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Cutting Board Hygiene Knowledge, Attitudes and Practices of Food Handlers at Home during Covid19 Pandemic in Selangor

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Abstract

The microbial quality of cutting boards used in the home kitchen indicates hygiene conditions and a potential source of public health risk. This study aimed to assess the hygiene knowledge, attitudes and practices on cutting boards among food handlers at home during the Covid19 pandemic in Selangor. One hundred home food handlers participated in the online survey using a validated self-administered questionnaire. Overall, findings indicate sufficient hygiene knowledge, attitudes and practices on cutting boards. These findings emphasize the need for educating home food handlers on food hygiene to improve their knowledge, behaviour and practices.

Keywords: Cutting board; hygiene; knowledge, attitudes, and practices (KAP); food handlers

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1.0 Introduction

Food hygiene, safety and security are a major global concern as foodborne illnesses continue to be a public health hazard, especially to vulnerable populations such as children, the elderly, infants and adults with weakened immune systems or who are ill. In 2018, 5146 cases of foodborne outbreaks were reported throughout Europe, affecting close to 50,000 people (Mihalache et al., 2021). As a result, these outbreaks caused a significant impact on the national and global economy, public health care systems, the tourist industry and commerce (Siddiky et al., 2022).

In Europe, Australia and New Zealand, 20-50% of foodborne disease outbreaks occurred at home (Møretrø et al., 2021). Home kitchens provide various functions, such as preparation, serving, and storage facilities for family food, and with covid19, home cooking is now a potential source of income. In Malaysia, the home-based sector has flourished due to the increasing demand for delivery and contactless purchasing until now. Food contamination by home food handlers may occur and lead to foodborne diseases if they neglect proper food utensils hygiene, especially cutting boards in their kitchen (Abdul-Mutalib et al., 2012). While home food handlers in Malaysia are not required to enroll in a food handler training, as they are only cooking for the family, those who operate a home food business must register for food handler training and receive typhoid vaccination (Food Act, 1983) to prevent unsafe and inappropriate practices. However,

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many fail even to register their businesses with relevant authorities, putting consumers at risk and the imposition of a compound and legal action. This is an issue that needs to be addressed, as previous studies have shown evidence of poor basic knowledge, attitudes and practices on food safety in the kitchen, temperature control for food storage, cross-contamination, personal hygiene and cleaning procedure still unclear (Saeed et al., 2021; Al-Beesh et al., 2019; El Haddad et al., 2020).

2.0 Literature review

Various kitchen tools are used to assist in cooking activities, such as spoons, knives, cutting boards, and microwave ovens (Okpala and Ezeonu, 2019). Cutting boards, in particular, is used daily and is made from various materials including plastics, glass, ceramics, and high-density polyethylene (HDPE). Regardless, wooden cutting boards remain the most popular and traditional. However, owing to the nature and porosity of wood, they are prone to breakage and chipping during activities such as cutting, and can develop cracks over time from prolonged knife use (Kim et al., 2021). Foreign substances are likely to become trapped in these cracks, creating an ideal environment for the growth of a variety of spoilage and disease-causing microorganisms such as *Escherichia coli*, *Campylobacter* spp., and *Vibrio parahaemolyticus* (Kim et al., 2021).

When food contact surfaces in the food preparation kitchen of the house are not cleaned or disinfected effectively, microbial cross-contamination can occur. Numerous studies indicate that between 50%–87% of foodborne disease outbreaks and cases are related to home-prepared food (Fawzi & Shama, 2009; Redmond & Griffith, 2003). Additionally, food debris accumulation may form biofilms on food contact surfaces or equipment, allowing bacteria to thrive and multiply, raising the risk of cross-contamination between food contact surfaces and food in the area. Apart from that, the most common kitchen activities that may result in cross-contamination are touching food without washing their hands in between, then opening drawers or the refrigerator, manipulating food containers, checking/answering the phone, and inefficient hand cleaning, such as wiping with a dishcloth, touching the dustbin (Mørretrø et al., 2021).

