RESEARCH ARTICLE

Factors influencing awareness and practice on household solid waste management among rural areas residents at Alor Pongsu, Kerian District

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Abstract:

Improper household solid waste management may cause various diseases to humans and bad impact on the environment. In addition, the majority of rural areas still practice dig and burn as a common practice of household waste management due to lack of an proper effective waste management system. Descriptive correlational study involving a total of 142 respondents in Alor Pongsu, Kerian district, Perak. Data were collected using face-to-face interview using a set of questionnaires for socio-demography profiles together with awareness and practice level on household solid waste. Data Analysis were done using SPSS for both; descriptive statistics on socio demography and Chi-Square for determining relationship between parameters. Awareness and practice on managing solid waste at home among residents in the study area were at moderate levels. Mean awareness on household solid waste was 6.965 (SD = 3.209) and the mean for practice level was 2.429 (SD = 0.593). Age, marital status, education level, problem in household solid waste management and training on household solid waste management were significantly correlated with awareness level ($p<0.001$). Meanwhile training on household solid waste management was significantly correlated with practice level on proper household solid waste management among the resident ($p < 0.005$). Sustainable management of household solid waste practice amongst residents in rural area could be achieved by focusing on awareness and practice elements.

Keywords: Awareness, household solid waste management, practice, rural areas

1. INTRODUCTION

The number of people throughout the globe has now exceeds 7 billion people worldwide. In addition, world prosperity has improved over the last few decades, resulting in more resources depletion and waste production. However, majority of the infrastructure service including waste management system were focused in urban area as compared to rural areas even though 46% of the people in the world were still living in rural areas (Mihai et al., 2017).

Waste management comprised an activity of waste collection, transportation, treating, disposing of, managing waste, and monitoring waste. This term usually applied to man-made materials, the process of which is usually done to reduce their adverse impact on health of human, the environment, or aesthetics (Adogu et al., 2015). Most waste in our community comes from household activities such as cleaning, cooking food, house sweeping, burning fuel and other domestic activities. In addition, humans also produced household solid waste by discarding equipment, used clothing, old furniture, and used products such as newspapers and old books.

Proper waste management can be achieved through waste separation and engagement of reuse, recycling, and composting waste at home. However, due to a lack of facilities, source isolation programs usually do not exist in local communities especially in rural area (Viljoen et al., 2021, Masjhoer et al., 2022, Mamady et al.,2016). The main reasons for poor level in management of household solid waste in communities are due to the lack of sufficient infrastructure, inadequate awareness, reduced involvement of major household stakeholders, and inadequate coverage of collection systems. To make matter worse, this condition also led to the existence of illegal dumping site where rural area is frequently exposed to such threat (Triasi et al., 2015, Borrel et al., 2014). To reduce waste production and improve household waste management, public should be aware of the various aspects of waste management and practice the correct methods toward better ways to manage household solid waste. (Sultana et al., 2021).

In urban areas, local authorities imposed an assessment tax annually. These generate income for the local authorities and in return, the urban resident will get amenities services such

as garbage collection, cleaning drains, beautifying landscapes, streetlights, and maintaining of traffic lights. However, there is no assessment tax in rural areas, therefore, the basic amenities service is not as inclusive as in urban area. This includes waste collection as well. As a solution, landfilling (dig and dump), open burning, and illegal dumping on untreated vacant land are the common methods used by rural residents to manage and dispose of their household solid waste (Yoada et al., 2014,).

In conjunction with that, this study intends to explore level of practice and awareness towards solid waste management and its relationship with socio-demographics factors among residents in rural area. Findings from this study could provide a better insight for researchers and authority in finding a win-win solution for household waste management in rural area.

2. MATERIALS AND METHODS

2.1 STUDY LOCATION

The research took place in Alor Pongsu, a petite township situated within the Kerian district, which is part of the state of Perak, Malaysia. Alor Pongsu was chosen as the study site due to its geographical location, specifically its proximity to a predominantly agriculturally zoned residential area. Additionally, local administrative data categorized this region as a rural area, falling outside the jurisdiction of local service zones.

