

Effects of Knowledge, Attitude, Practice on Food Safety Compliance among Food Handlers of School Canteens in Kuala Muda, Kedah

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ABSTRACT

The aim of this study is to determine the relationship between knowledge, attitudes, practices and food safety compliance. Questionnaires were distributed to 341 school canteen food handlers from 28 primary and 63 secondary schools respectively in Kuala Muda, Kedah. The responses were analysed using SPSS, Amos version 22.0, Pearson Correlation to analyse the correlation. Structural Equation Modelling (SEM) approach was used to test the research hypotheses and the predictive model. Based on the results, a framework is proposed to integrate knowledge, attitude and practices among the food handlers. The framework provides a more comprehensive understanding of the knowledge, attitude and practices related to this context: (1) correlation between knowledge with food safety compliance (2) a significant relationship between knowledge, attitude and practices with food safety compliance. The findings indicated that knowledge and attitude are significant factors that can improve food handlers' food safety compliance. Surprisingly, the study found insignificant relationship between food handlers practices and food safety compliance. This study concluded that food handlers should improve their knowledge and attitude through continuous awareness and education program in order to avoid issues related to food safety in school canteens.

1. INTRODUCTION

The issue of food hygiene in school canteen is regarded as crucial by the Malaysian Ministry of Education (Nik Adibah, Norhasmah & Laily, 2016). In this regard, food handlers play an important role in ensuring food handling areas are up to the established standard (Hernandez & Lipa, 2016). Ideally, food delivered by school canteen handlers should be in excellent conditions such as the dining area should be equipped with a hand washing facility. Woh, Thong, Behnke, Lewis and Siti Nursheena (2016) noted that cleanliness of the kitchen after cooking is essential and should be taken care of to prevent bacterial reproduction in the work surface. In addition to personal hygiene and cooking utensils, food preparation hygiene needs to be emphasized. Therefore, hygiene is an essential aspect among food handlers. They need to be concerned about their own personal hygiene, the appliances in the kitchen, and the

cleanliness around the room or building space where the service is conducted. In other words, they must always practise the principles of perfect self-care and good personality (Monney, Agyei & Owusu, 2013). However, the level awareness of food handling and food preparation among school canteen food handlers, still remains low in Malaysia (Saidatul Afzan & Hayati, 2013) because they do not practise a high level of cleanliness and food safety during food handling (Nurul Amelia, Roshanida, Mimi Haryani & Norzita, 2017). Although various awareness campaigns on hygiene and safety practices have been conducted, still food handlers' knowledge, attitude and practices on food hygiene and safety are not satisfactory (Machado, Monego, & Hidalgo, 2014).

Sharif, Obaidat and Al-Dalalah's (2013) shows that school canteen food handlers often ignore the suggested practice of hygiene. School food handlers need to apply all aspects of hygiene following the established guidelines to reduce cases of food poisoning (Norul Hajar, et.al 2015) and practice food safety more closely (Woh et al., 2016). This is because the hygiene level practised by food handlers can decrease the incidence of food poisoning among school students. Although schools are provided with the Ministry of Education Malaysia School Canteen Guidelines Handbook (2004), still food poisoning occurs as the results of food handlers negligent during meal preparation. Usually, this is also due to poor monitoring by management on food safety and hygiene practices in the workplace (Faridah Hanim, Chemah, Muhammad & Norhayati, 2016). Non-compliance with food regulations and guidelines is also a contributing factor to the food poisoning cases. For example, in 2019, there is a case of food poisoning at Iskandar National School, Alor Setar involving 24 students between the age of 8 and 12 years old, and 5 teachers (Noorazura, 2019). Among the causes of food poisoning cases in the school cafeteria are food handlers who lack knowledge of food hygiene and safety (Nora, Mimi & Mahmood, 2015). Food poisoning can lead to disability and chronic health problems such as colon inflammation which can also be fatal if not treated promptly (Nora, et al., 2015). Similarly Norul Hajar et al., (2015) found that this is due to the lack of concern among the school canteen food handlers in maintaining food hygiene. Likewise, Lee, Abdul Halim, Thong and Chai (2017) stated that 50 percent of food poisoning cases occur in schools due to low levels of food hygiene and inadequate premise hygiene.

