

**DETERMINING KNOWLEDGE, ATTITUDES AND PRACTICES
ON FOOD WASTE MANAGEMENT AMONG UNDERGRADUATE
STUDENTS IN UNIVERSITI TEKNOLOGI MARA (UITM)
SELANGOR CAWANGAN PUNCAK ALAM**

ABSTRACT

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Food waste is generated at various stages of the supply chain including processing, distribution and consumption and has been received increased attention on both academic and societal levels in the past decades. The impacts associated with food waste include greenhouse gas emissions and resource use inefficiency. The aim of this study is to determine the food waste management among students in Universiti Teknologi Mara Selangor Kampus Puncak Alam. The information was collected by using questionnaire comprising four sections: demographic information, knowledge, attitude and practice on food waste. This finding showed that the students has a high level of knowledge (3.935 ± 0.9699), attitude (5.100 ± 0.9798) and practice (2.672 ± 0.8897) (KAP) towards food waste management. There was a positive significant correlation between knowledge with attitude ($r_s = 0.217$, $p = 0.02$), and attitude with practice ($r_s = 0.241$, $p = 0.01$). However, the correlation of knowledge with practice ($r_s = 0.073$, $p = 0.31$) was not statistically correlated. There was a significant association between knowledge with gender ($r_s = 14.800$, $p = 0.011$), and attitude with gender ($r_s = 15.449$, $p = 0.009$) meanwhile there was no significant association between practice and gender ($r_s = 8.900$, $p = 0.064$). Furthermore, there was no significant association between knowledge with income ($r_s = 15.025$, $p = 0.131$), attitude with income ($r_s = 9.381$, $p = 0.496$), and practice with income ($r_s = 9.054$, $p = 0.338$). Hence, the results suggest in order to change people's behaviour in waste management, the knowledge and awareness in waste management must be

improved sustainably so that it will be able to change a person's attitude and formed it into a positive action.

Keywords: food waste, university students, knowledge, attitude, practice, demographic

1.0 INTRODUCTION

In the past decade, food waste has received increased attention on both academic and societal levels. Considered an important sustainability issue, food waste is defined as an unintentional loss or intentional disposal of edible food mass at any stage of the supply chain (Costa et al., 2020). According to United Nations Food and Agriculture Organization (UNFAO) (2013) food waste is referred to the decrease in the quantity or quality of food resulting from the decisions and actions by retailers, food service providers and consumers. In Malaysia, 15,000 tonnes of food waste was generated daily including 3,000 tonnes that is still fit for consumption and should not be discarded (The Star, 2016).

According to Abdelaal et al. (2019), food waste is a pressing issue that imposes economic, social and environmental impacts on both developing and developed countries. As a cause of negative economic, environmental and social effects, food waste is considered to be one of the sustainability issues that needs to be addressed (Aschemann et al., 2015). According to Thyberg et al. (2016), food waste may have negative environmental impacts at the end of its life depending on how it is managed such as in landfills, the food waste converts to methane, which is a greenhouse gas with a global warming potential twenty-five times greater than carbon dioxide on a hundred-year time scale. Food waste is not only tied to ethical issues and environmental impacts, it also

represents significant monetary losses, both for the individual consumer as well as for the national economy (Stavros T. Ponis et al., 2017).

Consumers are one of the largest sources of preventable food waste in developed countries, with over 60% of their waste considered avoidable (Nikolaus et al., 2018). Bravi et al. (2020) stated that a number of studies, especially focused in North America, highlighted the large amount of food waste generated by institutions, such as schools, universities, hospitals and hotels. Large population of students in a university will result in increased consumption of food and the resources required to make the food such as water and energy. According to Abdelaal et al. (2019), by focusing research efforts on food waste generation in universities, many advantages can be gained because the universities host individuals with knowledge and experience who can foster change in their surroundings easily. Furthermore, it is also proven by Liu et al. (2016) that one of the biggest contributors towards the generation of food waste are the university students.

