

ASSESSMENT OF CHOPPING BOARD HYGIENE KNOWLEDGE, ATTITUDES AND PRACTICES AMONG HOUSEHOLD FOOD HANDLERS DURING COVID-19 OUTBREAKS IN SELANGOR

ABSTRACT

By Rabi'atul' Adawiyah binti Abdul Wahab (ID: 2018693752)

Chopping boards are common utensils in kitchens and food processing units, so chopping board hygiene should be a priority in kitchens. The objective of the study was to investigate the level of knowledge, attitude and practice (KAP) on chopping board hygiene among household food handlers during COVID-19 outbreak. The information was collected through questionnaires comprising four sections: demographic characteristics, knowledge, attitude, and practices. The results showed that respondents had not sufficient knowledge (26.51 ± 8.478) 56.40%, attitude (9.50 ± 4.051) (55.88%), and practice (7.01 ± 2.710) (50.07%). A significant correlation was observed 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 ($r_s = 0.380$, $p < 0.05$). There was no significant different between income of household family (B40 and M40) with knowledge ($U = 938.000$, $p = 0.954$), attitude ($U = 877.500$, $p = 0.578$), and practice ($U = 760.500$, $p = 0.126$). However, the income of the household family (M40) had the highest knowledge (47.23) on chopping board hygiene but had the lowest attitude (44.75) and practice (40.85) towards chopping board hygiene compared to the income of the household family (B40). Hence, the results suggest developing an educational program related to food safety and handling in the household of Selangor during this pandemic the COVID-19 to improve their knowledge as well as attitude and practice.

Keywords: chopping board hygiene, household food handlers, COVID-19 and knowledge, attitude, practice (KAP)

1.0 INTRODUCTION

Food safety has become a major global concern due to the great effect on the economy and health of the citizens of developed and developing countries (Lim et al., 2016). A total of 17,094 cases of foodborne disease occurred in the United States between 1990 until 2008. These outbreaks also caused 370,266 people to become ill (Soon et al., 2011). In either case, between 2009-2010, of 766 outbreaks with a documented single setting where food was eaten, 21% were triggered by food expended in a private home (Gong et al., 2016). Within the European Union (EU), 36.4% of detailed food-borne episodes were caused by poor food handling practices in households. Data from Australia and New Zealand suggested that 20-50% of foodborne illness was related to the household (Lim et al., 2016). Food poisoning cases tend to be on the rise every year in Malaysia. In 2006, the incidence rate of food poisoning was 26.04% and in 2007 it doubled to 53.19%. Although the occurrence had dropped to 36.2% in 2009, it had rebounded to 56.25% in 2011 (Lim et al., 2016).

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, information itself does not inherently contribute to positive behaviour, because the relationship between knowledge and practice has been shown to be mediated by other variables (Ko, 2013). The lack of knowledge of food safety and handling in households has been viewed as one of the barriers to food safety for food managers (Gong et al., 2016). Food safety awareness affects food safety behaviours and may contribute to behavioural changes (Parry-Hanson Kunadu et al., 2016).

Due to the outbreak of covid 19, most people take advantage of being cooked and eating at home. However, food contamination by household food handlers may occur and lead to foodborne diseases if they neglect proper food utensils hygiene, in particular, chopping board hygiene in their premises (Abdul-Mutalib et al., 2012). Coronavirus can enter fresh food items (e.g. vegetables, natural products, or pastry kitchen) through an infected person who sneezes or coughs directly on them (Rizou et al., 2020). These droplets would fall quickly on the floor or the surface, as they are generally overwhelming to hang in the air (Nakat & Bou-Mitri, 2020). The transmission tends to be conceivable if the virus is passed to the mucous membranes of the mouth, throat, or eyes shortly afterward through the hands or food itself (Rizou et al., 2020). However, Rizou et al. (2020) reported that the European Food Safety Authority (EFSA) and the United States Food and Drug Administration (FDA) have concluded that, until now (30th May, 2020), there is no evidence that food may be likely to be transmitted, but that data on possible food infections will continue to be collected. There is also no evidence that infections can cause cross-contamination by the chopping board. It is because the most mode of transmission for COVID-19 is from individual to individual, mainly through respiratory droplets, that infected individuals wheeze, hack, or breathe out (Nakat & Bou-Mitri, 2020). However, there are limited studies available concerning on chopping board hygiene in household during the COVID-19 outbreak since most people tend to cook at home.

In this view of this need, this research has three primary goals: 1) to assess socio-demographic information on household food handlers in Selangor; and 2) to investigate the level of knowledge, attitude and practice (KAP) on chopping board hygiene among household food handlers during COVID-19 outbreak; and 3) to

analyze the association between knowledge, attitude, and practice (KAP) level on chopping board hygiene among household food handlers during COVID-19 outbreak; and 4) to compare mean between the income of household food handlers (B40 and M40) and their knowledge, attitude, practices (KAP) level on chopping board during COVID-19 outbreak.

