

ORIGINAL ARTICLE

EFFECTS OF INAPPROPRIATE WASTE MANAGEMENT ON HEALTH: KNOWLEDGE, ATTITUDE AND PRACTICE AMONG MALAYSIAN POPULATION

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ABSTRACT

Numerous health issues can arise from improper domestic waste management. Uncollected wastes provide food and breeding sites for insect, bird and rodent which can expose the community to vector borne disease. Therefore, this study aims to investigate the community awareness towards domestic waste management. This study is a cross-sectional study conducted at Bandar Baru Sungai Buloh, Selangor, Malaysia. The questionnaire consists of five sections with a total of 57 questions. The questionnaire consists of four parts: Socio-demographic, knowledge, attitude and practice. The data were analysed using SPSS version 22.0. T-test, ANOVA test, Chi-squared test were used according to the type of variables and significance level will be taken at 95% or p-value of less than 0.05. A total of 355 respondents participated in this study. The mean age was 40.52 ±14.94. The majority of them were male (52.1%), Malay (71.0%), married (71.3%), with secondary educational (81%) and employed (41.1%). The majority of respondents mentioned that inappropriate waste management can cause dengue fever and leptospirosis (98.0%, 97.2%; respectively). Property type, education, occupation, ethnicity, religions and household income were significant influenced the knowledge of the participants towards domestic waste management. For attitude, gender, education, ethnicity, religion and income significantly influenced the attitude of the participants towards domestic waste management. For practice, ethnicity, religion and occupation were significantly influenced the practice of the participants towards domestic waste management. In conclusion, the community has moderate awareness of domestic waste management. Awareness of waste management should also be taught in school so that the next generation of people will have a better understanding and eventually have better practice in domestic waste management. It is also hoped that a carefully thought-out strategy can be developed to further improve the community awareness towards domestic waste management which will shed a new light on tackling this issue.

Keywords: Waste Management, Health, Knowledge, Attitude, Practice, general population

INTRODUCTION

Inappropriate disposal of domestic waste has health impacts on people such as contamination of surface and groundwater mainly through leachate or direct contact with the waste and air pollution. Other manifestations are dengue outbreak, food poisoning and leptospirosis carried by vectors like mosquitoes, insects and rodents¹. Currently, 76% of municipal domestic wastes are disposed off properly while the rest are either thrown into illegal dumps, rivers, canals, ponds or drains. There are several ways of disposal methods for municipal domestic waste in Malaysia, which includes composting (10%), open dumping (50%), and land-filling (30%)².

A Malaysian study done in Petaling Jaya in 2010 showed that average domestic waste per household in the study area is 1.70 kg, and 0.34 kg/person/day³. In another study, urban dwellers were identified as the main contributor of domestic waste⁴. Increasing number of societies living in poor housing with lack of proper waste disposal and inadequate drainage due to rapid urbanization creates favorable breeding sites for *Aedes mosquito*⁵.

Health education still plays a major role in promoting the importance of a proper waste management. It is important to educate the public towards waste minimization as less volume of waste contributes to less health hazards. It is important to highlight the type of housing as it relates to storage and ease of collection from the household perspective.

The estimated population lives in this area (Bandar Baru Sungai Buloh, Shah Alam, Selangor, Malaysia) is 8000 people with total houses of about 2000. Bandar Baru Sungai Buloh is one of the old housing areas in Selangor, that dated back as far as in the 1980's and currently, the community is facing problems in the management of their domestic waste. According to the local authority, the weekly waste collection does not seem to ease the problem as their waste continues to be disorganized. Therefore, this study aims to investigate the community awareness towards domestic waste management.

METHODS

This study is a cross-sectional study conducted during the period from 8th September until 2nd October 2014. The inclusion criteria were 18 years and above. An exclusion criterion was unable to speak and understand the Malay language. The questionnaire was developed based on literature, expert's discussion and pre-testing. A pilot study among 30 participants was done at the study area before the actual study was initiated to pre-test and validate the set of questions in the questionnaire. The questionnaire consists of five sections with a total of 57 questions.

The questionnaire consists of four parts (socio-demographic, knowledge, attitude and practice). Socio-demographic includes (age, gender, race, and economic status). Knowledge, which contains 17 questions about knowledge on the management of domestic waste and the complications of improper management of the waste. For attitude, it comprises of 14 questions on garbage management and other aspects that play a role in its management.

