

The Awareness of Food Safety Knowledge, Attitudes and Practices among Food Handlers during COVID-19

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Abstract Food safety is an important social and public health agenda that affects people worldwide. Studies have shown that the awareness of food safety knowledge has increased even before the COVID-19 pandemic. However, the public awareness of food safety in Malaysia is considered low. Most consumers are less concerned with the preparation of food. Hence, this study aims to measure the level of awareness of foodborne diseases among food handlers by using the knowledge, attitudes, and practices (KAP) model. This is a nationwide, cross-sectional study involving 281 food handlers who attended food handler training between July and November 2021. Based on the overall results of the respondents' knowledge, attitudes, and practices, the researchers believe that attending training on safe food handling courses contributes to better food hygiene and safety. These findings suggest that prevention and intervention strategies to prevent food poisoning should emphasize food hygiene and safety. They should constantly exercise the five good food handling practices to ensure the food prepared is clean and safe to consume. However, the limitation of this study is that it does not cover all the food handlers in Malaysia, although it helps in getting an initial picture of the current situation. In addition, this study was conducted during the COVID-19 outbreak and post-COVID-19 studies are needed to enable comparisons to be made.

Keywords Attitude, Food Safety, Food Handlers, Knowledge, Practice

1. Introduction

The COVID-19 pandemic has fueled food business expansion, especially among home-based food handlers. The World Health Organisation (WHO), Food and Agriculture Organization (FOA) of the United Nations and the United States Food and Drug Administration (USFDA) have stated that COVID-19 is not transmitted by contaminated food. Despite the fact that COVID-19 is not a foodborne virus, it still can be transferred through food manufacturing and processing, thus it is vital to prioritize personal hygiene and kitchen sanitation. The safety, cleanliness and hygiene during the food preparation need to be highlighted. However, some food handlers neglect these aspects of food preparation therefore increasing consumers' risk of foodborne illness while a majority of them lack hygienic skills [1].

This paper proposes to measure the level of awareness of the foodborne disease among food handlers using knowledge, attitudes and practices (KAP) model in Kelantan, Malaysia.

2. Level of Awareness on the Foodborne Diseases

There are different levels of awareness on foodborne disease globally. In the African continent, consumers in Cameroon had the least knowledge on food safety compared to Ghana and Nigeria whereas in the Asian continent, consumers in Iran had the least knowledge on food safety compared to consumers in Malaysia and Pakistan [2]. It was also found that university students in Jordan were not aware of food safety requirements during the COVID-19 pandemic [3].

In recent years, the level of knowledge and awareness of food safety has increased globally. In Malaysia, consumers were showing a positive food safety attitude and adopting good practices during the COVID-19 pandemic [4] even though public awareness on food safety before COVID-19 was considered low [5]. Moreover, there has been a decline in number of food poisoning cases in 2019 (516), 2020 (288) and 2021 (197). Nevertheless, this declining number of cases has not stopped the government's efforts to protect the people and prevent food poisoning. This was done by conducting various promotional activities and intervention programs [6].

However, Malaysian consumers pay less attention to the preparation of the food [7]. Instead, they prioritise food taste, presentation, and price. Food safety importance requires high prioritisation from the public because poor food safety will lead to foodborne infections. Food handlers must maintain the highest level of hygiene and adhere to the hygiene practices imposed by the government to ensure the preparation of food is clean and safe. They are mandated by law to have immunization against typhoid and cholera and attend mandatory food handling training courses as stipulated in the Food Hygiene Regulation 2009. Since onsite training could not be offered during the pandemic, the Ministry of Health (MOH) has approved some accredited food handler training schools to conduct online food handling training courses. With this course, food handlers are expected to be well-versed in Good Food Hygiene, Food Safety, and Food-borne Illnesses topics. In addition, Food manufacturers must obtain any certification of Good Manufacturing Practice (GMP), Hazard Analysis Critical Control Points (HACCP), or Food Safety is the Responsibility of the Industry (MeSTI).

