Knowledge, Attitude, and Practice for Managing Infectious Waste Management during COVID-19 Pandemic: A Survey in Thailand

Kultida Bunjongsiri[1], Pathanin Sangaroon[1]*, Araya Prasertchai[1], Anunya Pradidthaprecha[1], Worrawit Nakpan[1], Saruda Jiratkulthana[1], and Pokkamol Laoraksawong[2]

[1]School of Health Science, Sukhothai Thammathirat Open University, Nonthaburi, 11120, Thailand

[2]Faculty of Public Health, Khon Kaen University, Khon Kaen, 40002, Thailand

* Corresponding author. E-mail address: Pathanin.san@stou.ac.th

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Abstract

The coronavirus (COVID-19) pandemic, which started in late 2019, has had a significant impact worldwide. During the pandemic a massive amount of infectious waste has been produced, making the planning and creation of new waste management systems imperative. The objective of our research was to assess the Knowledge of, Attitude towards, and Practices (KAP) of, infectious waste management and disposal, particularly COVID-19 waste, of Thai people. This cross-sectional study was conducted over 6 months from October 2020 to April 2021. A self-administrated questionnaire was returned by 281 respondents and the data derived from the questionnaire was analysed using descriptive statistics. The results showed that 76.16% of respondents showed a good level of knowledge, 81.49% exhibited positive attitudes towards proper infectious waste management, and 43.77% of respondents had moderate practice levels. Analysis of the responses suggested that the ideal course of action for infectious waste management is to include the informal sector in strategies for managing infectious waste, drawing on their practices and knowledge while aiming to improve production and the living and working conditions of those involved. To lessen the risk of environmental contamination and the possibility of infection or harm to the general population, local authorities should develop a well-planned collection and transfer mechanism for infectious waste.

Keywords: knowledge, attitude, practice, infection, COVID-19

Introduction

The coronavirus disease outbreak in 2019 (COVID-19), and ongoing, caused an exponential increase in the volume of hazardous and medical waste, including contaminated masks, gloves, and other protective gear, being produced by the healthcare industry and the general population (UNEP, 2020). Infectious wastes are biohazardous or biomedical wastes that include pathogens that cause infection. Infectious waste contains biological or chemical substances that have the potential to cause disease in the short or long term (Hussain, Paulraj, & Nuzhat, 2021). Infectious waste management and disposal is a public health issue in both developing and developed countries. Additionally, household waste that contains infectious contaminants like tissue papers, masks, and gloves is going to expose waste management staff to a risk of sickness (Al Arbash, Mahmood, & Sayyad, 2021). To prevent the spread of infectious residues, used masks, gloves, aprons, and other plastic safety equipment produced during the pandemic should not be recycled but must be carefully handled and disposed of safely. As well, such material must be considered hazardous to all employees during handling or collection and at waste treatment facilities (Luhar, Luhar, & Abdullah, 2022). Additionally, waste management is potentially a source of infection for personnel and members of the general public who may be exposed to infectious material disposed of as garbage.

Despite its importance, appropriate healthcare waste management and disposal pose considerable obstacles in many developing nations (Aung, Luan, & Xu, 2019). The use of disinfectants and holding the trash for nine days, as well as the use of autoclaves and incinerators with high-temperature burners, were studied as appropriate technological solutions to collect the infected waste (Das, Islam, Billah, & Sarker, 2021). However, due to a lack of appropriate policies and resources, infectious waste management in many developing nations falls short (Shammi, Behal, & Tareq, 2021). The ability to execute such programs in developing countries is severely limited due to resource restrictions. Several investigations from poor nations have revealed evidence that hazardous garbage is often, or usually, burned in the open air (Kerdsuwan & Laohalidanond, 2015). As well, infectious waste has been mixed with municipal rubbish (Mahmood, Din, & Mohsin, 2011), or illegally recycled and resold (Mohankumar & Kottaiveeran, 2011), a practice that poses a substantial and significant risk of harm to both the handlers' health and the environment.