2.0 MATERIALS AND METHODS

2.1 *Study Design*

This study was conducted in Selangor. A cross-sectional study was chosen as the study design. The selected are were Klang and Shah Alam. The target respondents were household food handlers. The total household in the Selangor (100 households) was collected via online questionnaires that were distributed. Participation by respondents was voluntary and sufficient time (15-20 min) was allowed to answer the questions.

2.2 *Questionnaire Design*

Structured questionnaires were translated into two languages (Malay and English). The questions were generated in the Google form which divides into 4 parts consisting of socio-demographic information (12 items), chopping board knowledge (47 questions), the attitude of the chopping board (17 questions), and practices of the chopping board (14 questions). The questionnaire comprises of 90 questions were answered by respondents.

The socio-demographic information (Section A) was used to collect data on participants' gender, age, level of education, occupation, the field of work, income, number person in the family, frequency of preparing food at home, typhoid vaccine, food safety training, have chopping board or not and the number of chopping board at home. The chopping board knowledge (Section B) included 47 questions. Each of the questions in Section B consist of 3 optional answers ("yes", "no", "unsure") to avoid the participants to select the correct answer by chance. . Each correct answer was given 1 point, incorrect or "unsure" answer was given 0 points. This section also consisted of 8 categories that tested the respondents' knowledge on cross-contamination (4 items), causative agents that can be found on the chopping board (4 items). Sign and symptoms of foodborne disease (10 items), chopping board hygiene (4 items), types of chopping board (7 items), storage of chopping board (2 items), personal hygiene (2 items), how to prevent cross-contamination on chopping board (14 items). The attitude of the chopping board (Section C) of the questionnaire contained 17 questions that were designed to measure the respondent's attitude on the chopping board. The practices of the chopping board (D) consist of 14 questions concerning respondents' practices during food handling in the household. In both parts, C and D consisted of 31 questions rated with a 5-points Likert scale ranging from 1 (strongly disagree/never practice) to 5 (strongly agree/practice every day).

2.3 *Pilot Study*

A pilot analysis was conducted on 30 household food handlers. The result obtained for the Cronbach's Alpha is 0.829. Hence, the questionnaire is reliable and consistent with the community.

2.4 *Statistical Analysis*

Data were analyzed using Statistical Package for Social Science (SPSS) 21 software. Summary respondent socio-demographic information and their knowledge, attitudes, and practices scores were obtained using descriptive statistics. Spearman's correlation coefficient was used to analyze the association between knowledge, attitude, and practice (KAP) level on chopping board hygiene among household food handlers during the COVID-19 outbreak. Mann-Whitney U t-test was used to compare the mean between the income of household food handlers (B40 and M40), and their knowledge, attitude, and practices (KAP) level on the chopping board during the COVID-19 outbreak.

3.0 RESULTS AND DISCUSSION

3.1 *Demographic characteristic of respondents*

The socio-demographic characteristic of one hundred (n = 100) household food handlers in Selangor are represented in (Table 1). Most of the respondents were females (88%), with a minority of males (12%). The most group common age group was between 21 and 30 years (97%), followed by 2% who were less than 20 years and 1% who were between 31 and 40 years respectively. About 98% of them have educations at College/ University. Most of the respondent income (63%) were below RM 4360, followed by 30% of respondents were between RM4360 to RM 9619 and 7% of respondents were above RM 9619. Approximately 24% of respondents go to work. From these respondents, only 4% were work at the restaurant, followed by 2% of respondents were work at the hotel kitchen, and 2% of respondents were work at the mobile stall. Almost 73% of respondents have 3-6 peoples in their house, followed by 19% were more than 6 peoples and 8% were less than 3 peoples. More than half (76%) of respondents were preparing food in their house every day but most of the respondents (71%) did not have typhoid vaccine and 74% of respondents did not participate in food safety training. All of the respondents have chopping boards in their house (100%) and the majority of respondents have two chopping boards in their house (51%).

Table 1

Demographic characteristic of the household food handler in Selangor

Demographic characteristic	Category	Percent (%)
Gender	Male	12.0
	Female	88.0
Age	Less than 20 years	2.0
	21-30 years	97.0
	31-40 years	1.0
Level of education	Secondary school	3.0
	College/university	97.0
Income of family household	Below than RM 4360	63.0
	RM 4360 to RM 9619	30.0
	Above RM 9619	7.0
Occupation	Yes	24.0
	No	76.0
Field of work	Restaurant	4.0
	Mobile stall	2.0
	Hotel kitchen	2.0
	Not applicable	92.0
Number of person in family	Less than 3 peoples	8.0
	3 – 6 peoples	73.0
	More than 6 peoples	19.0
Frequency of preparing food at home	Everyday	76.0
	3 – 6 per week	13.0
	Less than 3 days per week	11.0
Typhoid vaccine	Yes	29.0
	No	71.0
Food safety training	Yes	27.0
	No	73.0
Do you have chopping board?	Yes	100.0