2.1. Food Safety Practices in Food Handling

Food safety and hygiene practices are essential in food handling as they help protect consumers' health from foodborne illnesses and food poisoning. According to Youn and Sneed [8] and Ansari-Lari, Soodbakhsh and Lakzadeh [9], a high proportion of reported foodborne diseases were caused by unsafe practices in food handling. Hence, it is of utmost importance that good safety practices in food handling be adopted by food service establishments

and food processing operations to ensure foods produced and prepared are not contaminated by bacteria, viruses, and other germs. Else those who consume the food are in danger of contracting foodborne diseases.

According to the Knowledge, Attitude, and Practice (KAP) model, proper food handling behaviour is developed based on a positive attitude. A positive attitude is derived from solid knowledge of nutrition and food safety. The KAP model can be used to effectively change human health habits whereby the change process is divided into three parts which are acquiring knowledge, developing attitudes/ beliefs and forming practice/ behaviors [10]. Therefore, it is a prerequisite for food handlers to be trained in food safety and hygiene to ensure good food handling practices. However, there are divided findings on the role of food safety knowledge and attitude as determinants for food safety practices.

Previous studies proved that food safety knowledge is necessary to influence food safety practices. Toh and Birchenough believed that the lack of knowledge in food safety could lead to poor hygienic practices by food handlers [11]. This proposition was supported by Abdul-Mutalib et.al. [12] and Abd et al. [13] when their studies revealed positive relationships between the extent of knowledge on food safety and the adoption of food safety handling procedures. Nevertheless, some other studies suggested that the transfer of food safety knowledge to practice is unpredictable. A survey by Akabanda et al. [14] also indicated that food handlers might not necessarily apply strict food safety procedures during food handling, even when they were adequately trained in the practices.

In terms of literature review from food handlers, specifically on food handling and regulation, it is very limited. Hence, a study on the awareness of food handling regulations and foodborne disease among food handlers is timely and deserves due attention because of the increasing trend of online food business, especially during COVID-19.

Thus, this study aims to assess the level of knowledge, attitudes and adopted practices among food handlers. The following three research questions were developed to assess the main variables of the current research, including the awareness of food handlers about the foodborne disease and food handling regulations:

RQ1. Do food handlers have sufficient knowledge of food handling regulations?

RQ2. What is the level of food handlers' attitudes toward food safety?

RQ3. Are food handlers complying with food handling practices when preparing food?

3. Materials and Methods

The target population are food handlers who are

involved in food business in Malaysia. Purposive sampling was employed in identifying the appropriate sample size. This method is appropriate when the research needs to achieve a target sample and where sampling proportionality is not a major consideration [15]. The questionnaires were adapted from Soon, Wahab, Hamdan and Jamaludin [4] by using KAP model. For assessing knowledge, thirteen items were developed to measure if the food handlers were with the food handling regulations. For assessing attitudes, eleven items were developed to indicate the level of awareness of food handling regulations. For assessing practices, seven items were developed to measure the frequency of complying with the regulations. The authors assured the survey content validity by seeking comments and suggestions from the officers of Food Safety and Quality Division, Ministry of Health Malaysia. Negative statement in the KAP statements (K3.K6, K8, K12, A20, A22, A23, A24, P27, P33, P36, P37, R3 and R9) were reversely scaled prior to analysis.

Before collecting the data, Food Safety and Quality Division, Ministry of Health Malaysia had been consulted to clarify the objectives and validate the questionnaire. With their cooperation and assistance, an online survey was given to the food handlers who attended food handler training.

An online survey was given to the food handlers with the assistance of Food Safety and Quality Division, Ministry of Health Malaysia. The participants were asked on their awareness of the regulations and foodborne diseases in food handling. The process of distributing questionnaires was undertaken within the span of 4 months, from July 2021 to November 2021. A total of 281 responses from food handlers representing 4 types of food premises (food factory, catering, outlet and vehicle that has been used to sell food) were received. Data for this study was exported into SPSS 27.0 (IBM) for statistical analysis. Descriptive statistics were used to report results from the study. The authors assured the survey content validity by seeking comments and suggestions from the officers of Food Safety and Quality Division, Ministry of Health Malaysia. The survey protocol and questionnaire were revised and accepted by the Ethics Review Committee of the Universiti Teknologi MARA (UiTM) (REC/06/2021 (MR/432)).