With an increase in "eating at home," notably during the Covid19 pandemic, there is a risk of food poisoning from improperly cleaned and stored cutting boards in the kitchen. Furthermore, with online food delivery sales increasing, the home-based industry is witnessing the emergence of a trend for optimized home kitchens for the delivery economy (Donthu & Gustafsson, 2020). This trend has continued in Malaysia, where home-based businesses for delivery have increased since Covid19. Home food handlers play an important role in assuring the hygiene and safety of food consumed by family members and customers (Limon, 2021). Any microorganism can enter raw food or ready-to-eat dishes through direct sneezing or coughing, face touching or any other contact without first washing their hands (Rizou et al., 2020). Several studies demonstrate that the frequency of foodborne pathogen consumption increases due to contamination of prepared foods (from raw meals via unwashed cutting boards, knives, and the cook's hands) and due to increased contact between unwashed utensils and unwashed hands during food handling (Kennedy et al., 2011; Zhu et al., 2017). In fact, the kitchen counter and cutting board were determined to be the most contaminated surfaces, especially with *E. coli* ($>10^3$ CFU/swab) contamination (Azevedo, Albano, Silva, & Teixeira, 2014).

Numerous research has been conducted in the field of food control and disease prevention, a large number of these studies have focused on assessing the food safety knowledge of food handlers and utilising this criterion to evaluate their food hygiene practices. Using the knowledge, attitude, and practise model, Bin (2016) examined the degree of food safety knowledge among food handlers in Terengganu hospitals in Malaysia and found that food safety knowledge influences food handlers' food safety practices (Kwol, Eluwole, Avci and Lasisi, 2020). Food handlers' safety knowledge includes their understanding of the conditions and procedures related to the proper handling, preparation and storage of food (Kwol et al., 2020). However, knowledge alone does not guarantee positive behaviour, since the relationship between knowledge and practice has been shown to be mediated by other variables, or in other words, they were not always implemented (Mihalache et al., 2021; Ko, 2013). Poor knowledge of food safety and handling at home may minimize the potential of food poisoning, while food safety awareness affects food safety behaviours and may contribute to behavioural changes (Parry-Hanson Kunadu et al., 2016). However, there are limited studies on cutting board hygiene knowledge, attitudes and practices among home food handlers, particularly during the pandemic. Therefore, this study aimed to assess cutting board hygiene knowledge, attitudes and practices (KAP) among Selangor home food handlers during Covid19 pandemic.

3.0 Methodology

3.1 Sample and study design

This study is a cross-sectional survey conducted in several residential areas in Klang and Shah Alam, Selangor. The location was selected because it is the most developed and progressive state, which had the highest population and is the state with the largest economy in Malaysia (Department of Statistics Malaysia, 2022). Respondents are those who prepare and cook food at home during covid19 pandemic. A total of 100 home food handlers participated in the online survey using a validated self-administered questionnaire. Respondents were invited to participate voluntarily.

3.2 Questionnaire design and data collection

The survey consists of 4 sections: A] socio-demographic information (12 items), B] cutting board knowledge (47 questions), C] cutting board attitudes (17 questions), and D] cutting board practices (14 questions). The socio-demographic section was used to collect data on gender, age, level of education, occupation, income, number person in the family, frequency of preparing food at home, typhoid vaccine, food safety training, having a cutting board or not and the number of cutting board at home. Cutting board knowledge (Section B) consisted