Number of chopping board at home	1	14.0
	2	51.0
	3	27.0
	4	6.0
	More than 4	2.0

3.2 Knowledge of chopping board hygiene in the household

3.2.1 Knowledge of cross contamination

The overall chopping board hygiene knowledge of household food handlers was found to be unsatisfactory with a mean score (26.51 ± 8.478) (56.40%) (Table 2). The score was calculated by summation of the correct answer in the tested aspects (47 questions). Generally, knowledge of cross-contamination was found to be fair (50.75%) (Figure 1). Similar findings were obtained from previous research, indicating that food handlers had a lack of information on cross-contamination issues (Abdullah Sani & Siow, 2014; Al-Kandari et al., 2019; Osaili et al., 2017). This indicates that food handler unaware of all the chopping board hygiene in their kitchen that may lead to bacteria growth such as *Staphylococcus*, *Escherichia coli*, and *Salmonella species* or COVID-19 viruses caused from cross-contamination on food.

Findings show that most of the participants (73%) knew that cross contaminations is one of the indirect cross contaminations that caused by bacteria (69%) and can lead to foodborne disease such as Hepatitis A (49%). However, most of the respondents were found to have the least knowledge (12%) on cross-contamination is caused by the COVID-19 virus (Table 2). This may be due to no cases and information was found since research in the COVID-19 virus on food is

still ongoing. However, many arguments were found regarding that. The European Food Safety Authority (EFSA) and the United States Food and Drug Administration (FDA) conclude that there is no proof to date (30th May, 2020) that food is a possible transmission path (Rizou et al., 2020). However, the same author claimed that coronavirus can enter fresh food products (e.g. vegetables, fruit, or bakery) or food packaging through an infected person who sneezes or coughs directly on them. Transmission appears to be possible if the virus is spread through the mucous membranes of the mouth, nose, or eyes immediately afterward through the hands or food itself (Rizou et al., 2020). Based on the previous research, Kwok et al. (2015) discovered that people contact their faces about 23 times per hour. Of all the strokes, 44% included contact with a mucous film, 36% included mouth, 31% included nose, 27% included eyes (Kwok et al., 2015). This may contribute to cross-contamination of the COVID-19 virus on the chopping board and transmitted to food, as there is a substantial risk of infection by an asymptomatic infected individual during food preparation.

3.2.2 Knowledge of causative agent that can be found on chopping board

The overall knowledge of the causative agents that can be found on the chopping board was found to be unsatisfactory (34.75%) (Figure 1). According to Figure 1, respondents were found to have the least knowledge about the causative agents that can be found on the chopping boards (34.75%). Only 32% of the respondents knew about *Staphylococcus*, 37% about *Escherichia coli*, 42% about *Salmonella* species, and about 28% about the COVID-19 virus. These pathogens and viruses are disease-causing and could be transmitted on a chopping board (Table 2).

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). This show that household food handlers did not care about the causative agents that can be transmitted to the chopping board, therefore, household food handlers might unaware of all necessary procedure required for sanitation of chopping board hygiene and can cause cross-contamination on food. For example, the storage of wet chopping boards that are used to cut raw meat with other wet chopping boards that are used to cut ready-to-eat food such as salad can cause cross-contamination of bacteria such as *Salmonella* species. Thus, it may contaminate food especially during cutting ready-to-eat vegetables using a contaminated chopping board. Besides, Nakat & Bou-Mitri (2020) stated that SARS-CoV-2 lasted up to 24 hours on cardboard and up to 72 hours on hard surfaces such as steel and plastics. It was also possible for the COVID-19 virus to cause cross-contamination, as it could stay on the chopping board for a long period of time.

3.2.3 Knowledge of sign and symptoms of foodborne disease

As shown in Table 2, ten questions were asked to test the knowledge of signs and symptoms of foodborne disease. Generally, about 65.2% of respondents had knowledge of signs and symptoms of foodborne disease (Figure 1). The majority of the respondents have good knowledge of signs and symptoms of the foodborne disease 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 had knowledge that no sign and symptoms of the foodborne disease were a false statement (Table 2).

According to the Centers for Disease Control and Prevention (CDC) stated that food poisoning symptoms may range from mild to severe and may differ depending on the germ that had been swallowed (CDC, 2020). The major symptoms of food poisoning are upset stomach, stomach cramps, nausea, vomiting, diarrhea, and fever (CDC, 2020). This may be due to the lack of experience with fatigue symptoms since most household food handlers did not aware of that.