4. Result and Discussion

Demographic data reveals that 42.0% of respondents are male whereas 58.0% are female. All the food handlers received formal education, and out of this, 54.1% have secondary and 30.6% have tertiary qualifications. Concerning age, 54.8% of the respondents are in the age group 18–25 years old, while 19.2% belonged to the 26–30 age cohorts. Most food handlers (59.4%) have less than one year of experience, while 32.0% have 1–3 years of

experience, 85.4% indicate that they work in food outlets (restaurants, stalls, and canteen). In terms of food handling training, 96.1% attended the training while only 59.4% of them were immunised against typhoid.

Table 1 shows the result of food safety knowledge during COVID-19. Respondents, in general, reported having sufficient food safety knowledge. 97.2% of the participants agreed that hands should be washed before meal preparation (K1). This outcome indicates that the food handlers knew their hands were the primary source of food contamination. Thus, proper hand cleansing is very effective in limiting the transmission of foodborne diseases. This finding is supported by a study done in Indonesia, which reported that 99.2% of the respondents knew that it was necessary to wash their hands regularly when handling foods [16]. A similar study conducted in Lesotho also found that all participants are well aware of the need to wash hands before food preparation [17].

89.7% of respondents recognised that diarrhea could be transmitted by contaminated food (K2). Only 60.5% of respondents thawed frozen food at room temperature (K10). According to the standard thawing practice, the process shall be carried out under refrigeration, microwaves, or running water. Thawing food at room temperature can cause bacteria growth and lead to food poisoning. A study in Jordan [18] during the COVID-19 pandemic reported that more than half of the respondents demonstrated poor knowledge of this matter. The vast majority of the respondents (94%) knew that cross-contamination could be prevented by using separate equipment/utensils for raw meat and cooked food (K7). They also had accurate knowledge concerning cleaning the utensils (K9). They disagreed with the statement that food preparation utensils can be washed with pipe water only. In order to prevent cross-contamination, the food preparation utensils should be washed with hot water and detergent. The results are quite contrary to those revealed by Tuglo et al. [19] that most of the street-cooked food handlers in Ghana did not know that food cooking utensils should not be cleaned using tap water only.

Furthermore, the respondents also rejected the statement that raw meat can be stored anywhere as long as it is chilled (K8). The disagreement demonstrated that they were aware that raw meat should be stored separately to avoid cross-contamination. Bou-Mitri et al. noted that over 90% of the food handlers knew that cooked and raw foods must be stored separately to prevent food contamination [20]. However, the study revealed that the respondents lacked the knowledge on the effect of wearing a watch during meal preparation (K13). Most of them were uncertain whether wearing such item while preparing meals could contribute to food contamination. This result is consistent with the findings of Nur Izyan et al. [21]. They discovered that most home-based food providers had limited understanding about wearing a watch during food preparation. Most of the food handlers are aware of the

requirement to separate raw from cook food to prevent food contamination [22]. However, the study revealed that the respondents also lacked an understanding on the effect of wearing jewellery during meal preparation (A24). Most of them were uncertain whether wearing such items while preparing meals could contribute to food contamination.

97.9% of the food handlers in this study battled over the forms in which food safety should be maintained, such as raw chicken should be washed before preparation (K4), and 88.3% ensured that when cooking meat and poultry, the juices should be clear and not pink when cooked (K5). In the aspect of time and temperature control, the respondents' knowledge is considered high (K11). They were sure that cooked food should be kept and served hot above 60 °C (71.9%).

Based on the overall results on the knowledge of the respondents, the researchers believe that attending the training on food handling contributes to their high understanding on the food safety. However, according to Souza, Azevedo and Seabra, although the level of food safety knowledge has a direct influence on food safety practices, they believe that there may be other factors that also influence food safety practices [23].