of 8 categories: cross-contamination (4 items), causative agents that can be found on the cutting board (4 items), signs and symptoms of foodborne disease (10 items), cutting board hygiene (4 items), types of cutting board (7 items), storage of cutting board (2 items), personal hygiene (2 items) and how to prevent cross-contamination on cutting board (14 items). Questions in section B has 3 optional answers ("yes", "no", "unsure"). Each correct answer (yes) was given 1 point whereas incorrect or "unsure" answer was awarded 0 points. For sections C (attitudes) and D (practices), questions are rated with a 5-points Likert scale ranging from 1 (strongly disagree/never practice) to 5 (strongly agree/practice every day). The score points ranged from 0 to 100, with scores below 50 indicated as "poor", 50-70% as "satisfactory" and 70-100% as "good". A pilot analysis was conducted on 30 home food handlers. The result obtained for the Cronbach's Alpha is 0.829, indicating the reliability and consistency of the questionnaire. All questions were digitized to allow distribution online, as physical contact between and among people is strictly restricted during this pandemic. The survey questionnaire was sent via a social media link.

3.3 Data analysis

A summary of respondents socio-demographic information and their knowledge, attitudes, and practices scores were obtained using descriptive statistics. Data were analyzed using Statistical Package for Social Science (SPSS) software for Windows, version 21. Spearman's correlation coefficient was used to determine the association between knowledge, attitudes, and practices scores of home food handlers. Findings with a p-value less than 0.05 ($p < 0.05$) were shown statistically significant.

4.0 Results and Discussion

4.1 Demographic characteristic

Most respondents (88%) were females between 21 and 30 years old (97%). The education profile revealed that most respondents (98%) were university/college graduates, with the majority earning less than RM 4360 (63%) and only 24% is employed. Due to the fact that Selangor is the most developed state with the most prominent public and private universities or colleges, a large number of workers and students reside in Selangor (StudyMalaysia.com, 2020). According to Gong et al. (2016), the level of food safety knowledge and handling in households was influenced by factors such as gender, location and yearly income. 73% of respondents live with 3-6 people and prepare food daily at home (76%), but most (71%) do not have typhoid vaccine, and 74% do not have food safety training. All have a cutting board in their home (100%), and 51% have two. Thus, women who prepare dishes for their households may have a monopoly in the online food business industry or home-based food market (Soon, Vanany, Wahab, Sani, Hamdan and Jamaludin, 2022).

4.2 Knowledge of cutting board hygiene

The overall cutting board hygiene knowledge was found to be satisfactory (mean total score of 26.51 ± 8.478) (56.40%). This was greater than the score reported in Lahore, where the knowledge level was only 11.9% (Naeem et al., 2018). However, the result is almost similar to research in Sharjah (57.4%) (Saeed et al., 2021). Knowledge of cross-contamination recorded only a fair score (50.75%) (Figure 1). Similar findings were reported in previous research that food handlers lacked information on cross-contamination issues (Abdullah Sani & Siow, 2014; Al-Kandari et al., 2019; Osaili et al., 2017). This indicated that home food handlers are unaware of all the aspects of cutting board hygiene in their kitchen that may lead to bacteria growth such as *Staphylococcus aureus*, *Escherichia coli* caused by cross-contamination on food.

Figure 1 shows that the home food handler's correct responses (%) according to different knowledge categories. Findings show that most of the participants (73%) agreed that cross-contaminations is caused by bacteria (69%) and can lead to foodborne diseases such as Hepatitis A (49%). Most of them have the least knowledge about the causative agents that can be found on the cutting boards (34.75%). Additionally, only 32% knew about *Staphylococcus*, 37% about *Escherichia coli*, 42% about *Salmonella* species, and about 28% about the Covid19 virus. These pathogens and viruses are disease-causing and could be transmitted via a cutting board. These findings are confirmed by other research which has suggested that food handlers had poor knowledge of foodborne pathogens (Lee et al., 2017; Liu et al., 2015), demonstrating that home food handlers are unconcerned about the causative agents that can be transmitted to the cutting board, as well as unaware of all necessary sanitation and cutting board hygiene procedures and practices, which can result in cross-contamination. For instance, using the same cutting board to cut raw meat and ready-to-eat foods such as salad without washing could lead to contamination of *Salmonella*. As a result, it has the potential to contaminate food, particularly when cutting ready-to-eat veggies on an unwashed cutting board. This shows that there is a need to improve food safety knowledge among home food handlers, which may be a result of no food safety training.