3.2.4 Knowledge of chopping board hygiene

Based on Figure 1, about 68.5% of respondents were found to have knowledge of chopping board hygiene. Most of the respondents (69%) knew that the same chopping board cannot be used for raw and cooked food and about 64% of household food handlers gave correct responses to separate colour-coded chopping boards that are used for different types of food. Also, the respondents correctly answered questions regarding chopping board that have cracks, cervices, excessive knife scars (63%) and have excessively worn or have hard-to-clean grooves cannot be used for food preparation (78%) (Table 2). According to Goh et al. (2014), the re-use of the same cutting board for raw and ready-to-eat food without washing is a possible source of bacterial transmission. It is because microorganisms can migrate from raw food to hands and other food contact surfaces in domestic kitchens (Tan et al., 2013). Therefore, separate chopping boards must be used to cut raw and cooked food as pathogens on the surface of the cutting boards can be easily transferred to cooked food using dirty or unhygienic chopping boards.

3.2.5 Knowledge of types of chopping board

In general, about 33.4% of household food handlers had knowledge of types of chopping boards was found to be unsatisfactory (Figure 1). About 23% of respondent gave correct responses regarding chopping boards made of wood are better than plastic. Based on previous studies, Ain Saipullizan et al. (2018) stated that wooden chopping boards are not recommended because the surfaces are difficult to clean and wash thoroughly, particularly when cracked and had been demonstrated by (Rodriguez et al., 2011), chopping boards have a high microbial load if not thoroughly washed. This may cause cross-contamination in their food.

Most of the respondents knew chopping board had various type of colour-coded and its specific type of foods such as the white chopping board is used for bakery and dairy products (37%), the yellow chopping board is used for cooked meat (32%), the red chopping board is used for raw meat (37%), the brown chopping board is used for root vegetables (34%), the blue chopping board is used for raw fish (30%), the green chopping board is used for salad, fruit and fresh vegetables (41%) (Table 2). There were limited studies regarding on colour coded of chopping board and most household food handlers have or attend any food safety training, thus peoples did not aware of the existing colour coded on the chopping board and its function. This indicates that household food handlers were not working or involved in the food industry so most of them did not have any injection to prevent foodborne diseases such as typhoid fever.

3.2.6 Knowledge of chopping board storage

Overall, knowledge of chopping board storage was found to be good (63.5%) (Figure 1). Findings show that most of the participants (77%) had good knowledge on chopping board need to be stored in the vertical and upright position and 50% of them knew that stack wet chopping board can be stored with other kitchenware was not a suitable method (Table 2). It is because microorganisms have primarily been isolated from wet surfaces (Beumer & Kusumaningrum, 2003). To avoid the trapping of moisture and the accumulation of dust or grime under the boards, the chopping board must be stored in a vertical and upright position. Proper storage of chopping boards helps to keep the chopping board hygienic and dry.

3.2.7 Knowledge of personal hygiene

Generally, approximately 84.5% of respondents were aware of personal hygiene during food preparation (Figure 1). The respondents had knowledge of unwashed hands before the preparing foods could transmit bacteria (93%) and could transmit COVID-19 viruses (76%) on a chopping board (Table 2). Similar findings were observed in other research in which food handlers were found to have more accurate answers to good personal hygiene questions (Abdullah Sani & Siow, 2014; Al-Kandari et al., 2019; Al-Shabib et al., 2016). The findings showed that most household food handlers were less educated about the COVID-19 virus compared to bacteria. It was because there is still a need for ongoing research to be carried out, thus, the lack of knowledge would have been received by the household food handler because it was not proven that the COVID-19 virus could contaminate the hygiene of the chopping board.

3.2.8 Knowledge on how to prevent cross contamination on chopping board

Overall, the knowledge on how to prevent cross-contamination on the chopping board was found to be good (61.5%) (Figure 1). The majority of the respondents gave correct responses on personal hygiene should be prioritized in the kitchen (98%) and chopping boards that have excessively worn out with cracks, cuts, or hard-to-clean stains should be replaced (93%). Most of the respondents also knew that washing chopping board used with hot water (82%) and (34%), soap and water (85%) and (56%), sanitizer (75%) and (47%), antimicrobial solution or sterilize (65%) and (46%) can kill bacteria and COVID-19 virus respectively. Based on the previous study, Rizou et al. (2020) stated that coronaviruses are thermolabile, which SARS-CoV can be inactivated at $>75^{\circ}\text{C}$ for 15 min after incubation, while MERS is inactivated at 65°C for 1 min after incubation. Similarly, SARS-CoV-2 was found to be inactive at 70°C after 5 minutes of incubation (Or Caspi et al., 2020). This indicates that the COVID-19 virus can be inactive and killed at high water temperatures. Another author claimed that standard routine soap and water cleaning removes germs and debris from surfaces such as cutting boards. It lowers the risk of spreading COVID-19 infection when disinfectants destroy germs on the surface (Nakat & Bou-Mitri, 2020). Also, Rizou et al. (2020) recommend the use of sanitizers (such as 71% ethanol) to clean surfaces such as chopping boards during this COVID-19 pandemic. This has shown that cleaning with a sanitizer, soap, and water will cause the COVID-19 virus and bacteria to inactivate and destroy on the surface of the chopping board.