Questions on attitude were asked using Likert scale (strongly agree/ agree/ not sure/ disagree/ strongly disagree). For positive attitude items, scores of "5", "4", "3", "2", "1" for "strongly agree", "agree", "not sure", "disagree" and "strongly disagree" were given; respectively. For negative attitudes, the above scoring system was reversed. For practice, 10 questions were asked on the practice assessment of the respondent towards garbage management and also the efforts that were taken to manage garbage. Questions on attitude were asked using Likert scale (strongly agree/ agree/ not sure/ disagree/ strongly disagree). For good practice items, scores of "5", "4", "3", "2", "1" for "strongly agree", "agree", "not sure", "disagree" and "strongly disagree" were given respectively. For negative practices, the above scoring system was reversed. Multistage sampling was used in this study, cluster sampling technique was used to select five zones of the housing area and then simple random sampling technique was employed to select houses randomly. Ethical approval was obtained from the ethics committee, Faculty of Medicine, Universiti Teknologi MARA (UiTM). The sample size of this study was 355 and sample size was calculated using EPI software.

Data analysis

The data was entered, cleaned and analysed by using SPSS version 22.0. The categories of knowledge, attitude and practice scores were decided by using the arbitrary scoring system. Appropriate statistical test such as t-test, ANOVA test, Chi-squared test were used according to the type of variables and significance level will be taken at 95% or p-value of less than 0.05.

RESULTS

A total of 355 respondents participated in this study. The mean age was 40.52 ±14.94. The majority of them were male (52.1%), Malay (71.0%), married (71.3%), with secondary educational (51%), with income less than three thousand ringgit (51.0%) and employed (41.1%) (Table 1).

The majority of respondents mentioned that inappropriate waste management can cause dengue fever and leptospirosis (98.0%, 97.2%; respectively). Furthermore, most of them (95.2%) reported that improper waste management can cause water pollution. For waste management, most of them know that segregation of garbage is one of the ways to manage domestic waste (95.5%). The main source of information was from electronic media (93.5%) (Table 2).

Table 1: Socio-demographic characteristics of Bandar Baru Sungai Buloh residents (n=355)

Variables	Frequency (%)
Gender	
Male	185 (52.1)
Female	170 (47.9)
Ethnicity	
Malay	252 (71.0)
Indian	79 (22.3)
Chinese	20 (5.6)
Others	4 (1.1)
Religion	
Islam	275 (72.4)
Hindu	64 (18.1)
Buddhist	20 (5.6)
Christian	14 (3.9)
Marital status	
Single	102 (28.7)
Married	253 (71.3)
Houses	
Terrace	293 (82.5)
Bungalow	6 (1.7)
Flat	56 (15.8)
Educational Level	
Primary	27 (7.6)
Secondary	181 (51.0)
Tertiary	147 (41.4)
Income (RM)	
<3000 (Low)	181 (51.0)
3000 - 4999 (Middle)	107 (30.1)
> 5000 (High)	67 (18.9)
Occupation	
Employed	146 (41.1)
Self-employed	56 (15.8)
Unemployed	70 (19.7)
Retired	50 (14.1)
Student	33 (9.3)
Presence of Maid	
Yes	25 (7.0)
No	330 (93.0)

RM= Ringgit Malaysia

Table 2: Proportion of responses for knowledge statement regarding domestic waste management (n=355)