There is a global shortage of safe waste management services for infectious trash, particularly in the least developed nations. According to the most recent data (from 2019), one out of every three healthcare facilities in the world does not safely manage infectious waste. These were pre-pandemic statistics. The COVID-19 pandemic subsequently created a significant increase in infectious waste, placing a major burden on inadequately resourced healthcare facilities and escalating the effects of solid waste on the environment (Andeobu, Wibowo, & Grandhi, 2022). According to Tang's study from 2020, infectious waste in Wuhan, China, increased significantly from 40 tons per day to 240 tons per day. Elsewhere, forecasts for several other cities include daily infectious waste volumes of 280 tons for Manila, 154 tons for Kuala Lumpur, 160 tons for Hanoi, and 210 tons for Bangkok (Bank, 2020). There has been an increasing volume and accumulation of residues in various regions across Thailand, increasing the risk of COVID-19 infection in the country, despite government efforts to mitigate that risk. Aside from the behavior of people as a contributing factor, there was an urgent need to discover a mechanism to dispose of these infectious wastes. Both lay people in the general population, and professionals in associated activities, should be aware of and know how to appropriately sort and dispose of waste. Our study found that knowledge, attitude, and practice (KAP) were all associated with people's levels of fear that arose during the SARS pandemic in 2003 which it is believed helped to motivate efforts to contain and manage the outbreak at that time (Zhong et al., 2020).

In the Thai community, shortly after the arrival of COVID-19 in the country, everyone was advised to wear a face mask but for no more than one day for the same mask. This caused a massive mound of trash face masks and created a significant disposal problem. Face masks, face shields, sanitisers, disinfectants, Antigen Test Kits (ATK), and respirators have been used to combat COVID-19 almost since its inception, yet infectious waste and its burgeoning environmental effects may outlive the virus. Containers of used gloves, spent hand sanitisers, waterlogged masks, and other similar garbage produced as a result of COVID-19 precautions have often been found in common trash bins, the non-medical contents of which also become infected and need correct and proper handling to prevent stop the illness from spreading.

Our study was carried out to determine how Thai people are handling infectious waste during the COVID-19 pandemic, with the research goal of identifying and analyzing Thai people's knowledge, attitude, and practice (KAP) regarding infectious waste management. The results will provide a better understanding of the current situation and problems in the country and inform Thailand's future infectious waste management planning and practice.

Methods and Materials

Study Design: Population and Procedure Sampling

This research was a descriptive KAP study conducted in various Thai communities. The participants of interest were males and females over the age of 20 who reside in the Kingdom of Thailand, regardless of their educational background. Wayne's formula, which determines the proportion of the population in the case of an unknown population, was used to make a hypothesis and determine the sample size for this survey.

$$N = Z^2_{1-\alpha/2}\,[p(1-p)]/d^2 \qquad \text{(Wayne, 1995).}$$

When applied by (Zhang & Ma, 2020) to the moderate to severe 2019 coronavirus outbreak in China, the calculations included $Z^2_{1-\alpha/2} = 1.96$; p = 0.76 (the proportion of the population affected by; d= 0.05 (estimation accuracy). Based on the same formula, 281 Thai people (n = 281) were included in the study.

Due to the spread of the COVID-19 pandemic and the lockdown policy enforced in the country, a physical and paper-based questionnaire was not feasible. Our online survey started on the 9th of October 2020 and the dataset was extracted on the 11th of April 2021, with the data being gathered using the Snowball sampling technique. Online questionnaires were made available to or advised to, the participants in our research network via email, Facebook, LINE, and other applications and Google Forms were also employed to disseminate them. The respondents initially signed an agreement to provide personal information for the study before responding to the questions in various sections of the online survey. Only those who had access to the Internet were included in the study. These techniques worked well for gathering the information. However, the number of available responses that met the exclusion criteria, in our opinion, restricted the amount of data we could collect. We did agree, though, that once the sample size was reached, data saturation had been reached and no more participants were included in the data analysis. Importantly, the purpose of our study was to understand the experiences of persons impacted particularly by the COVID-19 pandemic to enhance the treatment advice available to the population, and to provide guidance and support offered to people. Our intention was not to produce conclusions that may be applied to other non-pandemic contexts.