Figure1: Map of Alor Pongsu, Kerian District, Perak State, Malaysia (Source; Google Map, 2023)

2.2 STUDY DESIGN

A descriptive correlational study was conducted from October 2022 until February 2023. Face-to-face interviews with the respondents have been conducted for data collection. Respondents' anonymity and confidentiality were strictly maintained.

2.3 STUDY PARTICIPANT

All the rural residents above 18 years old with at least 1-year duration living in Alor Pongsu, Kerian district are eligible to participate in this study. According to the data by the Alor Pongsu chief's office, there are 2500 families with 4998 male and 5174 female lived in Alor Pongsu. Sample sizes were determined using the following formula:

Sample size = $(Z^2 \times P\ (1\text{-}P))/e^2 \div 1 + (Z^2 \times P\ (1\text{-}P))/(e^2\ N)$

N = Population size
z = z-score based on confidence level, 95% confidence level = > 1.96 z-score
e = margin of error
P = standard of deviation
Confidence level was set at 95% and margin of error was at 8%. As a result, a total of 142 sample sizes are required for this study.

2.4 STUDY INSTRUMENT

To assess the awareness and practice of household solid waste management among rural residents at Alor Pongsu, Kerian district, the structured questionnaires adopted from Sultana et al., 2021 were used in this study. The questionnaire involved 37 items and it has been divided into three sections namely, socio-demographic, awareness, and practice of household solid waste management. The questionnaires were provided in bi-lingual versions of Malay and English.

The first section is the socio-demographic questionnaires consisting of 11 items that are used to identify the characteristics of the rural residents. This section included age, gender, education, monthly family income, occupation, marital status, types of solid waste, and household waste problems. The second section is awareness on household solid waste management questionnaires. This section consists of a 12-item questionnaire and the respondents were told to answer either yes or no or don't know option. There were three classifications for awareness level which are low (0-4), moderate (5-8), and excellent (9-12) based on the total score of maximum 12 point. Third section is practice of household

solid waste management questionnaires that consists of a 14-item questionnaire. For this section, the respondents were asked to give their opinion about their practice on management of solid waste based on using a 5-point Likert scale from 1=never, 2= seldom, 3= sometimes, 4= often, and 5= always. The level of practice on household solid waste management was categorized by poor level (total mean from 0-1), moderate level (total mean from 2-3) and excellent level (total mean from 4-5).

2.5 DATA ANALYSIS

SPSS version 28 was used to analyze the data in this study. Descriptive statistics of frequency, percentage, mean, and standard deviation (SD) were used for variables as appropriate. Inferential statistics were used to identify the relationship between awareness and practice with socio-demographic. A significant level was set at $p < 0.05$.

3. RESULTS AND DISCUSSION

In this section, it is explained the results of research and at the same time is given the comprehensive discussion.

3.1. Socio-demographic Characteristics of the Respondents

Table 1 shows socio-demographic characteristics of the respondents in rurals areas at Alor Pongsu Kerian, District. For age, according to the results of the research that has been done, most respondents are aged 48 years to 57 years and for gender, female was most of the respondents which were 76 (53.5%) and followed by male, 66 respondents (46.5%). Muslim residents dominate the area with a proportion of 99.3 % followed by other religion.

For marital status, shown that 88 (62.0%) of respondents were married, 33 (23.3%) respondents were unmarried, 11 (7.7%) were widowed and another 10 (7.0%) were divorced.In terms of occupation, the data indicated the following distribution: 13 respondents (9.2%) held government jobs, 4 respondents (2.8%) worked in the private sector, 40 respondents (28.2%) identified as housewives, 27 respondents (19.0%) were involved in business, 28 respondents (19.7%) were self-employed, and 30 respondents (21.1%) selected "other" as their occupation.