Although the level of awareness of food hygiene increases, cases of food poisoning continue to occur in Malaysia. It is the responsibility of the food handler to ensure that the food provided in the school is safe and that knowledge and hygiene practices among food handlers play an essential role in reducing the occurrences of food poisoning. Increasing cases of food poisoning in schools in Malaysia need to be investigated and evaluated from the knowledge and practices of food handlers during food preparation. Therefore, the objectives of this study are to examine the relationships between knowledge, attitude, practices and food safety compliance among food handlers in school canteens at Kuala Muda, Kedah.

2. LITERATURE REVIEW

2.1 Food Safety in School Canteen

Generally, principal or headmaster, senior assistant teacher of student affairs and food handlers are those people who are responsible for managing school canteens. In 2011, the Ministry of Education Malaysia introduced a handbook for Healthy School Canteen Management which outlines some guidelines for canteen management in schools for food handlers to follow. The school canteen management should closely monitor the canteen to

ensure that the maintenance and facilities in the canteen are maintained. The role of the canteen management committee at all levels is also crucial in determining the successful implementation of the guidelines outlined in the Healthy School Canteen Handbook. School canteen food handlers need to fulfil their role and responsibilities to make sure the safety of the food prepared.

The School Canteen Management Handbook serves as a critical reference point for the safety and hygiene aspects of food handling in the school canteen. This handbook includes a comprehensive guide for food handlers to manage, administer, control, evaluate and provide the best possible service. This handbook also provides a more detailed description of school canteen management, which explains the roles and functions of the school canteen, facilities and equipment of the school canteen, the needs of the school canteen staff, the provision, storage, and serving of food and beverages. Besides, it also lists food and beverage ingredients that are prohibited for sale in schools and explains how to control hygiene. Also, this handbook is aimed at preventing food poisoning and reducing obesity among school students. It is a reference to ensure the cleanliness and safety of the food before it is sold to students.

The food handlers are also responsible for making sure the food provided is safe for the students and they must be certified by a medical practitioner and have a health certificate (School Ministry of Education Division of Malaysia, 2004). Benedict, Raja Puteri Saadiah, Hashim Fadzil and Nor Asmalina (2016) argue that major causes of food contamination can be closely related to personal hygiene of food handlers. For example, food contamination occurs through physical contact of food handlers with food during the preparation process. Thus, maintaining personal hygiene while handling food can prevent food contamination from occurring. Similarly, Liana, Nadia, Rafidah, Azila and Arnieyanti (2015) agreed that maintaining personal hygiene is essential in food preparation as it is closely related to the cleanliness of the food to be served. Food hygiene can only be achieved if the workers, tools and utensils used are kept clean. Personal hygiene must be practised during the entire process of food preparation, from the arrival of raw materials to the cleaning and disposal stage.

2.2 Knowledge, Attitudes and Practices toward Food Safety Compliance

Nurul Amelia, et. al., (2017) stated that food handlers need to be knowledgeable about personal hygiene. This aspect of knowledge is crucial because many diseases can be spread through poor personal hygiene. The hygiene aspect among the food handlers can be categorized into several areas such as hair, skin, hands, ears, nose, mouth and even clothing. The food handlers should be free of any diseases such as flu, dry cough and any other contagious diseases as they can be infectious to others. Kubde, Pattankar and Kokiwar (2016) emphasized aspects of excellence hygiene attitude and practice among which food handlers. The food handlers should wash their hands with soap every time they use the toilet, before preparing or serving food. They must make sure their finger nails are short and clean, reduce talking with people around, sneeze or cough towards food, touch part of inner ears while preparing food. The food handlers should also make sure that their aprons and headgears are clean and properly worn. However, Hasyim, Widjajanti and Febry (2014) claimed that the practice of hygiene during preparation and storage of food is concentrated only in certain areas. For example, many do not practice good personal hygiene such as not

wearing a complete kitchen uniform, wearing jewellery such as rings, watches and bracelets which is not appropriate for food handling.