Questionnaire design

The questionnaire was created based on information derived by reviewing the literature. To ensure the questionnaire's validity, it was reviewed by three independent environmental specialists. The results were achieved after 30 samples of responses were tested to demonstrate reliability. Cronbach's alpha reliability coefficient was 0.94 for the overall scale and 0.93 for "knowledge", 0.95 for "attitude", and 0.94 for "practice" subscales. The measurement device was regarded as highly dependable because the value was more than 0.7. Four sections made up the questionnaire: 1) Part 1 asked about the baseline characteristics of the respondents (7 questions), 2) Part 2 probed respondents' knowledge of infectious waste management (10 questions) which a total score was 10 points. The findings were then classified into three levels using Benjamin Bloom's criteria-based scoring scale (Bloom, 1971): good (6.67 points), moderate (3.34 - 6.66 points), and poor (3.33 points), 3) Part 3 probed respondents attitudes toward infectious waste management (20 questions). Attitude level was scored by rating scales on 3 levels as follows; statements with a positive attitude were assigned a score of 3 points for "agree", 2 points for "undecided", and 1 point for "disagree". Conversely,

the statement with a negative attitude was assigned a score of 1 point for "agree", 2 points for "undecided", and 3 points for "disagree". The findings were then classified into three levels: good (2.35 – 3.00 points), moderate (1.68 – 2.34 points), and poor (≤ 1.67 points), and 4) Part 4 of the questionnaire probed respondents' practices of infectious waste management (10 questions). Practice level was scored by rating scales on 3 levels as follows; statements with a positive practice were assigned a score of 3 for"always", 2 for "sometimes", and 1 for "never". Contrarily, the statement with a negative practice was assigned a score of 1 for "always", 2 for "sometimes", and 3 for "never". The results were then interpreted and graded into 3 levels: good (2.35 – 3.0 points), moderate (1.68 – 2.34 points), and poor (≤ 1.67 points).

Overall consideration scores were graded by using class intervals as used with the attitude part.

Ethical Considerations

Ethical clearance and research authorization were obtained for this study. The informed consent declaration and the research tool were written and submitted to the School of Health Science Ethical Considerations Board of Sukhothai Thammathirat Open University and approved before dissemination (reference number: IBB SHS 2020/10004/69). All data were kept private during the whole study, and the survey was anonymous (no questions about institutions or participants' identities were asked). The survey could only be completed once, and participants were allowed to stop at any time. The researcher explained the specifics of the project to the study participants. The result will only be used for educational purposes and the entire research findings were presented. The Thai language was used to administer the web-based survey.

Data Analysis

Statistical analysis was performed using SPSS ver. 20.0 (IBM, Chicago, IL, USA). Demographic characteristics, knowledge, attitude, and practice of the participants are described using the frequency, percentage, mean, and standard deviation (SD).

Results

Participants' demographics

The demographic information of the participants is summarized in Table 1. The findings revealed that out of 281 people who took part in the study, 63.30 % were female (n = 178), and 36.70 % were male (n = 103). In terms of age, the largest group of participants in this study belonged to the age groups of 21–30 with a frequency of 51.25 % (n = 144). In terms of marital status, 69 % (n = 194) were single, 29.2 % (n = 82) were married, and 1.8 % (n = 5) reported a divorce or separation. The majority of participants among the 281 respondents had a bachelor's degree (72.60%) with Ph.D holders (19.22%), Master's (5.69%), and High School (2.49%). The study population was made up of 155 company employees, 60 government personnel, 18 undergraduate or graduate students, 17 business owners, 11 researchers or staff from universities, and 20 other people.

Table 1 General characteristics of study participants (n= 281)

Characteristics	Categories	n	%
Gender	Male	103	36.70
	Female	178	63.30

Table 1 (Cont.)

Characteristics	Categories	n	%
Age (years)	21 – 30	144	51.25
	31 – 40	70	24.91
	41 – 50	36	12.81
	51 – 60	29	10.32
	Over 60	2	0.71
Marital status	Single	194	69.00
	Married	82	29.20
	Divorce/Separate	5	1.80
Education	High School	7	2.49
	Bachelor	204	72.60
	Masters	54	19.22
	Ph.D.	16	5.69
Occupation	Company employee	155	55.16
	Government officer	60	21.35
	Student/Undergraduate student	18	6.41
	Personal business owner	17	6.05
	University researcher/employee	11	3.91
	Others	20	7.12