Table 1: Distribution of socio-demographic characteristics of the respondents (N=142)

Variable	Category	Frequency (n)	Percentage (%)
Age	18 years to 27 years	22	15.5
	28 years to 37 years	29	20.4
	38 years to 47 years	34	23.9
	48 years to 57 years	35	24.6
	≥58 years	22	15.5
Gender	Male	66	46.5
	Female	76	53.5
Religion	Islam	141	99.3
	Hindu	0	0
	Christian	0	0
	Buddhist	1	0.7
	Others	0	0
Marital Status	Married	88	62.0
	Unmarried	33	23.2
	Widowed	11	7.7
	Divorced	10	7.0
Occupation	Govt job	13	9.2
	Private job	4	2.8
	Housewife	40	28.2
	Business	27	19.0
	Self service	28	19.7
	Other	30	21.1
Education	No education	7	4.9
	Primary	38	26.8
	Secondary	81	57.0
	University	16	11.3
Monthly family income (RM)	<1000	4	2.8
	1000-1500	105	73.9
	1501-2000	29	20.4
	>2000	4	2.9

Types of solid waste	Recyclable waste	134	94.4
	Non-recyclable waste	1	0.7
	Others	7	4.9
Problem in household solid waste management	No good system for disposal waste	130	91.5
	Cost is high	2	1.4
	Lack of container to collect waste at home	9	6.3
	Others	1	0.7
Training on household solid waste management	Yes	7	4.9
	No	135	95.1

Regarding education levels, the majority of respondents, 81 individuals (57.0%), had completed their education up to the secondary level. Seven respondents (4.9%) reported having no formal education, 38 respondents (26.8%) had attained education up to the primary school level, and 16 respondents (11.3%) had reached the university level.

As for income, it can be concluded that the monthly income of Alor Pongsu residents fell within a moderate range. Specifically, 105 respondents (73.9%) reported incomes ranging from RM 1000 to RM 1500 per month. Four respondents (2.8%) had incomes below RM 1000, 29 respondents (20.4%) fell in the income range of RM 1501 to RM 2000, and four respondents (2.8%) reported incomes exceeding RM 2000.

Based on the collected data, it was observed that the majority of respondents, totaling 134 individuals (94.4%), reported that they generated recyclable waste. Only one respondent (0.7%) indicated that they produced non-recyclable waste, while seven respondents (4.9%) mentioned other types of waste.

Furthermore, the study aimed to determine if respondents had received any training in household solid waste management. The results revealed that the vast majority of respondents, accounting for 135 individuals (95.1%), had not received any training in household solid waste management. In contrast, a small minority, consisting of seven respondents (4.9%), reported having received such training.

3.2.Awareness level on household solid waste management among residents

Table 2 presents the distribution of awareness levels regarding household solid waste management among residents in the rural areas of Alor Pongsu, Kerian District. The analysis revealed that the mean awareness score among these residents was calculated to be 6.965 (SD=3.209) out of a maximum possible score of 12 points. Consequently, it can be inferred that the overall awareness level within this population falls within the moderate range.

Specifically, the majority of respondents (78.87%) exhibited a moderate level of awareness when it came to household solid waste management. A smaller percentage of respondents (11.97%) demonstrated an excellent level of awareness, while a further subset (9.15%) showed a lower level of awareness on this subject.

Table 2: Distribution of awareness level on household solid waste management among residents in rural areas at Alor Pongsu, Kerian District (N = 142)

Variable	Correct		Incorrect		M* ± SD**
	n	%	n	%	
Household solid waste management committee are needed in the community.	68	47.9	74	52.1	0.479 ± 0.501
Every people must know about household solid waste management.	141	99.3	1	0.7	0.993 ± 0.084
Local authorities have no role to play in the household solid waste management.	16	11.3	126	88.7	0.113 ± 0.376
Respiratory distress, diarrhoea and many other diseases arise due to improper waste management.	123	86.6	19	13.4	0.866 ± 0.342
Household solid waste can't reuse or recycle.	85	59.9	57	40.1	0.599 ± 0.491
Everybody awarded of electronic	2	1.4	140	98.6	0.014 ± 0.118