Kitchen equipment is the basic requirements of all foodservice operations other than raw food. The hygiene of the materials can be maintained by cleaning with safe bleach, soap or other appropriate substances. Failure to do so can cause bacterial breeding and propagation; therefore, kitchen utensils should be soaked and washed with a suitable detergent and then rinsed with clean water (Nik Rosmawati, Norhasmah & Laily, 2016). They should also be stored in a convenient place so that it is not contaminated for use. The equipment used in food preparation is an important aspect that cannot be ignored too because bacteria and viruses can be disseminated through the equipment. This is supported by Panchal, Bonhote and Dworkin, (2013) and Hairuddin et. al (2014) who found that the spread of bacteria occurs very fast when the same machine is used in handling raw materials as well as cooked food. Thus, the hygiene of the device needs to be taken care of as it can be a breeding ground and spread of bacteria.

A good practice in kitchen cleaning should be carried out continuously before and after food preparation work is done properly and carefully. Snacks that fall on the floor and the floor itself encourage the growth of bacteria and attract pests and insects (Faridah Hanim, et. al. 2016). According to Weerasinghe et al., (2017) animals such as flies and mice can be used as a reference to impurities. The presence of these animals means that there is an impurity which is their favourite place. They added that to prevent pests from entering the premises, the main task to do was to ensure that the premises did not attract any sources of pollution through foul odours. The food premise also needs to have the proper control of the fly, rat and cockroach cleaning work needs to be done on an ongoing basis. It should be done before, during and after the operation of food preparation. Hygiene routines must be established. Some need to be cleaned daily and others once a week. Kitchen cleaning habits should be a regular part of food preparation activities (Nik Rosmawati et al., 2016). Based on the above discussion, the following hypotheses are proposed.

H1: There is a significant relationship between knowledge and food safety compliance.

H2: There is a significant relationship between attitude and food safety compliance.

H3: There is a significant relationship between practices and food safety compliance.

3. METHODOLOGY

This study was based on a quantitative paradigm. Drawing from review of the relevant literature, the study's research model consists of three domains measured using validated multiple item scales from previous studies. The research instrument for knowledge, attitude, and practice was adapted from Mohd. Firdaus Siau., Son, Mohhiddin, Toh and Chai (2015) while for food safety compliance, the research instrument was adapted from Nora, Mimi and Mahmood (2015). All these instruments were compiled to be administered among respondents. Each item of the questionnaire corresponding to the designs was calculated using a five-point Likert scale, anchored on "1 = strongly disagree" and 5 = strongly agree". The target participants of this study were food handlers in school canteens. Based on Krejcie and Morgan (1970), for the population of 1980 the appropriate sample size is 322. Questionnaires were distributed to 341 school canteen food handlers comprising 28 primary and 63 secondary schools respectively in Kuala Muda, Kedah. The location was chosen because it has among

the highest reported food poisoning cases in Malaysia for the year 2018 (Pejabat Pendidikan Daerah Kuala Muda, 2018).

4. DATA ANALYSIS AND RESULTS

4.1 Construct Reliability and Validity

Following Hair, Black, Babin and Anderson (2010), the fitness and construct validity of the proposed measurement model were examined by evaluating its reliability, convergent validity and discriminatory validity. Convergent validity was assessed on the basis of the criterion that the approximate coefficient of the indicator was relevant for its underlying construct factor. The measurement scales were calculated using three criteria: all item factor loadings should exceed 0.7; composite loadings (CR) above 0.7; and the average variance extracted (AVE) for each construct should be greater than 0.50 (Fornell & Larcker, 1981). Table 1 demonstrates that the item and the AVE values for all constructs in the measurement model exceeded the recommended threshold values. The adequacy of the measurement model indicated that all items were reliable indicators of the hypothesized constructs. While all variables in this study have a Cronbach’s Alpha (CA) value above 0.70 which suggests the scale used in this study is reliable. The validity of all scales is necessary to ensure all the survey items are measuring the intended concepts of the independent and dependent variables.