According to Wu et al. (2019), low students' awareness of the adverse environmental problems related to food waste may derive from the insufficient information provision. Richter et al. (2018) stated that improper practice in food waste include purchasing of too much food, using unsuitable storage practices, cooking too much food, and discarding leftovers. There are several reasons involving the knowledge, attitude and practice (KAP) of a person which lead to the generation of food waste in the household. Examples include lack of food-related knowledge, personal values and poor cooking skills (Andrea et al., 2017). These reasons may be associated with socio-demographic characteristic of an individual such as age, gender and family household

income. Conventional models for predicting solid waste generation are based on socio-economic and demographic factors (Bach et al., 2004). These include the age, household income, gender and educational level.

The aim of this study is to determine the food waste management among students in Universiti Teknologi Mara Selangor Kampus Puncak Alam. The result from this study can provide the university with baseline information on overall knowledge, attitude and practice (KAP) of students on food waste management. By determining the students' socio-demographic, the association between students' socio-demographic and KAP on food waste management can be established. Insights from this study can be used to inform future interventions that focus on reducing the amount of avoidable wasted food among the younger generation such as university students as the impacts are realisable.

2.0 MATERIALS AND METHODS

2.1 *Study Design*

This study was conducted in Universiti Teknologi Mara (UiTM) Puncak Alam, Selangor. The study design chosen for this study was a cross sectional study. This study involved 201 respondents whom voluntarily participated. The respondents were from the Faculty of Health Sciences in UiTM Selangor Kampus Puncak Alam whom are currently pursuing Bachelor's degree programmes in full-time mode. The online questionnaire was distributed through the Whatsapp and Facebook platform. The respondents were able to submit their responses by clicking the form link. Participation by respondents was voluntary and sufficient time was allowed to answer the questions.

2.2 Questionnaire Design

The questions were generated in the Google form which divides into four parts consisting socio-demographic information (5 questions), knowledge on food waste management (5 questions), attitude in food waste management (6 questions), and practices on food waste management (4 questions). The questionnaire which comprises of twenty questions were answered by the respondents after clicking the form's link.

A 5-point Likert scale was used in constructing the questions for the knowledge, attitude and practice of students on food waste management. Each of these questions have a set number of response the respondent can choose from, respectively strongly agree, agree, neutral, disagree and strongly disagree. Respondents describe their agreements using a five-point scale, ranging from “1 equal to strongly disagree” to “5 equal to strongly agree”. Meanwhile, the demographic questions were in dichotomous and nominal scale.

2.3 Pilot Study

According to Choon et al. (2017) through their study, a pilot test was conducted with 30 respondents drawn from the sample in the study. The questionnaire was reviewed and updated as a pilot to be consistent with the community. Based on the reliability test conducted for 30 persons, the result for the Cronbach's Alpha was shown in Table 1. In general, items are considered to be valid if their alpha coefficient exceeds a level of 0.70. Hence, the questionnaire was reliable because the value for Cronbach's Alpha test was 0.809. Then, the questionnaire was distributed to the target sample for the collection of data from November 2020 until December 2020.

2.4 *Statistical Analysis*

Data entry and statistical analysis were performed using the Statistical Package for Social Sciences (SPSS) version 22.0 (SPSS, Inc., Chicago, IL, USA). All the categorical variables will be presented as frequencies, percentages, means and standard deviation. Spearman correlation test was used to determine the potential correlation between the KAP. In addition, in order to confirm the possible association between socio-demographic characteristics such as gender and household income with KAP, the Pearson chi-square test was used in this study.

