

Factors related to the management of infectious waste from caring for dependent elderly in the community, Maha Sarakham Province, Thailand

Dittaphol Jaisue¹, Nachalida Yukalang¹, Sumattana Glangkarn¹

¹Faculty of Public Health, Mahasarakham University, Mahasarakham, Thailand

Corresponding Author: Nachalida Yukalang **Email:** nachalida.y@msu.ac.th

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ABSTRACT

This cross-sectional study investigated factors related to the management of infectious waste generated from caring for dependent elderly in community settings. The sample consisted of 429 caregivers of dependent elderly, selected through multi-stage stratified random sampling. Data collection was conducted between October 2023 and February 2024 in 12 sub-district health-promoting hospitals in Maha Sarakham Province. The research instrument was a structured questionnaire comprising five sections including 1) general information about caregivers for dependent elderly, 2) types and quantities of infectious and other waste, 3) knowledge regarding infectious waste management, 4) attitudes toward infectious waste management, and 5) practices in managing infectious waste from caring for dependent elderly. Data were analyzed using descriptive statistics and bivariate analysis, odds ratios and 95% confidence intervals, with statistical significance set at $p < 0.05$.

The response rate was 96.40%. The majority of caregivers were female (86.7%) with an average age of 53.93 years (S.D. = 9.11). Most were married (77.8%) with primary education (50.8%) and an average family income below 18,000 baht (93.0%) (S.D. = 9293.4). Factors significantly associated with infectious waste management from caring for dependent elderly in the community included: caregivers aged 50 years and above (OR 2.162, 95%CI 1.146-4.078), caregivers who received training about elderly care (OR 4.285, 95%CI 1.938-9.476), training about infectious waste management in elderly care (OR 3.211, 95%CI 1.573-6.555), caregivers with good knowledge (OR 2.418, 95% CI 1.227-4.766), and caregivers with positive attitudes toward waste management (OR 2.002, 95%CI 1.008-3.975). Caregivers aged ≥ 50 years, with training experience, good knowledge, and positive attitudes showed significantly better performance for infectious waste management practices. The findings underscore the urgent need for specialized training programs and evidence-based policy interventions to enhance safety protocols and environmental sustainability in community-based elderly care.

Keywords:

caring for dependent elderly; infectious waste; waste management

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INTRODUCTION

The rapid increase in the elderly population has resulted in significant changes in global demographic structures¹ and has had profound impacts on health, economic, and social aspects. This is particularly evident among elderly individuals with health problems, illnesses, and dependency conditions, including homebound elderly and bedridden elderly who have limited or no ability to care for themselves. The increasing trend of dependent elderly populations has led to greater utilization of healthcare resources² including medications and medical supplies, diagnostic equipment, and medical instruments for continuous home healthcare treatment, as well as personal daily living items such as disposable diapers, tissue paper, and absorbent pads.³ These circumstances generate disposal problems of waste, infectious waste, and refuse from caring for dependent elderly individuals in communities. Examples include infectious waste from elderly patients with pressure ulcers, homebound and bedridden elderly, diabetic patients requiring insulin injections, tuberculosis patients, peritoneal dialysis patients, and elderly individuals with various other infectious diseases requiring home treatment.⁴⁻⁵ This also encompasses infectious waste and refuse from other home healthcare activities such as adult diapers, excretion absorbent pads, and alternative diapers for individuals with urinary or fecal incontinence problems. Infectious waste and refuse generated from caring for dependent elderly individuals in communities currently lack adequate support systems and standardized management practices that comply with proper academic principles.⁵ Infections waste management should encompass segregation, collection, transportation, temporary storage in designated areas, and

disposal. Currently, self-management at home involves burning, burying, illegal dumping in public areas, and disposal with general household waste.

Infectious waste is classified as hazardous and improper management leads to disease transmission and adverse impacts on public health and the environment.⁶⁻⁸ The collection, handling, transportation, and disposal of infectious waste facilitate pathogen transmission to the general population.⁹ Potential hazards also include injuries from sharp objects¹⁰⁻¹¹ and exposure to toxic substances from pharmaceutical products, particularly antibiotics and cytotoxic drugs released into the environment.¹²⁻¹⁴ Therefore, all sectors must cooperate to drive proper management of infectious waste and refuse generated from small-scale sources such as home healthcare for long-term dependent elderly individuals. Adequate knowledge, understanding, awareness, and effective management systems or approaches are lacking. Extensive research has been conducted on healthcare waste management in clinical settings but a significant knowledge gap remains regarding infectious waste management in community-based elderly care. The global population of dependent elderly receiving home-based care is increasing,^{6,15-17} thereby exacerbating environmental and health risks from improper waste disposal practices.