household solid waste management.					
Waste disposal on open places will be harmful for human health.	129	90.8	13	9.2	0.908 ± 0.289
Community people are awarded of any legislation which governs household solid waste management.	4	2.8	138	97.2	0.028 ± 0.166
All streets should be clean and free of waste.	142	100	0	0	1.000 ± 0.000
Incineration is the effective disposal mechanism for household solid waste management.	19	13.4	123	86.6	0.134 ± 0.342
Delay in household solid waste disposal causes of many difficulties.	121	85.2	21	14.8	0.852 ± 0.356
I am always concern about collect and dispose of household solid waste management.	139	97.9	3	2.1	0.979 ± 0.144
Total mean = 6.965 (SD = 3.209)					

M mean of score.*
*SD** standard deviation*

3.3. Practice level on household solid waste management among residents

Table 3 shows the distribution of the respondent's level of practice on household solid waste management at Alor Pongsu, Kerian District. According to the finding, the mean for practice score of household solid waste management was 2.429 (SD = 0.593) which out of a maximum of 5 points. The results showed that the level of the practice on household solid waste management among residents in rural areas at Alor Pongsu, Kerian district was at moderate level which indicates 98.59% of the respondents, while only1.41% of the respondents had low level of practice on household solid waste management.

Table 3: Distribution of practice level on household solid waste management among residents in rural areas at Alor Pongsu, Kerian District (N = 142)

Variable	Never n (%)	Seldom n (%)	Sometimes n (%)	Often n (%)	Always n (%)	M* ± SD**
Use different bins for waste disposal.	128	12	0 (0.0)	0 (0.0)	0 (0.0)	1.113 ± 0.359
Throw waste to drain.	89 (62.7)	43 (30.3)	0 (0.0)	0 (0.0)	0 (0.0)	1.444 ± 0.625
Kitchen waste as compost for gardening.	103 (72.5)	26 (18.3)	3 (2.1)	3 (2.1)	0 (0.0)	1.387 ± 0.713
Reuse of grocery bags.	78 (54.9)	42 (29.6)	4 (2.8)	4 (2.8)	0 (0.0)	1.634 ± 0.812
Reuse of old material	105 (73.9)	27 (19.0)	0 (0.0)	0 (0.0)	0 (0.0)	1.331 ± 0.604
Throw waste to open dump.	27 (19.0)	83 (58.5)	1 (0.7)	1 (0.7)	1 (0.7)	2.056 ± 0.702
Throw waste to open field.	134 (94.4)	7 (4.9)	0 (0.0)	0 (0.0)	0 (0.0)	1.063 ± 0.272
Put waste in bin without cover.	2 (1.4)	2 (1.4)	21 (14.8)	21 (14.8)	109 (76.8)	4.641 ± 0.775
Put waste in plastic bag.	36 (25.4)	18 (12.7)	21 (14.8)	21 (14.8)	32 (22.5)	2.965 ± 1.485
Segregate bio-degradable and non-biodegra-dable wastes	133 (93.7)	7 (4.9)	0 (0.0)	0 (0.0)	0 (0.0)	1.078 ± 0.317
Keep all garbage in one garbage bin	0 (0.0)	0 (0.0)	18 (12.7)	18 (12.7)	122 (85.9)	4.845 ± 0.400
Burn the solid waste	0 (0.0)	2 (1.4)	24 (16.9)	24 (16.9)	112 (78.9)	4.732 ± 0.582
Dispose the solid waste regularly.	0 (0.0)	0 (0.0)	38 (26.8)	38 (26.8)	102 (71.8)	4.704 ± 0.488

Dispose solid waste to waste collector.	141 (99.3)	1 (0.7)	0 (0.0)	0 (0.0)	0 (0.0)	1.014 ± 0.168
Total mean= 2.429 (SD = 0.593)						

M mean of score.*
*SD** Standard Deviation*

3.4.Relationship between socio-demographic and awareness level on household solid waste management among residents

Table 3.4 displays the connection between socio-demographic characteristics and the level of awareness regarding household solid waste management among rural residents in Alor Pongsu, Kerian District. After conducting the analysis, several noteworthy findings emerged.