3.0 RESULT AND DISCUSSION

3.1 *Socio-demographic information of the respondents*

The socio-demographic characteristics for two hundred and one (n = 201) students from Faculty of Health Sciences, UiTM Puncak Alam in Selangor are were analysed and tabulated in Table 1. The study was predominantly participated by female respondents (89.05%) as the male respondents attributing to 10.95%. The respondents were from the age 19 years old until 25 years old and currently studying in full-time mode. Regarding the respondents' participation in terms of their field of study, the majority of the respondents were from the Medical Imaging course (27.86%), and followed by respondents from Environmental Safety and Health (21.39%). Most of the respondents participated in this study came from a family with household income that is below RM 4,360 (49.25%). Out of 201 respondents, 35.82% of the respondents participated were from family with household income ranging from RM 4,360 to RM 9,619. Meanwhile,

least of the respondents (14.93%) were from family with household income above RM 9,619.

Table 1

The socio-demographic data of the respondents (n = 201).

Socio-Demographic Characteristics	Category	Percent (%)	Correct Answer
Age	< 19 years old	-	-
	19 – 25 years old	100	201
	> 26 years old	-	-
Gender	Male	10.95	22
	Female	89.05	179
Mode of Study	Full-time	100	201
	Part-time	-	-
Field of Study	Medical Imaging	27.86	56
	Environmental Safety and Health	21.39	43
	Nutrition and Dietitics	18.41	37
	Occupational Theraphy	10.45	21
	Nursing	9.95	20
	Physiotheraphy	4.98	10
	Medical Laboratory Technology	4.48	9
	Optometry	2.49	5
Income of Family Household	Below RM 4,360	49.25	99
	RM 4,360 – RM 9,619	35.82	72
	RM 9,619 and above	14.93	30

3.2 *Level of respondents' knowledge on food waste management*

The total score of KAP for each question was calculated and recorded. Overall, the respondents show high level of knowledge, attitude and practice on food waste management. The knowledge section was made up of 5 questions, with '1' score given for each correct answer and zero score for the incorrect answer. From the result shown in Table 2, a total of 119 respondents (59.2%) know that there is an enforcement of law on waste segregation in certain states. According to a study by Malik et al. (2015), most of

the respondents from the study had the input on solid waste segregation from the internet (24.6%) as their source of information; followed by the newspaper (9.7%), television (9.2%), books or journal (6.3%), and speech (1.0%). This study showed similar result with a study conducted by Malik et al. (2015) which found that 50.8% of their respondents know there is an enforcement of law waste segregation.

Separation at Source Initiative (SSI) under Solid Waste and Public Cleansing Management Act 2007 (Act 672) was effective on September 2015. The public need to sort their garbage into different bags such as paper goes in a blue bag, plastic in a white, and glass, aluminum and electronics in green. Leftover household waste is to be bagged and put into bins provided by the garbage companies. If those rules are failed to comply with, a fine of one thousand ringgit will be cited. It is recommended for the government to take full initiative to keep the rules known and accepted by the public (Soo, 2019). Regulatory approaches, including waste reduction targets such as laws and standards, mandatory management plans, restrictions or covenants, aim to induce waste reduction and prevention behaviour through penalties for actors who do not comply with regulatory provisions (Schanes et al., 2018).

Most of the respondents (94.5%) know that having a knowledge on proper food waste management can help in reducing daily food wastage. From the table also stated that ninety-three percent of the respondents know that improper food waste management is able to contaminate the environment. Besides, out of 201 respondents, 155 (77.1%) of the respondents had an idea that the “Use by” date indicates when a product may no longer be safe to eat. Meanwhile, from 201 respondents, a total of 144 respondents (71.6%) know that “Best before” date is an indication of quality rather than safety. Bravi et al. (2020)

stated that understanding that the ‘Best before’ date is related to quality, while the ‘Use by’ date is related to safety, certainly could help consumers to make more informed choices. This kind of knowledge can give an insight if the respondents can sometimes discard food that can be consumed due to a confusion of these dates on products (Jarjusey, 2017).

Table 2
Respondents’ knowledge on food waste management.

