 12.177) and family financial status (AOR: 2.01, 95% CI: 1.026 - 3.934).

This study underscores the pressing issue of prevalent stress among students in grades 10-12 at a public school in Muang District, Nakhon Ratchasima Province, Thailand. The fact that academic satisfaction and family financial status are associated with severe stress illustrates the need to prioritize both factors in fostering a healthier environment. Nonetheless, all the identified factors in this research were able to partially forecast the stress experienced by students.

Keywords: Stress, High school, Students, , Nakhon Ratchasima,, , Thailand

INTRODUCTION

Stress, a natural human response, arises from mental tension during difficult situations, motivating individuals to face difficulties and threats (1). Adolescents in grades 10-12, commonly referred to as high school students, experience a crucial transition from adolescence to early adulthood. This phase encompasses identity development and transformative challenges shaping self-perception and aspirations (2, 3). These experiences can trigger stress reactions across developmental domains. However, excessive stress can persist through adulthood and impact adolescents' mental and physical well-being even as life normalizes (4, 5).

High school students experience diverse situations and encounter multiple stressors, especially the pressure associated with competitive university admissions (6, 7). Previous studies have recognized several stress determinants beyond continuing higher education, encompassing individual, academic, and family factors (8-12). Nevertheless, their stress is frequently disregarded. If left unaddressed and managed inadequately, it can result in mental disorders and an elevated susceptibility to suicidal behavior (13). Several studies have explored stress levels among high school students in different areas. For instance, a study on university admission preparation in Samut Songkhram province found a severe stress prevalence of 22.0% (8). Similarly, a recent study among grade 12 students reported that 22.4% experienced extremely high-stress levels (14). In Trang province's Muang district, 52.1% of high school students experienced high-stress levels (11), while a study involving grade 7-12 students in the Bangkok Metropolitan Administration found that 54.7% had elevated stress levels (15).

A recent report highlights an increase in adolescent mental health issues in Nakhon Ratchasima Province (16) and a surge in adolescent suicide cases in the Muang District (17-19). Given the limited understanding of local adolescents' mental health and the absence of stress studies among high school students, this research aims to assess stress prevalence in grades 10-12 within the Muang District. Our specific goals include identifying factors associated with stress, which we anticipate uncovering through varying stress levels and associated factors.

METHODOLOGY

Study design and study area

The study employed a cross-sectional design to examine stress levels and associated factors among students in grades 10-12 at a large public school in Muang District, Nakhon Ratchasima. Data collection occurred in May 2023 using a self-reported questionnaire at their school. The school for the study was selected through a simple random sampling technique, choosing one school randomly from a pool of six schools under the Office of the Basic Education Commission (OBEC) 's jurisdiction in Muang District, Nakhon Province.

Sample size and study population

This study focuses on students in grades 10-12 at a public secondary school in the Muang District of Nakhon Ratchasima, Thailand. A proportionate stratified sampling technique will be used to ensure a

representative sample. The sample size of 360 students was determined using the Taro Yamane formula (20), with a 95% confidence level. Eligible participants must be currently enrolled in grades 10-12 at the selected school and willing to participate in the study. Students without parental or guardian consent or unwilling to participate will be excluded from the study.

Measurement tools

After obtaining school permission, data collection was conducted using a self-reported questionnaire. The items in the questionnaire exhibited IOC values ranging from 0.67 to 1.00, and the questionnaire demonstrated a reliability coefficient of 0.87. The questionnaire consisted of 15 main questions on sociodemographic characteristics and stress levels. The sociodemographic section included 10 questions on age, gender, education level, academic satisfaction, parental marital status, parents' education and employment status, and family financial status. The stress section had 5 questions adapted from the validated Srithanya Stress Test-5 (ST-5) questionnaire (21). Participants rated their stress levels using a 4-point Likert scale for the past 2-4 weeks. Scores were categorized as mild, moderate, or severe.

Data analysis

The collected data were analyzed using IBM SPSS Statistics Version 28 to examine stress levels among participants. Descriptive statistics were reported, including mean and standard deviation (SD) for normal distribution continuous data and median and interquartile range (IQR) for non-normally distributed continuous data. Frequency and percentage were reported for categorical data. The Chi-square test was employed to find associations with stress levels. An analysis significance level of p-value < 0.05 was used. Fisher's exact test was used if the assumption was not met. Multiple logistic regression analyses were exclusively conducted for variables with $p < 0.05$, as indicated by the chi-square test. The results are reported in terms of adjusted odds ratios (AOR) along with their corresponding 95% confidence intervals (CI).

RESULTS

Table 1 provides an overview of the sociodemographic characteristics of the study participants. The total study population was 330. The majority of participants identified as female (65.1%) and were aged between 16 and 17 (70.6%). In terms of education, the largest group (38.5%) was in grade 10, and a substantial proportion (94.5%) indicated satisfaction with their academic performance. Regarding the marital status of participants' parents, over half (60.9%) were married. The highest education levels of the participants' fathers and mothers were senior high school or vocational certificate programs (36.8% and 35.4%, respectively). Most participants' fathers and mothers were employed (91.8% and 84.6%, respectively). In relation to family financial status, a significant proportion of participants (86.7%) reported having sufficient financial stability.

Table 1 : Frequency and Percentage of Sociodemographic Characteristics (n = 330)

Characteristics	Study participant	
	Frequency	Percent (%)
Gender		
Male	94	28.5
Female	215	65.1
LGBTQIA+	21	6.4
Age (Years)		
Less than 16	20	6.1
16-17	233	70.6
Over 17	77	23.3
(Median = 17, IQR = 5, MIN = 15, MAX = 20)		
Education level		
Grade 10	127	38.5
Grade 11	109	33.0
Grade 12	94	28.5
Academic satisfaction		
Satisfied	312	94.5
Unsatisfied	18	5.5
Marital status of parents		
Married	201	60.9
Separated	30	9.1
Divorced	88	26.7
Widowed	9	2.7
Both deceased	2	0.6
Education level of the father (n = 296)		
No formal education	3	1.0
Elementary school	88	29.7
Junior high school	46	15.5
Senior high school/ Vocational certificate completion	109	36.8
Diploma/High vocational certificate	25	8.4
Bachelor's degree or Higher	25	8.4
Education level of the mother (n = 311)		
No formal education	4	1.3
Elementary school	69	22.2
Junior high school	65	20.9
Senior high school/ Vocational certificate completion	110	35.4
Diploma/High vocational certificate	37	11.9
Bachelor's degree or Higher	26	8.4
Employment status of the father (n = 282)		
Employed	259	91.8
Unemployed	23	8.2
Employment status of mother (n = 298)		
Employed	252	84.6
Unemployed	46	15.4
Family financial status		
Sufficient	286	86.7
Insufficient/Financial problem	44	13.3

Table 2 provides an overview of the stress levels among the study participants, assessed using the ST-5 questionnaire. The stress levels were classified as mild, moderate, and severe based on scoring criteria. The data reveals that 39.4% of participants reported a mild stress level, indicating a relatively low-stress level. Additionally, 33.6% of participants fell into the moderate stress category. Furthermore, 27.0% of participants reported a severe level of stress.

Table 2: Frequency and Percentage of Stress Levels (n = 330)

Stress level	Study participant	
	Frequency	Percent (%)
Mild	130	39.4
Moderate	111	33.6
Severe	89	27.0
(Median = 5.50, IQR = 15, MIN = 0, MAX = 15)		

The Chi-square test was used to examine the relationship between stress levels and sociodemographic characteristics, including gender, age, education level, academic satisfaction, parents' marital status, parents' education level, parents' employment status, and family financial status. Table 3 presents the results of this analysis.

Among these characteristics, two variables showed a strong association with stress levels. Firstly, there was a significant association between academic satisfaction (satisfied and unsatisfied) and stress levels (p=0.002). Secondly, the association between family financial status (sufficient and insufficient/financial problem) and stress levels was also statistically significant (p=0.030).

Table 3: Association between Sociodemographic Characteristics and Stress Levels (n =330)

Characteristics	Stress Levels				P-value
	Mild to Moderate		Severe		
	Frequency	%	Frequency	%	
Gender					0.445
Male	71	75.5	23	24.5	
Female	157	73.0	58	27.0	
LGBTQIA+	13	61.9	8	38.1	
Age (Years)					0.084
Less than 16	16	80.0	4	20.0	
16-17	162	69.5	71	30.5	
Over 17	63	81.8	14	18.2	
Education level					0.063
Grade 10	90	70.9	37	29.1	
Grade 11	74	67.9	35	32.1	
Grade 12	77	81.9	17	18.1	
Academic satisfaction					0.002**,b
Satisfied	234	75.0	78	25.0	
Unsatisfied	7	38.9	11	61.1	
Marital status of parents					0.435
Married	152	75.6	49	24.4	
Separated	22	73.3	8	26.7	
Divorced	58	65.9	30	34.1	
Widowed	7	77.8	2	22.2	
Both deceased	2	100.0	0	0.0	
Education level of the father (n = 296)					0.292 b
Junior high school or below	96	70.1	41	29.9	
Senior high school and above	121	76.1	38	23.9	
Education level of the mother (n = 311)					0.095 b
Junior high school or below	94	68.1	44	31.9	
Senior high school and above	133	76.9	40	23.1	
Employment status of the father (n = 282)					0.330 b
Employed	193	74.5	66	25.5	
Unemployed	15	65.2	8	34.8	
Employment status of mother (n = 298)					0.719 b
Employed	183	72.6	69	27.4	
Unemployed	35	76.1	11	23.9	
Family financial status					0.030**, b
Sufficient	215	75.2	71	24.8	
Insufficient/Financia problem	26	59.1	18	40.9	

** p-value<0.05 b Fisher's Exact Test

Variables in Table 3 with a p-value less than 0.05 were considered statistically significant and included in the multiple logistic regression analysis presented in Table 4. The first significant risk factor is academic dissatisfaction (p=0.003), with an adjusted odds ratio (AOR) of 4.523 (95% CI: 1.680-12.177). This indicates that academically unsatisfied individuals have approximately 4.5 times higher odds

of experiencing severe stress than satisfied individuals. The second significant risk factor is insufficient/financial family status (p<0.042), with an AOR of 2.009 (95% CI: 1.026-3.934). This suggests that individuals with insufficient/financial family status have about twice the odds of experiencing severe stress than those with sufficient family status.

Table 4: Multiple Logistic Regression Analysis on Factor Associated with Severe Stress Level

Characteristics	AOR	95% CL		P-value
		Lower	Upper	
Academic satisfaction				
Satisfied	1			
Unsatisfied	4.52	1.680	12.177	0 .003**
Family financial status				
Sufficient	1			
Insufficient/Financial problem	2.01	1.026	3.934	0 .042**

** p-value<0.05

DISCUSSION

This study, conducted in Thailand, aimed to investigate the prevalence of stress and related factors among students in grades 10-12 at a public school in the Muang District of Nakhon Ratchasima Province. The findings revealed a significant proportion of students experiencing varying stress levels, with 27.0% reporting severe stress. This prevalence exceeded that of previous studies among grade 12 students (22.0-22.4%) (8, 14) but was lower than a study in Trang province's Muang district where 52.1% of high school students reported high-stress levels (11). Another study among Bangkok grade 7-12 students reported 54.7% experiencing higher stress levels than average (15). Comparisons between studies are complex due to regional variations, population differences, survey instruments, methodologies, and study designs.

An important finding of this study is the gender distribution among the participants, with a majority being female. This aligns with previous research indicating that females are more susceptible to stress during adolescence (10, 11, 15). Our study's excellent representation of diverse genders may reflect the difficulties they encounter within the school environment.

The examination of academic literature has encompassed various dimensions, including satisfaction, which encapsulates the perception of the learning environment(23). Furthermore, this study reveals a notable association between academic satisfaction and stress levels, aligning with previous research findings (24). This significant finding highlights the importance of fostering a supportive and nurturing educational environment prioritizing students' well-being. By addressing the inherent stressors in academic pursuits, implementing effective stress management strategies, and providing valuable academic support resources, it becomes feasible to mitigate stress levels and enhance the overall intellectual satisfaction experienced by students.

The study also emphasizes how family finances affect stress levels. Insufficient income in families is associated with the mental well-being of high school students (25). Previous research has established a strong link between a family's

socioeconomic status and students' mental health, similar to our findings. This age group from financially disadvantaged or impoverished families faces more challenging circumstances and stressful family situations, which can harm their mental well-being (26). Poverty also presents obstacles in creating conducive home learning environments due to overcrowding and unhealthy living conditions. Regression analysis conducted in Croatia further confirms that financial difficulties within the family significantly predict students' mental health (27). Implementing interventions that alleviate financial burdens and support families in need has the potential to reduce students' stress levels.

In summary, the observed association between academic satisfaction, family financial status, and severe stress highlights the importance of prioritizing these factors to promote a healthier student environment. These findings underscore the significance of addressing stress, enhancing academic satisfaction, and improving family financial status among this population. Implementing interventions that target stress management and comprehensive support systems is crucial for improving the well-being of students in educational settings.