Variable	Frequency (%)	
	Yes	No
Effect of improper waste management towards health		
1. Dengue fever		
2. Leptospirosis	348 (98.0)	7 (2.0)
3. Spreading of bacteria	345 (97.2)	10 (2.8)
4. Breeding of flies	346 (97.5)	9 (2.5)
a) Diarrhoea		
b) Dysentery	342 (96.3)	13 (3.7)
5. Water pollution	154 (43.4)	201 (56.6)
a) Cholera		
b) Thyphoid fever	310 (87.3)	45 (12.7)
c) Dysentery	223 (62.8)	132 (37.2)
d) Liver disease (hep. A)	156 (43.9)	199 (56.1)
	147 (41.4)	208 (58.6)
Method of disposal		
1. Segregation of garbage	339 (95.5)	16 (4.5)
2. Open burning cause air pollution	347 (97.7)	8 (2.3)
3. Correct method disposal		
a) Burial	272 (76.6)	83 (23.4)
b) Dumping	38 (10.7)	317 (89.3)
c) Open burning	32 (9.0)	323 (91.0)
d) Sanitary landfill	315 (88.7)	40 (11.3)
e) Compose	234 (65.9)	121 (34.1)
Recycle		
1. Specific colour of recycle bin	340 (95.8)	15 (4.2)
2. Recycle material can be reused	343 (96.6)	12 (3.4)
3. Government cost can be reduced	338 (95.2)	17 (4.8)
4. Recycle materials		
a) Plastic bottle	308 (86.8)	47 (13.2)
b) Papers	337 (94.9)	18 (5.1)
c) Aluminium tins	329 (92.7)	26 (7.3)
d) Glass bottle	300 (84.5)	55 (15.5)

There was significant difference between mean total score of knowledge towards domestic waste management between landed property and non-landed property. Respondents with landed property had significantly higher mean of score of knowledge compared to respondents with non-landed property in domestic waste management. There was a significant difference between mean total score of knowledge towards domestic waste management between low and high education. Respondents with high educational level had significantly higher mean score of knowledge towards domestic waste management compared to respondents with low educational level. There was statistically significant difference between mean total score of knowledge between employed and non-employed respondents. Employed respondents had significantly higher mean score of knowledge compared to non-employed respondents in domestic waste management. There was also statistically significant difference in the mean knowledge between ethnicities. Using Dunnett C post hoc test indicates that Malay had significant higher mean (SD) of knowledge [58.81(3.21)] compared to Indian [56.75(4.70)]. There was statistically significant difference in the mean total score of knowledge between religions.

Dunnett C post hoc test indicates that Muslims had significant higher mean (SD) of knowledge [58.78(3.27)] compared to Hindus [56.38(4.90)]. There was statistically significant difference in the mean total score of knowledge between household incomes. Dunnett C post hoc test indicates that high income had significant higher mean (SD) of knowledge [59.46(3.35)] compared to low Income [57.27(4.02)] and middle income had significant higher mean (SD) of knowledge [59.18(2.86)] compared to low Income [57.27(4.02)]. The gender, marital status and having maid had p value > 0.05. Hence, the mean total score of knowledge towards domestic waste management between gender, marital status and presence of maid were not significant (Table 3).

Most of the respondent which was 299 (84.2%) agreed that they played an important role in garbage management in their community. Three hundred and ten (87.4%) agreed that any of their purchasing like food wrappers, papers, and others will affect the amount of garbage that they had to dispose. Out of 355 respondents, only 183 (51.5%) agreed that other personal issues like crime, unemployment and living cost are very important than garbage problem, while 105 (29.6%) of them

disagreed and another 67 (18.9%) were not sure. One hundred and sixty-six (46.8%) disagree that maid is the one that responsible for managing the household waste disposal. Most of the respondents which is 340 (95.8%) agreed that public education about proper garbage management is one of the ways to fix the garbage crisis. Two hundred and sixty-six (74.9%) of the respondents agreed that they should bring their own plastic bag during shopping or buying groceries. Two hundred and

sixteen (60.8%) respondents agreed that they were responsible to manage the garbage if the local government did not collect the garbage as scheduled. Two hundred and seventy-four (77.2%) of the respondents agree that they should advice their neighbors whenever they think their action in managing the domestic waste was not right (Table 4).

Table 3: Summary of mean total score of knowledge towards domestic waste management with socio-demography characteristic among Bandar Baru Sungai Buloh residents (n=355)