Knowledge	Frequency	Percent (%)	Correct Answer
There is an enforcement of law on waste segregation.	119	59.2	119
Knowledge on proper food waste management help in reducing daily food wastage.	190	94.5	190
“Use by” date indicates when a product may no longer be safe to eat.	155	77.1	155
“Best before” date is an indication of quality rather than safety.	144	71.6	144
Improper food waste management contaminates environment.	187	93.0	187

3.3 *Level of respondents’ attitude on food waste management*

The attitude section was made up of 6 questions, with ‘1’ score given for each correct answer and zero score for the incorrect answer. Based on the result from Table 3, the majority of the respondents (72.6%) has agreed that waste generators are responsible for the food waste management. This finding was supported by Richter et al. (2018) which 96% of their participants agree that the avoidance of food waste in their households was important for them. Out of 201 respondents, a total of 137 respondents (68.2%) were aware of how much food they wasted every day. In addition, most of the respondents (91.0%) had a favourable attitude that food waste can negatively impact the environment.

From the results by Cakar et al. (2020) in their study, it was estimated that food waste in Turkey throughout the food supply chain was responsible for greenhouse gas emissions of 23.7 metric ton (Mt) of carbon dioxide (CO₂) equivalent per year, accounting for the farm-to-retail life cycle. This finding shared similar result with a study by Gaiani et al. (2018), which reported that 90% of the respondents consider food waste as a serious issue.

From 201 respondents, 197 (98%) respondents agreed that proper food waste management will provide a better protection for the environment. Majority (64.7%) of the respondents from study by Gaiani et al. (2018) keep the environmental impact of food in consideration when shopping. Moreover, 95% percent of them agreed that carrying out a proper purchasing planning such as listing down items to buy, frequency of shopping, will reduce food waste generation. Last but not least, most of the respondents (86.1%) agreed that campaigning and public education programmes can lead to a successful food waste management. Previous study conducted by Grodzińska-Jurczak et al. stated that influencing public attitude, behaviour and perception only can reach at limited level through media campaign, leaflet drop, newspaper advertisement and others. A study by Pinto et al. (2018) which conducted an educational campaign by placing posters in canteen has achieved an average participation of 70.45% of the users and the average weight of separated wastes went from 0.67 kg to 2.28 kg per day. A study by Gaiani et al. (2018) reported that 89% of their respondents would like to receive more information concerning the consequences of food waste and the existing systems in order to reduce it.

Table 3

Respondents' attitude in food waste management.

Attitude	Frequency	Percent (%)	Correct Answer
Waste generators are responsible for food waste management.	146	72.6	146
I am aware of how much food I wasted daily.	137	68.2	137
Food waste can negatively impact the environment.	183	91.0	183
Proper food waste management will provide better protection for environment.	196	98.0	197
Proper purchasing planning (listing down items to buy, frequency of shopping) will reduce food waste generation.	191	95.0	191
Campaigning and public education programmes can lead to a successful food waste management.	173	86.1	173

3.4 *Level of respondents' practice on food waste management*

The practice section was made up of 4 questions, with '1' score given for each correct answer and zero score for the incorrect answer. Based on the result from Table 4, 60% of the respondents stated that they regularly plan their purchase by writing a shopping list. From a study conducted by Jörisen et al. (2015), 70% of their respondents used a shopping list and they suggested that the amount of food waste is higher when no shopping list is used. Mattar et al. (2018) confirmed that planning and creating a shopping list is considered to be effective in reducing food waste. In addition, a total of 174 (87.0%) respondents regularly check the "use by" and "best before" dates on product before buying any item. Similar to the finding reported by Environment Protection Agency (2019), sixty-six percent of their respondents also checked the 'best before' and 'use by' dates before purchasing. Thirty-five percent of the respondents agreed that they frequently buy food in bulks from promotional buying. This result was similar with the findings from Jörisen et

al. (2015) which only 18.9% of the respondents were attracted to special offers in the supermarkets. Unlike the previous study carried out by Ponis et al. (2017), the respondents in this study did not practice wasteful behaviour which could lead to food waste such as purchasing items in bulk during promotion or frequent shopping.