Most of the respondents have good knowledge of signs and symptoms of foodborne diseases such as upset stomach (97%), loss of appetite (60%), diarrhea (96%), headache (48%), abdominal cramps (62%), fever (58%), vomiting (96%), death (53%), and fatigue (26%). Only 56% of respondents knew that no signs and symptoms of the foodborne disease were false. Most (69%) also knew that the same cutting board cannot be used for raw and cooked food, and about 64% of household food handlers gave correct responses regarding separating colour-coded cutting boards that are used for different food. The re-use of the same cutting board for raw and ready-to-eat food without washing is a possible source of bacterial transmission (Goh et al. 2014), as microorganisms can migrate from raw food to hands and other food contact surfaces in kitchen (Tan et al., 2013).

About 23% of respondent gave correct responses regarding the use of wooden cutting boards versus plastic. Wooden cutting boards are not recommended because the surfaces are difficult to clean and wash thoroughly (Saipullizan et al. 2018), particularly when

cracked and this had been demonstrated in a prior study (Rodriguez et al., 2011). Cutting boards have a high microbial load when not thoroughly washed, leading to cross-contamination to their food.

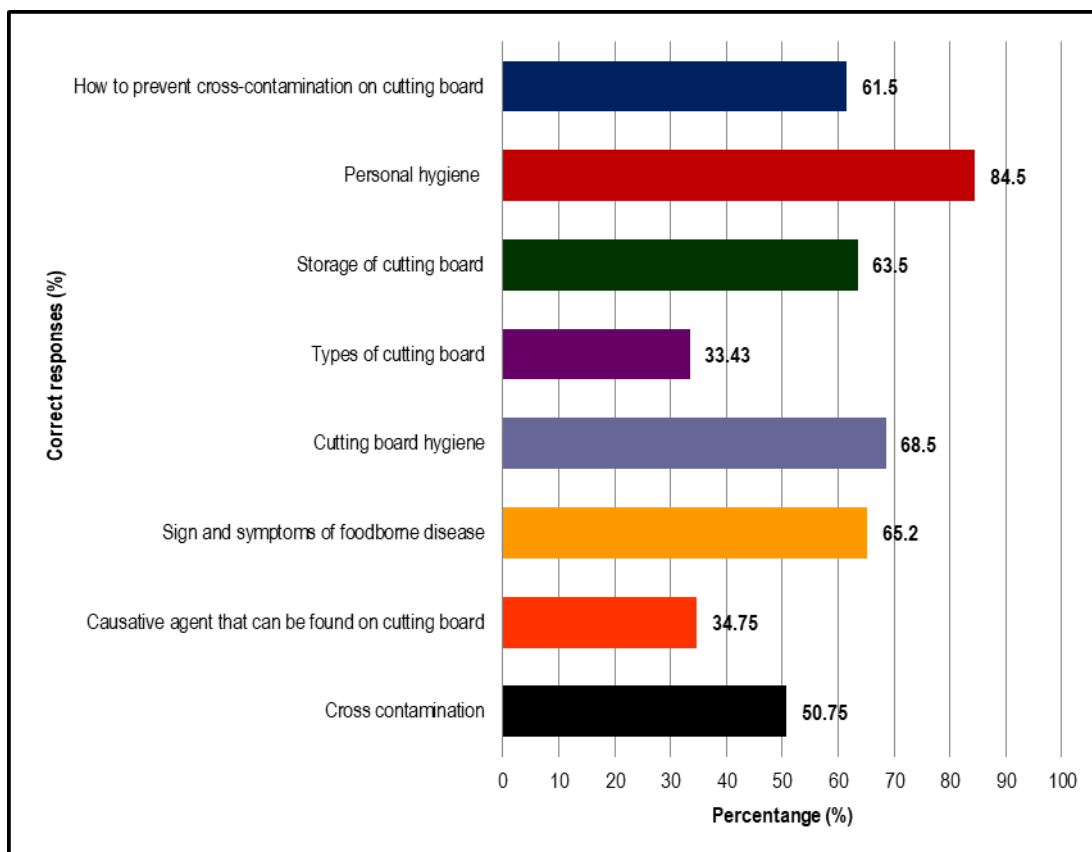


Fig. 1. Home food handler's correct responses (%) according to different knowledge categories