Table 3.4: Relationship between Socio-Demographic and Awareness Level on Household Solid Waste Management (N=142)

Variable	Category	n	t	p
Age	18 years to 27 years	22		
	28 years to 37 years	29		
	38 years to 47 years	34	45.692	<0.001*
	48 years to 57 years	35		
	≥58 years	22		
Marital Status	Married	88		
	Unmarried	33	23.263	<0.001*
	Widowed	11		
	Divorced	10		
Education	No education	7		
	Primary	38	57.425	<0.001*
	Secondary	81		
	University	16		
Problem in household solid waste management	No good system for disposal waste	130		
	Cost is high	2	13.329	0.038*
	Lack of container to collect waste at home	9		
	Others	1		
Have you received any training on household solid waste management	Yes	7	54.139	<0.001*
	No	135		

**p-value is significant at 0.05.*

Firstly, age (t = 45.692, p < 0.001), marital status (t = 23.263, p < 0.001), education (t = 57.425, p < 0.001), issues related to household solid waste management (t = 13.329, p = 0.038), and receiving training on household solid waste management (t = 54.139, p < 0.001) were all found to have a statistically significant relationship with the level of awareness concerning household solid waste management among the rural residents in Alor Pongsu, Kerian District.

The results further reveal a significant correlation between the age of the respondents and their awareness level regarding household solid waste management (t = 45.692, p < 0.001). This correlation may be attributed to the fact that most of the respondents fell within the age range of 18 to 47 years, encompassing both young and middle-aged individuals.

Additionally, marital status was found to be significantly related to awareness (t = 23.263, p<0.001), indicating that there is a significant correlation between marital status and the level of awareness among the respondents.

Furthermore, among the socio-demographic characteristics, education exhibited a highly significant correlation with the awareness level concerning household solid waste management (t = 57.425, p<0.001). This suggests that respondents with higher levels of education possessed greater knowledge about household solid waste management compared to those with lower educational backgrounds.

Additionally, the questions related to problems in household solid waste management were also found to be significantly correlated with the awareness level regarding household solid waste management (t = 13.329, p=0.038). This underscores that respondents who faced issues or challenges in managing household solid waste demonstrated a notable relationship with their awareness levels on this topic.

Training on household solid waste management had a positive effect on high awareness level on the management of solid waste at home. This can be further elucidated by the study's findings, which indicated a significant correlation between respondents who had undergone training in household solid waste management and their level of awareness. (t=54.139,

p<0.001). The other socio-demographic characteristics were non-significant with awareness level on household solid waste management.

3.4. Relationship between socio-demographic and practice level on household solid waste management among residents

Table 4 shows the result for the relationship between socio-demographic characteristics between levels of practice on household solid waste management among the respondents. It was found that training on household solid waste management was significantly correlated with practice (t = 8.783, p = 0.003). It can be concluded that respondents who had received training have a good practice level on managing their waste, reflecting on things they have been taught during the training session. The rest of other variables such as age, gender, religion, marital status, education, occupation, family income, residential status and types of solid waste were not significantly correlated and were not related to towards practices on household solid waste management.

Table 4: Relationship between Socio-Demographic and Practice Level on Household Solid Waste Management (N=142)