This study investigated the factors associated with the management of infectious waste and refuse from the long-term care of dependent elderly individuals in communities. These factors represent essential preliminary data for developing approaches to promote effective and appropriate infectious waste management that aligns with community lifestyles and living conditions, as well as reducing potential adverse impacts on health and the environment.

METHODS

Study design and population

This cross-sectional study was conducted in communities under the responsibility of 12 sub-district health-promoting hospitals in Maha Sarakham Province. The population consisted of 5,463 caregivers of dependent elderly, aged 18 years and above, who provided regular care and lived with the elderly individuals. The sample size was calculated using the WIN PEPI program,²³ with an acceptable difference = 0.016³, assumed proportion = 0.026²⁴, and population size = 5,463 allowing for a loss of 20% of subjects, resulting in a sample of 445 participants. Included criteria 1) family caregivers with at least one month of experience in caring for dependent elderly, 2) ability to read, write, and communicate in Thai, and 3) willingness to participate in the research. Exclusion criteria were 1) physical or mental limitations affecting the ability to provide information, 2) caregivers not involved in infectious waste management, and 3) inability to participate throughout the study period.

Multi-stage stratified random sampling was used to obtain a sample of caregivers of dependent elderly in communities from Maha Sarakham Province, with sampling units as province, district, sub-district, and village.

Research instrument

A structured questionnaire based on the literature review was used to collect the research data. This comprised five sections. Section 1 consisted of 10 questions covering caregiver demographics such as gender, age, marital status, education level, family status, and income. Section 2 contained 7 questions regarding the quantity and types of infectious waste generated daily from long-term care of dependent elderly individuals, with response criteria as "Yes or No." Section 3

included 15 questions on caregiver knowledge about infectious waste management covering methods of segregation, collection, transportation, and disposal with response criteria as "Yes or No." Criteria knowledge scores below the mean value indicated poor knowledge levels while scores equal to or above the mean value indicated good knowledge levels. Section 4 comprised 15 questions with 7 positive and 8 negative items on attitudes toward infectious waste management covering segregation, collection, transportation, and disposal, with answers assessed on a 5-point Likert scale ranging from "strongly agree" to "strongly disagree". Mean scores of 4.51-5.00 indicated the highest level of agreement, while mean scores of 1.00-1.50 indicated the lowest level of agreement. Section 5 contained 15 questions on behavioral practices regarding infectious waste management covering segregation, collection, transportation, and disposal. The answers were assessed on a 3-point scale as "regularly practiced," "sometimes practiced," and "never practiced," with 13 positive and 2 negative items. Mean scores of 2.51-3.00 indicated a high level of practice, mean scores of 1.51-2.50 indicated a moderate level of practice, and mean scores of 1.00-1.50 indicated a low level of practice.

The instrument was assessed for quality by five experts who examined accuracy, content validity, content coverage, and language clarity to determine the Index of Item-Objective Congruence (IOC). The IOC values included 1) general information from the caregivers of dependent elderly as - 0.8, and 2) knowledge, attitude, and practice measures regarding infectious waste management from long-term care of dependent elderly in the community as - 0.8, 0.7, and 0.7, respectively. Reliability was tested by conducting a trial with 30 participants similar to the study population and calculated using the Kuder-Richardson 20

(KR-20) formula, yielding 0.8. The Cronbach's alpha coefficient was calculated for the attitudes and behaviors related to infectious waste management, yielding 0.8 and 0.8, respectively.

Data collection procedures

The data were collected between October 2023 and February 2024 by 12 professional nurses experienced in community-based dependent elderly care. The nurses were informed of the research objectives, questionnaire details, data collection methods, interviewing techniques, data recording, and problem-solving during data collection.

Permission for data collection was obtained from the directors of the sub-district health-promoting hospitals after explaining the study objectives. Village health volunteers and community leaders in the targeted areas were contacted to promote the research project and facilitate access to the participants.