4.3 Cutting board hygiene attitudes

Attitudes of home food handlers were satisfactory for the overall cutting board hygiene (total mean of 9.50 ± 4.051) (55.88%). However, food handlers in foodservice with no training showed a higher attitude score (89.26) (Abdullah Sani and Siow, 2014). Table 1 shows that the home food handler's attitude correct responses (%) on cutting board hygiene. The statement on using one cutting board for all-purpose is unsafe was approved by 59% of respondents. Additionally, 76% respondents agreed on the use of colour-coded cutting boards to differentiate its usage for different food. Many of the respondents agreed and strongly agreed that washing the cutting board with hot water 72% and 23%, soap and water 71% and 44%, sanitizer 66% and 38%, and antimicrobial solution or sterilize 59% and 42% can kill bacteria and Covid19 virus respectively. This indicates that home food handlers had a good attitude on removing bacteria on the chopping board. Previous studies have been undertaken to examine effective cleaning methods for plastic and wood cutting boards and other surfaces that comes into contact with contaminated food in a food preparation environment (Barker et al., 2003; Cogan et al., 2002; Kusumaningrum et al., 2004).

According to Goh et al. (2014), washing used cutting boards with hot water and detergent is effective for eliminating bacteria attached to the cutting board surface. Home food handlers need to wash their cutting board daily with hot water, detergent or disinfect them with 0.05% sodium hypochlorite (NaClO) and ethanol-based products (at least 70%) to ensure hygiene. Respondents also had a good attitude on removing bacteria on the cutting board. About 49%, 81% and 85%, of the respondents, strongly agreed and agreed that and wet cutting board should not be stored with other kitchenware but stored in a vertical or upright position, and any cutting board which is excessively worn out with cracks, cuts, or hard to clean strains need to be throw away respectively. The majority were also confident that wiping a washed cutting board with a clean cloth (62%) and (33%) and tissue (46%) and (33%) can reduce the growth of bacteria and Covid19 virus, respectively. According to Beumer & Kusumaningrum (2003), when preparing contaminated food, the pathogens are easily spread to the cutting boards or through the cleaning of surfaces (dishcloth). Some pathogens (*Salmonella* and *Campylobacter*) are only found during and right after the preparation of contaminated food, while others (*Listeria monocytogenes*) are also present at other points in time. Thus, home food handlers need to change their clothes, dishcloth, or apron regularly since the bacteria can present on clothes. Also, the cutting board needs to be separated and replaced to ensure cutting board hygiene in the kitchen.