Variable	Category	n	t	p
Age	18 years to 27 years	22		
	28 years to 37 years	29		
	38 years to 47 years	34	3.728	0.444
	48 years to 57 years	35		
	≥58 years	22		
Gender	Male	66	0.010	0.920
	Female	76		
Religion	Islam	141		
	Hindu	0		
	Christian	0	0.014	0.905
	Buddhist	1		
	Others	0		
Marital Status	Married	88		
	Unmarried	33	6.700	0.085
	Widowed	11		
	Divorced	10		
Occupation	Govt job	13		
	Private job	4		
	Housewife	40	2.944	0.709
	Business	27		
	Self service	28		
	Other	30		
Education	No education	7		
	Primary	38	3.361	0.339
	Secondary	81		
	University	16		
Monthly family income	<1000	4		
	1000-1500	105	0.715	0.870
	1501-2000	29		
	>2000	4		
Residential status	Own	112	0.543	0.461
	Rented	30		
Types of solid waste	Recyclable waste	134		
	Non-recyclable waste	1	0.121	0.941
	Others	7		
Have you received any training on household solid waste management	Yes	7	8.793	0.003*
	No	135		

** p-value is significant at 0.05.*

4. DISCUSSION

4.1 Socio-demographic characteristics of the residents in rural areas at Alor Pongsu, Kerian district

This study predominantly comprised participants from young and middle age groups, ranging from 18 to 47 years old, with a higher representation of female respondents. This demographic composition can be linked to occupation, as the study identified "housewife" as the most common occupation among the participants. Consequently, data collection predominantly involved female respondents, as they are typically responsible for managing household solid waste, including garbage disposal. This factor likely contributed to their increased interest and willingness to participate in the study. A similar pattern was observed in Owerri Municipal, Imo State, Nigeria, as reported by Adogu et al. (2015), where the majority of respondents fell within the age range of 21 to 40 years old, with 180 of them being female. This dominance of female participants in the study indicated a heightened interest among women in household solid waste management. Moreover, females often reported being actively involved in

activities such as lawn mowing and waste disposal tasks compared to their male counterparts.

Regarding education levels among respondents in rural areas of Alor Pongsu, Kerian District, the study found that a substantial portion had attained secondary education, with 16 respondents having received a university-level education, while the remaining respondents had primary education or no formal education. These findings closely resemble those of a previous study conducted in rural areas of Kota Bharu, Kelantan, as documented by Fadhullah et al. (2022). In the Kota Bharu study, the majority of respondents had completed secondary education (57.4%), followed by university-level education (31.1%), and primary education (8.0%). Thus, a consistent pattern emerges, indicating that the education level in rural areas tends to be predominantly at the secondary level.

The study also revealed that a significant portion of the respondents had not received any training on household solid waste management. This lack of training can lead to a limited exposure to proper waste management practices, causing them to continue practicing incorrect waste management methods. Such a situation can have detrimental effects on both the environment and human health. A study conducted in Mugda, Dhaka (Sultana et al., 2021) yielded similar results, with respondents in Dhaka also lacking training in household solid waste management. This underscores the importance of training in this field, as inadequate training can result in lower levels of awareness and suboptimal waste management practices.

Furthermore, the study found that most respondents were able to identify recyclable components within their waste, such as plastic bottles, plastic bags, food wrapping paper, and food waste. However, despite this awareness, many respondents tended to dispose of these recyclable materials in their backyards or burn them, possibly due to habitual behavior and a lack of sensitivity to the importance of recycling in household solid waste management. Only a few respondents practiced recycling, such as using food waste for composting, reusing plastic bags, and repurposing old materials into new items. This situation aligns with the findings of Razali et al. (2018), who reported that the majority of households in Malaysia lagged behind in waste separation and recycling practices compared to other countries.

Additionally, a similar pattern was observed in a study by Fadhullah et al. (2022) among residents in the East Coast of Malaysia, emphasizing the need for awareness programs initiated by local authorities and community involvement to educate people about proper household solid waste management. This sentiment was echoed in a study by M. A. Abas et al. (2021), which investigated the willingness of rural communities to pay for improved solid waste management in rural areas of Kelantan.

4.2 Awareness level on household solid waste management among residents

The present study's categorization of moderate awareness levels among rural respondents in Alor Pongsu, Kerian District mirrors the findings of previous research in Lahore, Pakistan, and is likely influenced by a combination of socio-demographic factors, educational backgrounds, and the availability of educational information through various channels, including media.