Variables	Mean (SD)	P-value
Type of house		
Landed property	58.56 (3.50)	0.003*
Non-landed property	56.62 (4.37)	
Gender		
Male	58.12 (3.98)	0.459*
Female	58.41 (3.41)	
Marital status		
Single	58.43 (3.62)	0.152*
Married	57.81 (3.92)	
Educational Level		
Low education	57.62 (3.99)	0.000*
High education	59.16 (3.07)	
Occupation		
Employed	58.62 (3.87)	0.036*
Non-employed	57.78 (3.44)	
Presence of Maid		
Yes	57.32 (5.69)	0.190*
No	58.33 (3.52)	
Ethnicities		
Malay	58.81(3.21)	<0.001#
Chinese	57.65 (3.01)	
Indian	56.75 (4.70)	
Others	56.25 (6.40)	
Religions		
Islam	58.78(3.27)	<0.001#
Christian	57.71 (4.03)	
Buddhist	58.00 (2.60)	
Hindu	56.38 (4.90)	
Household Income (RM)		
-<3000 (Low)	57.27(4.02)	<0.001#
- 3000 - 4999 (Middle)	59.18(2.86)	
- > 5000 (High)	59.46(3.35)	

#Statistical test: ANOVA, * Statistical test: Independent T-test

By using independent t-test, there are statistically significant difference between mean total score of attitudes with gender, educational level and occupation with p-value <0.05 which are gender (p=0.010), educational level (p=0.016) and occupation (p=0.036). By using ANOVA, there are statistically significant difference between mean total score of attitudes with ethnicity, religion and the household income with p-value <0.05 which are ethnicity (p=0.014), religion (p=0.002) and household income (p=0.032). There is a statistically significant difference between mean total score of attitudes towards domestic waste management between male and female. Female respondents has a significant higher mean of

attitude compared to male in domestic waste management. There is a statistically significant difference between mean total score of attitudes towards domestic waste management between low and high education. Respondents with high educational level have a significant higher mean of attitude towards domestic waste management compared to respondents with low educational level. There is a statistically significant difference between mean total score of attitudes towards domestic waste management between employed and unemployed. Employed respondents have a significantly higher mean of attitude compared to non-employed respondents in domestic waste management. Therefore, there is statistically significant difference in the

mean total score of attitudes towards domestic waste management between ethnicity. Benferroni post hoc test indicates that Malay has higher mean (SD) of attitude [55.92(5.2)] compared to Indian [53.90(4.90)]. Therefore, there is a statistically significant difference in the mean total score of attitudes towards domestic waste management between religions. Benferroni post hoc test indicates that Muslims has significant higher mean (SD) of attitude [55.99(5.22)] compared to Buddhist [52.70(4.41)] and Hindu [53.75(4.87)]. There is also a

statistically significant difference in the mean attitude score between household incomes. However, Bonferroni post hoc shows the result was not significant. This is due to the difference of each of the category is so small, thus no difference could be detected. The type of house, marital status and presence of maid has p-value >0.05, hence the null hypothesis is not rejected. So, there is no significant different between mean total score of attitudes towards domestic waste management and type of house, marital status and presence of maid (Table 5).

Table 4: Proportion of responses for attitude statement regarding domestic waste management (n=355)

Variables	Frequency (%)		
	Agree	Not sure	Disagree
Play an important role in garbage management in the community.	299 (84.2)	29 (8.2)	27(7.6)
Pick and throw the garbage found around the housing area at the right place.	286 (80.6)	45 (12.6)	24(6.8)
Any purchasing like food, food wrappers, papers and others will affect the amount of garbage that have to dispose.	310 (87.4)	23 (6.4)	22(6.2)
Burning of the garbage gives bad health impacts	340 (95.8)	7 (2.0)	8 (2.2)
Community that throw garbage on the streets and in the drains and gullies because they have no other means of getting rid of (disposing of) their garbage.	284 (92.1)	12 (3.4)	16(4.5)
Proper garbage management should be taught in schools.	328 (92.4)	12 (3.4)	15(4.2)
Improper waste disposal is a threat to environment and community health.	347 (97.8)	4 (1.1)	4 (1.1)
Improper waste disposal is a threat to environment and community health.	347 (97.8)	4 (1.1)	4 (1.1)
Bring own plastic bag during shopping / buying groceries.	266 (74.9)	35 (9.9)	54(15.2)
Any residents that failed to manage their garbage properly can be imposed by the law.	319 (89.9)	21 (5.9)	15(4.2)
Advice neighbour whenever their action in proper waste management is not right.	27 (77.2)	48 (13.5)	33(9.3)