Respondents were found to have the major knowledge on wiping the chopping board that has been washed with a clean cloth (64%) and (37%), and tissue (50%) and (29%) can reduce bacteria and the COVID-19 virus growth respectively. According to the previous report, clothing is not a major source of virus transmission. Clothes are made of porous materials, but SARS-CoV-2 lasts longer on non-porous surfaces (Duda-Chodak et al., 2020). In the study of Or Caspi et al. (2020), researcher proved that no infectious virus could be recovered from printing and tissue papers after a 3-hour incubation, while no infectious virus could be detected from treated wood and cloth on day 2. However, unwashed clothing or apron may be a source of bacterial transmission to food if household food handlers were not informed that they would clean their hands regularly after touching their clothes or apron. It was seen from a previous study that food handlers used their apron to clean their hand and rub their hand on their body parts when they were working (Abdul-Mutalib et al., 2012). Items or sites with a high number of microorganisms that can be easily spread to other surfaces are known to be reservoirs/disseminators, such as dishcloths and aprons (Beumer & Kusumaningrum, 2003). Another research recorded that *Staphylococcus* species, *Escherichia coli* total coliform, were found on food handlers' apron contributing to cross-contamination of food (Lues & Van Tonder, 2007). This suggested that clothing and an apron had the potential to cause cross-contamination of food through poor personal hygiene of household food handlers.

Table 2

Household food handlers' knowledge on chopping board hygiene

Category	Questions	Responses, %		
		True (%)	False (%)	Unsure (%)
Cross contamination	Chopping board is one of the indirect cross contaminations	73.0	0.0	27.0
	Cross contamination is caused by bacteria	69.0	4.0	27.0
	Cross contamination is caused by COVID-19 virus	12.0	38.0	50.0
	Cross contamination can lead to foodborne disease such as Hepatitis A	49.0	2.0	49.0
Causative agent that can be found on chopping board	Salmonella species can be transmitted on chopping board	42.0	5.0	53.0
	Staphylococcus species can be transmitted on chopping board	32.0	1.0	67.0
	Escherichia coli species can be transmitted on chopping board	37.0	3.0	60.0
	COVID-19 viruses can be transmitted on chopping board	28.0	29.0	43.0
Sign and symptoms of foodborne disease	Upset stomach	97.0	2.0	1.0
	Loss of appetite	60.0	17.0	23.0
	Diarrhea	96.0	3.0	1.0
	Headache	48.0	32.0	20.0
	Abdominal cramps	62.0	12.0	26.0
	Fever	58.0	22.0	20.0
	Vomitting	96.0	2.0	2.0
	Fatigue	26.0	33.0	41.0
	No sign and symptoms	14.0	56.0	30.0
Chopping board hygiene	Death	53.0	13.0	34.0
	Same chopping board can be used for raw and cooked food	19.0	69.0	12.0
	Chopping board that have cracks, services and excessive knife scars can be used for food preparation	16.0	63.0	21.0
	Chopping board that have excessively worn or have hard-to-clean grooves can be used for food preparation	10.0	78.0	12.0
	Separate colour coded chopping board are used for different type of foods	64.0	13.0	23.0

Types of chopping board	Chopping board made of wood is better than plastic	30.0	23.0	47.0
	White chopping board is used for bakery and dairy products	37.0	5.0	58.0
	Yellow chopping board is used for cooked meat	32.0	4.0	64.0
	Red chopping board is used for raw meat	37.0	3.0	60.0
	Brown chopping board is used for root vegetables	34.0	5.0	61.0
	Blue chopping board is used for raw fish	30.0	3.0	67.0
	Green chopping board is used for salad, fruit and fresh vegetables	41.0	3.0	56.0
Storage of chopping board	Chopping board need to stored in vertical and upright position	77.0	2.0	21.0
	Stack wet chopping board can be stored with other kitchenware	32.0	50.0	18.0
Personal hygiene	Unwashed hand before preparing foods could transmit bacteria on chopping board	93.00	3.0	4.0
	Unwashed hand before preparing foods could transmit COVID-19 viruses on chopping board	76.0	8.0	16.0
How to prevent cross contamination on chopping board	Personal hygiene should be prioritized	98.0	1.0	1.0
	Replace chopping board which are excessively worn out with cracks, cuts, or hard to clean stains	93.0	3.0	4.0
	Wash chopping board used with hot water can kill bacteria	82.0	2.0	16.0
	Wash chopping board used with hot water can kill COVID-19 virus	34.0	28.0	38.0
	Wash chopping board used with soap and water can kill bacteria	85.0	2.0	13.0
	Wash chopping board used with soap and water can kill COVID-19 virus	56.0	12.0	32.0
	Wash chopping board used with sanitizer can kill bacteria	75.0	4.0	21.0
	Wash chopping board used with sanitizer can kill COVID-19 virus	47.0	11.0	42.0