The research objectives, data collection procedures, confidentiality, and the rights of the participants were fully explained before data collection. All the caregivers signed an informed consent form, and data were collected using the prepared instrument as a questionnaire. During the interviews, the researcher or assistants observed the home environment and infectious waste management practices of each caregiver to supplement data analysis.

Data analysis

Data analysis was conducted using IBM SPSS Statistics 26. Demographic characteristics, quantities, and types of

infectious waste from caring for dependent elderly were analyzed using descriptive statistics including frequency, percentage, mean, and standard deviation. Factors related to infectious waste management were analyzed using inferential statistics, specifically bivariate analysis with the odds ratios and 95% confidence intervals, with statistical significance set at $p < 0.05$.

Ethical approval

Ethical approval for this study was obtained from the Ethics Committee for Human Research, Mahasarakham University (protocol number: 3 2 9 - 345/2023, approved on August 25, 2023). The study was conducted in accordance with the Declaration of Helsinki.

RESULTS

The questionnaire response rate was 96.40% and yielded the following findings:

1. Demographic characteristics of the sample

Among the 429 caregivers of dependent elderly individuals, the majority were female (86.7%) with an average age of 53.93 years (S.D. = 9.11). Most were married (77.8%), with primary education (50%). The predominant occupation was farming (75.1%). Most participants were family members of the dependent elderly (66.7%), with most families having three or more members (61.8%). The average monthly family income was less than 18,000 baht (93.0%) (Median = 6,000, P_{25} = 4,000, P_{75} = 10,000). Details are shown in Table 1.

Table 1. Number and percentage of demographic characteristics of caregivers of dependent elderly (n= 429)

Demographic characteristics	Number (%)
Gender	
Male	57 (13.3)
Female	372 (86.7)
Age (years)	
Below 40	34 (7.9)
40-49	114 (26.6)
50-59	185 (43.1)
60-69	58 (13.5)
70 and above	38 (8.9)
(Mean = 53.93, SD = 9.11, Min = 24, Max = 79)	
Marital status	
Single	41 (9.6)
Married	334 (77.8)
Widowed	41 (9.6)
Divorced/Separated	13 (3.0)
Education level	
Primary	218 (50.8)
Secondary	181 (42.2)
Higher than secondary	30 (7.0)
Family status	
Head of family	143 (33.3)
Family member	286 (66.7)
Average monthly family income (baht)	
Less than 18,000	399 (93.0)
18,000 or more	30 (7.0)
(Median = 6,000, P ₂₅ = 4,000, P ₇₅ = 10,000, Min = 5,000, Max = 30,000)	

2. Types and quantities of infectious waste from caring for dependent elderly in the community

The Infectious waste generated from caring for dependent elderly was classified by type and average quantity as adult diapers and absorbent pads contaminated with urine and feces (89.3%), urine bags that had not been emptied and peritoneal dialysis fluid bags (54.1%),

medicine bottles, tubes, glass bottles, medicine packages, and leftover medications (41.5%), healthcare products contaminated with blood and secretions (21.9%), blood components, secretions, pus, phlegm, saliva (17.5%), sharp objects contaminated with blood and secretions (13.5%), and body parts resulting from wound dressing or home healthcare (7.2%). The details are shown in Table 2.

Table 2. Infectious waste types from daily care of dependent elderly

Types of infectious waste from daily care of dependent elderly	Number (%)
1. Body parts resulting from wound dressing or home healthcare (e.g., tissue fragments)	31 (7.2)
2. Sharp materials such as needles, insulin needles, blades, glass tubes, and sharp containers contaminated with secretions	58 (13.5)
3. Blood components, secretions, pus, phlegm, saliva	75 (17.5)
	94 (21.9)

Types of infectious waste from daily care of dependent elderly	Number (%)
4. Healthcare products contaminated with blood and secretions (e.g., cotton, gauze, cloth, saline bottles, IV lines, and tubes)	178 (41.5)
5. Medicine bottles, tubes, glass bottles, medicine packages, and leftover medications	383 (89.3)
6. Adult diapers and absorbent pads contaminated with urine and feces	
7. Urine bags that had not been emptied and peritoneal dialysis fluid bags	232 (54.1)

3. Knowledge, attitudes and practices regarding infectious waste management from caring for dependent elderly in the community

The overall levels of knowledge, attitudes, and practices of infectious waste management among caregivers of dependent elderly were good in all three aspects. Knowledge about infectious waste management among caregivers of dependent elderly was at a good level of

80.2% (Mean = 12.42, SD = 1.87). Attitudes toward infectious waste management among caregivers of dependent elderly were at a high agreement level of 79.3% (Mean = 8.51, SD = 1.37). Practices of infectious waste management among caregivers of dependent elderly were at a good level of 90.0% (Mean = 9.75, SD = 1.82). Details are shown in Table 3.

