ORIGINAL ARTICLE

Knowledge, Attitude and Practice on Food Waste Management Among Food Vendors in Universiti Putra Malaysia, Serdang, Selangor

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ABSTRACT

Introduction: Malaysian produced about 38,000 tons of waste per day in 2017, and 15,000 tons of it was food waste. **Objective:** To determine the knowledge, attitude, and practice of food waste management among food vendors in Universiti Putra Malaysia (UPM), Serdang. **Methods:** Universal sampling has been conducted to the respondents who are all food vendors under UPM Holdings provision. In this study, a modified questionnaire has distributed online to 37 food vendors. Fisher's Exact test was applied to determine the association among variables. **Results:** All respondents in UPM had a moderate level of knowledge, attitude, and practice on food waste management. The results highlighted that attendance in food waste management training has a significant association with food waste management (p<0.05, p=0.048). Furthermore, a significant association between age and practice on food waste management has also been identified (p<0.05, p=0.034). **Conclusion:** This study's information has indicated that a food waste management training program is needed, in which UPM could cooperate with organisations to improve food waste management.

Keywords: Knowledge, Attitude, Practice, Food waste management, Food vendors.

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INTRODUCTION

According to Food and Agriculture Organization (1), food waste refers to reducing food quantity or quality resulting from producers, food handlers, or customers' decisions and actions towards food-waste, and loss of food created at all stages from farm to fork. Food loss may result from failure of equipment (such as faulty cold storage), over-ordering, and culling of defective products at the retail level. Approximately one-third of the world's food produced for human consumption each year, about 1.3 billion tons, were lost or wasted (1). Surprisingly, the wasted food by the U.S. and Europe enough to feed 3 billion people in the world (2). The awareness of food waste products needs to be enhanced to tackle all the issues related to food for ecological health status.

According to Sim (3), Malaysians produce about 38,000 tons of waste per day, and 15,000 tons of it was food waste. These numbers can reduce when a proper food waste management is implemented, and it could save from overuse of resources itself. In Malaysia, 31% - 45% of solid waste production is food waste. Among those percentages, ICI (industrial, commercial, and institutional) sector produced around 31.4%. A survey was carried out in 2012 by the National Solid Waste Management Department (JPSPN) (4). In Europe, 14% of food waste generated by food services, which have a standard practice towards food waste management (5). Knowledge, Attitude, and Practice (KAP) are taking an important matter. A study conducted by F. Jarjusey (6) has claimed that poor understanding of food waste will contribute to even more food waste. Food waste in food processing, households, and food service industries has contributed significantly to the effects of global warming (7). Food waste's environmental impacts can reduce if the knowledge, awareness, and practice towards food waste management are in a good state.

According to Jereme, Siwar and Begum (8), food courts and restaurants' food waste was 5,319 tonnes per day, which simultaneously 1,941,608 tonnes per year in

Malaysia. Moreover, 55 tonnes per day and 26 962 tonnes per year of food waste are generated in Malaysia institutions. Food vendors need to practice proper food waste management throughout the operation time. Hence, food waste minimisation can practice. For food waste management, the National Solid Waste Management Department (JPSPN) of Malaysia has developed a plan focusing on industry, commercial, and institution sectors (2016-2026), targeting efficient and effective food waste management.

This study highlights food waste management of the institutional sector in Universiti Putra Malaysia (UPM), Serdang. The other factor that has included was food vendors in UPM. Food vendors are responsible for managing food waste to prevent any food waste-related issues. This study's main objective is to determine the level of knowledge, attitude, and practice on food waste management (FWM) among food vendors in UPM.

MATERIALS AND METHODS

The researcher has conducted a cross-sectional study method in UPM. The study population was among food vendors in UPM. All 37 food vendors are located around the campus chosen as respondents (Universal Sampling). Food vendors sell or prepare food for consumption to students and staff on campus under the supervision of UPM Holdings. In this study, food vendors have been chosen due to the lack of effort to understand the cause of waste among retailers and suppliers (9).

A modified questionnaire from Kasavan et al. (10), Jatau (11), and Hami (12) on KAP towards food waste management referred to in this study. The questionnaire was distributed through email given from UPM holdings to 37 food vendors in UPM who had given their consent to participate in this study.