Wash chopping board used with antimicrobial solution or sterilize can kill bacteria	65.0	2.0	33.0
Wash chopping board used with antimicrobial solution or sterilize can kill COVID-19 virus	46.0	5.0	49.0
Wiping the chopping board that has been washed with a clean cloth can reduce the growth of bacteria	64.0	11.0	25.0
Wiping the chopping board that has been washed with a clean cloth can reduce the growth of the COVID-19 virus	37.0	13.0	50.0
Wiping the chopping board that has been washed with tissue can reduce bacterial growth	50.0	18.0	32.0
Wiping the chopping board that has been washed with tissue can reduce the growth of COVID-19 virus	29.0	28.0	43.0

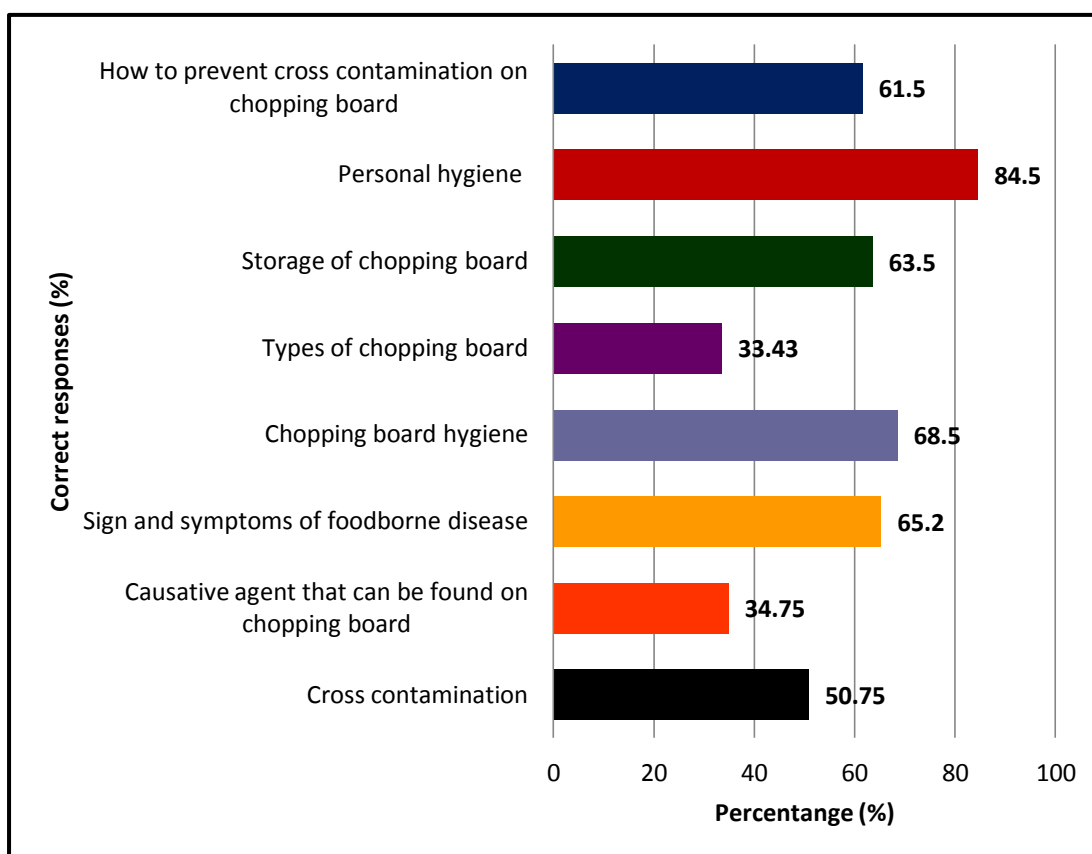


Figure 1 Household food handler's correct responses (%) according to different knowledge categories

3.3 Attitude of chopping board knowledge

Table 3 shows unsatisfactory scores for the overall chopping board hygiene attitude of household food handlers with a total mean of (9.50 ± 4.051) (55.88%).