LIMITATIONS

This study's cross-sectional design necessitates considering limitations like recall bias and the inability to determine anxiety and depressive symptom incidence. Self-reporting questionnaires introduce concerns about socially desirable responses, where participants may conform to social expectations rather than truthfully express their experiences. These limitations must be considered when interpreting and generalizing the findings.

CONCLUSION AND RECOMMENDATION

In conclusion, this study significantly contributes to our comprehension of stress prevalence among high school students in the Muang District of Nakhon Ratchasima Province, Thailand. The findings underscore the need for targeted interventions and support systems that address stress management, enhance academic satisfaction, and improve family financial status. By addressing these factors, we must use multisector collaboration to collectively foster a healthier and more supportive environment for students.

It is important to note that the findings of this study are specific to the population of students attending grades 10-12 at a public school in a particular district of Thailand. Therefore, caution must be exercised in generalizing these results to other populations or educational settings. Further research is warranted to explore stress levels and associated factors in diverse adolescent populations, thus fostering a comprehensive understanding of this issue.

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INTERNATIONAL RETIREMENT MIGRATION: A CASE STUDY OF LONG STAY TOURISM IN HUA HIN, THAILAND

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ABSTRACT

Long-stay tourism and international retirement migration to Hua Hin, Thailand by Western retirees have witnessed significant growth. Understanding their experiences and the challenges they face in their long-term stays, as well as the factors influencing their choice of destination, is crucial.

This study aims to explore the life experiences of Western retirees in Hua Hin, identify the problems and obstacles they encounter during their stay, and determine the relevant factors that influence their selection of this destination.

A qualitative approach was employed, utilizing face-to-face interviews with 24 Western retirees in Hua Hin. Semi-structured interviews were conducted to gather demographic and socio-economic data, and to gain an in-depth understanding of their long-term stay experiences, including difficulties and obstacles encountered.

The findings indicate that Western retirees in Hua Hin generally enjoy a positive overall quality of life. They appreciate the city for its relaxed and easy lifestyle, friendly locals, good transport system, and affordable cost of living. Hua Hin is also perceived as a favorable location for remote work, offering amenities such as good restaurants, shopping malls, healthcare facilities, and beaches. However, security, proximity to family, location, welcoming culture, and climate were identified as the main factors influencing their choice of destination. Concerns were expressed regarding political stability, changing personal circumstances, limited land ownership, visa policies, higher cost of living, serious health issues, and pollution, which could potentially prompt them to leave Hua Hin.

This study provides valuable insights into long-stay tourism and retirement migration in Thailand. With the increasing global aging population, Thailand can enhance policies and facilities to attract more foreign retirees. Retirement agencies and communities should provide support to facilitate newcomers' relocation and adjustment processes. Hua Hin holds the potential to become a premier retirement destination for Western retirees in Thailand. The study's results offer insightful perspectives for policymakers and relevant agencies to further promote Thailand as an international retirement migration destination.

Keywords: long-stay, international retirement migration, Western retirees

INTRODUCTION

Over the past few decades, there has been a significant rise in the number of International Retirement Migrants and their destination countries have expanded beyond North and South Europe as it was previously. In the past, the migration of retirees was mostly limited to North and South Europe (1, 2). However, recent trends show that more and more retirees from Europe and North America are relocating to the Global South, and this trend is expected to persist in the coming years (3-7). In recent years, there has been a notable increase in the number of retirees from the Global North relocating to certain Southeast Asian countries, making it a global trend. Many Southeast Asian countries are positioning themselves as prime locations for international retirees (8). Southeast Asia, particularly Thailand, Malaysia, the Philippines, Cambodia, and Vietnam, has become a sought-after region for long-stay tourism and retirement migration among wealthy individuals from the Global North. Of these countries, Thailand has experienced a significant influx of international retirees, prompting the Thai government and economic developers to promote the country as an ideal retirement destination. One such initiative is the foreign retiree program, which allows participants to obtain a renewable one-year visa (9).

This paper focuses on Western seniors, who are migrating or retiring to Thailand, as this group is growing in number. This group includes individuals who enter Thailand with a long-stay visa or a special marriage visa as part of a transnational marriage, and both groups are expected to increase in the future (10). International Retirement Migration (IRM) is a crucial sector driving the Thai economy, particularly since Western retirees have high purchasing power due to income from pensions or social security, as well as savings accumulated during their working life. These IRM Westerners play a crucial role in the growth of the economy, at both local and national levels. Thus, in recent years, Thailand has taken measures to increase the number of IRM by encouraging foreign retirees to relocate to the country and supporting industries involved in retirement migration as part of national development strategies (8, 11). As such, the importance of IRM to the Thai economy cannot be overlooked.

In recent years, Thailand has become a popular destination for expatriates, particularly males, looking for a place to retire. This is due to several factors such as warm climate, low cost of living, political stability, and affordable healthcare, as well as the opportunity to experience exotic culture and lifestyle and establish late-life intimate relationships with younger local partners (4, 12, 13). Long-stay International Retirement Migration is driven by a desire for a particular lifestyle that aligns with environmental preferences such as climate, location, and scenery, which retirees perceive as an improvement in their quality of life (14). The Tourism Authority of Thailand (TAT) reported that Thailand was ranked as the best Asian country for foreigners to retire in the "2022 Annual Global Retirement Index" released by International Living in January. Thailand was also ranked as the eleventh best country to retire worldwide (15). According to the report, a single person can retire in Thailand for around US$1,000 or 33,000 baht per month, and an apartment cost around US$400 to US$500 per month or approximately 13,200 to 16,500 baht. The report also indicated that Bangkok, Chiang Mai, and

Hua Hin in Prachuap Khiri Khan Province are the top cities for retirees (16)

Hua Hin has gained a reputation as the "retirement haven" of Thailand and is considered one of the best retirement destinations in Asia by US News in May 2019. The city has an ever-growing expat population, with an estimated 3,000 to 5,000 expats and around 118,910 Thai residents. Additionally, Hua Hin receives over 1,230,000 tourist arrivals each year, a number that continues to increase (17). Many expats from Europe, especially England have retired here while others have second homes (17). Hua Hin boasts a pleasant climate with clean air throughout the year and is conveniently located just two hours south of Bangkok along the Gulf of Thailand. The city also has low crime rates, making it a safer alternative to larger cities like Bangkok or Pattaya. Facilities such as hotels, transportation, and sports activities, including some of the best golf courses in the country, are easily accessible (18, 19). Hua Hin is experiencing significant growth, particularly in the tourism and real estate sectors, and is becoming a hotspot for International Retirement Migration. It is also home to many large-scale housing and villa projects (9).

The experiences and motivations of Western retirees in choosing a long-term stay destination are of great importance to Thailand and its society. Understanding the factors that attract retirees to Hua Hin can have positive impacts on the local economy and community. As Western retirees relocate to Hua Hin, they contribute to the growth of the tourism and real estate sectors, generating income and creating job opportunities for locals. This influx of retirees with higher purchasing power also boosts local businesses and supports the development of retirement-specific services and facilities, ultimately benefiting the broader Thai society. Moreover, gaining insights into the challenges faced by Western retirees during their long-term stays allows policymakers and relevant agencies to address any potential obstacles and improve the retirement migration experience. By identifying and resolving these challenges, Thailand can enhance its reputation as an attractive retirement destination, leading to increased migration and economic benefits for the country (1).

Thailand attracts Western long-term retirees, generating significant income for the tourism industry and creating jobs. However, foreign retirees face challenges when relocating. This study aims to explore the life experiences of Western retirees in Hua Hin, identify the problems and obstacles they encounter during their stay, and determine the relevant factors that influence their selection of this destination. By gaining insight, it seeks to benefit both migrants and the host country, aiding long-term planning and economic development. Understanding their reasons for settling in Thailand will foster mutual benefits (2).

METHODOLOGY

Research Design

The primary data was collected through open-ended, semi-structured interviews with long-stay tourists or international retirement migrants in Hua Hin, Thailand, using purposive sampling to select participants who met the research criteria. Documentary data was also collected from various sources such as previous studies, research articles, and books. The collected data was analyzed and evaluated to obtain the necessary information for the research objectives.

Data Collection Process

To achieve the research objectives, a qualitative approach was used, and face-to-face interviews were conducted with 24 long-stay international retirement migrants living in Hua Hin, Thailand, between October and November 2022.

Sample Size and Choice of the Interviewees

It is important to note that this study specifically targets international retirement migrants or retired long-stay tourists, rather than encompassing long-stay tourists in general. To ensure the suitability of participants for the study, the inclusion and exclusion criteria have been set as follows:

- Aged 50 years old and older.
- Have lived in Hua Hin for 6 months or longer.
- Retired already or currently being in retirement transition.
- From Europe, North America (Canada and the United States), and Oceania (Australia and New Zealand).

The sample size of 24 participants was determined based on data saturation, a criterion commonly used in qualitative research. Data collection continued until reaching a point where additional participants would unlikely provide substantially new insights. After face-to-face interviews with 24 participants, data saturation was achieved, indicating sufficient representation of Western retirees' experiences and motivations in Hua Hin.

This study focused on Western retirees in Hua Hin, Thailand, who lived there for at least 6 months. This timeframe was chosen to ensured that participants had enough time to establish a significant and meaningful long-term experience in Hua Hin. This allowed the study to capture a comprehensive understanding of their living conditions, challenges, and perceptions during their extended stay. Moreover, the longer stay allowed retirees to immerse themselves in the local community, interact with locals, and experience the local culture deeply. This integration played a pivotal role in shaping their overall retirement experiences and motivations for choosing Hua Hin as their destination.

The study focused on retirement migrants from Europe, North America and Oceania for the following reasons. Firstly, these regions have a substantial population of retirees seeking international retirement destinations. Targeting them allowed the study to capture a significant and diverse demographic group of retirement migrants. Secondly, Europe, North America, and Oceania have demonstrated a notable inclination towards Southeast Asian countries, with Thailand emerging as a preferred retirement haven. By homing in on this specific group, the study sought to uncover the underlying factors influencing their attraction to Hua Hin. Finally, the economic impact constituted another critical aspect of the study's exploration. Retirees from these regions often enjoy higher purchasing power due to pensions, social security benefits, and accumulated savings. Understanding the magnitude of their economic contributions to Thailand's economy was of paramount importance, considering the significant role that international retirement migration plays in shaping the country's financial landscape.

Limitations

Limitations of the study include an imbalanced gender distribution, with a majority of male participants, which may limit the generalizability of the findings to female participants. Conducting interviews with individuals from diverse cultural backgrounds may lead to potential cultural misunderstandings due to differences in communication styles and language barriers. Due to these challenges, it may not always be possible to cover all relevant points during the interview without interrupting its natural flow. As such, it is crucial to focus on the primary questions and ensure that they are adequately addressed.

Data analysis

1. The researcher organized and prepared data for the analysis process. For the study, data was collected through audio-recorded interviews. The researcher meticulously organized and prepared the data for analysis by transcribing the recorded interviews and summarizing the information obtained from semi-structured interviews and field notes. The collected data underwent thorough checks to ensure accuracy and minimize bias.

2. To gain a comprehensive understanding of the collected data, the researcher carefully read through all the information. Key points from each source were captured, while any irrelevant discussions were excluded.

3. The coding process was initiated by the researcher to categorize and label the collected data. They identified broad concepts, phrases, and behaviors within the data and assigned appropriate codes to them. This coding involved capturing information such as age, gender, socio-economic status, marital status, former occupations, and even sentiments expressed in response to specific questions. These codes served as the foundation for identifying themes.

4. The researcher used narrative passages to display the findings of the analysis, thoroughly analyzed and validated the identified themes, providing a descriptive account of the analysis process. This involved discussing various themes, including sub-themes, presenting multiple perspectives from the participants, and incorporating relevant quotations or discussions that demonstrated interconnected themes.

5. In the final step, the researcher offered interpretations of the qualitative research conclusions and findings, as well as the insights gained from the study. They drew upon literature reviews, personal experiences, historical context, and other relevant sources to provide a comprehensive understanding of the research topic (20). This step allowed the researcher to extract valuable lessons from the research process.

RESULTS

In this study, the participants stayed in Hua Hin for a period of time ranging from half a year to 12 years, with an average length of stay of 3.5 years.

Table 1: Socio-demographic Characteristics of Participants

Profile	Categories and numbers				
Sex	Male			Female	
	21			3	
Age	50-59	60-69		70-79	80-89
	4	11		7	2
Education	Below Bachelor's	Bachelor's or higher		Others	
	5	15		4	
Financial status	Have enough money to enjoy life			Have to watch what they spend	
	17			7	
Marital status	Single	Married		Divorced	Widowed
(Legal)	3	11		8	2
	Have Thai partner	Married with Thai	Married with non-Thai	Have Thai partner	Have Thai partner
	2	7	4	4	1
Nationality	United Kingdoms (8), Germany (5), Australia (2), Norway (2), Denmark (1), Canada (1), the Netherlands (1), Sweden (1), Finland (1), France (1), and the United States (1)				

Long-term Stay Experience of Western Retirees

The findings of this study indicate that IRMs in Hua Hin, Thailand, have a positive overall quality of life.(See Figure 1) They appreciate the city for its relaxed and easy lifestyle, friendly people, good transport, and affordable cost of living. The city is also seen as a good place for working remotely, including good restaurants, shopping malls, health care, and beaches. The majority of participants expressed a desire to live in Thailand in their later life, with some mentioning specific locations within Hua Hin as their ideal retirement destination.