The questionnaire consists of five parts; section A consists of 11 questions on the food vendors' sociodemographic information, for example, level of education. Section B (knowledge of food waste management) has 15 questions; for example, separating food waste in food premise is very important. Section C (attitude on food waste management and section) has 16 items; for example, proper food waste disposal is very important in food premise. Section D (practice on food waste management) has 21 questions; for example, "*I practice food waste composting*". Section E was to obtain the suggestion from the food vendors to improve on food waste management. The modified questionnaires were in Bahasa Melayu. Hence, to keep its reliability and validity, an opinion from five academic experts in this field was done. Pre-testing the questionnaire was done by distributing the questionnaires to ten respondents among Taman Sri Serdang food vendors.

For section B, the points of 4-Likert scales used to interpret items in the questionnaire. Each of the Likert scales has its point indicating a strongly obtained score converted in terms of score level. The mean score and standard deviation of the group used to classify subject into different levels as follows:
- Low level: Score < Mean – S.D
- Moderate level: Score = Mean +/-S. D
- Good Level: Score> Mean +S. D

Section D, the 4-Likert scales utilised, and each of the Likert scales often have it (4 Points). The obtained score was converted in terms of score level. The mean score and standard deviation of the group used to classify subject into:
- Low level: Score < Mean +/-S. D
- Good Level: Score > Mean +S. D

Cronbach's Alpha test for the modified questionnaire has obtained for each part, knowledge = 0.865, attitude = 0.633 and practice = 0.773. Then, the collected data were tabulated and analysed by using the Social Sciences Statistical Programme Version 25. To identify the association between variables in this study, Fisher's Exact Test is used to analyse the data for testing the association of the categorical variables in this study.

RESULTS

Sociodemographic Information of Food Vendors in UPM
From the total of food vendors who participated in this study (N=37), 19 (51.4%) of them were male, and 18 (48.6%) were female. 36 (97.3%) of the food vendors were Malaysian citizens, and only one (2.70%) of the food vendors was non-citizen. For the range of age, none of them was below 18 years old. The majority of the food vendors were at the age of 40-50 years old (48.6%). The remaining food vendors were at the age of 18-30 years old (10.8%), 30-40 years old (16.2%), exceeds 50 years old (24.3%). Furthermore, all the food vendors in UPM had experience in running the business for more than one year. Eleven (29.7%) of the food vendors had one to five years of experience. 16 (43.2%) of the food vendors had already been in this business for five to ten years, and 10 (27%) food vendors had more than ten years of experience in the food industry. For the food vendors' educational level, 9 (24.3%) of the food vendors had ended their studies at secondary school, and 28 (75.7%) had pursued courses for a diploma/ degree/ certificate. Besides, 21 (56.8%) of the food vendor's monthly income was RM2000 to RM5000. Eight (21.6%) of them were in the range of RM5000 to RM10000 and 2 (5.4%) in the field of RM10000 to RM15000.

The monthly income of below RM2000 and above RM15000 were three food vendors (8.1%). All of

the food vendors had attended the food handling attendance. During the food handling training, 30 of the food vendors (81.1%) had claimed that the training included the food waste management aspect, and 7 of them (18.9%) had voiced out a vice versa. Only 11 food vendors (29.7%) took part in the practice of food waste management training. Among the eleven food vendors, 63.6% of them managed to join the food waste management training for only once.

Level of Knowledge on Food Waste Management among Food Vendors

The mean score for knowledge level on food waste management was 49.67, and the standard deviation was 5.318. Both mean and standard deviation were used to classify the subjects into three knowledge levels: low, moderate, and high (2). The story of knowledge on food waste management among food vendors in UPM was presented in Table 2. Most of the food vendors obtained a moderate level of expertise, 26 (70%). Then, 8 (22%) received a high level of knowledge, and 3 (8%) got a low level of understanding of food waste management.

Level of Attitude on Food Waste Management among Food Vendors

For the attitude level, 16 questions were stated through the online questionnaire. Each of the questions has four answers which strongly disagreed, disagree, agree and strongly agree. The mean score for attitude level on food waste management was 36.86, and the standard deviation was 4.183. Both mean and standard deviation were used to classify the subjects into three attitude levels as low, moderate and high (2). Most of the food vendors obtained a moderate level of attitude, which were 28 (76%) food, vendors. Then, 5 (14%) of them received a low level of attitude, and 4 (11%) got a high level of mentality on food waste management.

