RESEARCH ARTICLE

Determining knowledge, attitudes, and practices on food waste management among Health Sciences students in Universiti Teknologi MARA

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Abstract:

This study aims to determine food waste management among students in Universiti Teknologi MaraUiTM). The information was collected by using a questionnaire comprising four sections: demographic information, knowledge, attitude and practice on food waste. The number of respondents involved was 201. The finding showed that the students have a high level of knowledge (3.935 ± 0.9699), attitude (5.100 ± 0.9798) and practice (2.672 ± 0.8897) towards food waste management. There was a positive significant correlation between knowledge with attitude (rs = 0.217, p = 0.02), and attitude with practice (rs = 0.241, p = 0.01). However, the correlation of knowledge with practice (rs = 0.073, p = 0.31) was not statistically correlated. There was a significant association between knowledge with gender (rs = 14.800, p = 0.011), and attitude with gender (rs = 15.449, p = 0.009) meanwhile there was no significant association between practice and gender (rs = 8.900, p = 0.064). Furthermore, there was no significant association between knowledge with income (rs = 15.025, p = 0.131), attitude with income (rs = 9.381, p = 0.496), and practice with income (rs, 9.054, p = 0.338). Hence, the results suggest that to change people's behaviour in waste management, the knowledge and awareness in waste management must be improved sustainably so that it will change a person's attitude and form it into positive action.

Keywords: Attitudes, knowledge, practices, food waste, institutional

1. INTRODUCTION

In the past decade, food waste has received increased attention on both academic and societal levels. Generally, food waste sources can be classified into three groups: food losses, unavoidable food waste, and avoidable food waste (Thi et al., 2015). According to Elimelech et al., (2018), household food waste accounted for 45% of total waste, or 573g per capita, of which 54% was identified as preventable. According to United Nations Food and Agriculture Organization (UNFAO), 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. The authority is up against formidable obstacles in the management and disposal of food waste. Food waste contributes to the current environmental problem because it is improperly separated from urban solid waste, resulting in the generation of greenhouse gases in landfills. Food waste disposal is classified under the disposal of solid waste, which may include any method from destruction, incineration, deposit or decomposing under the Malaysia Solid Waste and Public Cleansing Management Act 2007 (Act 672).

As a cause of adverse economic, environmental, and social effects, food waste is considered to be one of the sustainability issues that need to be addressed (Aschemann et al., 2015). 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 associated with ethical concerns and environmental consequences; it also represents significant monetary losses, both for the individual consumer and the national economy (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 several studies, mainly 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 universities host individuals with knowledge and experience who can easily foster change in their surroundings.

According to (Wu et al.,2019) low students' awareness of the adverse environmental problems related to food waste may derive from insufficient information provision. Chalak A, Abou-Daher C, Abiad MG (2018) stated that improper food waste practices include purchasing too much food, using unsuitable storage practices, cooking too much food, and discarding leftovers. There are several reasons involving the knowledge, attitude and approach (KAP) of a person which lead to the generation of food waste in the household include lack of food-related knowledge, personal values, and poor cooking skills (Bech-Larsen T, Tsalis G, 2018). These reasons may be associated with socio-demographic characteristics 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.

This study aims to determine the food waste management among students in Universiti Teknologi Mara. This study can provide the university with baseline information on students' overall knowledge, attitude, and practice (KAP) on food waste management. Proper food waste management can be established by determining the association between students' socio-demographic and KAP on food waste. Insights from this study can 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 realizable.

2. MATERIALS AND METHODS

2.1. Study design

This was a cross-sectional study conducted among undergrad students. The target respondents of the study were students (19 to 25 years old) who are currently pursuing Bachelor's degree programs in full-time mode. The online questionnaire was distributed through social media (i.e: Whatsapp and Facebook platforms). Participation by respondents was voluntary and sufficient time (10-15 min) was allowed to answer the questions.

2.2. Questionnaire

The questions were generated in the Google form which divides into four parts consisting of 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 respondents answered the questionnaire which comprises of twenty questions after clicking the form's link. A 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 scales.

2.3. Pilot study

A pilot analysis was conducted on 30 household, which were not included in the actual experiment (Al-Kandari et al., 2019). 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 as shown in Table 1 was 0.809. Hence, the questionnaire was reliable because the value for Cronbach's Alpha was more than 0.7. Then, the questionnaire was distributed to the target sample.

2.4. Data 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 and percentages. Spearman correlation test was used to determine the potential correlation between KAP. Pearson chi-square test was used to confirm the possible association between sociodemographic characteristics and KAP.3.