Table 2 presents the findings of a survey on food handlers' attitudes. The findings revealed that food handlers' general attitude toward food safety was satisfactory, with the proportion of agreed replies ranging from 50.5% to 99.6%. The vast majority of food handlers demonstrated positive attitudes towards personal and food hygiene (A14, A16, A17, A21). The results showed that 90.7% of respondents wash their hands with soap and

water before handling or preparing food to prevent foodborne illness. A similar finding was reported by Kwol et al. [24], who noted that almost all of male food handlers in Saudi Arabia agreed that hands need to be washed before handling food. In addition, the respondents also concurred that hand injuries and cuts must be covered to minimise cross-contamination (96.8%).

Regarding food hygiene, nearly all of the respondents held extremely favourable attitudes. They wash fruits and vegetables prior to consumption (99.6%), avoid using damaged eggs (91.1%), and wash the chopping board frequently after using it to prepare raw meat/poultry/seafood (90%). It is encouraging to discover that food handlers have a positive attitude toward personal hygiene because a favourable attitude may prevent food poisoning outbreaks. There are, however, two hygiene-related items that receive the lowest scores from respondents. Only 50.5% of respondents agreed with the statement that they cough or sneeze inside the elbow and 66.5% clean their thermometer with water and soap each time after using.

In addition, most respondents have a good attitude toward preventing cross-contamination during food preparation. It was reported that they do not wear jewellery while handling food (95.5%), use a separate towel for cleaning and drying purposes (84%), and reheat the leftover food, which is kept at room temperature (81.5%). The results are also supported by Kwol et al. [24] who emphasized that food handlers' attitude positively influences their perception to kitchen hygiene.

Table 1. Knowledge of food handlers during COVID-19

No	Knowledge	Yes (%)	No (%)	Not Sure (%)
K1	Hands should be washed before meal preparation to prevent food borne disease	97.2	2.5	.3
K2	Diarrhoea can be transmitted by consuming contaminated food	89.7	8.9	1.4
K3	Pets are allowed into the kitchen area	95.0	3.6	1.4
K4	Raw chicken should be washed before preparation	97.9	1.8	.3
K5	If cooking meat and poultry, the juices should be clear and not pink when cooked	88.3	6.0	5.7
K6	Runny eggs are safe to eat	81.1	9.6	9.3
K7	Separate equipment such as chopping boards and utensils are used for raw meat and cooked food	94.0	5.3	.7
K8	Raw meat can be stored anywhere in the refrigerator as long as it's chilled	81.5	15.7	2.8
K9	Food preparation utensils can be washed with pipe water only	50.9	44.5	4.6
K10	Frozen food is thawed at room temperature	60.5	32.4	7.1
K11	Cooked food should be served hot (more than 60 °C)	71.9	17.1	11.0
K12	Leftover food can be stored at room temperature to be eaten at the next meal	63.7	28.1	8.2
K13	Wearing a watch during food preparation can cause food contamination	55.5	41.3	3.2

Table 2. Attitude of food handlers during COVID-19

No	Attitude	Strongly disagree (%)	Disagree (%)	Uncertain (%)	Agree (%)	Strongly Agree (%)
A14	Washing hands with soap can prevent food poisoning	3.9	4.3	1.1	40.2	50.5
A15	When coughing / sneezing, we should cough/sneeze into our elbow	19.9	21.0	8.5	33.1	17.4
A16	Hand injuries or cuts are covered to prevent cross contamination of food	2.1	1.1	0	55.9	40.9
A17	Fruits and vegetables (e.g. ulam) are washed before eating	0	.4	0	43.4	56.2
A18	I do not use damaged or cracked eggs	3.9	3.6	1.4	39.9	51.2
A19	If I use a thermometer, I will clean it with water and soap each time after using	5.7	12.1	15.7	42.3	24.2
A20	Raw meat is stored at the bottom of the refrigerator shelf	11.0	21.0	3.9	33.8	30.2
A21	If there is only one chopping board, it should be washed after using it to prepare raw meat / poultry / seafood	3.6	3.2	3.2	55.2	34.8
A22	It is adequate to use one kitchen towel for all cleaning and drying purposes	6.0	8.2	1.8	34.2	49.8
A23	Leftover food is kept at room temperature so I don't have to reheat it	2.1	6.8	9.6	39.9	41.6
A24	Jewellery such as ring can be worn while handling food	1.4	1.1	1.4	28.8	67.3