Table 3. Levels of knowledge, attitudes, and practices regarding infectious waste management among caregivers of dependent elderly (n=429)

Variable	Number (%)
Knowledge about infectious waste management in elderly care (Mean = 12.42, SD = 1.87)	
Good level	344 (80.2)
Poor level	85 (19.8)
Attitudes about infectious waste management in elderly care (Mean = 8.51, SD = 1.37)	
High agreement	340 (79.3)
Low agreement	89 (20.7)
Practices of infectious waste management in elderly care (Mean = 9.75, SD = 1.82)	
Good level	386 (90.0)
Poor level	43 (10.0)

4. Factors related to infectious waste management from caring for dependent elderly in the community

Bivariate analysis revealed several factors associated with infectious waste management resulting from caring for dependent elderly in the community. These factors included caregivers above 50 years old (OR 2.162, 95% CI 1.146-4.078), caregivers who had received training about

elderly care (OR 4.285, 95% CI 1.938-9.476), training about infectious waste management in elderly care (OR 3.211, 95% CI 1.573-6.555), caregivers with a good level of knowledge (OR 2.418, 95% CI 1.227-4.766), and caregivers with highly agreeable attitudes toward waste management (OR 2.002, 95% CI 1.008-3.975). The strongest predictor was elderly care training (OR=4.285, 95% CI 1.938-

9.476), indicating that trained caregivers were 4 times more likely to have good waste management practices. Details are shown in Table 4.

Table 4. Factors related to infectious waste management from caring for dependent elderly in the community (n=429)

Variable	Practice		Crude odds ratio	95% CI	p-value
	Poor n (%)	Good n (%)			
Gender					
Male	8 (14.0)	49 (86.0)	1		
Female	35 (9.4)	337 (90.6)	1.572	0.689-3.585	0.279
Age					
Under 50 years	22 (14.9)	126 (85.1)	1		
50 years and above	21 (7.5)	260 (92.5)	2.162	1.146-4.078	0.015*
Marital status					
Married	33 (9.9)	301 (90.1)	1		
Single/Widowed/Divorced/Separated	10 (10.5)	85 (89.5)	0.922	0.441-1.968	0.853
Education level					
Primary	20 (9.2)	198 (90.8)	1		
Higher than primary	23 (10.9)	188 (89.1)	0.826	0.439-1.553	0.552
Average monthly income					
Less than 18,000 baht	41 (10.3)	358 (89.7)	1		
18,000 baht and above	2 (6.7)	28 (93.3)	1.603	0.368-6.977	0.526
Received training about elderly care					
No	35 (15.2)	195 (84.8)	1		
Yes	8 (4.0)	191 (96.0)	4.285	1.938-9.476	0.001*
Received training about infectious waste management in elderly care					
No	32 (14.8)	184 (85.2)	1		
Yes	11 (5.2)	202 (94.8)	3.211	1.573-6.555	0.001*
Knowledge about infectious waste management in elderly care					
Poor	15 (17.6)	70 (82.4)	1		
Good	28 (8.1)	316 (91.9)	2.418	1.227-4.766	0.004*
Attitude about infectious waste management in elderly care					
Low agreement	14 (15.7)	75 (84.3)	1		
High agreement	29 (8.5)	311 (91.5)	2.002	1.008-3.975	0.044*

*Statistically significant at the 0.05 level

DISCUSSION

The infectious waste and healthcare waste definitions in this study were consistent with the WHO which classifies infectious waste and healthcare waste⁵ as pathological

waste, sharps waste, chemical waste, pharmaceutical and cytotoxic waste, radioactive waste, and non-hazardous or general waste. Multiple studies have indicated that infectious waste and healthcare waste from elderly care and dependent

elderly care are primarily generated from various activities in daily routine care, healthcare provision, and continuous home-based treatment provided by primary caregivers.^{4,17} These include diapers, tissue paper, gloves, gauze, plasters, injection needles, syringes, medical containers, expired medications, human waste, vomit, sputum, pus, contaminated cloth, and plastic bags.^{19,25} Caregivers of dependent elderly individuals are key persons who need to manage infectious waste and healthcare waste to prevent potential impacts on human health and the environment. Four factors were identified as statistically significantly related to infectious waste and healthcare waste management of long-term care of dependent elderly individuals in the community, as follows.