3. RESULTS AND DISCUSSION

3.1. Socio-demographic information of the respondents

The socio-demographic characteristics for two hundred and one (n = 201) students are presented in Table 1. Majority of the respondents were females (89.05%), with a minority of male respondents (10.95%). The study only targeted respondents whom from the age 19 years old to 25 years old and currently studying in full-time mode. Regarding the respondents' participation in terms of their field of study, most of the participants were from Medical Imaging (27.86%), followed by Environmental Safety and Health respondents (21.39%). Most of the respondents came from a household family with an income below RM 4,360 (49.25%). 35.82% of the respondents were from households with an income range between RM 4,360 to RM 9,619, least of the respondents (14.93%) came from family households with

income above RM 9,619.

Table 1. The socio-demographic data of the respondents (n = 201).

Socio-Demographic Characteristics	Category	Percent (%)
Age	Below 19 years old	-
	19 – 25 years old	100
	25 years old and above	-
Gender	Male	10.95
	Female	89.05
Income of Family Household	Below RM 4,360	49.25
	RM 4,360 – RM 9,619	35.82
	RM 9,619 and above	14.93

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, 119 respondents (59.2%) know that there is an enforcement of law on waste segregation in certain states such as Kuala Lumpur, Putrajaya, Pahang Johor, Melaka, Negeri Sembilan, Perlis, and Kedah in Malaysia. According to Table 3, most of the respondents (94.5%) know that having a knowledge on proper food waste management can help reduce daily food wastage. Besides, 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, a total of 144 respondents (71.6%) know that the "Best before" date is an indication of quality rather than safety. Ninety-three percent of the respondents know that improper food waste management can contaminate the environment.

Table 2. Respondents' knowledge on food waste management.

Knowledge	Frequency	Percent (%)
There is an enforcement of law on waste segregation in certain states (Kuala Lumpur, Putrajaya, Pahang, Johor, Melaka, Negeri Sembilan, Perlis, and Kedah) in Malaysia.	**119**	**59.2**
Knowledge on proper food waste management help in reducing daily food wastage.	**190**	**94.5**
"Use by" date indicates when a product may no longer be safe to eat.	**155**	**77.1**
"Best before" date is an indication of quality rather than safety.	**144**	**71.6**
Improper food waste management contaminates environment.	**187**	**93.0**

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, most respondents (72.6%) have agreed that waste generators are responsible for food waste management. 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 favorable attitude that food waste can negatively impact the environment. Ninety-eight percent of the respondents agree that proper food waste management will provide better protection for the environment. Moreover, ninety-five percent of them decided that the frequency of shopping will reduce food waste generation by carrying out appropriate planning of purchasing. Last but not least, most of the respondents (86.1%) agreed that campaigning and public education programs can lead to successful food waste management.

Table 3. Respondents' attitude in food waste management.

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

The practice section consisted of 4 questions, with '1' score given for each correct answer and a zero score for the incorrect answer. Based on Table 5, sixty percent of the respondents stated that they regularly plan their purchases by writing a shopping list. In addition, a total of 174 respondents (87.0%) periodically checks the "use by" and "best before" dates on the product before buying any item. Thirty-five percent of the respondents frequently buy food in bulk from promotional buying. Then, the majority of the respondents (80.0%) said that they only buy things when necessary.

Table 4. Respondents' practice in food waste management.

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

3.2. 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. The result was shown in Table 5 where, a significant positive correlation was found between knowledge with attitude (rs = 0.217, p = 0.02) and attitude with practice (rs = 0.241, p = 0.01). However, the correlation between knowledge with practice was weak (rs = 0.073, p = 0.31).

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).**

3.3 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. A summary of association between knowledge, attitude, and practice level was shown in Table 6 and Table 7. From Table 6, there was a significant association between knowledge with gender (rs = 14.800, p = 0.011), and attitude with gender (rs = 15.449, p = 0.009). However, there was no significant association between practice and gender (rs = 8.900, p = 0.064). From result in Table 7, there was no significant association between knowledge with income (rs = 15.025, p = 0.131), attitude with income (rs = 9.381, p = 0.496), and practice with income (rs, 9.054, p = 0.338) as the the p-values for the Pearson chi-square test were more than 0.05.

Table 6. The association of respondents' gender and KAP.

	Gender	
	Chi-square test	
	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.

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

4. DISCUSSION

Food waste comes with considerable economic and adverse environmental effects, owing to resource losses during the production, processing, storage, distribution, and consumption stages. This study explores the management of food waste among university students by determining their knowledge, attitude, and practice. According to different studies, demographic characteristics of individuals consisting of age, family size, education level, material status, and occupation are very important in the knowledge, attitude and practice (Ghani et la, 2013; Miafodzyeva & Brandt , 2013).