The study's assessment of awareness levels concerning household solid waste management among respondents in rural areas within the Alor Pongsu, Kerian District categorized their awareness as moderate. These findings are consistent with a prior study conducted in Lahore, Pakistan by Shahzadi et al. in 2018, which similarly reported that the majority of participants exhibited a moderate level of awareness. It is plausible that these outcomes are influenced by a combination of factors, including the respondents' educational backgrounds, income levels, cultural influences, and access to educational resources related to household solid waste management.

Furthermore, these findings align with previous research conducted by Shahzadi et al. (2018) and Sultana et al. (2021), which asserted that individuals with higher educational statuses tend to exhibit a greater awareness of household solid waste management. The congruence in results across these studies may be attributed to shared socio-demographic characteristics, educational levels, challenges in household solid waste management, and the role of media in disseminating information about household solid waste management.

4.3 Practices level on household solid waste management among residents

The study highlighted the challenges of composting kitchen waste due to knowledge gaps and space limitations among respondents. Moreover, the practice of collecting waste without covers, while consistent with findings in Accra, differed from practices in Nigeria, underscoring the influence of local waste management systems and infrastructure on

household practices.

Regarding the practice levels of household solid waste management among residents in rural areas within the Alor Pongsu, Kerian District, the study revealed a moderate level of practice. Notably, a significant number of respondents did not utilize separate bins for waste disposal, instead choosing to accumulate all their garbage in a single container. This practice was often attributed to the limited availability of garbage containers in their households. Additionally, a substantial portion of the respondents did not engage in the segregation of biodegradable and non-biodegradable waste before disposal, primarily due to a lack of knowledge about waste segregation at home, which contributed to the observed moderate practices.

These findings parallel those of a previous study conducted in urban Accra (Yoada et al., 2014), which reported that a majority of respondents did not engage in garbage separation. Specifically, only 17.3% of respondents practiced waste separation during storage, while the remaining 82.7% did not partake in waste separation at home. This lack of waste separation practices creates a conducive environment for the proliferation of disease vectors such as cockroaches and mosquitoes, as well as rodents like rats and mice, posing potential threats to public health**.**

Furthermore, this study uncovered that a significant portion of the respondents did not utilize their kitchen waste for composting in gardening, primarily due to insufficient knowledge about composting practices and space constraints at home. This contrasts with a prior study conducted in Uganda (Almasi et al., 2019), which reported different outcomes. In Uganda, respondents were more inclined to use their kitchen waste for gardening, largely because they had received education on proper household solid waste management practices.

Additionally, most respondents in this study habitually collected their household solid waste without using a cover. This practice is considered poor waste management since it can attract disease vectors drawn to the waste's odor. These findings align with a previous study conducted in Accra (Yoada et al., 2014), where only a small minority of respondents used covered plastic bins to prevent direct exposure to flies and to contain odors.

However, it's important to note that in Nigeria (Adogu et al., 2015), the results diverged from the findings of the current study, with respondents practicing waste collection using covers. This disparity may be attributed to the presence of a more robust waste collection system and the availability of covered waste containers in Nigeria.

The study also revealed that a significant majority of respondents tended to resort to burning solid waste when they accumulated a substantial volume of it although most respondents are aware that burning waste will cause toxic chemicals such as Nitric Oxide (NO), Sulphur Dioxide(SO_2), and Polyoxometalates (POMs to be released into the air. Burning waste such as plastics also can cause release of Dioxin ($C_4H_4O_{2)}$ which these toxic chemicals can have adverse effects on the human respiratory system the environment.

4.4 Relationship between socio-demographic and awareness level on household solid waste management among residents.

This study underscores the critical role of awareness in household solid waste management among rural residents. Age, marital status, and problems related to household solid waste were identified as significant factors influencing awareness levels, with findings consistent with prior research in some cases and diverging in others, likely due to contextual differences.