Most of the respondents, 185 (52.1%) said that they used soap very often to wash their hands after handling rubbish. The least number of respondents which is 52 (14.6%) said that they segregated their household garbage waste according to the types of waste very often. One hundred and twenty-three (34.6%), said that only for sometimes they bring their own bag during shopping in order to reduce the number of plastic bags they used. Most of the respondents

341 (96.1%) in BBSB chose to dispose their garbage by using garbage truck rather than burning, dumping, recycling or burying. One hundred and twenty-nine (36.3%) of the respondents had 2 dustbins at home followed by >3 and 1 dustbin at home which is 125 (35.2%) and 101 (28.5%) respectively. Out of 355 respondents, 189 (53.2%) used L size garbage bags, 145 (40.8%) used M size and only 21 (5.9%) used S size. Most of the respondents which is 85

(23.9%) discarded 8 bags of garbage per week (Table 6).

By using independent t-test, there are statistically significant difference between the mean total score of practice with occupation (p=0.044). By using ANOVA, there is a statistically significant difference between mean total score of practice with ethnicity, religion and the household income with the p-value of <0.05 which are ethnicity (p=0.018) and religion (p=0.023). There is a statistically significant difference between mean total score of practice between employed and unemployed residents. Employed residents have significantly higher mean score of practice compared to non-employed residents regarding proper domestic waste management. There is a statistically significant difference in the mean practice score

between ethnicity. Benferroni post hoc test indicates that Indian has significant higher mean (SD) of practice [40.09(5.48)] compared to Malay [38.24(5.06)]. There is also a statistically significant difference in the mean total score of practice towards domestic waste management between religions. However, Dunnet C post hoc test shows the result was not significant. This is due to the difference of each of the category is so small, so no difference could be detected. The p-value for types of house, gender, marital status, educational level, household income and presence of maid is >0.05, thus the null hypothesis is not rejected. Hence, there is no significant difference between mean total score of practice towards domestic waste management and types of house, gender, marital status, educational level, household income and presence of maid (Table 7).

Table 5: Summary of mean total score of attitudes towards domestic waste management with socio-demography characteristic among Bandar Baru Sungai Buloh residents (n=355)

Variables	Mean (SD)	p-Value
Type of house		
Landed property	55.55 (5.38)	0.056*
Non landed property	54.28 (4.30)	
Gender		
Male	54.67 (5.08)	0.010*
Female	56.09 (5.32)	
Marital status		
Single	55.38 (5.43)	0.842*
Married	55.26 (4.77)	
Educational level		
Low education	54.78 (5.27)	0.016*
High education	56.15 (5.12)	
Occupation		
Employed	55.99 (5.23)	0.036*
unemployed	54.51 (3.44)	
Presence of Maid		
Yes	56.28 (5.89)	0.360*
No	55.28 (5.19)	
Ethnicities		
Malay	55.92(5.20)	0.014**
Chinese	53.90(5.51)	
Indian	53.90(4.90)	
Others	55.50(8.70)	
Religions		
Islam	55.99(5.22)	0.002**
Christian	54.71(6.02)	
Buddhist	52.70(4.41)	
Hindu	53.75(4.87)	
Household-Incomes (RM)		
-< 3000	54.66(5.02)	0.032**
- 3000 - 4999	55.89(5.52)	
- > 5000	56.37(5.20)	

* Statistical test: Independent T-test, **Statistical test: ANOVA

DISCUSSION

In this study, the participants had moderate awareness towards domestic waste management. This is in line with the results of a Malaysian study which reported that the awareness of

domestic waste management among the general community in Malaysia is still moderate⁶.

For knowledge on domestic waste management, most of the participants were in the “moderate” category with only about half of them actually knew about diseases related to improper waste

management. Since only mere half of the participants had the knowledge on the health impact of improper waste management, this suggests the need of educating these people on this issue, especially on the health impact that can occur as a result of poor domestic waste management. Another study in Japan stressed 'health effects' as one of the most important concerns regarding solid waste in their community⁷, implicating the seriousness of this issue.

It is also very important for the public to know the correct method of domestic waste disposal. According to the study in Kuala Lumpur, Malaysia the majority of the respondents (69%) knew that the main waste disposal option is landfilling⁸. Majority of our respondents agreed on this. They generally disagree on littering and open burning and are aware of the hazardous impact of these waste disposal methods. However, only a few of them practice composting as most of them were not aware of this as an excellent method of disposal. Composting is an environmentally sound way of reducing waste. Hence, it is worth educating the public on this.