1) Caregiver age

Caregivers aged 50 and above (COR 2.162, 95% CI 1.146-4.078, $p < .05$) demonstrated 2.162 times better infectious waste and healthcare waste management practices compared to those under 50 because elderly caregivers have greater life experience and maturity²⁶ leading to enhanced thinking, decision-making, and responsibility in caregiving practices. Dependent elderly individuals require continuous long-term care with slow and gradual disease progression or changes.²⁷ Elder caregivers have more opportunities to learn and participate in general waste management in the community, allowing them to better manage infectious waste and healthcare waste.²⁸ This finding concurred with previous studies reporting that elderly caregivers followed better infectious waste and healthcare waste management practices compared to younger caregivers.²⁹ Studies on infectious waste management in hospitals indicated that age was significantly related to understanding waste management guidelines, with longer duration of patient care significantly associated with knowledge and

correct infectious waste management practices.³⁰

2) Training experience

Experience with elderly care training (COR 4.285, 95% CI 1.938-9.476, $p < .05$) and experience with infectious waste management training in elderly care (COR 3.211, 95% CI 1.573-6.555, $p < .05$) showed that caregivers of dependent elderly individuals who had received training demonstrated 4.285 and 3.211 times better infectious waste and healthcare waste management practices compared to those without training. Good infectious waste and healthcare waste management practices require experience from training and learning in caring for dependent elderly individuals. Training provides caregivers with knowledge and skills that can be applied in infectious waste and healthcare waste management. Training enables caregivers to develop their potential and hone their practical skills to enhance infection prevention and control.³¹ Training also provides social support that stimulates caregivers to better care for dependent elderly individuals and follow correct infectious waste management guidelines.³² Bloom's learning theory³³ discusses the development of learning at various levels leading to deep learning through knowledge transfer, practical skills, and application in diverse contexts. Capability development learning comprises perception, response, demonstration of ability and confidence, skilled activity performance, and adaptation. These elements promote creative problem-solving.³⁴ Receiving training on infectious waste management was significantly related to infectious waste management practices, with trained caregivers 9.23 times more likely to have good infectious waste and healthcare waste management practices compared to untrained groups (AOR: 9.233, 95%CI: 4.907–17.373).³⁵ This result concurred with

previous studies showing that participants who received waste management training were 1.94 times more likely to follow good practices than those without training (AOR 95% CI=1.94 1.12–3.22).³⁶

3) Knowledge about infectious waste management in elderly care

Having a good knowledge level (COR 2.418, 95% CI 1.227-4.766, $p < .05$) resulted in 4.061 times better infectious waste and healthcare waste management practices. Knowledge of infectious waste and healthcare waste management is crucial for correct and appropriate practices. Caregivers may have good attitudes but the lack of good knowledge prevents integration into elderly care practices.³⁷ Having a good knowledge level results from diverse learning through various channels including training and hands-on experience.³⁸ The current era of technological advancement, communication and information access enables more diverse and easier learning through various knowledge media.³⁹ The application of knowledge and learning in elderly care and infectious waste and healthcare waste management was significantly related to better infectious waste and healthcare waste management practices compared to groups with poor knowledge levels.⁴⁰ This result was consistent with previous studies showing that poor knowledge was associated with poor waste management (1.280, 95% CI 1.070-1.533).⁴¹ Studies on knowledge, attitudes, and practices regarding medical waste management in Bangladesh indicated that groups with good knowledge levels were more likely to follow medical waste management guidelines compared to groups with poor knowledge,⁴² while groups with insufficient knowledge had poor healthcare waste management practices.⁴³