Table 1. Home food handlers' attitude on cutting board hygiene

Questions	Responses (%)				
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Using one cutting board for all purpose is safe	33.0	26.0	30.0	7.0	2.0
Used colour-coded cutting board to differentiate cutting board use for different type of food	0.0	3.0	21.0	24.0	52.0
Wash the cutting board used with hot water can kill bacteria on cutting board	2.0	1.0	25.0	46.0	26.0
Wash the cutting board used with hot water can kill Covid19 virus on cutting board	12.0	11.0	49.0	15.0	13.0
Wash the cutting board used with soap and water can kill bacteria on cutting board	0.0	1.0	28.0	33.0	38.0
Wash the cutting board used with soap and water can kill Covid19 virus on cutting board	6.0	6.0	44.0	22.0	22.0
Wash the cutting board used with sanitizer can kill bacteria on cutting board	3.0	3.0	28.0	33.0	33.0
Wash the cutting board used with sanitizer can kill Covid19 virus on cutting board	5.0	6.0	51.0	21.0	17.0
Wash the cutting board used with antimicrobial solution or sterilize can kill bacteria on cutting board	1.0	2.0	38.0	25.0	34.0
Wash the cutting board used with antimicrobial solution or sterilize can kill Covid19 virus on cutting board	5.0	6.0	47.0	18.0	24.0
Wiping the cutting board that has been washed with a clean cloth can reduce the growth of bacteria	5.0	1.0	32.0	34.0	28.0
Wiping the cutting board that has been washed with a clean cloth can reduce the growth of Covid19 virus	11.0	10.0	46.0	15.0	18.0
Wiping the cutting board that has been washed with tissue can reduce the growth of bacteria	12.0	8.0	34.0	25.0	21.0
Wiping the cutting board that has been washed with tissue can reduce the growth of Covid19 virus	18.0	11.0	38.0	18.0	15.0
Throw away any cutting board which are excessively worn out with cracks, cuts or hard to clean strains	1.0	1.0	13.0	26.0	59.0
Cutting board is store in vertical or upright position	2.0	3.0	14.0	28.0	53.0
Wet cutting board is store with other kitchenware	26.0	23.0	18.0	16.0	17.0

4.4 Cutting board hygiene practices

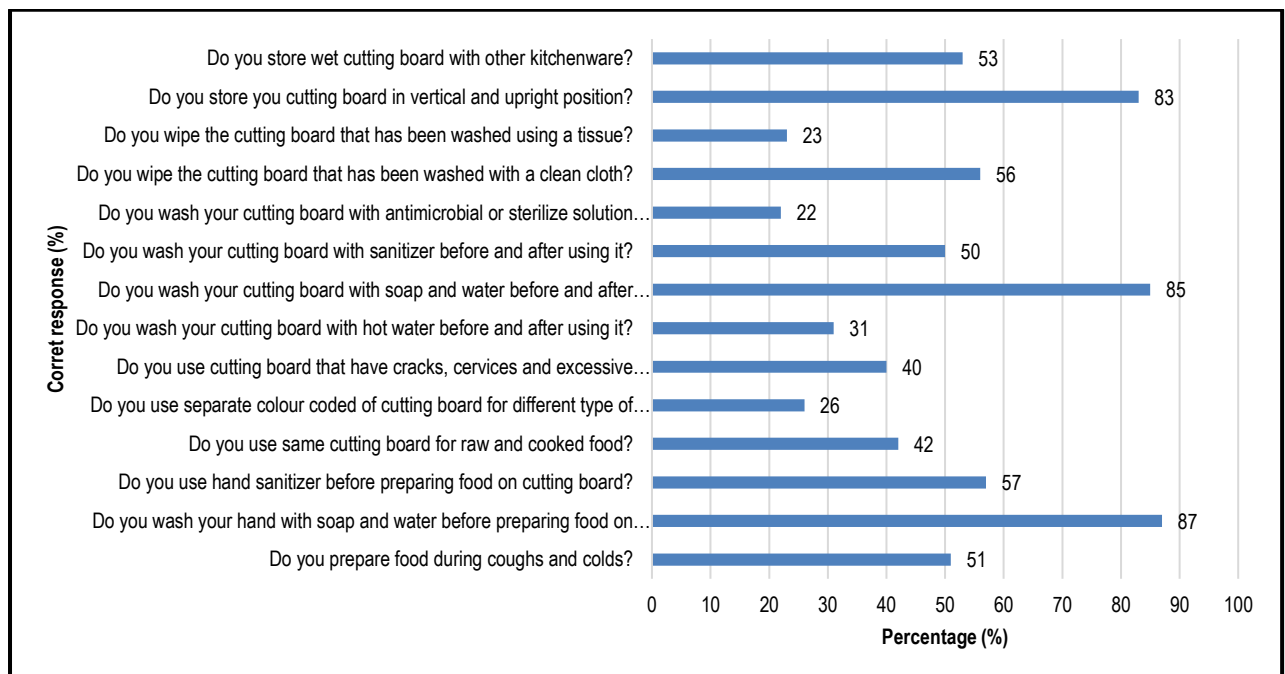


Fig. 2: Home food handlers' practice correct responses (%) on cutting board hygiene