In addition, majority of the respondents (80.0%) said that they only buy things when necessary. Environment Protection Agency (2009) stated in their study that 70% of their respondents only buy the amount of fruit and vegetables they need. Overall, the respondents for this study scored high in the knowledge, attitude and practice on food waste management. Previous study from Luo et al. (2019) stated that college students have inadequate knowledge and inappropriate practices about food safety which could put their health at risk from food borne diseases. However, this study has proven the opposite result.

Table 4
Respondents' practice in food waste management.

Practice	Frequency	Percent (%)	Correct Answer
I regularly plan my purchase by writing a shopping list.	132	66.0	133
I regularly check the "use by" and "best before" dates on product before buying.	174	87.0	175
I frequently buy food in bulks from promotional buying.	70	35.0	70
I only buy things when necessary.	160	80.0	161

3.5 Correlation between knowledge, attitude, practice of students on food waste management

Based on Spearman's rank-order test, the correlation test between total knowledge, total attitude and total attitude score was done against total KAP scores. A summary for the correlation was shown in Table 5. There was a significant positive correlation found between knowledge with attitude ($r_s = 0.217$, $p = 0.02$) and attitude with practice ($r_s = 0.241$, $p = 0.01$). However, the correlation between knowledge with practice was weak ($r_s = 0.073$, $p = 0.31$). However, this finding on the correlation of knowledge and practice was quite contradict with the findings from a study by Tsai et al. (2020) which stated that there was a positive correlation between knowledge and practice. Zhu et al. (2007) found in a study that only positive attitude and knowledge do not lead to the development of correct practice.

Table 5
Correlation among knowledge, attitude and practice levels.

Level	Spearman's rho	Sig.
Knowledge – Attitude	0.217	0.02
Knowledge – Practice	0.073	0.305
Attitude – Practice	0.241	0.001
**Correlation is significant at the 0.01 level (2-tailed).		

3.6 Association of Socio-Demographic with Knowledge, Attitude and Practice

The relationship between demographic characteristics and knowledge, attitude and practice was assessed by Pearson Chi-square test at a significance level of less than 0.05. For establishing the association between socio-demographics and KAP, the decision criterion is to reject the null hypothesis if the p-value is more than or equal to the level of

significance ($p > 0.05$). A summary of association between socio-demographics and KAP was shown in Table 6, 7 and 8. From Table 6, there was a significant association between knowledge with gender ($r_s = 14.800$, $p = 0.011$), and attitude with gender ($r_s = 15.449$, $p = 0.009$). However, there was no significant association between practice and gender ($r_s = 8.900$, $p = 0.064$). This result was similar with a study by Limon et al. (2020) which found that gender was not associated with practice on food waste management.

According to the result in Table 7, there was no significant association between knowledge with income ($r_s = 15.025$, $p = 0.131$), attitude with income ($r_s = 9.381$, $p = 0.496$), and practice with income ($r_s = 9.054$, $p = 0.338$) as the the p-values for the Pearson chi-square test were more than 0.05. This result was similar with a study by Limon et al. (2020) which found that there was a negative significant association between monthly income and attitude of respondents. In addition, a study by Melbye et al. (2016) also showed a similar result where there was no significant association between income and food waste attitude.

According to the result in Table 8, there was a significant association between knowledge with field of study ($r_s = 75.647$, $p = 0.000$) and attitude with field of study ($r_s = 61.963$, $p = 0.003$), as the p-values for the Pearson chi-square test were more than 0.05. Meanwhile, there was no association between practice with field of study ($r_s = 17.783$, $p = 0.934$). For the association of age and KAP, there were no statistics computed because age was a constant. This means that there was no variance in the variables because the values (19 – 25 years old) are the same for every case, hence the case values for the variables are "constant". From a study conducted by Limon et al. (2020), it was found that

age and educational attainment have no correlation at all with any of the factors of knowledge, attitudes and practices on food waste.