This study discovered that retirees in Hua Hin appreciate the many benefits of living in Thailand, yet they are also mindful of the potential drawbacks and are taking their options into consideration. Some participants expressed concern over issues such as political stability, personal circumstances that may change, limited land ownership, visa policies, higher cost of living, serious health problems, and pollution. These are factors that could lead retirees to leave Hua Hin.

One interesting finding is the participants' daily routine and activities. The participants engage in a variety of activities in their daily lives, such as playing golf, going to the beach, swimming, and shopping. These activities reflect the leisurely and relaxed lifestyle that many participants appreciate in Hua Hin.

Obstacles and challenges that long-stay IRMs face during their stay in Hua Hin.

The study uses a three-dimensional framework of Difficulties, Differences, and Dependencies to organize and present the findings.(see Figure 2) These obstacles and challenges have created a challenging and stressful experience for IRMs. Determining the most pressing concerns for IRMs can be challenging since priorities may vary based on individual needs and circumstances. However, a lack of social support, language barriers, differences in medical systems and healthcare services, infrastructure and cities not suitable for the elderly, visa issues, pollution, and high costs of medical treatment are all pressing concerns that must be addressed. These issues can

have a significant impact on retirees' quality of life and well-being, thus prioritizing those with the most significant impact is crucial.

The most relevant reasons influencing long-stay IRMs' choice of destination in Hua Hin.

In a study conducted with local expat communities, participants named five main reasons for choosing Hua Hin as their retirement destination (see Figure 3).

1. Security: Hua Hin's reputation as a politically and socially stable country, coupled with friendly locals and an efficient police force, provided a sense of safety for retirees.
2. Family and personal relationships: Some retirees sought a fresh start in Thailand, while others maintained connections with family members residing there. Personal relationships, including having a Thai partner, influenced their retirement decision. The desire for companionship was also a factor for those who had lost their spouses.
3. Warm and hospitable culture: The welcoming nature of the Thai people, often referred to as the "Land of Smiles," made retirees feel at home and comfortable in Hua Hin.
4. Convenient location: Hua Hin's proximity to Bangkok and international airports made it easily accessible for retirees. Its location between mountains and the seaside offered various leisure activities, such as golfing, which appealed to retirees.
5. Pleasant climate: Hua Hin's warm climate, beneficial for both physical and mental health, attracted retirees seeking a comfortable and relaxed lifestyle, particularly older individuals.

DISCUSSIONS AND CONCLUSIONS

This study and the studies conducted by Robert W. Howard (4, 12) share some similarities and differences. One similarity between the present study and Robert W. Howard's studies is that all the studies reported that Western retirees are attracted to Thailand for its low cost of living, warm climate, and the desire to live a Thai lifestyle. However, this study's findings diverge from those of Howard (4) which suggested that individuals migrated to Thailand primarily to find sexual partners. Contrarily, the majority of Western retirees in Hua Hin did not move there with the objective of finding attractive partners. Nonetheless, social interaction with the local community remained significant, although it was less important than retirement, given that almost half of the respondents had no pre-existing connections with Thailand. Moreover, this study found that retirees residing in Hua Hin are financially stable, relying on their pensions, savings, and investments to sustain their daily expenses. However, the participants acknowledged that a rise in the cost of living could potentially compel them to consider relocating to more affordable locations which is similar to previous studies by Howard (4, 12).

The findings indicated that Western retirees in Hua Hin generally enjoy a positive overall quality of life. This study revealed that Western retirees in Thailand generally view Thai people as friendly, but with a concern for money. However, they also expressed some negative views about certain Thai men who they perceive as lacking manners. Additionally, some Western retirees feel that Thais do not hold them in high regard and only view them as a source of financial gain.

This study suggests that it would be beneficial for potential retirees to have basic knowledge of Thai culture and language before moving, and the Thailand should not only focus on economic benefits when attracting retirement migrants, but also provide cultural education and language courses. This study revealed a notable trend among Westerners, indicating a lack of substantial interest in learning the Thai language, despite its potential to greatly enhance their integration into the local community. It is unfortunate that a significant portion of Western individuals do not display a strong inclination towards undertaking the endeavor of learning Thai. However, within this broader context, a smaller subset of individuals stands out for their willingness to embrace the challenge and devote their time and effort to becoming proficient in the Thai language.

Retirees residing in Hua Hin, face a plethora of obstacles during their extended stay, but these challenges have not left them feeling negative. Instead, they have developed a profound understanding of life and its difficulties, which has helped them to navigate their retirement years with greater resilience and positivity. Despite the challenges they encounter, many retirees in Hua Hin would still choose to reside there, as it offers a warm climate, stunning scenery, affordable cost of living, and numerous leisure activities.

However, retirees in Hua Hin also face various difficulties, such as language barriers, cultural differences, and access to healthcare. Yet, their experiences have taught them the significance of simple things in life and the importance of human connections. By forming close bonds with their peers, they have created a supportive community that helps them navigate the challenges of retirement living. Retirees living in Hua Hin have impressively developed their own set of coping mechanisms to overcome the obstacles they face in their new home. For instance, they adeptly adapt to higher living costs by seeking out cheaper food options or adjusting their lifestyle to better suit their budget. Additionally, they have cleverly become resourceful by utilizing translation apps on their mobile devices or enlisting the help of friends or locals when encountering language barriers. Their resilience and positive attitudes have helped them navigate challenges with grace and adaptability. Furthermore, retirees often turn to Facebook groups to share their problems or obstacles, asking for suggestions or answers from fellow retirees in the community. Overall, these retirees have demonstrated a remarkable ability to embrace the challenges of their new lifestyle with an optimistic and proactive approach.

Although retirees in Hua Hin have developed strategies to overcome many of the obstacles they face, there are some problems that require the support of local authorities to make the necessary changes and improvements. These may include issues related to infrastructure, healthcare, and government policies. In such cases, retirees often rely on their community and advocacy groups to raise these issues and work towards finding affordable solutions that benefit everyone. Through their efforts, they have become an integral part of the local community and have helped to make Hua Hin a more welcoming and accommodating destination for retirees.

If given the opportunity to turn back time, many retirees in Hua Hin would still choose to live there during their retirement years. Their experiences have taught them valuable life lessons, and they have found a sense of purpose and fulfillment in their new home. They have become part of a vibrant community, made new friends, and learned to embrace new challenges with a positive attitude. Hua Hin is not just a retirement destination, but a place where they have found a new way of life.

RECOMMENDATIONS

In conclusion, this research highlights the significance of this phenomenon and its potential impact on the destination. The findings suggest that implementing specific policies and regulations for long-stay tourists and international retirees, along with strengthening social support, addressing language and cultural barriers, improving healthcare access, enhancing infrastructure, and addressing environmental issues, can significantly enhance the retirement experience in Hua Hin. Streamlining visa and residency processes, establishing support services for elderly residents, and promoting cultural activities are also crucial steps.

These recommendations aim to create a more attractive and supportive environment for long-stay tourists and international retirees, ultimately contributing to the sustainable development of Hua Hin as a retirement destination.

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ASSOCIATION STUDY OF POLYMORPHISMS IN DRUG METABOLIZING ENZYME AND DNA REPAIR GENES WITH CISPLATIN-INDUCED NEPHROTOXICITY IN THAI CANCER PATIENTS

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ABSTRACT

Cisplatin, a widely used anti-cancer drug often leads to nephrotoxicity, commonly manifested as Acute Kidney Injury (AKI), which may result in either delayed or terminated treatment. The incidence of AKI among Thai head & neck cancer patients is reported as 13.4%. Frequency, duration and dosage of cisplatin are known risk factors of cisplatin-induced nephrotoxicity (CIN). Clinical criteria to define AKI varies among prior studies, leading to discrepancies in the reported outcomes. Effects exerted by cisplatin may result from genetic variability, such as Single Nucleotide Polymorphisms (SNP), in drug metabolizing, transport and DNA repair genes. Identifying such biomarkers would benefit clinicians to plan a more patient-specific treatment program.

The objective of this study was to identify the validation of probable SNPs related to cisplatin-induced nephrotoxicity in Thai head and neck, lung and esophageal cancer patients.

Cancer patients of age ≥ 18 years who were treated with cisplatin at Ramathibodi hospital, Thailand, between 2016-2020, and had blood samples stored at Ramathibodi tumor biobank were recruited. A total of 103 patients were included; 84 head and neck, 17 lung and 2 esophageal cancer. These patients were categorized based on the Kidney Disease Improving Global Outcome (KDIGO) staging for AKI. SNPs were selected based on the criteria of having significant association(s) in prior studies and a minor allele frequency (MAF) of ≥5% in Thai population. Subsequently, SNPs in SLC22A2 (rs316019), EPHX1 (rs1051740), ERCC1 (rs11615 & rs3212986) and ERCC2 (rs13181 & rs1799793) were assessed for CIN association. Genotyping was performed using TaqMan SNP genotyping assays. Patient demographics were compared by Fisher's exact test, whereas SNP

associations were assessed by logistic regression using additive genetic model in patients with and without AKI. Overall survival was also performed in AKI and Non-AKI groups. $P < 0.05$ was considered statistically significant.

Out of 103, 4 (3.9%) patients developed AKI. Histopathology and cancer type were significantly associated with AKI. Association analysis could only be performed using additive model in EPHX1 rs1051740 and ERCC1 rs11615 & rs3212986. No significant association was found. In overall survival, no significant difference was observed between the AKI and Non-AKI groups (P=0.549).

There was no association between these 3 SNPs and cisplatin-induced AKI in Thai cancer patients. Lower-than-expected AKI incidence in our cohort may reflect recent improvements in clinical management efficiency of cisplatin-induced AKI at our institute. Larger cohorts are required to identify whether there is any association.

Keywords: Cisplatin, Nephrotoxicity, AKI, KDIGO, SNP

INTRODUCTION

Cancer is one of the leading cause of deaths globally (1), where approximately 70% of cancer deaths occurs in the low- and middle-income countries (2). Cisplatin is amongst the most widely used drugs for various solid tumor treatments. Cisplatin toxicity is an important factor which influences the patient's treatment plan. Cisplatin-induced nephrotoxicity (CIN) is triggered through multiple mechanisms including DNA damage, inflammation, oxidative stress, and apoptosis. Cisplatin accumulates in the renal proximal tubules, causing histopathological changes and an increase in the nephrotoxicity markers such as serum creatinine (3).

Nephrotoxicity is a functional decline of the kidney owing to toxic effects exerted by certain chemicals and medication. Types of nephrotoxicity vary, since different medications may affect the kidney function in multiple ways (4). Usually it develops 10 after cisplatin administration, and varies according to the frequency, duration, and cumulative dose. Reportedly, cisplatin concentration is five times increased in kidney as compared to blood (5). Most common manifestation of nephrotoxicity is Acute Kidney Injury (AKI), observed in 20 - 30% of the patients. A retrospective study at Ramathibodi Hospital reported 68 (13.4%) out 509 cisplatin-treated locally advanced head and neck squamous cell carcinoma (HNSCC) patients developed AKI (3).

Nephrotoxicity is defined using many different grading criteria's in prior studies, causing differences in the reported outcomes. Most commonly used criteria include Common Terminology Criteria for Adverse Events (CTCAE), Risk, Injury, Failure, Loss, end-stage (RIFLE) kidney disease criteria and Kidney Disease Improving Global Outcome (KDIGO) staging. Additionally, certain patient-related factors may also increase the risk of developing nephrotoxicity, such as gender, comorbidities, nutritional status and use of concurrent drugs (6). Biomarkers to detect AKI exist, but their use in clinic is limited because of less sensitivity to detect mild cases (7). Therefore, there is a need to identify pharmacogenomics-based biomarkers using polymerase chain reaction (PCR), SNP microarray and/or DNA sequencing, which can allow early identification of patients prone to develop this toxicity (3)

Single Nucleotide Polymorphism (SNP) is a simple variation in DNA present among individuals, with a frequency of more than >1% in a particular population. They might have a role in drug response differences amongst cisplatin-treated patients (8). Hence, identifying genetic variation in drug metabolism, transport, and DNA repair genes would allow differentiation of patients, having an increased risk of cisplatin-induced nephrotoxicity. Therefore, we aim to validate probable SNPs related to cisplatin-induced nephrotoxicity in Thai head and neck, lung and esophageal cancer patients.