Based on the results obtained from the survey conducted on the food handlers' practices (Table 3), they were found to have complied with all the assessed aspects accordingly, with the percentage of agreed responses between 65.1% to 99.3%. In fact, ten (10) of the evaluated practices indicated a very encouraging score of over 90.0%. These outcomes may be due to the fact that majority of the respondents (96.1%) are food handlers who have attended food handling courses. Hence, it is very likely that they are already aware of proper food handling procedures and have even practiced them prior to COVID-9 pandemic.

Very high compliance was recorded in the cleaning and washing routines (P25, P26, P29, P31) proving that this exercise is very much emphasized by the food handlers involved. The respondents agreed that they wash raw meat before cutting (99.3%); clean food preparation areas and utensils after preparing raw meat, poultry and seafood (99.3%); wash hands with soap after using the toilet (98.2%); and wash hands if they sneezed or coughed into them while preparing food (97.1%).

Cleanliness is a key factor in preventing foodborne illness. Therefore, all cooking utensils must be cleaned and sanitized properly before starting any food preparation. This is especially important for equipment in direct contact with food such as cutting boards, knives, mixers, blenders, countertops, etc. These equipment and areas are known to

store harmful bacteria that when they get into foods that cause serious illness. All utensils and crockery need to be cleaned for the same reasons.

According to the Centres of Disease Control and Prevention [25], handwashing is one of the most important steps that can be taken to prevent food poisoning when preparing food, since hands have high potential to spread germs in the kitchen and some of these germs, like Salmonella, can be very harmful to the health. In fact, hand washing accounts for 33% of all related food poisoning cases [26]. Therefore, it is necessary for the people who prepare foods to maintain good personal hygiene practice by washing hands frequently with soap and water to prevent germs from spreading around the kitchen and to other food.

The respondents also expressed strong agreement with the practice of using separate utensils and equipment (P32, P33) to avoid contamination or germs being transferred from one material to another such as using different chopping boards for meats and vegetables (98.9%) and different kitchen towels to wipe kitchen surfaces and dry hands (93.5%).

There are various kitchen tools and appliances designed for different purposes. Therefore, food providers should use the right tools at the right time to avoid cross-contamination. The use of appropriate equipment,

such as separate cutting boards is to prevent bacterial, physical, chemical, and allergic infection [27].

The food handlers seemed to place great importance on healthy and safe food choices (P28, P30). This practice is proven through a significant score of 97.9% for selecting fresh and wholesome food to purchase, as well as 93.9% for not using food beyond its expiry date. In addition, respondents are also very careful and meticulous with the prohibitions set by food handling regulations and avoid doing things that are contrary to hygienic practices (P27, P37).

They ensure that pets are not permitted to roam in the kitchen area (96.8%) and would avoid wearing accessories and jewellery while handling foods (94.0%). According to Food Safety Information Council, pets can carry bacteria, viruses, parasites, and fungi which can be transmitted to humans, through bites, poop, saliva or dander [28].

Respondents also have made the right decision to choose fresh and wholesome food because it is more nutritious and healthier as it does not have artificial flavours, preservatives, other additives or genetically modified substances found in the industrialised food, since it does

not go through physical changes as applied to processed foods. The food handlers also took a stand not to use expired food items. This action shows that they are aware of the dangers of expired food to the human body. Although sometimes the effects of consuming expired substances do not occur immediately but gradually, yet the side effects should not be taken lightly because the chemical reactions in the food will turn into poisons and injure the digestive organs and cause poisoning.

However, the results revealed that three (3) of the practices received less attention by the food handlers, with relatively low scores of only between 73.1% to 65.1%. The habits that need to be further improvised are: checking if the food is cooked by visual appearance, e.g., fish should be opaque and flaky and egg yolk and white should be firm (73.3%); not keeping leftover food at room temperature until the next meal (68.7%); and checking if the food is cooked by tasting it (65.1%). The lack of consideration on these measures may be based on their perceived assumption that these aspects are less harmful or do not affect food quality and safety.