Level of Practice on Food Waste Management among Food Vendors

For the practice level, 21 questions were stated through the online questionnaire among respondents. Each of the questions has four answers, which were never, not often, often, and very often. The mean score for practice level on food waste management was 61.46, and the standard deviation was 6.021. Both mean and standard deviation were used to classify the subjects into three practice levels: low, moderate, and high (2). The level of practice on food waste management among food vendors in UPM was presented in Table 4. Most food vendors obtained a moderate level of practice, which was 25 (68%). Then, four (11%) received a low level of practice, and eight (22%) got a high level of practice on food waste management.

Association between Knowledge Level and Practice Level on Food Waste Management among Food Vendors

Table I shows the total number (N=37) of the association between knowledge and practice on food

waste management among food vendors in UPM. The results show no sign of the association between experience and training on food waste management among food vendors. The p-value for the Fisher's Exact test was 0.258. The p-value was more than 0.05, which indicates no significant association between both variables (Table II). Fisher's Exact Test has been utilised as six cells (66.7%) have expected count less than 5.

Table I : Association between Knowledge and Practice on Food Waste Management among Food Vendors (N=37)

Variables		Practice Level			
		Low	Moderate	High	Total
Knowledge Level	Low	1	1	1	3
	Moderate	3	19	4	26
	High	0	5	3	8
Total		4	25	8	37

Table II : Association between Knowledge Level and Practice Level on Food Waste Management among Food Vendors (Fisher's Exact Test)

	Value	df	p-value
Fisher's Exact Test	4.845	4	0.258
N of Valid Cases	37		

Association between Attitude Level and Practice Level on Food Waste Management among Food Vendors

In table III, shows the total number (N=37) of association between attitude and practice on food waste management among food vendors. From the results, it has shown that there was no significant association between attitude and approach to food waste management among food vendors. The p-value for the Fisher's Exact test was 0.557. The p-value was more than 0.05, which indicates no significant association between both variables. Hence, Fisher's Exact Test has utilised as seven cells (77.8%) have expected count less than five.

Table III : Association between Attitude Level and Practice Level on Food Waste Management among Food Vendors (N=37)

Variables		Practice Level			
		Low	Moderate	High	Total
Attitude Level	Low	1	3	1	5
	Moderate	3	20	5	28
	High	0	2	2	4
Total		4	25	8	37

Association between Socio-Demographic and Knowledge Level on Food Waste

Management among Food Vendors

Based on the summarised data in Table V, it reports the association between sociodemographic and knowledge level on food waste management among food vendors in UPM. Fisher's Exact Test has been utilised for all the

variables as the data collected had an expected count of less than 5 for more than 20% (13). As a result, none of the sociodemographic shows a significant association with knowledge level on food waste management among food vendors in UPM.

Table IV : Association between Attitude Level and Practice Level on Food Waste Management among Food Vendors (Fisher's Exact Test)

Variables		Practice Level			
		Low	Moderate	High	Total
Attitude Level	Low	1	3	1	5
	Moderate	3	20	5	28
	High	0	2	2	4
Total		4	25	8	37
		Value	df	p-value	Exact Significance (2-sided)
Fisher's Exact Test		3.075	4	4	0.557
N of Valid Cases		37			

Association between Sociodemographic and Attitude Level on Food Waste Management among Food Vendors

In table VI, summarised the association between sociodemographic and attitude levels on food waste management among food vendors. Fisher's Exact Test has been conducted to determine both variables' association; all the variables as the data collected had an expected count of less than five for more than 20% (13). The p-value was 0.048 for training attendance food waste management. The result shows a significant association between food waste management training attendance and attitude on food waste management among food vendors. As a result, it was the only significant association that has been determined for the association between sociodemographic and attitude levels on food waste management among food vendors.