METHODOLOGY

Patient Selection

HNSCC, lung and esophageal cancer patients of age ≥ 18 years who were treated with cisplatin at Ramathibodi hospital, Thailand, between 2016-2020, and had blood samples stored at Ramathibodi tumor biobank were recruited. Patients having prior kidney diseases but eligible to receive cisplatin-administration were excluded. To evaluate

SCr, laboratory values which were closest or within 30 days period before cisplatin initiation were deemed as a baseline cutoff. In total 103 patients were identified; 84 HNSCC, 17 lung and 2 esophageal cancer. Selected patients were further categorized based on the Kidney Disease Improving Global Outcome (KDIGO) criteria, where an increase in SCr by 50% within 7 days or 0.3 mg/dl (26.5 µmol/l) within 2 days or oliguria is considered as AKI. Out of 103 total patients, 4 were identified as AKI cases and 99 non-AKI cases were defined as controls **(Figure 1)**.

Data obtained from various databases of Ramathibodi hospital was verified by medical oncologists. Informed consents were obtained from all patients. This study was approved by the Human Research Ethics Committee, Faculty of Medicine Ramathibodi Hospital, Mahidol University, in compliance of the Declaration of Helsinki, protocol number COA. MURA2020/1109.

SNP Selection

Review of previous literatures showed SNPs associated with cisplatin-induced nephrotoxicity **(Figure 2)**. Selection of SNPs was based on positive associations in case-control studies (9) and a systematic review (10) in addition to minor allele frequency (MAF) of ≥5% in Thai population. Accordingly, genetic variation in *SLC22A2* (rs316019) and *EPHX1* (rs1051740) drug metabolizing genes as well as DNA repair genes *ERCC1* (rs11615 & rs3212986) and *ERCC2* (rs13181 & rs1799793) were selected to assess CIN. Thai population MAF was confirmed from Thai Reference Exome Database (T-REx) (accessed on 25th February 2022) (11).

Genotyping

Genomic DNA (gDNA) was extracted by Gene All™ (Roche life sciences, Switzerland) and GF-1 Blood DNA Extraction Kit (Vivantis Technologies, Malaysia), according to manufacturer's recommendation. Quantification was performed using Nanodrop^s spectrophotometer (ThermoFisher Scientific™, USA) and then gel electrophoresis on 1% agarose. Subsequently, genotyping was performed using TaqMan SNP genotyping assays as directed in manufacturer's protocol. Taqman probe ID of selected SNPs are: *SLC22A2* (C__3111809_20), *EPHX1* (C__14938_30), *ERCC1* (C__2532959_20), (C__2532948_10), *ERCC2* (C__3145033_10) and (C__3145050_10). ViiA™ 7 Real-Time PCR system (Applied Biosystems, USA) was used for genotyping and analysis of allelic discrimination plots.

Statistical Analysis

Patient demographics and clinical factors were compared between AKI and No-AKI groups using Fisher's exact test whereas SNP association was assessed by logistic regression using additive genetic model.

Survival analysis focused only on overall survival (OS), where it was defined as the time from cancer diagnosis till death due to any cause or patient's last follow-up. To assess survival difference between AKI and No-AKI groups, Kaplan-Meier method and log-rank test were employed. $P < 0.05$ was considered statistically significant. Statistical analysis was performed on STATA 14.0 (College Station, TX: StataCorp LP).

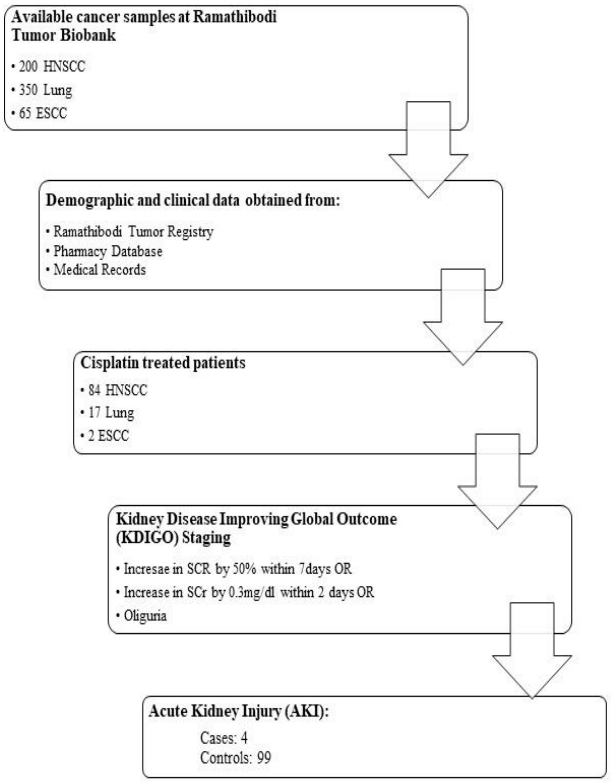

Figure 1: Patient selection flow chart

Gene	SNP	Reference	OR	Risk genotype	Population	Cancer type	Outcome
SLC22A2	rs316019	Filipski et al., 2009	N/A	GG	Caucasian (EUR)	N/A	% change in serum creatinine
		Iwata et al., 2012	N/A	GG	Asian	Various	Increase of SCr
		Zhang J. et al., 2012	N/A	GG	Asian	Various	Increase of SCr & change in cystatin C
		Chang et al., 2017	N/A	GG	Caucasian (EUR)	Various	Fold changes in protein biomarkers
		Zazuli et al., 2019	4.41	AA/AC	Caucasian	Testicular	CTCAE v4.03
		Driessen et al., 2019	3.78	GT/TT	Caucasian (EUR)	HNSCC	Decrease of 25% or more in creatinine clearance
EPHX1	rs1051740	Khrunin et al., 2014	9.524	CT	Caucasian	Ovarian	Grouped into grade 0 vs 1-4
ERCC1	rs11615	Khrunin et al., 2010b	2.51	TC	Caucasian	Ovarian	CTCAE > grade 0
		Tzvetkov et al., 2011	N/A	TC	Caucasian	Various	Change in eGFR
		Eugene et al., 2014	N/A	CC	Asian	Lung	Any level of renal dysfunction (RIFLE)
	rs3212986	Khrunin et al., 2010b	3.29	CA	Caucasian	Ovarian	CTCAE > grade 0
		Tzvetkov et al., 2011	N/A	CA	Caucasian	Various	Change in eGFR
		Zazuli et al., 2019	0.45	CC	Caucasian	Testicular	CTCAE v4.03
ERCC2	rs13181	Goekkurt et al., 2009	2.27	TC	Caucasian	Gastric	Not defined
		Windsor et al., 2012	N/A	AC/CC	Caucasian	Osteosarcoma	Change in eGFR
		Windsor et al., 2012	4.4	AC/CC	Caucasian	Osteosarcoma	CTCAE > grade 0
		Powrozek et al., 2016	0.07	AA/AC	Caucasian	NSCLC	CTCAE > grade 1
		Lopes-Aguiar L et al., 2016	3.55	AC/CC	Caucasian	HNSCC	CTCAE v.4.0
	rs1799793	Goekkurt et al., 2009	2.27	TC	Caucasian	Gastric	Not defined

Figure 2: Selected studies showing association of selected SNPs related to cisplatin-induced nephrotoxicity

RESULTS

Patient Characteristics

Patient characteristics and clinicopathological data are shown in **Table 1**. Incidence of AKI was 4 (3.9%) out of 103 patients. Mostly, AKI was present in Age <65.0; 85 (82.5%) with males 66 (64.1%) whereas females were 37 (35.9%). Stage (III-IV) was at a higher frequency 84 (81.6%). HNSCC had a higher frequency of patients 84 (81.6%). Among comorbidities, before cisplatin administration, hypertension was present in 27 (26.2%), with diabetes found in 8 (7.8%). Heart and cerebrovascular diseases were 8 (7.8%) and 7 (6.8%) respectively. Histopathology and HNSCC were found to be associated with AKI, P=0.034 and P=0.020, respectively.

Table 1: Clinical characteristics of cisplatin treated patients *Statistically significant *P* value < 0.05. HNSCC, Head & Neck Squamous Cell Carcinoma. *P* values calculated by Fisher's exact test

Patient Characteristics	Total (%) (n=103)	AKI (%) (n=4; 3.9%)	No AKI (%) (n=99; 96.1%)	*P*
Age				
≥ 65.0	18 (17.5)	0	18 (18.2)	1.000
< 65.0	85 (82.5)	4 (100)	81 (81.8)	
Sex				
Male	66 (64.1)	1 (25.0)	65 (65.7)	0.131
Female	37 (35.9)	3 (75.0)	34 (34.3)	
Histopathology				
Squamous Cell carcinoma	80 (77.7)	1 (25.0)	79 (79.8)	**0.034***
Non-Squamous Cell Carcinoma	23 (22.3)	3 (75.0)	20 (20.2)	
Stage				
I - II	19 (18.4)	1 (25.0)	18 (18.2)	0.564
III - IV	84 (81.6)	3 (75.0)	81 (81.8)	
Cancer Type				
HNSCC	84 (81.6)	1 (25.0)	83 (84.0)	**0.020***
Lung	17 (16.5)	3 (75.0)	14 (14.0)	
Esophageal	2 (1.9)	0	2 (2.0)	
Comorbidity				
Hypertension				
Yes	27 (26.2)	1 (25.0)	26 (26.3)	1.000
No	76 (73.8)	3 (75.0)	73 (73.7)	
Diabetes				
Yes	8 (7.8)	0	8 (8.1)	1.000
No	95 (92.2))	4 (100.0)	91 (91.9)	
Heart Disease				
Yes	8 (7.8)	0	8 (8.1)	1.000
No	95 (92.2)	4 (100)	91 (91.9)	
Cerebrovascular				
Yes	7 (6.8)	0	7 (7.1)	1.000
No	96 (93.2)	4 (100)	92 (92.9)	

Association analyses between SLC22A2, EPHX1, ERCC1, and ERCC2 SNPs and AKI

Genetic association analyses were performed in the successfully genotyped 103 patient samples using logistic regression. No significant deviation from Hardy-Weinberg Equilibrium (HWE) was observed in the control group. Additive model was successfully applied on the SNPs of *EPHX1* rs1051740 OR 0.402, 95% CI 0.087 – 1.859; *P*=0.244, *ERCC1* rs11615 OR 0.645, 95% CI 0.124 – 3.348; *P*=0.602 and *ERCC1* rs3212986 OR 0.712, 95% CI 0.145 – 3.476; *P*=0.675. Model was then adjusted with Age and Sex which yielded *EPHX1* rs1051740 OR 0.392, 95% CI 0.080 – 1.910; *P*=0.247, *ERCC1* rs11615 OR 0.343, 95% CI 0.050 – 2.335; *P*=0.274 and *ERCC1* rs3212986 OR 0.679, 95% CI 0.117 – 3.922; *P*=0.666. No significant association was observed in both adjusted and non-adjusted models. *SLC22A2* rs316019 and *ERCC2* rs13181 & rs1799793 did not yield any results in both adjusted and non-adjusted models **(Table 2)**.

Table 2: Association between selected genetic polymorphisms and acute kidney injury (AKI).

SNP	Genotype Frequencies			OR (95% CI)	*P*	OR (95% CI) *Adj*	*P Adj*
***SLC22A2* (rs316019)**	CC	CA	AA	NA	NA	NA	NA
Non-AKI	78	19	2				
AKI	4	0	0				
	CC	CT	TT	0.402 (0.087 -		0.392 (0.080 -	
***EPHX1* (rs1051740)**				1.859)	0.244	1.910)	0.247
Non-AKI	15	53	31				
AKI	2	1	1				
	GG	GA	AA	0.645 (0.124 -		0.343 (0.050 -	
***ERCC1* (rs11615)**				3.348)	0.602	2.335)	0.274
Non-AKI	43	45	11				
AKI	2	2	0				
	CC	CA	AA	0.712 (0.145 -		0.679 (0.117 -	
***ERCC1* (rs3212986)**				3.476)	0.675	3.922)	0.666
Non-AKI	47	40	12				
AKI	2	2	0				
***ERCC2* (rs13181)**	TT	TG	GG	NA	NA	NA	NA
Non-AKI	81	17	1				
AKI	4	0	0				
***ERCC2* (rs1799793)**	CC	CT	TT	NA	NA	NA	NA
Non-AKI	86	11	2				
AKI	4	0	0				

Association analysis was performed by logistic regression using additive model. Left panel: unadjusted OR was calculated between AKI outcome and SNP. Right panel: model was then adjusted with age and sex. OR, Odds Ratio. 95% CI, 95% Confidence Interval. *P*-Adj, Adjusted *P* value, * statistically significant *P* value < 0.05. NA = Not Applicable: there was too little variability among the genotype frequencies, hence the OR and CI could not be computed.

Comparison of survival between cancer patients with and without cisplatin-associated AKI

Survival analysis was performed for overall survival in patients having AKI and No-AKI by Kaplan-Meier method. At a median follow-up of 3.24 years, no significant difference was observed between the two groups. Log-rank *P*=0.549 **(Figure 3)**.