Table 1: Discriminant Validity

Inter Construct Correlation						
	Knowledge	Attitude	Practices	Food Safety Compliance	AVE	CA
Knowledge	0.789				0.622	0.852
Attitude	0.907	0.834			0.696	0.856
Practices	-0.033	-0.043	0.620		0.385	0.815
Food Safety Compliance	0.684	0.701	-0.075	0.824	0.679	0.882

Notes:

AVE = average variance extracted = Σ squared loadings/n,

^a standardized factor loading, all significant at $p < 0.001$

^b square root of AVE (diagonal elements in bold)

Discriminant validity was calculated on the basis of the squared correlations between the variables and their respective mean variance. In order to assess the discriminant validity, the average variance shared between all the construct and its indicators should be greater than the difference divided between the construct and all other domains in the model (Fornell & Larcker, 1981). As shown in Table 1, the derived average variance value for reflective variables is consistently higher than the off-diagonal squared correlations that suggest a good discriminant validity among the variables.

Next, before further to the following steps of analysis, the correlation between all variables has been tested by using Pearson Correlation. Table 2 shows that there is a correlation between food safety compliance and knowledge ($b=.626, p=.000$). There is also a significant correlation between attitude and food safety knowledge ($b=.249, p=.000$). Unfortunately, there is an insignificant correlation between practices and food safety compliance ($b=-0.01,$

$p=.868$). All in all, the results suggest a compelling evidence that the inner model measurement has achieved satisfactory reliability and validity. This is essential before further analysis of the outer model measurement is to be conducted.

Table 2: Pearson Correlation Analysis

Variables	Knowledge	Attitude	Practices	Food Safety Compliance
Knowledge (1)	1			
Attitude (2)	.249***	1		
Practices (3)	-0.014	-0.082	1	
Food Safety Compliance (4)	.626***	-0.059	-0.067	1

P significant at 0.000\

4.2 Structural Equation Modeling Analysis for Hypothesis Testing and Predictive Model

4.2.1 Relationships between Knowledge, Attitudes, Practices and Food Safety Compliance

Table 3 shows that there is a significant relationship between knowledge with food safety compliance $b=.683$, $p=.000$. It means that most of the respondents agreed that basic knowledge about food safety will make sure their work becomes more efficient and more comfortable to accomplish their task at a specific time. They found it more comfortable to know how to handle and manage the foods. Next, there is a significant relationship between attitude with the food safety compliance with a value of $b=.236$, $p=.000$, showing that the respondents feel that their attitudes are a secure platform to use because they would know the precaution what do's, and don'ts is when handling the foods especially in the school canteen. However, the strength of the relationship is moderate. Not all the respondents are looking forward to practicing all the rules while preparing the foods. Somehow, they affirmed that food safety compliance is a reasonable effort that should be followed by all the food handlers involved. But there is no significant relationship between practices with food safety compliance value of $b =.000$, $p=.964$. Most of the respondents were aware that food safety is an important thing, but they did not apply or practice properly on the premises. They found that it is difficult to practice an excellent habit of making sure the foods are safe to eat. In summary, hypothesis 1 and 2 are supported, while hypothesis H3 is rejected.

Table 3: Standardized Regression Weights for Standardized Estimated

Hypotheses	<i>b</i>	CR	<i>p</i>
H1. Knowledge <--- Food Safety Compliance	.683	.430	***
H2. Attitude <--- Food Safety Compliance	.236	1.425	***
H3. Practices <--- Food Safety Compliance	.000	.045	.964

4.2.2 Predictive Model of Knowledge, Attitude, Practices and Food Safety Compliance

Figure 1 illustrates the R^2 and the resulting path coefficients of the proposed research model. Food safety compliance was found to be significantly determined by the two exogenous variables: knowledge and attitude of food handlers and through the direct effect of all paths,

resulting in an R^2 of 0.84. However, the study found there is insignificant relationship between practices and food safety compliance. The variables explain 84 percent of the variance in the knowledge and attitude of food handlers towards food safety food compliance. The structural model was tested to assess how well the model represented the data. We evaluated the following indices (Curran, West & Finch, 1996): the chi-square test statistic, the goodness-of-fit index (IFI), the normed fit index (NFI), the comparative fit index (CFI), Tucker Lewis Index (TLI), and the root mean square residual (RMSR). The chi-square/df value is 2.574, and the remaining four indices are IFI=0.935; NFI=0.901; CFI=0.937; and RMSEA=0.068. It is concluded that the goodness-of-fit indices met the recommended levels that suggest the research model provided a good fit for the data.