Further analysis of the groups' demographic characteristics highlighted differences in family household income and gender. Ilakovac et al. (2020) found from their study that respondents who were representatives of lower-income households discarded, as expected, less food because to them buying food represented a high financial cost, and they could not afford to discard it. Moreover, according to Richter & Bokelmann (2018), women consider environmental aspects as important factors for avoiding food waste, and they also believe food is more valuable compared to men (Richter & Bokelmann, 2018). This study was fully participated by full-time university students with age ranging from 19 to 25 years old. The previous research conducted by Bravi et al. (2020) stated that younger individuals have a greater tendency to waste food than older people. However, from this study, the respondents who were young adults showed a high knowledge, attitude and practice in managing food waste.

It was crucial to evaluate the student's knowledge level, as it will influence their perception and attitude. Besides, attitude is considered along with knowledge because attitude plays a fundamental role in one's behavior. Overall, the respondents for this study scored high in the knowledge, attitude and practiced on food waste management. Previous research from Luo et al. (2019) stated that college students have inadequate knowledge and inappropriate practices about food safety, putting their health at risk from food-borne diseases. However, this study has proven the opposite result. In addition, unlike the previous study carried out by Ponis et al. (2017), the respondents in this study did not practice wasteful behaviour, leading to food waste such as purchasing items in bulk during the promotion or frequent shopping. This study was conducted to focus on food waste generation in universities because universities host

individuals with knowledge and experience who can easily foster change in their surroundings.

According to Table 3, most of the students have high knowledge on the management of food waste. However, only fifty-nine percent of the respondents know that there is law enforcement on waste segregation in certain states (Kuala Lumpur, Putrajaya, Pahang, Johor, Melaka, Negeri Sembilan, Perlis, and Kedah) in Malaysia. This study shows a similar result with a survey conducted by Malik et al. (2015) which found that their respondents (49.2%) do not know about solid waste segregation. Separation at Source Initiative (SSI) under Solid Waste and Public Cleansing Management Act 2007 (Act 672) was influential on September 2015. The initiative was believed to increase the rate of separation of waste at source and improve the national recycling rate. The public needs to sort their garbage into different bags such as paper in a blue bag, plastic in a white, 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 that the government take full initiative to keep the rules known and accepted by the public (Jun, 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 behavior through penalties for actors who do not comply with regulatory provisions (Schanes et al., 2018).

A study by Jarjusey (2017) stated that 57% of respondents claim they do not know the difference between best before and use by date. However, most respondents claimed that they know the difference between best before and use-by date in this study. 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). The minority of the respondents agreed that they frequently buy food in bulks from promotional buying, as shown in Table 5. This result was similar to the findings from Jörissen et al. (2015) which only 18.9% of the respondents were attracted to special offers in the supermarkets. According to Jörissen et al. (2015), people who are often drawn to special offers waste less food on average than people who are not interested in special offers.

The result from Table 5 suggested that 80% of the respondents only buy things when necessary. Environment Protection Agency (2009) stated in their study that 70% of respondents indicated they only purchase the amount of fruit and vegetables they needed. The majority (87%) of the respondents agreed that they checked the ‘best before’ and ‘use-by dates before purchasing regularly. 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. From Table 6, the result has shown that there was no significant correlation between knowledge and practice. However, this finding was quite contradictory with the findings from a study by Tsai et al. (2020), which stated a positive correlation between knowledge and practice.

For determining the association between socio-demographics and knowledge, attitude, and practice, the decision criterion is to reject the null hypothesis if the p-value is more than or equal to the level of significance ($p>0.05$). Table 7 showed that the gender and practice on food waste management was not statistically significant with a value of 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. From Table 8, the result shown there was no statistically significant association between household income with knowledge, attitude, and approach on food waste management. This result was similar to a study by Limon et al. (2020), which found a significant negative association between monthly income and attitude of respondents. In addition, a study by Miafodzyeva & Brandt (2013) also showed a similar result where there was no significant association between income and food waste attitude.

5. CONCLUSION

In conclusion, the matter on food waste shall not be taken lightly as the impact is harmful to human health and the environment. By focusing the study on university students who are the future generation, we can communicate sufficient knowledge, changing attitude and practice on food waste management for better and efficient food waste management. In order to change people's waste management behaviors, waste management knowledge and awareness must be improved sustainably to the point where they can change a person's attitude and transform it into a positive action.

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CONFLICTS OF INTEREST

The authors declare that they have no conflict of interest.

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