Awareness of household solid waste management holds paramount importance in achieving excellence in waste management practices among rural residents. The current study unveiled a significant correlation between the age of respondents and their awareness levels. This finding aligns with a previous study conducted by Fadhullah et al. (2022), which also observed that age plays a pivotal role in influencing awareness levels regarding the management of household solid waste. This connection can be attributed to the notion that age is linked to an individual's maturity, and it serves as a crucial factor in shaping awareness regarding environmental health and hygiene.

Moreover, marital status emerged as another significant factor correlated with awareness levels in this study. Specifically, married respondents displayed a higher awareness of household solid waste management. This outcome is consistent with the findings of a study by Abbas et al. (2020), which noted a similar trend. According to Abbas et al., married individuals tend to exhibit more positive attitudes toward household solid waste management than their single counterparts. This inclination may be attributed to the increased responsibilities and cultural factors associated with

marriage, leading married individuals to better manage their household waste and appreciate the significance of waste reduction, reuse, and recycling.

Additionally, the current study identified a significant correlation between issues related to household solid waste, such as the absence of an effective waste disposal system and a lack of containers for waste collection at home, and awareness levels in household solid waste management. In contrast, a study by Sultana et al. (2021) found no significant relationship between waste management issues and awareness levels. This discrepancy may be explained by the presence of waste management facilities in the area studied by Sultana et al., potentially mitigating the impact of such issues on awareness levels.

In the course of this study, education also exhibited a significant correlation with the level of awareness, with respondents who had received education demonstrating a moderate to excellent level of awareness regarding household solid waste management. Conversely, those who had not received any formal education displayed a lower level of awareness, which was categorized as poor. These findings are consistent with a prior study conducted in Thailand (Laor et al., 2018), where individuals lacking formal education similarly exhibited lower levels of awareness regarding household solid waste management.

Furthermore, the study also identified a significant correlation between training in household solid waste management and awareness levels. This relationship stems from the fact that individuals who had undergone training in household solid waste management had access to comprehensive information and knowledge on the subject. As a result, their awareness levels were generally higher compared to those who had not received such training.

4.5 Relationship between socio-demographic and practices level on household solid waste management among residents

The findings of the present study revealed that residents in rural areas of Alor Pongsu, Kerian District exhibited a moderate level of practice in household solid waste management. Notably, the research showed a significant correlation between respondents who had received training in household solid waste management and their level of practice. A substantial portion of the respondents had not received any such training, which consequently led to inadequate waste management practices, primarily characterized by open dumping and open burning. These results align with prior research conducted in Nigeria (Adogu et al., 2015), where respondents similarly practiced suboptimal waste management, resorting to open dumping and burning. The common factor in both studies was the absence of formal training in waste management, with 96.1% of respondents in the Nigerian study sharing this characteristic.

Additionally, a study conducted in Mugda, Dhaka (S. Sultana et al., 2021) yielded parallel results, where a majority of respondents (81.25%) had not received any training in household solid waste management. Collectively, these findings from rural regions in various countries emphasize the recurring theme that residents in such areas often lack access to formal training in household solid waste management, resulting in the perpetuation of traditional waste management methods.

In conclusion, these studies underscore the critical importance of providing training in waste management to ensure effective and responsible waste disposal practices at the household level.

5. CONCLUSION

The results of this study indicate a moderate level of awareness and practice regarding household solid waste management among the surveyed individuals. In terms of the association between socio-demographic factors and awareness, it was observed that age, marital status, education, issues related to household solid waste, and participation in training on household solid waste exhibited positive correlations. Conversely, when examining the relationship between socio-demographic factors and the practice of household solid waste management among rural residents in the Alor Pongsu Kerian District, only participation in training on household solid waste displayed a positive correlation.

In addition, the investigation revealed that a majority of the respondents resort to open dumping and open burning as their waste management methods, primarily because a significant portion of them lacked any training in household solid waste management. These findings underscore the importance of imparting appropriate information and training to the rural community on proper waste disposal techniques, pointing towards a potential solution for addressing the waste management challenges in the Alor Pongsu area.

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