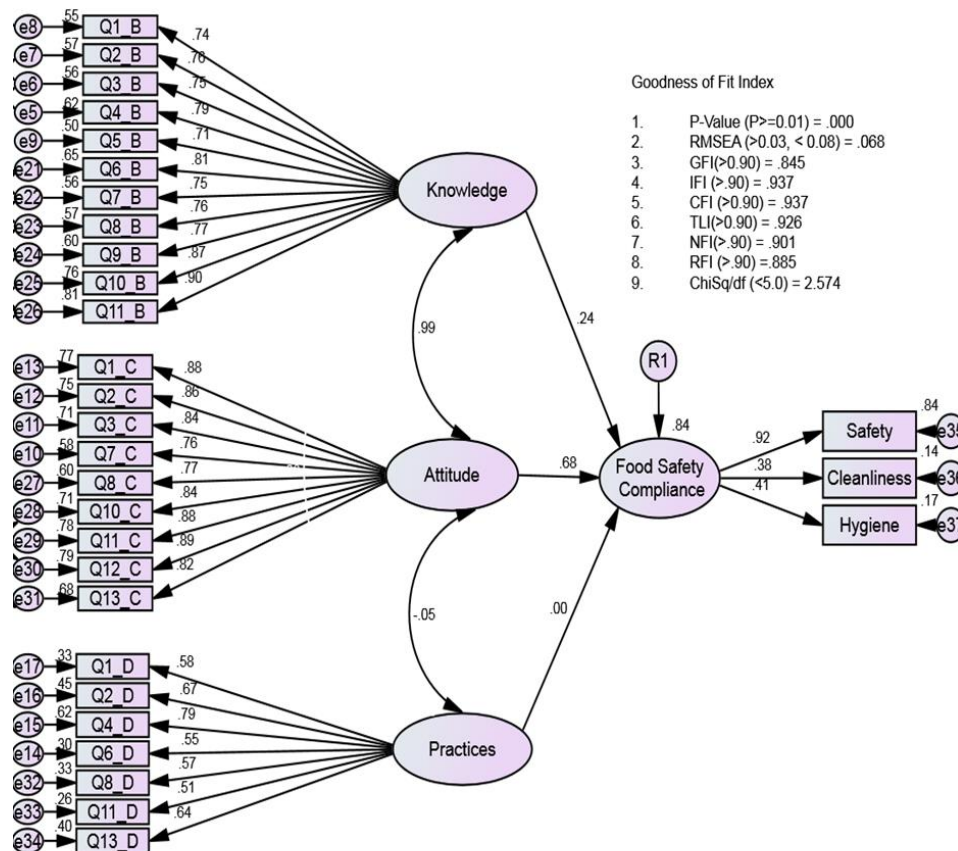


Figure 1: The Research Model of Knowledge, Attitude, Practices and Food Safety Compliance

5. DISCUSSION AND CONCLUSION

The study aimed to investigate the connection between knowledge, attitude, practice and food safety compliance. The findings show that knowledge has a significant influence on food safety compliance. This is consistent with Dora Liyana, Nor Ainy, Mohammad Rashedi, Abdullah and Hariri (2018) that stated having a good knowledge in food hygiene and safety lead to proper food handling practices. This means that if their knowledge of food hygiene is in good condition, their attitude towards food safety compliance is also good. The findings of this study also show that food handlers are knowledgeable about the process of food preparation and storage. This is because the food handlers were acknowledging that cooked food can be stored for at least three hours at room temperature. Generally cooked food cannot

be stored for more than two hours at room temperature. This is also supported by Kubde, Pattankar and Kokiwar (2016) who stated that bacteria can propagate rapidly at temperatures between 10°C - 63°C. It is important for food handlers to take proper food storage steps to quickly store them in the refrigerator and to know the effect of temperature on bacterial reproduction. Keeping food in the right way helps to minimize food from being stale, contaminated and wasted (Hernandez, Lipa, Baygan, & Baccay, 2016).