Analysis of participants' knowledge

Table 2 shows the analysis of the respondents' knowledge of infectious waste management. The mean (±standard deviation) score for overall knowledge (0-10 points) was 8.23±1.28 points, indicating a sufficiency of knowledge on this topic. The maximum percentage of study participants who correctly answered a question about managing infectious waste was 98.22 % (n= 276), while the lowest percentage of incorrect responses was 1.78 % (n=5) in a positive statement such as "Infectious waste has the potential to infect the general public with dangerous communicable diseases.". This indicates that the majority of participants were well- informed about the potential for infectious waste to transmit disease to humans and have a long- term impact on the ecosystem. Negative questions, such as "Both general and infectious garbage can be disposed of in the same container." Received the second-highest score with 96.44 % correct responses. The positive statement, "The best option to get rid of infectious waste is to have it taken care of by the local government." Received the fewest correct answers. Overall, there were 50.18% erroneous responses and 49.82 % right ones. The fact that the respondents were still unclear about how to properly dispose of contagious trash indicated a general level of uncertainty about this. The information acquired indicates that infectious trash was handled incorrectly, increasing the risk of biological agents dispersing and harming the ecosystem.

Table 2 Frequencies and percentages among each Knowledge item question

Questions	Number of correct (%)
1. Infectious waste is not as dangerous as non-infectious garbage. (-)	200 (71.17)
2. Infectious waste has the potential to infect the general public with dangerous communicable diseases. (+)	276 (98.22)
3. Infectious waste germs are incapable of spreading to water and land sources. (-)	215 (76.51)

Table 2 (Cont.)

Questions	Number of correct (%)
4. Red plastic bags are used to support infectious waste bins. (+)	251 (89.32)
5. A thick bag can be used to dispose of infectious garbage. (-)	201 (71.53)
6. If there is just a small amount of infectious waste, it does not need to be collected every day to save money. (-)	252 (89.68)
7. Personal protective equipment is not required for infectious waste collectors if the volume of infectious material is small. (-)	257 (91.46)
8. Both general and infectious waste can be disposed of in the same container. (-)	271 (96.44)
9. In order to save money, infectious waste should be stored to the bag's maximum capacity. (-)	250 (88.97)
10. The best option to get rid of infectious waste is to have it taken care of by the local government. (+)	140 (49.82)
Total score (Mean ± S.D.)	**8.23 ± 1.28**

Note (+) positive statement (-) negative statement/ Minimum 3 points, Maximum 10 points

Attitude Analysis

The results of the attitude analysis on the management of infectious waste are shown in Table 3. The mean (±standard deviation) score for overall attitude (maximum 3 points) was 2.64±0.24 points, indicating a sufficient attitude level on this topic. The majority of the questions elicited participants' attitudes toward infectious waste management, with 14 good items and 6 moderate items. A positive question "Are you willing to help remove infectious waste in the community in a sanitary manner?" received the highest attitude level of 2.94 out of 3, showing that the majority of respondents were very concerned about their own and/or others' hygienic safety, and were ready to help the neighborhood remove infectious waste in a sanitary manner. The lowest level of attitude in the sample group was seen in the responses to the negative message "Do you think a washable cloth mask can protect you from germs as well as a surgical mask?". This question received a moderate attitude level of 2.09, which indicated that the majority of responders were unsure about using a washable cloth mask and considered that works just as well as wearing a mask for germ prevention. Our results were in line with those of Kiran, Kini, Ravi, Santhosh, and Kiran (2015). Most participants had a positive attitude toward solid waste disposal, and 98.3% of them agreed that improper removal and disposal of solid waste have a negative influence on the environment.

Table 3 Frequencies and percentages among each Attitude item question

Questions	$\bar{x}$ (SD.)	interpret
1. Do you think the infected waste container can be used to put all kinds of garbage together? (-)	2.93 (0.31)	good
2. Do you think it will help to support more infectious waste segregation if government agencies explicitly give space for rubbish sorting and have enough numbers in the proper place? (+)	2.80 (0.58)	good
3. Do you think that sorting infectious garbage will assist to reduce the amount of infectious waste that must be disposed of? (+)	2.83 (0.54)	good
4. Do you think that each household should have a separate waste container? (+)	2.80 (0.55)	good
5. Do you think that every household is required to take infectious waste to the municipal/sub-district administrative organization's bins? (+)	2.38 (0.85)	good
6. Do you think mixing infected waste with regular garbage is an easy and safe approach to dispose of it? (-)	2.62 (0.74)	good
7. Do you think that the disposal of infectious waste is solely the responsibility of health workers? (-)	2.21 (0.90)	moderate

Table 3 (Cont.)