Association between Socio-Demographic and Practice Level on Food Waste Management among Food Vendors

The information related to the sociodemographic of food vendors has been collected in this study. The data has been summarised in Table VII for the association of both variables. Fisher's Exact Test has been utilised for all the variables as the data collected had an expected co unt of less than 5 for more than 20% (13). Based on the findings, Fisher Exact test has indicated that age and practice on food waste management had a significant association. There were four age divisions stated in the sociodemographic information, 18 to 30 years old, 30 to 40 years old, 40 to 50 years old, and above 50 years old. The p-value for the association between age and practice on food waste management among food vendors was 0.034. As seen in Table VII, no significant association has been reported for the other variables.

DISCUSSION

Sociodemographic Information for Food Vendors
This study was focussing on food vendors in UPM who voluntarily answered the questions based on the questionnaire given.

In the course of this study, the pandemic of Covid-19 concurrently occurred. Tan Sri Muhyiddin Yassin was declared public, and private universities' closure begins on 18 March 2020 (14). Food vendors were affected by their monthly income due to the order. The highest monthly payment among food vendors was above RM15000. Therefore, all of the food vendors in UPM can be classified as small company size, sales below 100 million dollars (15). Based on a conducted survey, small food vendors had significantly higher food donation rates and food waste recycle (15). It shows that income can be associated with the practice of food waste. There were only 11 food vendors who attended the movement for food waste management training, and the others had not participated in the activity. Hence, it could be affected by the level of knowledge, attitude, and practice on food waste management.

Level of Knowledge on Food Waste Management among Food Vendors
Most food vendors, 26 (70%), had a moderate level of knowledge of food waste management. Eight (22%) of them had obtained a high level, and another three (8%) got a low level of knowledge. Based on the questionnaire, one (3%) food vendors have not agreed that food waste experience could reduce the food waste amount. Nevertheless, a study conducted by F. Jarjusey (6) has stated that inadequate knowledge of food waste will contribute to even more food waste because knowledge influences attitude and practices in generating food waste. Besides, there were four (11%) of food vendors in UPM had not aware of proper food waste disposal at the food premise.

The majority of the food vendors in UPM believed that food waste management training is supposed to be compulsory for all food vendors as it will help them manage food waste. A study has disclosed that if respondents are trained with appropriate recycling practices, particularly in managing food waste, this may help them reduce their food waste (16). Previous research has reported that the United Kingdom was experienced a substantial reduction in food waste from 8.3 million tons to 7.2 million tons between 2009 and 2011 as a result of the successful campaign in developing the knowledge on food waste (6).

Level of Attitude on Food Waste Management among Food Vendors
Most food vendors obtained a moderate level of attitude, which were 28 (76%) food vendors. Then, five (14%) received a low level of perspective, and four (11%) got

Table V : Association between Socio-Demographic and Knowledge Level on Food Waste Management among Food Vendors (N=37) (Fisher's Exact Test)

Variables		Knowledge Level			χ2	df	p-value
		Low	Moderate	High			
Gender	Male	3	13	3	3.476	2	0.176
	Female	0	13	5			
Citizenship	Citizen	3	25	8	0.435	2	0.805
	Non-Citizen	0	1	0			
Age (years)	18-30	0	3	1	1.255	6	0.974
	30-40	1	4	1			
	40-50	1	13	4			
	>50	1	6	2			
Working Experience (years)	1-5	0	9	2	4.730	4	0.316
	5-10	3	10	3			
	>10	0	7	3			
Educational Level	Not School	0	0	0	0.156	2	0.925
	Primary School	0	0	0			
	Secondary School	1	6	2			
	Certificate/Diploma/ Degree	2	20	6			
Monthly Income	< RM 2000	1	2	0	7.352	8	0.499
	RM 2000 - RM 5000	1	16	4			
	RM 5000 - RM 10000	1	4	3			
	RM 10000 - RM 15000	0	1	1			
	> RM 15000	0	3	0			
Food Handling Training Attendance	Yes	3	26	8	-	-	-
	No	0	0	0			
Food Waste Management Aspect Includes in Food Handling Training	Yes	2	21	7	0.623	2	0.732
	No	1	5	1			
Food Waste Management Training Attendance	Yes	1	7	3	0.348	2	0.840
	No	21	19	5			
Times (Food Waste Management Training)	1	1	4	2	4.639	6	0.591
	2	0	2	0			
	3	0	1	0			
	>4	0	0	1			
Organizer (Food Waste Management Training)	Government Agency	0	1	0	2.357	4	0.670
	Private	1	4	3			
	NGO	0	2	0			
	Others	0	0	0			