4) Attitude about infectious waste management in elderly care

Having a good attitude level (COR 2.002, 95% CI 1.008-3.975, $p < .05$) resulted in 2.002 times better infectious waste and healthcare waste management practices. Caregivers of dependent elderly individuals

are often family members who provide close, attentive care with compassion without showing disgust in managing infectious waste and healthcare waste. Caregivers believe that good attitudes toward care and their love for the care recipients significantly affect good practices in elderly care.²⁷ If elderly caregivers do not have good practices and management, this results in detrimental health, environmental, and image impacts on family members, neighbors, and the community.⁴⁴ A lack of good attitude from primary caregivers prevents dependent elderly individuals from receiving care and assistance in daily living activities.⁴⁵ Elderly caregivers recognize the importance and necessity of developing good management practices toward infectious waste and healthcare waste.⁴⁶ This result concurred with studies showing that poor attitudes toward waste management posed 1.264 times higher risk to the public compared to good attitudes (1.264, 95% CI 1.082-1.477),⁴¹ and that good attitudes of elderly caregivers who were family members created understanding and generated love and attention, even when elderly care activities involved excretory care and changing soiled diapers.⁴⁷⁻⁴⁹

Interestingly, gender, marital status, education level, and average monthly income were not significantly related to infectious waste and healthcare waste management from long-term care of dependent elderly individuals in the community. This result was consistent with previous studies^{41,50-51} which reported that infectious waste and healthcare waste management by elderly caregivers was a characteristic individual behavior arising from personal skills and experience including knowledge levels. These factors resulted from direct learning and experience in elderly care and additional knowledge seeking, making education level unrelated to practical caring ability. Average monthly income was also not significantly related to healthcare practices because dependent elderly individuals receive support from government funds, community welfare, and various sectors to promote their health and quality of

life, making income factors unrelated to care practices. Experience in caring for dependent elderly individuals showed no significant relationship with care practices, and caregivers having less than 5 years of experience showed 42% good management. Caregivers with 5 years or more experience were familiar with infectious waste and healthcare waste management practices in elderly care but were fatigued, resulting in management practices similar to those of caregivers with less than 5 years of experience who were still in the learning and trial-and-error phase.

STUDY LIMITATIONS

This study was unable to identify all the situations and factors related to infectious waste and healthcare waste management occurring in home and community healthcare, with the focus specifically on the context of caregivers of dependent elderly individuals in Maha Sarakham Province. The generation of infectious waste types, quantities, and management may differ from other general waste management practices.

RECOMMENDATIONS

Based on study findings, knowledge (OR 2.418), training experience, and positive attitudes (OR 2.002) significantly influence infectious waste management practices, targeted interventions should focus on comprehensive capacity building for community caregivers.

Knowledge Enhancement Programs should prioritize caregivers under 50 years old through structured 12-hour training modules covering waste classification, safe handling techniques, and risk awareness. Training must include interactive identification of seven waste categories using real examples and hands-on practice with color-coded sorting systems. Monthly refresher sessions and peer-to-peer learning

networks will reinforce knowledge retention.

Attitude Improvement Strategies should address community perceptions through site visits to proper disposal facilities, success story sharing sessions, and recognition programs for exemplary households. Establishing caregiver support groups will create social networks that sustain positive attitudes toward waste management responsibilities.

Government Support Infrastructure requires dedicated budget allocation for color-coded household containers, monthly personal protective equipment supplies, and weekly infectious waste collection services. Local authorities should provide support for waste management and integrate training programs into existing community health systems.

Future Research should investigate intervention effectiveness through randomized controlled trials and examine specific waste types from different chronic conditions. Priority populations include patients receiving terminal care, patients with chronic kidney disease, and disabled individuals with limited self-care capacity.

AUTHOR CONTRIBUTIONS

D.J.: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing—original draft, Writing—review & editing; N.Y.: Investigation, Methodology, Project administration, Supervision, Validation, Visualization, Writing—original draft, Writing—review & editing and S.G.: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Supervision, Validation,

Visualization, Writing—original draft, Writing—review & editing.

ETHICAL CONSIDERATION

The participants received information on the research and its voluntary nature, as well as a declaration of anonymity and confidentiality. All participants then provided written informed consent and completed a self-report questionnaire. This study was reviewed and approved by the Ethics Committee for Research Involving Human Subjects at Maharakham University (approval no. 329-345/2023). The reaseach proposal was reviewed and approved on 25 August 2023.

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CONFLICTS OF INTEREST

All authors state that no conflict of interest.

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