Questions	$\bar{x}$ (SD.)	interpret
8. Do you think that before disposing of infectious waste, the bag's mouth must always be tied first? (+)	2.93 (0.33)	good
9. Do you think that, in today's world, there is no need to divide trash because contemporary technology can already eliminate all types of waste? (-)	2.73 (0.59)	good
10. Do you think that burning infectious waste in the open air affects human health? (+)	2.74 (0.63)	good
11. Do you think that dumping infectious waste in a landfill is a difficult, time-consuming, and inefficient method? (-)	2.21 (0.85)	moderate
12. Do you think that sorting waste is difficult, time-consuming, and unprofitable? (-)	2.80 (0.54)	good
13. Do you think that disposing of infectious waste in the community is difficult? (-)	2.10 (0.90)	moderate
14. Do you think that used masks can be reused till they are broken? (-)	2.79 (0.55)	good
15. Do you think that infectious waste, such as masks and face tissue, should be separated from other types of waste by placing them in cans or bottles before disposal? (-)	2.41 (0.85)	good
16. Do you think a washable cloth mask can protect you from germs as well as a surgical mask? (-)	2.09 (0.88)	moderate
17. Do you think the mask, which might be infested with germs, was appropriately disposed of, as germs could spread if it was not? (+)	2.89 (0.41)	good
18. Do you think that community members should be involved in resolving infectious waste issues? (+)	2.93 (0.30)	good
19. Do you think that providing separate rubbish bins is a waste of money and not necessary? (-)	2.70 (0.64)	good
20. Are you willing to help remove infectious waste in the community in a sanitary manner? (+)	2.94 (0.31)	good
Total score (Mean ± S.D.)	2.64 ± 0.24	good

Note (+) positive statement (-) negative statement

Analysis of Disposal Practices

Table 4 contains the summary of the findings of the practice analysis on the management of infectious waste in individuals. The respondents' participation in managing infectious waste was rated good for 4 items, with 4 moderate items, and 2 poor items. The mean (±standard deviation) score for overall practice score (maximum 3 points) was 2.34±0.31 points, indicating a moderate practice level on this topic. Two questions had the same level of good practice level at 2.72. The first question was positive "Do you understand and follow the recommendations for handling used masks in the Coronavirus Disease 2019 (COVID-19) outbreak?". The second question with the same result was the negative "Do you have a mask that you share with other members of your family?". Overall, the respondents demonstrated that they appropriately used masks. However, while they knew that the virus can be transferred between people who did not display symptoms, which means that some people may be contagious without even realizing it, most of them don't wear a mask with other family members. Responses to the positive question " Do you have a different method of disposing of infectious waste, such as incineration or landfill?" achieved the lowest practice level at 1.63, indicating that the majority of respondents were unclear about how to dispose of infectious waste.

Table 4 Frequencies and percentages among each Practice item question

Questions	$\bar{x}$ (SD.)	interpret
1. Do you keep infectious garbage, masks, and toilet paper apart from regular waste? (+)	2.36 (0.61)	moderate
2. To limit the amount of infectious waste, do you use cloth masks instead of masks? (+)	2.27 (0.64)	moderate
3. Do you dispose of the infectious rubbish you've collected in the garbage container provided by the municipality/administrative organization? (+)	2.30 (0.76)	moderate
4. Do you dispose of infectious waste in public spaces on a frequent basis? (-)	2.41 (0.67)	good
5. Do you wash the cloth mask completely with water and detergent on a regular basis? (+)	2.59 (0.71)	good
6. Do you use an infectious waste bin with a tight lid? (+)	2.59 (0.64)	good
7. Do you have a different method of disposing of infectious waste, such as incineration or landfill? (+)	1.63 (0.80)	poor
8. Do you understand and follow the recommendations for handling used masks in the Coronavirus Disease 2019 (Covid-19) outbreak? (+)	2.72 (0.49)	good
9. Do you have a mask that you share with other members of your family? (-)	2.72 (0.53)	good
10. Do you send infectious garbage to a hospital or a health-promoting hospital close to your home to be disposed of? (+)	1.81 (0.84)	poor
Total score (Mean ± S.D.)	**2.34 ± 0.31**	**moderate**

Note (+) positive statement (-) negative statement

Overall Analysis of Knowledge, Attitude and Practice

Table 5 shows the summary of the KAP distribution of the participants about infectious waste management. The knowledge levels of the participants were investigated. It was found that 76.16% (n=214) were at a good level, 19.22% (n=54) were at a moderate level, and 4.62% (n=13) were at a poor level. Overall, 81.49% (n=229) of respondents indicated a good practice level, 17.08% (n=48) had a moderate level and 2.85% (n=4) had a poor attitude level. When the practice levels were considered, it was found that 43.77% (n=123) were moderate, 29.18% (n=82) were at a poor level, and 27.05% (n=76) were at a good level. Appropriate garbage disposal is an important part of these management measures. Nonetheless, the findings of this study that infectious waste and municipal solid garbage were frequently intermingled, were consistent with those of Jang, Lee, Yoon, and Kim (2006), who reported on the situation in Korea.