N=37, Fisher's Exact Test, p-value <0.05 is significant

Table VI : Association between Sociodemographic and Attitude Level on Food Waste Management among Food Vendors (N=37) (Fisher's Exact Test)

Variables		Attitude Level			χ2	df	p-value
		Low	Moderate	High			
Gender	Male	1	15	3	2.918	2	0.232
	Female	4	13	1			
Citizenship	Citizen	5	27	4	0.330	2	0.848
	Non-Citizen	0	1	0			
Age (years)	18-30	0	4	0			
	30-40	1	4	1	1.791	6	0.938
	40-50	3	13	2			
	>50	1	7	1			
Experience (years)	1-5	1	9	1			
	5-10	1	13	2	3.319	4	0.506
	>10	3	6	1			
Educational Level	Not School	0	0	0			
	Primary School	0	0	0	1.883	2	0.390
	Secondary School	0	8	1			
	Certificate/Diploma/ Degree	5	20	3			
Monthly Income	RM 2000	0	3	0			
	RM 2000 – RM 5000	0	18	3			
	RM 5000 – RM 10000	2	5	1	14.970	8	0.060
	RM 10000 – RM 15000	1	1	0			
	> RM 15000	2	1	0			
Food Handling Training Attendance	Yes	5	28	4	-	-	-
	No	0	0	0			
Food Waste Management Aspect Includes in Food Handling Training	Yes	5	21	4	2.775	2	0.250
	No	0	7	0			
Food Waste Management Training Attendance	Yes	0	8	3	6.057	2	0.048*
	No	5	20	1			
Times (Food Waste Management Training)	1	0	5	2			
	2	0	1	1	1.277	3	0.735
	3	0	1	0			
	>4	0	1	0			
Organizer (Food Waste Management Training)	Government Agency	0	0	1			
	Private	0	6	2	3.438	4	0.179
	NGO	0	2	0			
	Others	0	0	0			

N=37, Fisher's Exact Test, *p-value <0.05 is significant

Table VII : Association between Socio-Demographic and Practice Level on Food Waste Management among Food Vendors (N=37)

Variables		Practice Level			χ^2	df	p-value
		Low	Moderate	High			
Gender	Male	2	14	3	0.834	2	0.659
	Female	2	11	5			
Citizenship	Citizen	4	24	8	0.493	2	0.781
	Non-Citizen	0	1	0			
Age (years)	18-30	2	2	0	13.659	6	0.034*
	30-40	2	3	1			
	40-50	0	14	4			
	>50	0	6	3			
Experience (years)	1-5	1	8	2	2.776	4	0.596
	5-10	3	9	4			
	>10	0	8	2			
Educational Level	Not School	0	0	0	0.792	2	0.673
	Primary School	0	0	0			
	Secondary School	1	7	1			
	Certificate/Diploma/Degree	3	18	7			
Monthly Income	RM 2000	0	1	2	12.538	8	0.129
	RM 2000 - RM 5000	1	17	3			
	RM 5000 - RM 10000	1	5	2			
	RM 10000 - RM 15000	1	0	1			
	> RM 15000	1	2	0			
Food Handling Training Attendance	Yes	4	25	8	-	-	-
	No	0	0	0			
Food Waste Management Aspect Includes in Food Handling Training	Yes	4	18	8	4.144	2	0.126
	No	0	7	0			
Food Waste Management Training Attendance	Yes	0	7	4	3.302	2	0.192
	No	4	18	4			
Times (Food Waste Management Training)	1	0	4	3	3.592	3	0.309
	2	0	2	0			
	3	0	1	0			
	>4	0	0	1			
Organizer (Food Waste Management Training)	Government Agency	0	1	0	0.737	2	0.692
	Private	0	5	3			
	NGO	0	1	1			
	Others	0	0	0			

N=37, Fisher's Exact Test, *p-value <0.05 is significant

a high level of attitude on food waste management. In a previous study conducted at Puncak Alam City in Selangor, the respondents in the survey have displayed an overall positive attitude towards waste management (17). In this study, three (8%) food vendors disagreed with a statement of "Food waste disposal is a responsibility of each employee". However, the other 34 (92%) food vendors had shown a positive attitude towards that statement. In the same research by (17), it has demonstrated a high mean score for the expression of each worker is responsible for conducting waste disposal. In a self-report analysis of food waste practices in Romania, (18) also reported that attitude was a significant contributor to food waste management.