The statement of using one chopping board for all-purpose is safe not a good method was approved by 59% of respondents. Also, 76% of respondents agreed to use a colour-coded chopping board to differentiate the chopping board used for different types of food. Many of the respondents were agreed that wash the chopping board used 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 COVID-19 virus on chopping board respectively. Previous studies have been undertaken in the past to examine effective cleaning methods for plastic and wood cutting boards and other surfaces that come 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), the washing of cutting boards after use with hot water and detergent is an effective method for eliminating bacteria attached to the cutting board surface. The best way to eliminate COVID-19 virus from chopping boards using surface virucidal disinfectants such as 0.05 % sodium hypochlorite (NaClO) and ethanol-based products (at least 70%) should be used for household cleaning and disinfection, suspected or confirmed COVID-19 (WHO, 2020). Household food handlers therefore need to wash their chopping board daily with hot water, detergent, or soap, disinfect them with 0.05% sodium hypochlorite (NaClO) and ethanol-based products (at least 70%) to ensure the hygiene of the chopping board throughout the kitchen. The household food handler had a good attitude on removing bacteria on the chopping board compared to

the COVID-19 virus. It was because household food handlers had more knowledge of bacteria compared to COVID-19 viruses.

About 49%, 81% and 85%, of the respondents strongly agreed that a wet chopping board should not be stored with other kitchenware but stored in a vertical or upright position and any chopping board which is excessively worn out with cracks, cuts, or hard to clean strains need to be thrown away respectively. Many respondents were confident that wiping the chopping board that has been washed with a clean cloth (62%) and (33%) and tissue (46%) and (33%) can reduce the growth of bacteria and COVID-19 virus respectively. According to Beumer & Kusumaningrum (2003) stated that when preparing contaminated food, the pathogens easily spread to the chopping 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 large numbers of other types (*Listeria monocytogenes*) are also present at other points in time. Thus, household food handlers need to change their clothes, dishcloth, or apron regularly since the bacteria can be present on clothes. Also, the chopping board needs to be separated and replaced to ensure chopping board hygiene in the kitchen.

Table 3

Household food handlers' attitude on chopping board hygiene

Questions	Responses, (%)				
	Strongly disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly agree (%)
Using one chopping board for all purpose is safe	33.0	26.0	30.0	7.0	2.0
Used colour-coded chopping board to differentiate chopping board use for different type of food	0.0	3.0	21.0	24.0	52.0
Wash the chopping board used with hot water can kill bacteria on chopping board	2.0	1.0	25.0	46.0	26.0
Wash the chopping board used with hot water can kill COVID-19 virus on chopping board	12.0	11.0	49.0	15.0	13.0
Wash the chopping board used with soap and water can kill bacteria on chopping board	0.0	1.0	28.0	33.0	38.0
Wash the chopping board used with soap and water can kill COVID-19 virus on chopping board	6.0	6.0	44.0	22.0	22.0
Wash the chopping board used with sanitizer can kill bacteria on chopping board	3.0	3.0	28.0	33.0	33.0
Wash the chopping board used with sanitizer can kill COVID-19 virus on chopping board	5.0	6.0	51.0	21.0	17.0
Wash the chopping board used with antimicrobial solution or sterilize can kill bacteria on chopping board	1.0	2.0	38.0	25.0	34.0

Wash the chopping board used with antimicrobial solution or sterilize can kill COVID-19 virus on chopping board	5.0	6.0	47.0	18.0	24.0
Wiping the chopping 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 chopping board that has been washed with a clean cloth can reduce the growth of COVID-19 virus	11.0	10.0	46.0	15.0	18.0
Wiping the chopping 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 chopping board that has been washed with tissue can reduce the growth of COVID-19 virus	18.0	11.0	38.0	18.0	15.0
Throw away any chopping board which are excessively worn out with cracks, cuts or hard to clean strains	1.0	1.0	13.0	26.0	59.0
Chopping board is store in vertical or upright position	2.0	3.0	14.0	28.0	53.0
Wet chopping board is store with other kitchenware	26.0	23.0	18.0	16.0	17.0

3.4 Practice for chopping board hygiene

Table 4 shows the chopping board hygiene practices by 100 household food handlers in their houses in Selangor. The respondents were found to have unsatisfactory chopping board hygiene practices 50.07% with a mean score (7.01 ± 2.710).

The majority maintained safe practices such as wash hands with soap and water (87%), used hand sanitizer (57%) before preparing food on a chopping board, and practice separate colour-coded a chopping board for a different type of foods (26%). The respondents had a good attitude however least knowledge and practice on the used colour-coded chopping boards to differentiate chopping board used of different types of food colour-coded chopping boards in their home. This indicates that the attitude of household food handler does not link between knowledge and practices. Nevertheless, attitude is a crucial factor in food handling since it is the main connection between knowledge and practice, 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% of respondents did not prepare food during cough and colds, use the same chopping boards for raw and cooked food (42%) and use chopping board that has cracks, crevices, and excessive knife scars during food preparation (40%). The respondents showed unsatisfactory practice by washing their chopping board before and after using it with soap and water (85%), hot water (31%), sanitizer (50%), antimicrobial solution, or sterilization (22%). About 56% and 23% of respondents were wiped their chopping boards that have been washed with clean cloth and tissue respectively. The findings showed that respondents were

stored chopping boards in a vertical position (83%) and do not store wet chopping boards with other kitchenware (53%). The results show household food handlers had the least knowledge, attitude, and practices of COVID-19 virus towards chopping board hygiene. These results may be proved from the previous study, Odeyemi et al. (2019) stated that knowledge and attitude towards food safety influenced food handlers' practice of food safety procedures. Therefore, information of COVID-19 virus on chopping board should be enhanced to the household food handlers to ensure that they have a good attitude and practice toward chopping board hygiene in the kitchen.