Table 5 Distribution of participants' knowledge, attitude and practice towards infectious waste management of Participants (n=281)

	Poor	Moderate	Good
	N (%)	N (%)	N (%)
Knowledge	13 (4.62)	54 (19.22)	214 (76.16)
Attitude	4 (2.85)	48 (17.08)	229 (81.49)
Practice	82 (29.18)	123 (43.77)	76 (27.05)

Discussion

Since COVID-19 has impacted the world since late 2019, extra monitoring of infectious waste linked to the disease has been necessary. As a result, additional attention must be given to the infected waste, which might help spread the disease making the management of infectious waste a major issue on a global scale. The problem had been worsened due to insufficient KAP and inadequate waste handling facilities. (Deress, Jemal, Girma, & Adane, 2019). The focus is now on reducing the volume of infectious trash. First, separate infectious waste from non-infectious waste by using separate collection bins for medical waste to mitigate the potential for the spread of the virus through contaminated garbage. However, in the research area, there were no specific bins for collecting used Personal Protection Equipment as trash. An effective training and awareness-raising program can also improve infectious waste management. It is advisable to use separate containers for collecting infectious waste in diverse locations, such as contaminated masks and gloves. It is advisable to designate "COVID Infectious Waste" on any COVID-19 infectious waste produced by clinics, wards, exam rooms, and laboratories, as well as in the community. Also, while locating picture posters illustrating the various types of medical waste next to collection bins would assist individuals in separating their waste, no such picture posters were in evidence.

With an overall accuracy rate of 76.16% and an average knowledge score of 8.23±1.28, 9espondents had strong knowledge about infectious waste management. This result was consistent with the 2021 study of Thammaapipon, Ditpraphat, & Klinsrisuk who researched the knowledge of infectious waste and infectious waste management of people in Nakhon Pathom province. It was found that most of the population knew infectious waste at a high-level accounting for 79.73%. This might be because there are community-based organizations that regularly disseminate information and expertise on waste management, like the village health volunteers. There was also a public relations alert for news from social media and television. Due to limited access to the internet and online health information resources, it is more likely that people do not know how to manage infectious waste. However, for the vulnerable Thai groups afflicted by the COVID-19 pandemic, such as the elderly and residents of rural areas, 13% of the responses received a poor level of practice.

Our research results imply that awareness of infectious waste management has increased. However, there are still certain instances where people think that masks can be discarded the same way as typical household debris, particularly when it comes to disposal. Our overall assessment of respondents' practice was that this aspect rated very good to prevent the spread of pathogens to people and the environment. Relevant organizations or agencies should establish clear guidelines for local governments to adhere to as the standard and engage in public relations to spread knowledge about the proper management of surgical waste of the mask type at every stage, from separation to storage and disposal.

There is a dearth of studies focusing on KAP for the control of infectious waste in people. The majority of them deal with domestic waste management (Almasi et al., 2019; Amouei et al., 2016; Barloa, Lapie, & de la Cruz, 2016; Laor et al., 2018) or the examination of this subject by medical professionals (Doylo, Alemayehu, & Baraki, 2019; Huynh et al., 2020; Karmakar et al., 2016; Krithiga, Sudharsana, Sribalaji, & Snega, 2021; Mehrotra, Jambunathan, Jindal, Gupta, & Kapoor, 2021; Mitiku, Admasie, Birara, & Yalew, 2022; Uchechukwu, Babatunde, & Anne, 2017).