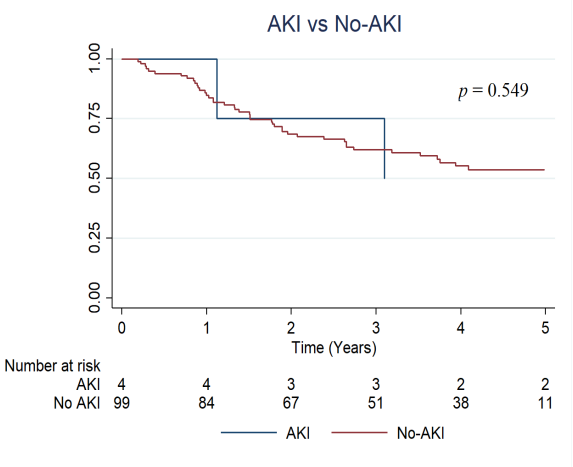

Figure 3: Survival curves depicting overall survival of patients with and without cisplatin-associated acute kidney injury (AKI). The median follow-up time was 3.24 years.

DISCUSSION

In this study, we aimed to analyze association of SNPs in drug metabolizing enzymes and DNA repair genes with cisplatin-associated AKI. As shown in previous reports, *SLC22A2* rs316019, *EPHX1* rs1051740, *ERCC1* rs11615 and rs3212986, *ERCC2* rs13181 and rs1799793 were significantly associated with AKI. Though the association results varied mainly due to differences in the population being studied, sample size, and CIN defining criteria. No association was observed between the reported SNPs and AKI in our study. One of the possible explanations is the small number of patients with AKI in our cohort. Owing to the low number of AKI patients, logistic regression analyses of each SNP based on the 4 genetic models; co-dominant, dominant, recessive, and over-dominant, could not be calculated. Hence, only additive model was successfully applied on the SNPs of *EPHX1* and *ERCC1* gene, while SNPs of *SLC22A2* and *ERCC2* were unable to yield any observation.

SNPs in the *ERCC1* and *ERCC2* genes, are part of nucleotide excision repair pathway that are linked to changes in the process of DNA repair. They may cause a decrease in the helicase activity and DNA repair. *ERCC1* plays a role in incising the DNA damage site and can cause a rate-limiting effect. *ERCC2* on the other, is involved in helicase unwinding the DNA at damaged site. Therefore, mutation in the SNPs may reduce the efficiency of DNA repair mechanisms thus allowing damage to occur upon cisplatin exposure and increased formation of platinum-DNA adducts. It is assumed that upon cisplatin exposure nephron repair would be hindered.

One of the widely studied SNP in *EPHX1* gene is the rs1051740 (337T>C) that leads to a substitution of tyrosine to histidine at position 113, which results in 40% decreased enzyme activity (12). Decreased enzymatic activity may reduce the detoxification process eventually increasing the formation of highly reactive metabolites, making the cells more susceptible to challenges. A study by Khrunin AV et al. 2014 showed rs1051740 to be associated with cisplatin induced nephrotoxicity in ovarian cancer patients. However, the nephrotoxicity criteria were not adequately defined (9).

SLC22A2 gene encodes for the Organic Cation Transporter, which is one of the transporters, that facilitates influx of cisplatin in the cell along with Ctr1. Polymorphism in this transporter enzyme may lead to an increased accumulation of cisplatin in the kidney cells. Hence, it may lead to an increased renal toxicity.

Patients studied in Thai population for AKI showed 13.4% incidence in head & neck cancer, where patients were retrospectively selected from 2007-2018, while 54.5% among Caucasians. AKI incidence in Lung cancer patients was 17.4% in Asians and 29.5% in Caucasians (3,13-15).

Patients enrolled in our study were from 2016-2020. In HNSCC and lung cancer patients, AKI was developed in 1/84 (25%) and 3/17 (75%), respectively. No AKI was observed in esophageal cancer patients. One of the possible reasons for lower AKI incidence in our cohort may be due to efficient clinical management of such patients at present; based on new clinical evidences, enhanced protocols and hydration therapies. Perhaps the previous treatment protocols might have comprised of higher and/or frequent cisplatin doses, which may have played a role in higher incidence of cisplatin-induced nephrotoxicity. Recently, it has been shown that the frequency, dosage and duration of cisplatin administration is a major risk factor for nephrotoxicity in cisplatin treated patients, where nephrotoxicity is mainly defined as AKI (3).

AKI develops within 7 days of cisplatin administration, it may be reversed or controlled by magnesium supplementations or mannitol-induced forced diuresis (16). It is recommended that patients undergoing cisplatin treatment, should be given short-duration hydration (17). A recent prospective pilot study in Thai head & neck cancer patients demonstrated that magnesium pre-loading and lower cisplatin dose weekly, reduces cisplatin nephrotoxicity (18). Therefore, effective personalized treatment plans, post-chemotherapy care, improved nutritional guidelines and increased attention of clinicians towards this problem, may have reduced the overall AKI incidences in our institute.

In our medical center, AKI was determined by the KDIGO staging, which considers serum creatinine (SCr) and oliguria as an endpoint (19). Another possibility of lower AKI incidence in our cohort could be the defining criteria. Previously, studies comparing cisplatin-induced nephrotoxicity outcomes using multiple definitions have shown that the AKI incidences differ within the same datasets.

The foremost reason of this variation is the different combination of clinical parameters defined in each AKI criteria. SNPs analyzed in our study were more commonly investigated with the CTCAE

or RIFLE criteria. In testicular cancer patients, different definitions resulted in varied outcomes. *SLC22A2* rs316019 and *ERCC1* rs3212986 were found to be significantly associated with increased and decreased risk of cisplatin-induced nephrotoxicity, respectively, when CTCAE v4.03 was applied; however, no association was found using other CIN criteria (20). Similarly, in a study by Torso et al 2023, more AKI cases in HNSCC were identified when using RIFLE as compared to Acute Kidney Injury Network (AKIN). The same study compared RIFLE and AKIN criteria with KDIGO classification, and found that KDIGO identified fewer AKI cases (21). These differences may occur because RIFLE also considers glomerular filtration rate (GFR) decrease in addition to serum creatinine (22). AKI can be developed in cancer patients due to factors other than cisplatin itself such as nutritional deficiencies, radiation dyes and use of concurrent medications. Therefore, for a better diagnosis of cisplatin induced AKI, defining criteria in conjunction with other markers of renal damage, may prove to be a better approach (23).

Previously, studies have reported female gender to be a risk factor for cisplatin-induced nephrotoxicity, where women had twice the risk of CIN as compared to men (24). Asian females in the perimenopausal stage (45–55 years) showed a significantly increased risk of developing CIN. Sex steroids such as estradiol might have a role in the gender-based difference as it is at a higher level in this stage (25). Existence of comorbidities like hypertension, diabetes mellitus and cancer stage are linked to an increased nephrotoxicity incidence in females (26). Reason for this gender-based difference could be a lower muscle mass and Organic Cation Transporter 2 (OCT2) levels in women as compared to men. OCT2 is a transporter of cisplatin in the renal proximal tubule and this difference may lead to an increased clearance of platinum compounds in men, and retention in women resulting in a higher CIN risk (27). Since our study cohort had lower number of female patients (35.9%), this may be another reason of observing lower AKI incidence.

CONCLUSION

Our results may indicate that the clinical management of cisplatin-treated patients have improved to a great extent. Investigations of these SNPs in combination with multiple AKI staging criteria and urinary markers in a larger prospective study cohort should be conducted to confirm whether there are any association with cisplatin-induced AKI.

LIMITATIONS

Small sample size and retrospectively identified patients posed to be a major limitation. Due to small number of AKI patients, we were unable to achieve the appropriate statistical power and not enough frequencies were observed in each genotype, resulting in no observations when logistic regression analyses were applied. There were many unavailable patient-related and clinical parameters that were not taken into consideration due to retrospective nature of the study.

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CAREGIVER BURDEN AMONG COMMUNITY CAREGIVERS OF DEPENDENT ELDERLY IN LONG-TERM CARE SYSTEM: A CROSS-SECTIONAL STUDY IN THAILAND

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ABSTRACT

The phenomenon of population aging affects countries worldwide, including Thailand. Consequently, there is an increasing need for long-term care (LTC) services to support older people who experience dependence. Notably, Thailand has developed a unique community based LTC system that involves formal caregivers in the community to provide care for the dependent elderly. To improve their support and LTC system in Thailand. It is essential to assess caregiver burden in order to better understand the current level of their burden.

The study aimed to determine the level of caregiver burden among community caregivers in LTC system in Thailand. A cross-sectional study was conducted in May–June 2023 using a stratified random sample according to a probability proportional-to-size of total caregivers who provided LTC services for dependent elderly in 76 provinces throughout Thailand. A self-administered online questionnaire was distributed to examine socio-demographic characteristics and the Zarit Burden Interview (ZBI) was used to assess the level of burden among community caregivers. All data collected were analyzed by descriptive statistics.

A total of 409 community caregivers were analyzed in this study. The majority of respondents were female (94.4%), aged 45-59 years old (67.2%), graduated from secondary school (70.6%), married and living together (67.5%), and worked in farming or gardening (61.4%). Half of respondents reported their personal income was less than 5,000 baht (51.1%) and perceived income inadequacy (54.8%). About 22.5% of respondents have reported experiencing a caregiver burden, of which 19.1% experienced a low level of burden while the remaining were with a moderate level of burden. When categorized across four dimensions, nearly half of all community caregivers perceived a moderate level in the dimension of guilt (49.2%), attitude (48.7%), and personal strain (46.0%). Whereas a large majority of participants (76.8%) reported a had not perceived burden in privacy conflict dimension.

This study indicated that community caregivers in Thailand's LTC system are experiencing a burden in caring for dependent elderly mostly at a low level. However, the moderate perceived burdens on guilt, attitude, and personal strain were observed among them, implying that these burdens may negatively impact their lives and should be further examined. These findings could help guide government sector to develop policies and interventions aimed at prevention and coping with caregiver burdens, particularly in addressing stress and fostering positive attitudes, in the near future when the demand for LTC services increases due to the aging society phenomenon.

Keywords: Caregiver burden, Dependent elderly, Long-term care, Community caregivers

INTRODUCTION

The phenomenon of population aging affects countries worldwide, with estimates projecting a doubling of the elderly population to 2.1 billion by 2050. Several countries in Asia are already facing aging societies, including Thailand, where the proportion of elderly individuals has steadily risen from 6.8% in 1994 to 19.6% in 2021. By 2023, Thailand is expected to become a complete-aged society, with the elderly comprising more than 20% of the total population. However, if the current demographic trends persist, Thailand will likely enter a super-aged society within the next 20 years, with over 31% of the population being 60 years or older (1, 2). Accompanying with population aging, life expectancy has increased in part due to the success of public health measures. The current average life expectancy in Thailand stands is about 77.0 years, with men at 73.5 and women at 80.5(1). The growing number of elderly people along with additional demand on healthcare, social services, and long-term care, particularly for those with chronic illnesses, leading to higher healthcare expenses and potentially lower quality of life (1, 3). The Health Data Center (HDC), Ministry of Public Health (MOPH), Thailand in 2021 shown that the elderly in active aging group was 96.8% (Activities of daily living scale or ADL greater than 11), homebound elderly group was 2.6% (ADL 5–11), and bedridden elderly group was 0.6% (ADL 0–4) (4). According to a study that assumed that 2 - 25 % of people with severe dependency would be admitted into long-term care institutions, the cost of institutional long-term care in 2009 was estimated to be 908 - 11,354 million Baht, and will be increasing to 2,766 - 34,573 million Baht in 2024(5).

In 2016, Thai government launched a long-term care (LTC) policy to improve the quality of life of bedridden and homebound elderly people via a case management system. LTC system is part of the strategy of integrating health and social services through promoting community based LTC that is widely available using a home-based care model. All the benefits of LTC policy are supported by a public funding through the National Health Security Office (NHSO), which is further allocated to the Local Administrative Organizations (LAOs) as a local fund. The LAOs will pay for the services based on benefit packages within a limited budget per person. These services are usually provided by the local health care units under MOPH that offer a proactive service at home according to a care plan for dependent elderly (6, 7).

The key workforce in LTC system as such home visits and providing care for dependent elderly are care managers, who have the main responsibility for the management and coordination. Until now, there were 15,114 persons who have completed training and registered. Another key player are community caregivers who have an essential role in fulfilling the care needs for bedbound or homebound elderly in the individual care plan, which have now 94,968 persons been registered (1). Community caregivers are a formal type of paid but non-professional caregiver that is most often recruited from village health volunteers. They are supervised by a care manager with allocated care plans for 5–10 dependent elderly per person and receive compensation after submission of the monthly care report (8).