Table 4 Household food handlers' practice on chopping board hygiene

Questions	Correct responses (%)
Do you prepare food during coughs and colds?	51
Do you wash your hand with soap and water before preparing food on chopping board?	87
Do you use hand sanitizer before preparing food on chopping board?	57
Do you use same chopping board for raw and cooked food?	42
Do you use separate colour coded of chopping board for different type of foods?	26
Do you use chopping board that have cracks, cervices and excessive knives scars during food preparation?	40
Do you wash your chopping board with hot water before and after using it?	31
Do you wash your chopping board with soap and water before and after using it?	85
Do you wash your chopping board with sanitizer before and after using it?	50
Do you wash your chopping board with antimicrobial or sterilize solution before and after using it?	22
Do you wipe the cutting board that has been washed with a clean cloth?	56

Do you wipe the cutting board that has been washed using a tissue?	23
Do you store your chopping board in vertical and upright position?	83
Do you store wet chopping board with other kitchenware?	53

3.5 Association between knowledge, attitude, practices level

A summary of the association between the knowledge, attitude, and practice level is shown in Table 5. 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 ($r_s = 0.380$, $p < 0.05$). According to Al-Kandari et al. (2019) stated that the specified size of the benchmark effect for the value of Cramer's V was used, suggesting the following. Small effect=0.1, moderate effect=0.3 and high effect=0.5. As a result, our findings have shown that the experience of household food handlers has had a substantial impact on their activities and behaviours during this COVID-19 pandemic in the field of chopping 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).

Table 5
Correlation among knowledge, attitude and practice levels

Level	Spearman's rho	Sig.
Knowledge - Attitude	0.590**	0.000
Knowledge - Practice	0.375**	0.000
Attitude - practice	0.380**	0.000

**Correlation is significant at the 0.01 level (2-tailed)

3.6 Comparing differences mean ranks and relationship between knowledge, attitude, practices level and income (B40 and M40)

A summary of ranks and the relationship between the knowledge, attitude, and practice level is shown in Tables 6 and 7. Table 6 shows that the income of the household family (M40) had the highest knowledge (47.23) on chopping board hygiene but had the lowest attitude (44.75) and practice (40.85) towards chopping board hygiene compared to the income of the household family (B40). According to Gong et al. (2016), gender, place of residence, and per capita annual income were once identified as the most important and significant influential variables in determining the level of knowledge of food safety and handling in households. Thus, education programs should create and adapted to the food handlers that are distinguished by annual income factors. However, even though the income of the household family (M40) had higher knowledge but they had a lack of attitudes and practices of chopping board hygiene in their kitchen. Pacholewicz et al. (2016) point out that although some of the food handlers were found to have good food safety knowledge about their responsibilities, they were not always found to implement this knowledge into practice and attitudes. This indicates that knowledge of household food handlers does not influence enough to cause a positive attitude and practice towards chopping board hygiene in the kitchen.

Based on the table 7, there was no significant different between income of household family (B40 and M40) with knowledge ($U= 938.000$, $p = 0.954$), attitude ($U= 877.500$, $p = 0.578$) and practice ($U = 760.500$, $p = 0.126$). Previous studies have found no significant connection between food safety awareness score and income, educational level, age, and previous courses on food safety (Osaili et al., 2017). This clearly shows that there is no significant association between the income of a household family with their knowledge, attitude, and practice (KAP) levels towards the chopping board hygiene in their kitchen.

Table 6

Ranks of household food handler's income and their knowledge, attitude and practice level

Level	Mean rank (B40)	Mean rank (M40)
Knowledge	46.89	47.23
Attitude	48.07	44.75
Practice	49.93	40.85

Table 7

Relationship of household food handler's income and their knowledge, attitude and practice level

Level	Man-Whitney U	Asymp. Sig
Knowledge	938.000	0.954
Attitude	877.500	0.578
Practice	760.500	0.126

4.0 CONCLUSION

The current study concludes that the level of chopping board hygiene knowledge, attitudes, and practices of household food handlers during pandemic COVID-19 towards microbial was satisfactory compared to COVID-19 viruses. Even though foodborne transmission of SARS-CoV-2 is unsupported by scientific evidence, but it still could have possibly been transmitted to other peoples. To reduce the risk transmission of COVID-19 viruses, knowledge of household food handlers needs to be improved as well as attitude and practice by enhancing educational programs for household food handlers.

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