The findings show that attitude has a significant relationship with food safety compliance. Food handlers should not carry out cleaning activities such as cleaning and cleaning the floor during food preparation. This is because cross contamination can occur between washers, dust and cooked food. The dirty premise invites pests such as cockroaches, flies and mice. Pests such as mice can cause food to be contaminated through impurities and urine left around the premises (Nora, Mimi, & Mahmood, 2015). This urine contains bacteria such as leptospirosis that are extremely dangerous to humans and can be fatal. Mouse urine can be found on the cookware or in the storage area if the food handlers do not keep the premises clean. The premises should be maintained on a regular basis and used with appropriate detergents. Not all detergents are allowed on the food premises. Tools such as ultraviolet lamps are also important for controlling the presence of flies (Tan, Cheng, Soon, Ghazali, & Mayudin, 2013).

Surprisingly, the study found an insignificant relationship between practices and food safety compliance. It is inferred that the workers at a school canteen did not apply the knowledge that they have when preparing the foods. The researchers suggest that food handlers need to attend training in order to improve their practices. Food hygiene practices are critical in ensuring the food prepared is safe and clean for consumption. Poor personal hygiene is one of the causes of food poisoning in which cross contamination occurs between food and food handlers (Mohd. Firdaus, Siau, Son, Mohiddin, Toh & Chai, 2015). Practices that do not maintain hygiene can cause bacterial reproduction such as staphylococcus aureus and e-coli on their body, especially in the hands, nose and mouth area. Therefore, unhealthy food handlers are not allowed in food premises and they should not sneeze and cough towards food to prevent the spread of bacteria from the body of the food body.

The results of the theoretical model in this research study can become a guide and aid in the preparing of health promotion intervention strategies for food handlers to improve knowledge, attitudes and practices on food contamination and consumer protection. It would also reduce the national mortality rates of food contamination. Education, training and the production of food safety certification examinations are important elements in the responsibility of enhancing that food handlers are qualified. Food managers should also undergo adequate training in the fundamental concepts of food safety. Special attention should be given to the quality of temperature and relative humidity control, hygiene practices, contamination of food, forms of pollution and factors that determine the germination and development of microbial pathogens in food (Oi Nee & Norrakiah, 2011). By having such knowledge, it is expected that food handlers can function efficiently and efficiently in the school canteens. Proper training would increase their awareness about food hygiene and safety which in turns could minimize cases related to food poisoning. Besides that, administrators of food canteens should conduct periodic monitoring of their food handlers' food hygiene practices. This is important since proper food hygiene practices would ensure the food served to students is safe to eat. Indirectly, this could reduce the food poisoning incidence related to school canteen.

Proper handling practices are important when preparing food. Food handlers should ensure that the utensils used such as pots, pans, plates or cups are in good condition. As stated by Das (2018), the use of scratched tools such as plates can cause bacterial breeding. These bacteria can cause serious harm to those with low immune systems, such as children and the elderly. A study conducted by Machado, Monego and Hidalgo (2014) examined the transfer of a bacterium *Listeria monocytogenes* (*L. monocytogenes*) to a cutting board used for the preparation of raw and cooked chicken. They found that *L. monocytogenes* is able to transfer from raw chicken to cooked chicken within an hour through a cutting board. Other than that, food poisoning may occur due to the lack of proper sanitation practices. The occurrence of food poisoning may be due to improper handling of equipment that contributes to food contamination. Weaknesses in handling cooking utensils provide opportunities for reproduction and infection of microorganisms to cause food poisoning to students. Thus, food handlers should be educated with proper sanitation practices such as the correct way to wash, dry and store kitchen equipments and dishes. Food handlers should be made aware that unclean kitchen equipments can be the source of contamination where the bacteria from soiled kitchen equipments can be transferred to food (Norul Hajar, Muhammad Rizal, & Sharifah Zarina, 2018).

Although the study provides significant theoretical and practical contributions, it is important to note the limitations of the study. In terms of research setting, the study is limited to food handlers in school canteens at Kuala Muda, Kedah. Thus, future studies should conduct similar study in other school canteens located in different parts of the country. This could greatly improve the generalizability of the study. Also, future researchers could further extend the research model by incorporating other significant variables, which might include possible moderators and mediators. As the study only employed a single type of data collection approach, thus, it is recommended that future studies should conduct a mix data collection method such as conducting face-to-face interviews after the field survey. This can enhance the information richness and to minimize possible bias in the data collection process. Albeit the limitations of study, the study serves as an important signpost for future studies to examine further the issue of food poisoning in Malaysia. It acts as a valuable reference in understanding the critical factors contributing to food poisoning.

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