Although the fact that in Thai culture, most of the care for elderly people is commonly provided by their family member (9), they are not adequate for meeting the needs of the elderly population in the country, particularly the dependent elderly requiring care. Community caregivers serve as an additional assistance for this vulnerable group; however, this role of caring could bring some negative impacts to them. In Thailand, 80.15% of caregivers for elderly dependents experienced a burden of care (10) and in Singapore, 71.8% of caregivers of older adults reported caregiver burden (11). Community caregivers under LTC system may also face some difficult situations when caring the elderly patients, leading to some potential burden that may cause unwanted changes in the quality of caregiving and the number of caregivers in the future. However, since launching the LTC system in Thailand, this issue has not been adequately examined, while the most previous studies have primarily focused on the burden experienced by family caregivers. Therefore, this study aimed to determine the level of caregiver burden among community caregivers of dependent elderly in the Thailand's LTC system, in order to provide the necessary information to understanding and help sustain the LTC system in Thailand.

METHODOLOGY

Target population and setting

The study was conducted from May to June 2023, using a cross-sectional design. The study focused on sub-district (Tambon) areas across all provinces of Thailand, excluding Bangkok, which were part of the LTC system. The selected participants were community caregivers providing care for dependent elderly. The eligibility criteria included being a caregiver in the LTC system, completing at least 70 hours of caregiver training, having assigned care responsibilities with a care plan, having internet access to complete an online survey, and not caring for dependent family members.

Sample size estimation and Sampling Technique

The sample size was calculated using a 95% confidence interval, based on a total of 73,460 community caregivers who met the criteria, using the Yamane formula (12). As a result, the study required approximately 398 participants, with an additional 10% (40 persons) who refused to participate in this research. Therefore, the total sample size was determined to be 438 participants.

A stratified random sampling technique was used to obtain a representative sample by employing the sampling command in the SPSS program to randomly select community caregivers from a list, with selection probability proportional to the size of caregivers in each province.

Measurement Tools and Data collection method

The self-administered questionnaire in the Thai language was distributed to community caregivers through an online survey channel, facilitated by care managers who directly supervised participants in each LTC area. These care managers ensured that participants received a link to access online questionnaires. Additionally, they provided clear instructions on how to accurately complete the questionnaire. If there were any gaps about the accuracy of the questionnaire responses. The researcher will contact participants directly by phone for clarification.

The questionnaires in this study were included 2 parts as following:

The sociodemographic characteristics included age, gender, education, marital status, number of children, personal income, family income, and living status.

Caregiver burden utilized The Zarit Burden Interview (ZBI-Thai version) which has been developed by Toonsiri et al. (13) with Cronbach alpha coefficient was 0.92. This tool evaluated through 22 questionnaires that measure on a 5-point Likert scale that ranged from "never" (0 points) to "always" (4 points). The scores were classified into four burden levels: no burden (0-20), low burden (21-40), moderate burden (41-60), and high burden (61-88). Additionally, it includes the following multidimensional caregiver burden designed to capture aspects: personal strain (items 1, 2, 3, 4, 5, 6, 9, 10, 16), privacy conflict (items 11, 12, 13, 17), guilt (items 7, 8, 14, 15, 22), and uncertain attitude (items 18, 19, 20, 21).

Data analysis

The analysis was performed using SPSS software version 26. Descriptive statistics were used to analyze sociodemographic information and the level of caregiver burden, which included frequency, percentage, mean, and standard deviation. The caregiver burden dimensions (personal strain, guilt, and uncertain attitude), the interquartile range (IQR) was used to classify perceived burden into three level: scores ≤ Q1 as low level, scores between Q3 and Q1 as moderate level, and scores > Q3 as high level. For privacy conflict, it was classified into two levels; have not perceived = 0 points and have perceived > 1 points, as 76.8 % of respondents had zero score for this dimension.

RESULTS

Caregiver's sociodemographic characteristic

All of 438 sample population responded to the questionnaire, however 29 participants were excluded as they also have responsibility for caring their dependent elderly family members. A total of 409 community caregivers have been analyzed in Table 1. Their average age was 51.3 years old (ranged from 23 to 78), and age between 45-59 years old comprises the largest proportion at 67.2%. Nearly all respondents were female (94.4%), with around two-thirds was secondary school students (70.6%). 35.5% of respondents reported having two children, and about two-thirds (67.5%) were married and living together. The most common living status was resided with their married partners and children (65.3%). Among the income, half of respondents reported earning less than 5,000 baht (51.1%), and perceived income inadequacy (54.8%). In terms of family income, nearly half (45.2%) reported having an income of less than 10,000 baht, while 53.3% considered their income to be sufficient.

Table 1: Percentage of community caregiver by sociodemographic characteristic

Characteristics	Frequency	Percent (%)
Age (years) (n=409)		
18 – 44	78	19.1
45 – 59	275	67.2
60 or higher	56	13.7
Mean = 51.3, SD = 8.35, Min = 23, Max = 73		
Gender (n=409)		
Male	23	5.6
Female	386	94.4
Education level (n=409)		
Primary school	78	19.1
Secondary school	289	70.6
Bachelor's degrees or higher	42	10.3

Characteristics	Frequency	Percent (%)
Marital status (n=409)		
Single	46	11.2
Married and living together	276	67.5
Married and separate	22	5.4
Widowed	42	10.3
Divorced	23	5.6
Living status (n=409)		
Living with married partners and their children	267	65.3
Living with extended family	117	28.6
Living with someone who is not a family member	6	1.5
Living alone	19	4.6
Number of Children (n=409)		
0 person	61	14.9
1 person	39	9.5
2 persons	145	35.5
3 persons	58	14.2
More than 3 persons	106	25.9
Occupation (n=409)		
Housewife/Unemployed	57	13.9
Farmer/Gardener	251	61.4
Merchant	19	4.6
Freelance	63	15.4
Self-employed	19	4.6
Personal income (n=384)		
Less than 5,000 THB	209	51.1
5,000 – 10,000 THB	145	35.5
More than 10,000 THB	30	7.4
Median = 4,000, IQR = 4,375, Min = 600, Max = 40,000		
Family income (n=399)		
Less than 10,000 THB	185	45.2
10,000 – 20,000 THB	144	35.2
20,001 – 30,000 THB	43	10.5
More than 30,000 THB	27	6.6
Median = 10,000, IQR = 15,000, Min = 600, Max = 100,000		
Perception of family income (n=409)		
Insufficient	191	46.7
Sufficient	128	53.3

Levels of multidimensional caregiver burden

As for the overall community caregiver burden, Figure 1 showed that around three quarters of the respondents (77.5%) reported no burden in caring for dependent elderly. However, 22.5% of respondents have reported experiencing a caregiver burden, of which 19.1% experienced a low level while the remaining were at a moderate level. When categorizing the score of caregiver burden into four dimensions, the median and interquartile range (IQR) for each dimension presented in Table 2 revealed that the data for all dimensions did not follow a normal distribution. The results showed that the average value (median + IQR) for personal strain, guilt, and uncertain attitude were (4 + 5), (4 + 5), and (4 + 4) respectively. However, the median and IQR of privacy conflict was found 0 due to 76.8% of the respondents reported a score of zero for this dimension.

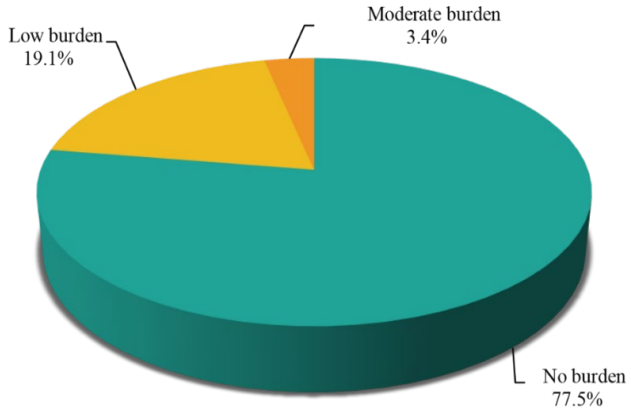

Figure 1: The level of community caregiver burden by ZBI scores

Table 2: The median and Interquartile range (IQR) of caregiver burden dimensions (N = 409)

Caregiver burden dimensions		Minimum	Maximum	Median	IQR	Q1	Q3
Personal strain	(0 – 36 scores)	0	24	4	5	2	7
Privacy conflict	(0 – 16 scores)	0	11	0	0	0	0
Guilt	(0 – 20 scores)	0	15	4	5	2	7
Uncertain attitude	(0 – 16 scores)	0	13	4	4	2	6

The levels of caregiver burden across four dimensions among all community caregivers were demonstrated in Figure 2. The results of caregiver burden in each dimension, except the privacy conflict, were categorized into three levels: low, moderate, and high. The findings revealed that nearly half of participants experienced moderate levels of burden in the guilt dimension (49.2%), the uncertain attitude dimension (48.7%), and the personal strain dimension (46.0%). However, the majority of participants reported a have not perceived burden in privacy conflict dimension.

DISCUSSION

This study aimed to assess the caregiver burden level among community caregivers in Thailand's LTC system, providing insights into the burden of care experienced by formal caregivers within this system. The role of community caregiver in this study is mainly fulfilled by female (14) and some of them are still quite elderly. From prior research has identified factors associated with a greater burden for caregivers (15) such as female caregivers, job (16), lower levels of education, financial resources (17), and marital status (18), Therefore, besides assessment caregiver burden, the collected sociodemographic data will be further analyzed to explore the factors influencing caregiver burden. Additionally, the results of this study showed that the majority of community caregivers (77.5%) reported no burden, 19.1% reported to low burden, and 3.4% reported to moderate burden from caring for dependent elderly people. Therefore, it is important to highlight that about 22.5% of community caregivers in Thailand's LTC system still have a negative impact and experience burdens ranging from low to moderate levels. Similar with previous study on caregivers of bed-bound elderly and older adults in the community revealed that the majority of caregivers reported no burden (19, 20). Notably, the burden of care was influenced by factors such as non-children or non-spouses' relationships (19), indicating that community caregivers who are not family members may also experience caregiver burden. Additionally, our findings are consistent with the study conducted on Community Health Volunteers (CHVs) in Taiwan also revealed that volunteers generally experience a low level of burden. This may potentially be attributed to the social and cultural interactions associated with their role, as well as the sense of fulfillment and usefulness derived from helping others (21). However, there is a contrast with previous study on caregivers of elderly dependents found that 80.15% caregiver experience a burden (10). However, the findings of this study on formal caregivers were only partially supported by previous studies. The difference in results may be because the role of caregivers in volunteer positions, aligning with the cultural value placed by most Thai people on deriving usefulness from helping others and not responsible for full-time

caregiving. Thus, implying that community caregivers in Thailand's LTC system experience a relatively low burden which among four caregiver burden dimensions, guilt, attitude, and personal strain were impacted on caregiver in moderate level, and privacy conflict was reported less frequently as a perceived burden.

CONCLUSION AND RECOMMENDATION

The finding of this study indicates that community caregivers in Thailand's LTC system are experiencing a burden in caring for dependent elderly mostly at a low level. Among the four caregiver burden dimensions, namely guilt, uncertain attitude, and personal strain have been observed that these perceived burdens may have a negative impact on caregivers' lives. Conducting in-depth studies focusing on each dimension, Care recipient information (such as the elderly person's age, relationship to the caregiver, presence of chronic diseases, and ADL scores), Caregiver's work characteristic, and compensation would be beneficial in better understanding the underlying causes of caregiver burden and facilitating more effective explanations. These findings could help guide government sector to develop policies and interventions aimed at prevention and coping with caregiver burdens, particularly in addressing stress and fostering positive attitudes, in the near future when the demand for LTC services increases due to the aging society phenomenon.

LIMITATION

The limitation of this study was the challenging and time-consuming of ensuring a shared understanding among all parties involved. Moreover, the use of self-administered online questionnaires could present difficulties for older caregivers or those unfamiliar with the online platform, potentially affecting the accuracy of questionnaire completion.

ETHICAL DECLARATION

This research was approved from The Research Ethics Review Committee for Research Involving Human Research Participants, Group I, Chulalongkorn University, Thailand. (COA No. 099/66)

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MEDICAL SERVICE UTILIZATION AMONG INTERNATIONAL TOURISTS IN BANGKOK, THAILAND

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Abstract

After the COVID-19 pandemic, Thailand has experienced a resurgence in international travel and remains a popular destination for millions of tourists. However, there are concerns for foreign tourists, including food, transportation, safety, and especially health. In Thailand, there are most common health problems which are acute diarrhea, dengue fever, and viral infections. Therefore, using medical services in Thailand is important for tourists. The objective of the study is to investigate the medical service utilization among international tourist in Bangkok.

The questionnaire related to sociodemographic characteristics and medical services utilization was developed and validated. Google forms was used to collect the data through online social media platforms, as well as face-to-face interviews at tourist gathering places. Descriptive statistics were used to described the characteristics of medical service utilization among tourists in Bangkok.

The data analysis includes 422 participants ranging in age from 18 to 71, with an average age of 33.38 years. Taiwan, China, Malaysia, Japan, and South Korea were the top five nationalities among the participants. Approximately 23.5% of the tourists sought medical treatment during their trip, primarily for illness, expert opinions, and accidents. Participants with a monthly household income below $1000 USD preferred purchasing over-the-counter (OTC) medicine from convenience stores, while those in the $1000-$2000 USD income group commonly utilized pharmacy services with certified pharmacists. It's worth noting that a significant number of participants chose private hospitals for hospitalization, suggesting a potential link to the demand for medical tourism services.