Hygiene is an important factor for home food handlers, however, the respondents in this research were found to have satisfactory cutting board hygiene (mean of total score 7.01 ± 2.710) (50.07%). Figure 2 shows that the home food handlers' practice correct responses (%) on cutting board hygiene. Based on the survey result, 87% of home food handlers practice washing their hands with soap and water, while 57% used hand sanitizer before preparing food on a cutting board. As mentioned in Section 4.3, respondents had good attitudes towards colour-coded cutting boards, but this is not translated to practice, as only 26% uses colour-coded cutting board for different type of foods. While attitude is not necessarily translated into knowledge and practices, attitude is a crucial factor in food handling since it may affect

knowledge and practice. In fact, food handlers with knowledge are more likely to convert knowledge into practice if they have a good attitude, and vice versa (Al-Kandari et al., 2019).

In this study, only 51% respondents did not prepare food when sick, while 41% use the same cutting boards for raw and cooked food, 40% use cutting board that has cracks, crevices, and excessive knife scars during food preparation. The respondents showed unsatisfactory practice by washing their cutting board before and after using it with only soap and water (85%), hot water (31%), sanitizer (50%), or antimicrobial solution, or sterilization (22%). About 56% and 23% of respondents wiped their cutting boards that have been washed with clean cloth and tissue, respectively. The findings showed that respondents stored cutting boards in a vertical position (83%) and do not store wet cutting boards with other kitchenware (53%).

4.5 Association between cutting board hygiene knowledge, attitudes and practices

A significant positive correlation was found between knowledge with practice ($r_s = 0.375$, $P < 0.05$), knowledge with attitude ($r_s = 0.590$, $p < 0.05$) and attitude with practice ($r_s = 0.380$, $p < 0.05$). The specified size of the benchmark effect for the value of Cramer's V was used (Al-Kandari et al. 2019), which suggests the following: small effect=0.1, moderate effect=0.3 and high effect=0.5. Pacholewicz et al. (2016) noted that although some food handlers were found to have strong food safety knowledge regarding their tasks, they were not always found to put this information into practice and adopt the appropriate attitudes. As a result, our findings showed that the experience of home food handlers has a substantial impact on their activities and behaviours during the pandemic in terms of cutting board hygiene. These results are confirmed by others whose findings also show a strong positive association between awareness, attitudes, and practices (Abdullah Sani & Siow, 2014; Al-Kandari et al., 2019; Al-Shabib et al., 2016). The limitations of the present study include the fact that this survey was conducted online and in urban areas during the Covid19 pandemic and that the majority of respondents or community members are graduates, whether they are staff or students at one of Selangor's 20 public or private universities. The survey was performed online, and respondents with poor internet connections would have been excluded from the findings. Future research should be conducted in rural residential areas to assess hygiene knowledge, attitude and practices of home food handlers using a larger sample size and a diversity of age groups and cultures.

5.0 Conclusions & Recommendations

The current study concludes that the level of cutting board hygiene knowledge, attitudes, and practices of home food handlers during Covid19 pandemic was satisfactory. To reduce the risk transmission of microbial, knowledge of home food handlers needs to be improved as well as attitudes and practices by enhancing educational programs for home food handlers. It is recommended that qualitative research methods such as focus group discussion, in-depth interviews, observation or recording be conducted to understand home food handlers attitudes and practices.

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Paper Contribution to Related Field of Study

This paper contributes to the field of environmental health in Malaysia by describing the current status of food safety related to cutting board hygiene knowledge, attitudes and practices among home food handlers. The information can be used as basic data to develop specific educational program and preventive actions.

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