Our research findings are consistent with earlier researchers' conclusions that a moderate percentage of personnel from academic institutions in practice which was discovered to be 62.59% (Decharat & Phethuayluk,

2022). A study conducted in 158 academic institutions in Thailand, the findings revealed that more than half of educational institutions at each level did not separate contagious waste from ordinary solid waste and that the majority do not have trash cans or garbage bins that are labeled or symbolized as infectious waste bins. Additionally, some of the respondents believed that infectious waste bins also contained hazardous garbage. Therefore, in the context of the COVID-19 epidemic, promoting understanding and awareness of the purchase of trash containers, as recommended in published guidelines for environmental health care, is essential. So, relevant agencies should set up specific bins for supporting used masks in the community. These bins should be designed to collect and store waste for proper disposal to prevent the spread of pathogens to the environment and humans. On the other hand, Decharat and Phethuayluk (2022) discovered that academic institution staff members' attitudes were moderate, with an $\bar{x}\pm S.D.$ of 2.10±0.16. This was in contrast to our analysis, which relies on 2.64±0.24. Thus, understanding and knowledge are fundamentally crucial. Along with thinking, intelligence, attitudes, emotions, and personal ideas, in part due to perception and individual learning (Kunsook, 2017). That demonstrates how the development of accurate information and understanding is the essential aspect that underlies human action (appropriate behavior).

This study had numerous positive outcomes. First, there has been surprisingly little community-based research done in Thailand concerning the handling of infectious waste. Second, it necessitates an awareness that the majority of infectious waste is created in healthcare facilities, even though alternate contexts like household production are typically overlooked. Third, this study demonstrates the disparities in Thai people's knowledge, attitudes, and practices. This study has led us to the conclusion that we should focus on the areas of the community that will enable us to recognize the hazards related to the generation of infectious waste, inform the public about them, and enhance public health. We also understand that by doing this, we can avoid unintended outcomes. Additionally, some of the limitations of this study are described here because it was conducted concurrently with the COVID-19 outbreak. While our research was specifically about hazardous medical waste management, considering other types of waste management is interesting as well. In our study, we reduced paper waste by collecting data online rather than using a paper-based questionnaire. However, older and less experienced personnel found it challenging to complete the online survey as a result of posting the questionnaire link on the social network. One explanation for the low participation rate is due to this. Participants in the study were from both urban and rural parts of Thailand, where waste management practices may have been impacted by methods for handling infectious waste.

Conclusion and Suggestions

Basic infection control procedures are the only way to contain the pandemic, as evidenced by the current state of the epidemic. There is no doubt that certain countries still use dangerous disposal techniques. This study aimed to alert concerned governments and local administrative levels to the need for meticulous implementation of mandated policies in order to enhance overall infectious waste management segregation and management in everyday practice, which will be very beneficial even after the pandemic. However, as such waste material must be identified and categorized according to its potential level of hazard, the original developer of potentially hazardous materials bears the primary duty for their handling. Once infectious trash has been located, it needs to be properly packed and contained until decontamination or inactivation can be finished. According to numerous

media or scholarly investigations, there are numerous issues with policy management. Therefore, it is a crucial problem for infectious waste management and should be urgently improved. For instance, advocates for policymaking should diligently investigate the cause of the issue, speed up the policy's advancement to better reflect actual practices, and develop mechanisms to deal with issues. Additionally, organizations involved in spatial management, staff, officials, and the general public need to be aware of the problem with the overflow of infectious trash and collaborate to change behaviors to lessen the amount of infectious waste. In order to avoid the critical situation, they should also support one another throughout garbage disposal activities. To lessen the risk of environmental contamination and the risk of infection among municipal garbage collectors and the general public, local authorities should develop a well-planned trash collection and transfer operation. Eventually, the Thai government must also strictly enforce its policies and regulations regarding infectious waste management to advance the KAP of the Thai people, particularly in the collecting and transportation of infectious waste. Due to limited access to the internet and online health information resources, vulnerable Thai populations affected by the COVID-19 epidemic, such as older adults and rural residents, are more likely to lack knowledge about infectious waste management, have unfavorable attitudes toward it, and use inappropriate preventive practices. In today's Thailand, KAP towards infectious waste management of vulnerable groups merits special research attention. The unstandardized and inadequate evaluation of practices toward infectious waste management in the COVID crisis, which should be developed through focus group discussions and in-depth interviews and constructed as multi-dimensional measures, is the second limitation of this study. More research is required to understand the KAP regarding the management of infectious waste from the COVID-19 disaster among Thai inhabitants due to the sample's limited representativeness. The likelihood of participants providing socially acceptable responses is another restriction on the scope of the current investigation. Because the participants in this study provided their information, they possibly responded positively to attitude and practice questions based on what they believed was expected of them.

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