This research contributes to understanding how international travelers utilize medical services in Bangkok and highlights the health concerns that foreign tourists may encounter. These findings can be valuable for healthcare providers and policymakers in catering to medical needs and improving the service quality to serve the international tourist in Bangkok.

Keywords: Oversea Medical Utilization, Bangkok, Satisfaction

Introduction

The travel industry has seen a significant increase in recent years. In 2019, more than 1.5 billion international tourist arrivals, bring the output of 1.7 trillion as indicated by the World Tourism Organization, a UN specialized agency(1). Thailand is one of the most popular tourist destinations with over 40 million international tourists visiting in 2019 and also ranking the 5th in the world (2). Bangkok, the capital of Thailand, is a city full of tourists from all over the world and attracts tourists from all over the world with its world-famous Thai cuisine and magnificent temple. Furthermore, on response to the large number of international tourists, many large private hospitals in Bangkok provide a high-quality medical service.

As international travel and is a part of the population movement which also can transmit the diseases from one place to another as observed in the transmission of COVID-19, SARS, MERS, and Ebola from the origin to other counties (3). Additionally, other diseases such as food poisoning, typhoid fever (4) and traffic accidents can arise from differences in weather, temperature, and eating habits during travel (5).

Besides the primary medical tourist who intend to seek medical care in the main hospital in Thailand, many international travelers are also need the medical service at the certain level such as medication purchase at the local pharmacies or visit the small clinics for medical assistance. However, there is a limited study related to the utilization of the medical services among these international travelers. Therefore, this study aims to investigate the medical service utilization among international traveler in Bangkok, Thailand after the country reopened again after the critical COVID-19 pandemic (6) around the world.

The findings from this study will help to understand the characteristics of medical service utilization which will benefit the service provided to improve and deliver their services to international tourist. Moreover, results will benefit to the marketing and promotion plans for medical tourism in Bangkok (7).

METHODOLOGY

Study Design

The research design of this study is a cross-sectional study design. (8) The study will analyze the characteristic of the international tourists who using the medical service in Bangkok, Thailand

Study population

This study recruited the international tourist who traveled to Thailand after country reopen (9) to the international tourists after critical period of COVID-19 with no quarantine or compulsory travel health insurance requirement (form Oct 1, 2022 - May 2023) in Bangkok.

Inclusion and Exclusion criteria

Male and female foreign tourists who are currently or had experience of traveling as tourist in Bangkok after OCT 2022 with age over 18 years old. Only foreign tourists who have experienced of medical service in Thailand can give information about medical service utilization and satisfaction which include tourists who buying drug from pharmacy/convenient store, hospitalization, and outpatient clinic visit. Foreign tourists who can speak English and willing to participate in this study.

Person who has Thai nationality or have a Thailand residence permit, Thailand long-term visa (working visa, study visa, retire visa)

Measurement tool and Data collection

The questionnaire related to sociodemographic information, travel related, medical services utilization were developed. The tool was validated by 3 experts in the field of public health.

The Item-Objective Congruence (IOC) score was 0.83. The questionnaire was also test for the reliability. The Cronbach alpha score was 0.724

The online questionnaire using Google form (10) spreadsheet was sent out to social media platforms (i.e., Facebook, Twitter, and LINE) as well as face-to face interviews at the tourist gathering places (i.e., Khaosan Road, SIAM area, Chatuchak weekend market). The questionnaire is able to be completed within 10-15 minutes.

Statistical Analysis

Descriptive statistics were used to describe the sociodemographic characteristics and medical service utilization. These includes percentage, mean, and standard deviation. Data was analyzed with statistical software SPSS (11) version 28 (SPSS. Co., Ltd., USA.).

Ethical consideration

The ethical consideration will be submitted to the Research Ethics Review Committee for Research Involving Human Research Participants, Group I, Chulalongkorn University. Certificate of Approval (COA) no. 134/66. All data are for research use and will be kept confidential strictly.

RESULTS

Demographic Information

In total, 422 subjects participated in this study. There were 208 male (49.20%) and 206 (48.83%) females in this study, while 8 subjects preferred not to clarify their gender (1.9%). Majority of participants age between 18-30 years old (49.7%). Most participants travelling without any underlying disease (94.1%). According to the nationality distribution, Taiwanese were the most (42.2%), followed by Chinese (13%), and Korean (10.4%). More detail data are listed in Table 1.

Table 1: Demographic characteristics of participants in this study (N = 422)

Variable	Number (%)
Gender	
Male	208 (49.20%)
Female	206 (48.83%)
Prefer not to say	8 (1.9%)
Age (years old)	
18-30	210 (49.7%)
31-40	116 (27.50%)
41-50	51 (12.08%)
51-60	28 (6.64%)
Above 60	17 (4.02%)
Underlying disease	
No underlying disease	397 (94.1%)
Cardiovascular disease	9 (2.1%)
Diabetes mellitus	6 (1.4%)
Arthritis	4 (0.9%)
Diabetes, Arthritis	2 (0.5%)
Chronic kidney disease	1 (0.2%)
Cancer	1 (0.2%)
Diabetes, Cardiovascular disease	1 (0.2%)
Diabetes, Chronic kidney disease	1 (0.2%)
Nationality	
Taiwan	178 (42.2%)
China	55 (13%)
Korea	44 (10.4%)
Japan	40 (9.5%)
Malaysia	34 (8.1%)
India	21 (5%)
Russia	13 (3.1%)
United States	12 (2.8%)
Singapore	8 (1.9%)
Hongkong	4 (0.9%)
Vietnam	4 (0.9%)
Indonesia	3 (0.7%)
United Kingdom	2 (0.5%)
France	2 (0.5%)
Philippines	1 (0.2%)
Myanmar	1 (0.2%)

Table 2 shows the subject travel related characteristics in relation to age distribution. Most subjects do not have any overseas medical insurance and bring their own medicines for their underlying disease and other simple medication. Many tourists have experience of traveling in Thailand before and spent 1-5 days traveling in Thailand (Table 2).

Table 2: Age distribution and travel related characteristics of international tourist in Bangkok.

	18-30 (n=210)	31-40 (n=116)	41-50 (n=51)	51-60 (n=28)	Above 60 (n=17)
Underlying disease					
No underlying disease	207 (98.6%)	110 (94.8%)	46 (90.2%)	25 (89.3%)	9 (52.9%)
Diabetes mellitus	1 (0.5%)	1 (0.9%)	1 (2%)	2 (7.1%)	1 (5.9%)
Cardiovascular disease	2 (0.9%)	2 (1.8%)	-	-	5 (29.4%)
Chronic kidney disease	-	-	-	-	1 (5.9%)
Arthritis	-	3 (2.6%)	1 (2%)	-	-
Cancer	-	-	-	1 (3.6%)	-
Diabetes, Arthritis	-	-	1 (2%)	-	1 (5.9%)
Diabetes, Cardiovascular disease	-	-	1 (2%)	-	-
Diabetes, Chronic kidney disease	-	-	1 (2%)	-	-
Monthly household income					
Less than $1000USD	94(44.8%)	32(27.6%)	16(31.4%)	9(32.1%)	4(23.5%)
USD $1000~$2000	62(29.5%)	32(27.6%)	14(27.5%)	11(39.3%)	6(35.3%)
USD $2000~$3000	15(7.1%)	19(16.4%)	5(9.8%)	-	3(17.6%)
USD $3000~$4000	15(7.1%)	6(5.2%)	3(5.9%)	5(17.9%)	2(11.8%)
USD Greater than $4000	8(3.8%)	24(20.7%)	12(23.5%)	2(7.1%)	2(11.8%)
Prefer not to say	16(7.6%)	3(2.6%)	1(2%)	1(3.6%)	-
Time spent while traveling in Thailand					
1-5 days	130 (62.2%)	63 (54.3%)	31 (64.3%)	18 (64.3%)	13 (76.5%)
6-10 days	61 (29.2%)	53 (45.7%)	19 (37.2%)	10 (35.7%)	3 (17.7%)
11-14 days	11 (5.3%)	-	1 (2%)	-	1 (5.9%)
More than 14 days	7 (3.3%)	-	-	-	-
Frequency of visiting Thailand					
1-2 times	174 (83.2%)	89 (76.7%)	36 (70.5%)	14 (50%)	10 (58.8%)
3-4 times	24 (11.5%)	18 (15.5%)	9 (17.6%)	9 (32.1%)	5 (29.4%)
5 times or above	11 (5.3%)	9 (7.8%)	6 (11.8%)	5 (17.9%)	2 (11.8%)
Overseas medical insurance					
Do not have overseas medical insurance	143 (68.1%)	75 (64.7%)	33 (64.7%)	12 (42.9%)	9 (52.9%)
Have overseas medical insurance	67 (31.9%)	41 (35.3%)	18 (35.4%)	16 (57.2%)	8 (47.1%)
Carrying personal medicines					
Yes	158 (75.2%)	92 (79.3%)	45 (88.2%)	26 (92.9%)	17 (100%)
No	52 (24.8%)	24 (20.7%)	6 (11.8%)	2 (7.1%)	-

According to the results, 323 (76.54%) participants never used medical service in Thailand before. Among participants who experienced the medical services, 43 (10.19%) participants chose to take service from pharmacy with certified pharmacists, followed by buying OTC drugs from convenience stores 31 (7.35%) participants, and hospitalize in private facility 20 (4.74%) participants as shown in Figure 1. More detailed information was listed in Table 3 and Table 4.

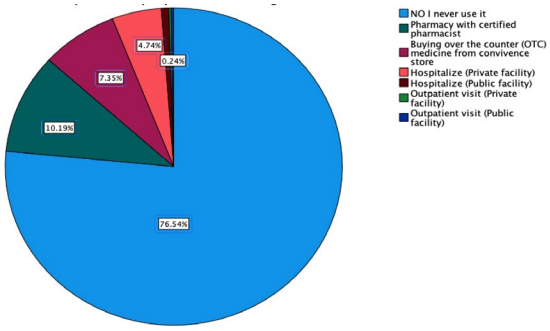

Figure 1: Distribution of medical services utilization

Table 3: Experience of utilizing medical service in Thailand

Age Group Characteristics	18-30 n=210	31-40 n=116	41-50 n=51	51-60 n=28	Above 60 n=17
Experience of utilizing medical service in Thailand					
Never use medical service	147 (70%)	90 (77.6%)	42 (82.4%)	28 (100%)	16 (94.1%)
Use medical service	63 (30%)	26 (22.4%)	9 (17.6%)	-	1 (5.9%)
Medical service utilization					
Hospitalize (Public facility)	-	2 (1.7%)	-	-	1 (5.9%)
Hospitalize (Private facility)	10 (4.8%)	9 (7.8%)	1 (2%)	-	-
Outpatient visit (Public facility)	1 (0.5%)	-	-	-	-
Outpatient visit (Private facility)	1 (0.5%)	-	-	-	-
Pharmacy with certified pharmacist	27 (12.9%)	11 (9.5%)	5 (9.8%)	-	-
Buying over the counter (OTC) medicine from convenience store	24 (11.4%)	4 (3.4%)	3 (5.9%)	-	-

Table 4: Reason for utilizing medical services among participants who use medical service. (N=99)

Age (years)	18-30 n=63	31-40 n=26	41-50 n=9	51-60 n=0	Above 60 n=1
Reason for utilizing medical service (N= 99)					
Accident	10 (15.9%)	7 (26.9%)	2 (22.2%)	-	1 (100%)
Illness	24 (38.1%)	9 (34.6%)	1 (11.1%)	-	-
Asking for expert opinion	11 (17.5%)	5 (19.2%)	4 (44.4%)	-	-
Accident and Illness	7 (11.1%)	-	1 (11.1%)	-	-
Accident and asking for expert opinion	1 (1.6%)	-	-	-	-
Illness and Asking for expert opinion	10 (15.9%)	5 (19.2%)	1 (11.1%)	-	-
Accident, Illness and Asking for expert opinion	-	-	-	-	-

DISCUSSION

Tourists in Thailand come from all over the world. According to our finding, Taiwan, China, Malaysia, Japan, Korea, Russia, the United States, and Europe are the main tourist in Thailand. This finding is consistent with the report from the Ministry of Tourism & Sports in Thailand (12) which indicated that Northeast Asia has recovered the fastest in the post-epidemic era, and Taiwan has the largest growth rate, an increase of 64 times. Therefore, majority of the participants this time are from Taiwan. In the research results, after excluding Taiwan, China and Malaysia are the two countries with the most visits to Thailand, which is in line with the top two in the data.