Table 6

The association of respondents' gender and KAP.

Chi-square test		
Gender		
	Pearson chi-square	Asymp. Sig
Knowledge	14.800	0.011
Attitude	15.449	0.009
Practice	8.900	0.064

Table 7

The association of respondents' household income and KAP.

Chi-square test		
Family Household Income		
	Pearson chi-square	Asymp. Sig
Knowledge	15.025	0.131
Attitude	9.381	0.496
Practice	9.054	0.338

Table 8

The association of respondents' field of study and KAP.

Chi-square test		
Family Household Income		
	Pearson chi-square	Asymp. Sig
Knowledge	75.647	0.000
Attitude	61.963	0.003
Practice	17.783	0.934

4.0 CONCLUSION

In conclusion, the students in Universiti Teknologi Mara Selangor Kampus Puncak Alam has a good food waste management as they have high knowledge, positive attitude and good practice on food waste. This study has revealed the overall finding results based on the presented analysis result concluded that; (i) the correlation between knowledge with attitude, and attitude with practice were significantly positive; (ii) the association between knowledge with gender, and attitude with gender were tested positively significant. By using the results from this study, we are able to further understand the students' perceptive and behaviour towards food waste. Hence, we will be able to communicate sufficient knowledge, changing attitude and practice on food waste management for a better and efficient management of food waste among the students in the campus.

In order to change people's behaviour in waste management, the knowledge and awareness in waste management must be improved sustainably so that it will be able to change a person's attitude and formed it into a positive action. The matter on food waste shall not be taken lightly as the impact is harmful for the human and environment. This effort will be able to reduce food waste along the food supply chain, thereby increasing efficiency of resource use and minimize the impact on environment. Thus, everyone shall contribute in the effort of conserving public health and the environment.

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APPENDIX

QUESTIONNAIRE OF STUDENTS' FOOD WASTE MANAGEMENT

INSTRUCTION: Please cross the box of your choice (X).

Part 1: Demographic Information

1. Age

- a. Below 19 years old
- b. 19 – 25 years old
- c. 25 years old and above

2. Gender

- a. Male
- b. Female

3. Mode of Study

- a. Full-Time Student
- b. Part-Time Student

4. Income of family household (monthly)

- a. Below RM 4,360
- b. RM 4,360 to RM 9,619
- c. Above RM 9,619

5. Field of study

- a. Environmental Safety and Health
- b. Medical Imaging
- c. Medical Laboratory Technology
- d. Nursing

e. Nutrition and Dietetics

f. Optometry

g. Physiotherapy

1. Strongly disagree	2. Disagree	3. Neutral	4. Agree	5. Strongly agree
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Part 2: Knowledge on Food Waste Management		1	2	3	4	5
6.	There is an enforcement of law on waste segregation in certain country in Malaysia.					
7.	Knowledge on proper food waste management help in reducing daily food wastage.					
8.	“Use by” date indicates when a product may no longer be safe to eat.					
9.	“Best before” date is an indication of quality rather than safety.					
10.	Improper food waste management contaminates environment.					

Part 3: Attitudes in Food Waste Management		1	2	3	4	5
11.	Waste generators are responsible for waste management.					
12.	I am aware how much food I wasted daily.					
13.	Food waste can negatively impact the environment.					
14.	Proper food waste management will provide better protection for environment.					
15.	Proper purchasing planning (listing down items to buy, frequency of shopping) will reduce food waste generation.					
16.	Campaigning and public education programmes can lead to a successful food waste management.					

Part 4: Practices in Food Waste Management		1	2	3	4	5
17.	I regularly plan my purchase by writing a shopping list.					
18.	I regularly check the “use by” and “best before” dates on product before buying.					
19.	I frequently buy food in bulks from promotional buying.					
20.	I only buy things when necessary.					