Table 3. Practice of food handlers during COVID-19

No	Practice	Strongly disagree (%)	Disagree (%)	Uncertain (%)	Agree (%)	Strongly Agree (%)
P25	I wash my hands with soap after using the toilet	1.1	.4	.4	42.7	55.5
P26	I wash my hands if I sneezed or coughed into my hands while preparing food	.7	1.4	.7	42.3	54.8
P27	If I have a pet (e.g. cat or dog) it's free to roam in the kitchen area	.7	.7	1.8	29.2	67.6
P28	When purchasing food, I select fresh and wholesome food	0	.7	1.4	38.8	59.1
P29	I wash raw meat before cutting or preparing them	0	.7	0	42.0	57.3
P30	I do not use food beyond its expiry date	2.5	3.2	.4	37.7	56.2
P31	I clean food preparation areas and utensils after preparing raw meat / poultry / seafood	0	.4	.4	43.4	55.9
P32	I chop vegetables using a separate or a clean chopping board	0	.7	.4	42.3	56.6
P33	I use the same kitchen towel to wipe kitchen surfaces and dry my hands	1.4	2.8	2.1	24.9	68.7
P34	I check if the food is cooked by tasting it	10.3	17.8	6.8	47.0	18.1
P35	I check if the food is cooked by visual appearance (e.g. fish should be opaque and flaky; egg yolk and white should be firm)	3.9	12.1	10.7	47.7	25.6
P36	Leftover food from lunch are kept at room temperature until the next meal (e.g. dinner)	2.8	19.2	9.3	43.1	25.6
P37	I wear jewellery while handling food	2.5	1.8		1.8	29.9

5. Conclusions and Recommendations

This study revealed that the level of awareness of foodborne diseases among food handlers in Malaysia is satisfactory. They have sufficient knowledge of food safety and food handling procedures. However, they should enhance their understanding of the right temperature to keep cooked food, the proper ways for thawing frozen food, and cleaning utensils. The general attitudes of the food handlers toward food safety were satisfactory, except on issues relating to the proper way to cough/ sneeze and the proper cleaning of the thermometer after every use. The result of this study also is congruent with the other studies conducted in Indonesia [5] and Pakistan [2] who stated that most food handlers comply with food safety practices. Overall score of the KAP shows that there is positive level of adoption by the food handlers in Malaysia.

Nonetheless, their compliance in checking cooked food by visual appearance, keeping leftover food at a suitable temperature, and tasting food to determine if it is cooked needs to be increased. Therefore, based on the findings, this study proposes that the above-mentioned undesired response should be highlighted to the food handlers during food handlers training courses.

These findings indicate that food handlers need to emphasize more on food hygiene and safety to prevent food poisoning. They should constantly exercise these five good practices to ensure food prepared is clean and safe to consume. They are washing hands before and after preparing food; using different tools for raw and cooked foods; cooking thoroughly and consume within four hours; keeping ready to eat food at safe temperatures for not over three days in the fridge; and using fresh raw ingredients and clean water for cooking. This is imperative to prevent the incidents of perennial problem which is food poisoning and food borne disease. The consumers, food handlers and enforcement should have to bear the burden of responsibility in terms of food safety and hygiene. The consumers need to always check on the quality of food items to ensure it is safe, learn and practice hygienic shopping and shun places that are dirty or pose health dangers. On the other hand, food handlers must be educated on food safety and health requirements. Whilst the enforcement should be more responsible in carrying out regular supervision and strict enforcement. However, the limitation of this study is that it does not cover all the food handlers in Malaysia, although it helps in getting an initial picture of the current situation. In addition, this study was conducted during the COVID-19 outbreak and post COVID-19 studies are needed to enable comparisons to be made. Moreover, this study consists of food handlers from four different types of premises. Since the respondents are from the newly registered food handlers who are compulsory to attend the preliminary courses conducted by MOH, the result might be different with the other experienced food handlers.

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