The respondents of this study demonstrated moderate attitude towards domestic waste management which is comparable to the finding of another study which also reported that majority of the respondents had favorable attitudes on waste management⁹. Most of our respondents agreed that they play an important role in garbage management in their community. It is important to take note of this because when

people realized their contributory role to the solid waste management problem, they will realize that the problems were caused by themselves, and eventually, they will also realize that they could contribute something to solve the problems⁹. A startling majority of our respondents agreed that the proper garbage management should be taught in school and also to the public.

Our findings that attitude is associated with gender, ethnicity, religion, educational level and occupation are supported by previous studies. For example, a study reported that factors such as a provision of recycling facilities, socio-economic status, demography or ethnicity influenced recycling behaviour, and these factors were inter-related¹⁰. Besides that, another study in Malaysia showed that students attitudes were affected by their educational level which supports the idea that education played a role in developing people's attitudes towards the environment⁶.

This study has several limitations. Firstly, respondents in this research is limited to the study area, thus, our findings may not represent the Malaysian population. Furthermore, this study was conducted in an area which is predominantly of Malay population. The random sampling does not give an equal proportion of other different races. Hence, it might not represent the awareness of the other ethnics accurately. Future study should take account of this.

Table 6: Proportion of Responses for Practice Statement Regarding Domestic Waste Management (n=355)

Variables	Frequency (%)				
	Very Often	Often	Sometimes	Rarely	Never
Use soaps to wash hands after handling rubbish	185 (52.1)	134(37.7)	32 (9.0)	3(0.8)	1(0.3)
Clean drains and pipes free from blockage	61(17.2)	131(36.9)	110(31.0)	28(7.9)	25(7.0)
Committed to minimize the production of garbage waste	60(16.9)	170(47.9)	92(25.9)	22(6.2)	11(3.1)
Segregate household garbage wastes according to the types of waste	52(14.6)	84(23.7)	109(30.7)	54(15.2)	56(15.8)
Reuse things that can be recycled	32(9.0)	76(21.4)	103(20.9)	54(15.2)	90(25.4)
Always bring own bag during shopping in order to reduce the number of rubbish and plastics	31(8.7)	64(18.0)	123(34.6)	55(15.5)	82(23.1)

Table 7: Summary of mean total score of practice towards domestic waste management with socio-demography characteristic among Bandar Baru Sungai Buloh residents (n=355)

Variables	Mean (SD)	T-statistic	P-value
Type of house		-0.395	0.693*
-Landed property	38.63(5.28)		
-Non-landed property	38.93(5.19)		
Gender		-1.732	0.084*
-Male	38.21 (5.23)		
-Female	39.18(5.26)		
Marital status		0.787	0.432*
- Single	38.53(5.21)		
- Married	39.02(5.40)		
Educational level		-1.684	0.093*
-Low Education	38.28(5.30)		
-High Education	39.23(5.22)		
Occupation		2.025	0.044*
-Employed	39.16(5.10)		
-unemployed	38.03(5.42)		
Presence of Maid		0.952	0.342*
-Yes	39.64(5.70)		
-No	38.60(5.23)		
Ethnicities			0.018**
- Malay	38.24	5.06	
- Chinese	39.35	6.30	
- Indian	40.09	5.48	
- Others	34.75	2.06	
Religions			0.023**
- Islam	38.24	5.03	
- Christian	41.71	6.85	
- Buddhist	38.50	7.10	
- Hindu	39.81	4.87	
Household Incomes (RM)			0.402**
-< 3000 (Low)	38.54	5.19	
-3000-4999 (Middle)	38.41	5.33	
- > 5000 (High)	39.45	5.36	

* Statistical test: Independent T-test, **Statistical test: ANOVA

CONCLUSION

The community has moderate awareness of domestic waste management. Awareness of waste management should also be taught in school so that the next generation of people will have a better understanding and eventually have better practice in domestic waste management. It is also hoped that a carefully thought-out strategy can be developed to further improve the community awareness towards domestic waste management which will shed a new light on tackling this issue.

CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest associated with the submitted manuscript.

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