In medical service utilization, almost half of participants age between 18-30 years old. Only 99 from 422 participants have experience of utilizing medical service in Thailand. Pharmacy with certified pharmacist and convenience store were the popular medical services. Convenience stores were the mostly second used service among people in age between 18-30 years old. The outstanding points of convenience stores are that participants can choose drug by themselves (self-treat), quick and cheap. Next, the most second used services among participants age between 31-40 years old was hospitalized in private facility. In this age range, chronic disease such as diabetes mellitus and arthritis were found. Due to their underlying disease, checking up by a physician at hospital is needed and the medicines are mostly available in and hospital. Most participants age more than 40 years old are seldom utilize medical service. Due to the serious underlying diseases like cardiovascular disease, cancer or chronic kidney disease, they brought their personal medicines from their home countries. The reasons of utilizing medical service were accident, illness and asking for expert opinion in similar proportion. However, this study did not investigate specific treatment or diagnosis. According to the study of Siikamäki H et al. diagnosis categories were investigated. There were 10,119 people hospitalized when traveled to Asia. In addition, 9,514 people traveled to South-East Asia of which 7,746 people were outpatient visit and the rest were inpatient visit. Furthermore, 6,081 people were diagnosed as infection, 1,113 people were diagnosed as injuries and 711 people were diagnosed as skin diseases (13). These results illustrate that South-East Asia has Asia's highest risk of traveler illness. Traveler's diarrhea is the most common illness associated with travel (14). Food on street food was found to be significant risk factor (15). These results illustrate that South-East Asia has Asia's highest risk of traveler illness.

There were some limitations in this study. The proportion of participants in age groups were clearly different. It is crucial to highlight that the questionnaire survey was conducted using social media platforms, and some of the participants were from certain nations, with around 42% from Taiwan which may refer to selection bias. (12) Furthermore, most of participants came from Asian countries due to the fact that northeast Asia has recovered the fastest in the post-epidemic era, and Taiwan has the

largest growth rate. Therefore, the sample may not fully represent the entire target population, limiting the generalizability and external validity of the research findings. Northeast Asia has recovered the fastest in the post-epidemic era, and Taiwan has the largest growth rate. Hence, most of participants came from Asia. Additionally, the data collected through self-reporting in the questionnaire may be subject to recall biases (16) and inaccuracies. Moreover, the length of trip was short. Therefore, it can contribute to no use of medical services in some facilities and also the majority declared drug carried from their home country.

CONCLUSION

Although only small number of tourists utilize the medical services during their trip in Thailand, it is still important to provide an excellence service to the international tourist. The pharmacy and convenience store where OTC were supplied would be the target service provider to deliver the service to the tourist. Interpersonal manner was the most satisfy part while using medical service. On the other hand, communication part was the lowest score due to language barrier between healthcare provider and foreign tourist. Appropriate service training as well as the communication aid to avoid the language barrier(17) would be able to increase the service quality of these local provider to the international tourist which lead to the increasing of customer satisfaction.

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ประกาศ วิทยาลัยวิทยาศาสตร์สาธารณสุข จุฬาลงกรณ์มหาวิทยาลัย

เรื่อง แต่งตั้งคณะกรรมการจัดการประชุมวิชาการบัณฑิตศึกษานานาชาติ

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ตามที่ สถาบันวิจัยประชากรและสังคม สถาบันพัฒนาสุขภาพอาเซียน มหาวิทยาลัยมหิดล และวิทยาลัยวิทยาศาสตร์สาธารณสุข จุฬาลงกรณ์มหาวิทยาลัย ได้มีบันทึกข้อตกลงความร่วมมือระหว่างสามสถาบัน เพื่อการพัฒนาวิชาการด้านการเรียนการสอน การวิจัย และกิจกรรมนิสิตนักศึกษาระดับบัณฑิตศึกษา ทั้งนี้ได้กำหนดให้มีการนำเสนอผลงานวิจัยของนิสิต อาจารย์ และบุคลากรร่วมกันทั้งสามสถาบัน ในการประชุมวิชาการบัณฑิตศึกษานานาชาติด้านประชากรและวิทยาศาสตร์สาธารณสุข ครั้งที่ 14 “The 14th International Graduate Students Conference on Population and Public Health Sciences” (IGSCPP) ในวันที่ 7 กรกฎาคม 2566 ณ วิทยาลัยวิทยาศาสตร์สาธารณสุข จุฬาลงกรณ์มหาวิทยาลัย เพื่อให้การดำเนินการเป็นไปโดยเรียบร้อย มีประสิทธิภาพ และบรรลุวัตถุประสงค์ จึงขอแต่งตั้งคณะกรรมการในการดำเนินงานประชุมดังกล่าว ตามรายนามและตำแหน่งต่อไปนี้

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11. นางสาวศุกรินทร์ วิมุกตายน	กรรมการ
12. ผู้ช่วยศาสตราจารย์ ดร.วันดี ศิริโชคชัชวาล	กรรมการและเลขานุการ

<u>ภาระหน้าที่ความรับผิดชอบ</u>

ให้คณะกรรมการปฏิบัติงานหน้าที่พิจารณากำหนดกรอบ แนวทาง หัวข้อของการประชุม และกำหนดกรอบแนวทางเนื้อหา/กิจกรรม วิทยากร และผู้เข้าร่วมประชุม

คณะกรรมการดำเนินการ

1. ศาสตราจารย์ ดร.จิตรลดา อารีย์สันติชัย	ที่ปรึกษา
2. รองศาสตราจารย์ ดร.ณัฏฐา ฐานีพานิชสกุล	ประธานกรรมการ
3. รองศาสตราจารย์ ดร.ธันวดี สุขสาโรจน์	ประธานกรรมการร่วม
4. รองศาสตราจารย์ ดร.จงจิตต์ ฤทธิรงค์	ประธานกรรมการร่วม
5. รองศาสตราจารย์ ดร.ชีระวิทย์ รัตนพันธ์	กรรมการ
6. รองศาสตราจารย์ ดร. นพ.ตะวันชัย จิรประมุขพิทักษ์	กรรมการ
7. นางมนชญา อภิวาทนสิริ	กรรมการ
9. รองศาสตราจารย์ ดร.อรพินท์ เล่าซื้	กรรมการ
10. ผู้ช่วยศาสตราจารย์ ดร.วันดี ศิริโชคชัชวาล	กรรมการ
11. ผู้ช่วยศาสตราจารย์ ดร.มนทกานติ์ เชื่อมชิต	กรรมการ
12. นางสาวดาวนภา เมธาธีระนันท์	กรรมการ
13. นายภูมิรัตน์ โกกิลกนิษฐ	กรรมการ
14. นายธงชัย จินดาสิทธางกูร	กรรมการ
15. นายเอกพิสิฐ ธนวัชร์สมบัติ	กรรมการ
16. นางสาววันเพ็ญ พรเจริญ	กรรมการ
17. นางอโณทัย เกิดเจริญ	กรรมการ
18. นางสาวออหทัย จิระรัตนโพธิ์ชัย	กรรมการ
19. นางสาวมณีวรรณ สุวัฒน์รณกร	กรรมการ
20. นายวรวัชร วงษ์พนัส	กรรมการ
21. นายธนาพงศ์ วงษ์งามมงคล	กรรมการ
22. นางสาวดวงพร เขียวชะอุ่ม	กรรมการ
23. นางสาวฐิตินันท์ มากกำเหนิด	กรรมการ
24. นางนฤมล ชอบสันเทียะ	กรรมการ
25. นางวรรณพา ชนะชัย	กรรมการ
26. นางเสาวณี บุพลับ	กรรมการ
27. นายสมลักษณ์ คลังเพ็ชร์	กรรมการ
25. นางสาวกุลญาณินทร์ ศรีดาชาติ	กรรมการและเลขานุการ
26. นางสาวกาญรัตน์ อินทุรัตน์	กรรมการและผู้ช่วยเลขานุการ
27. นางสาวสฐาปนีย์ นิลทะราช	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.เกรียงไกร เลิศทัศนีย์	ที่ปรึกษา
4. ศาสตราจารย์ ดร.จิตรลดา อารีย์สันติชัย	ที่ปรึกษา
5. รองศาสตราจารย์ ดร.ณัฏฐา ฐานีพานิชสกุล	ประธานกรรมการ
6. รองศาสตราจารย์ ดร. นพ. ตะวันชัย จิรประมุขพิทักษ์	ประธานกรรมการร่วม
7. รองศาสตราจารย์ ดร.อรพินท์ เล่าซื้	ประธานกรรมการร่วม
8. ผู้ช่วยศาสตราจารย์ ดร.มนทกานติ์ เชื่อมชิต	รองประธานกรรมการ
9. รองศาสตราจารย์ ดร.ธันวดี สุขสาโรจน์	กรรมการ
10. ผู้ช่วยศาสตราจารย์ ดร.ดวงใจ บรรทัพ	กรรมการ
11. รองศาสตราจารย์ ดร.ชีระวิทย์ รัตนพันธุ์	กรรมการ
12. ผู้ช่วยศาสตราจารย์ ดร.สิรินทร์ยา พูลเกิด	กรรมการ
13. ผู้ช่วยศาสตราจารย์ ดร.บังอร เทพเทียน	กรรมการ
14. ผู้ช่วยศาสตราจารย์ ดร.พจนา หันจางสิทธิ์	กรรมการ
15. ผู้ช่วยศาสตราจารย์ ดร.ดุสิตา พึ่งสำราญ	กรรมการ
16. รองศาสตราจารย์ ดร. ปิยวัฒน์ เกตุวงศา	กรรมการ
17. Assistant Professor Dr. Marc Voelker	กรรมการ
18. Associate Professor Dr.Seo Ah Hong	กรรมการ
19. Assistant Professor Dr.Wakako Takeda	กรรมการ
20. ศาสตราจารย์ ดร.ปัทมา ว่าพัฒนวงศ์	กรรมการ
21. รองศาสตราจารย์ ดร.ศุทธิดา ชวนวัน	กรรมการ
22. ศาสตราจารย์ ดร.สถิรกร พงศ์พานิช	กรรมการ
23. รองศาสตราจารย์ ดร.เขมิกา ยามะรัต	กรรมการ
24. รองศาสตราจารย์ ดร.ปิยะพงษ์ จันทร์ใหม่มูล	กรรมการ
25. รองศาสตราจารย์ ดร.กาญจนา รังษีหิรัญรัตน์	กรรมการ
26. ผู้ช่วยศาสตราจารย์ ดร.เทพนาฏ พุ่มไพบูลย์	กรรมการ
27. รองศาสตราจารย์ ดร.วัฒน์สิทธิ์ ศิริวงศ์	กรรมการ
28. ผู้ช่วยศาสตราจารย์ ดร.ปกเกศ วงศาสุลักษณ์	กรรมการ
29. ดร.นุชนาฎ หวนนากลาง	กรรมการ
30. ดร.อรอุมา ซองรัมย์	กรรมการ
31. ผู้ช่วยศาสตราจารย์ ดร.อนุชิต ภานุมาสวิวัฒน์	กรรมการ
32. พญ.นิพรรณพร วรมงคล	กรรมการ
33. ศาสตราจารย์ ดร.รัตนา สำโรงทอง	กรรมการ
34. ผู้ช่วยศาสตราจารย์ ภก.ดร.ประมณฑ์ วิวัฒนากุลวาณิชย์	กรรมการ
35. ผู้ช่วยศาสตราจารย์ ดร.ไกรวุฒิ กัลวิชา	กรรมการ
36. ผู้ช่วยศาสตราจารย์ ดร.อัญชลี ประสารสุขลาภ	กรรมการ
37. ผู้ช่วยศาสตราจารย์ ดร.วันดี ศิริโชคชัชวาล	กรรมการ

38. รองศาสตราจารย์ ฉวีวรรณ บุญสุยา	กรรมการ
39. พญ.นันทา อ่วมกุล	กรรมการ
40. พญ.นภาพรรณ วิริยะอุตสาหกุล	กรรมการ
41. ดร.นฤมล ภุมมาพันธุ์	กรรมการ
42. Dr.Vo Thi Hue Man	กรรมการ
43. นางสาวกุลญาณินทร์ ศรีดาชาติ	กรรมการและเลขานุการ
44. นางสาวกาญรัตน์ อินทุรัตน์	กรรมการและผู้ช่วยเลขานุการ
45. นางสาวสฐาปนีย์ นิลทะราช	กรรมการและผู้ช่วยเลขานุการ

ภาระหน้าที่ความรับผิดชอบ

ให้คณะทำงานปฏิบัติงานหน้าที่พิจารณาบทความวิจัยเพื่อการนำเสนอในการประชุมของผู้สมัครพิจารณาให้รางวัลการนำเสนอดีเด่น (Outstanding Oral / Poster Presentation Award) รวมทั้งจัดทำบทความวิจัยตีพิมพ์เผยแพร่ลงใน Proceeding งานประชุม / Journal of Health Research และหน้าที่อื่นๆ ที่เกี่ยวข้อง

ทั้งนี้ ตั้งแต่บัดนี้เป็นต้นไป จนเสร็จสิ้นภารกิจ

ประกาศ ณ วันที่ 22 พฤษภาคม พ.ศ. 2566

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คณบดีวิทยาลัยวิทยาศาสตร์สาธารณสุข