Level of Practice on Food Waste Management among Food Vendors

Most food vendors obtained a moderate level of practice, which was 25 (68%). Then, four (11%) of them obtained a low level of practice, and eight (22%) got a high level of practice on food waste management. This study has identified that most of the food vendors had practised a positive purchasing practice. There were only five (14%) food vendors who unlikely to consider the purchasing practices. According to a similar study, hoteliers' food purchasing practices were high, where it above the mean value (10). Food purchasing practice is important to reduce the amount of food waste. A person who spends lots of money on food tends to generate more incredible food waste (19).

All of the food vendors had stored the fresh food at an optimum temperature and arrange the food stocks using a "first-in, first-out" (FIFO) method. Food storage with an ordering arrangement will improve visibility and avoid food from being concealed (20). Thus, it will prevent or reduce food waste. Four (10%) food vendors have never donated the quality leftover food in managing the leftover, and 15 (40%) were hard to present. Moreover, one (3%) food vendors have never given their staff to take the remaining quality foods home, and the other 11 (29%) food vendors were infrequently practised it. Abdelradi (21) indicated that the reduction of food waste in developed countries is presumed a threat related to the attitudes and practices of people towards food. Based on a survey in Cairo-Egypt, it indicated that food preference, food waste management, and personality factors contribute significantly to the respondents' practices on food waste (22).

Association between Knowledge Level and Practice Level on Food Waste Management among Food Vendors

The findings of the association between knowledge level and practice level on food waste management among food vendors in UPM has reported as no significant association as the p-value = 0.258. In this study, Fisher's Exact Test has been used because six cells (66.7%) have expected count less than five. In Karan district, Somalia,

a previous study on waste management has found that the communities' knowledge shows no association with the practice (23). In Malaysia, researchers (24) has found out that there was no association between knowledge and practice among respondents on food waste management.

Association between Attitude Level and Practice Level on Food Waste among Food Vendors

The association between attitude level and practice level on food waste management among food vendors has been reported as no significant association. The p-value = 0.557. According to a previous study by (24), the study found out a similar hypothesis, which was no association between attitude and practice on waste management (23,25).

Association between Food Waste Management Training Attendance and Attitude Level on Food Waste Management among Food Vendors

There was a significant association between food waste management training and food waste management attitude among food vendors. The p-values = 0.048. Food vendors who had participated in the food waste management training obtained a high attitude level to compare with the food vendor who has not attended the training. An employee trained on the significant impact of food waste by participating in training seems to be more likely to have a better practice on food waste (26). Food waste management will be hindered to implement if workers are not trained enough on the importance of food waste management (27).

Association between Age and Practice Level on Food Waste Management among Food Vendors

According to the findings, it has been reported that there was an association between age and practice level on food waste management among food vendors in UPM, Serdang. The p-value was 0.034. This finding was the same as a previous study in Northern Thailand that has reported a significant association between age and practice on food waste management among residents (28). The highest number of food vendors who had acquired high practice level was 40 to 50 years old. A previous study in the United Kingdom has claimed that age may affect an individual's practice towards food waste (29). As reported by Laor (28), the age group of 41 to 59 was shown the highest number of respondents who got high practice levels on food waste management among the other group of age.

CONCLUSION

In conclusion, the food vendors in UPM, Serdang, had a moderate level of knowledge, attitude, and practised food waste management. There was no association between knowledge and practice on food waste management among food vendors in this study. Besides, this study has also reported no association between attitude and

approach to food waste management among food vendors. Furthermore, there was no association between sociodemographic and knowledge on food waste management among food vendors. However, this study has found out that there was an association between food waste management training attendance and attitude on food waste management among food vendors. Meanwhile, the other association has been identified in this study, between age and practice on food waste management among food vendors. Thus, education program such as food waste management training needs to be organised among food vendors. Moreover, UPM could cooperate with organisations related to food waste to improve food waste management.

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