Knowledge, Attitude and Practice of Food Utensils Hygiene amongst Food Handlers in Kuala Pilah, Negeri Sembilan, Malaysia

(Pengetahuan, Sikap dan Amalan Pengendali Makanan terhadap Kebersihan Peralatan Makanan di Kuala Pilah, Negeri Sembilan, Malaysia)

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ABSTRACT

This study aimed to evaluate the level of knowledge, attitude and practice (KAP) amongst food handlers in food utensils hygiene and presence of bacterial contamination on food utensils. There were two approaches used in this study. In the first approach, 134 of food handlers from 75 food premises were interviewed via questionnaires to assess their knowledge, attitude and practice. In the second approach, the presence of Staphylococcus aureus, Escherichia coli and total coliform of 225 utensils (knives (75), chopping boards (75) and dish plates (75)) was examined. The result showed that the food handlers had sufficient level of knowledge (80.5%), attitude (87.4%) and practice (90.1%). Highest contamination was found on the chopping boards for the presence of S. aureus (82.8%), E. coli (9.7%) and total coliform (73.9%). Logistic regression analysis showed that knowledge contributes to the presence of E. coli on the dish plates; and total coliform on the knives. Thus, ongoing training that focused on food utensils hygiene must be emphasized to improve knowledge, attitude and practice amongst the food handlers.

Keywords: Attitude; bacteria; food utensils; knowledge; practice

ABSTRAK

Kajian ini bertujuan untuk menilai tahap pengetahuan, sikap dan amalan dalam kalangan pengendali makanan terhadap kebersihan peralatan makanan serta kehadiran bakteria pada peralatan makanan. Terdapat dua pendekatan yang digunakan dalam kajian ini. Pendekatan pertama ialah dengan menggunakan borang soal selidik untuk menilai pengetahuan, sikap dan amalan seramai 134 orang pengendali makanan daripada 75 buah premis makanan. Pendekatan kedua ialah mengenal pasti kehadiran Staphylococcus aureus, Escherichia coli serta jumlah koliform pada 225 peralatan makanan (pisau (75), papan memotong (75) dan pinggan pinggan (75)). Keputusan kajian menunjukkan bahawa pengendali makanan mempunyai tahap pengetahuan (80.5%), sikap (87.4%) dan amalan (90.1%) yang baik serta mencukupi. Pencemaran peralatan makanan yang tertinggi adalah papan pemotong dengan kehadiran S. aureus (82.8%), E. coli (9.7%) dan jumlah koliform (73.9%). Analisis regresi logistik membuktikan bahawa tahap pengetahuan pengendali makanan menyumbang kepada kehadiran E. coli pada pinggan; dan jumlah koliform pada pisau. Oleh itu, kursus yang berterusan tentang kebersihan peralatan makanan perlu diadakan bagi mengukuhkan lagi pengetahuan, sikap dan amalan dalam kalangan pengendali makanan.

Kata kunci: Amalan; bakteria; pengetahuan; peralatan makanan; sikap

INTRODUCTION

Foodborne diseases have received considerable critical attention worldwide. Nevertheless, detecting foodborne disease is technically challenging. In Malaysia, the hot and wet climate in Malaysia influences foodborne diseases' rate, showing a different rate each year (Noor Azira et al. 2015). Rodriguez et al. (2011) concluded that frequent change in climate has increased the risk of pathogenic bacteria being present in the food industry.

Cleaning and sanitizing are basic routines to assure food utensils and food premises are in a hygienic condition. Some bacteria survive on food utensils if cleaning and sanitizing are ineffective (Cosby et al. 2008). Microbiological analysis of food utensils has been used to check hygiene of food utensils and practices of food handlers in food preparation (Ismail et al. 2013). Contaminated food utensils should not be used for food preparation, especially for ready to eat food. Ready to eat food does not go through any further cooking processes and are directly served to consumers.

Bacteria present on food utensils are easily transmitted to food during preparation. Santana et al. (2009) found that food utensils have a different degree of contamination risk due to food handlers' hygiene practices in food premises. Food handlers with good knowledge and practices reduce contamination risk of food utensils. The presence of bacteria is an indicator of food utensils' cleanliness level (Lues & Van Tonder 2007). Microbiological analysis can determine contamination level and specific type of bacteria present on the food (Rashed 2016).

Although Kuala Pilah is a rural area, the number of food premises have increased tremendously with the changes to the community's lifestyle. Residents in Kuala Pilah prefer to eat outside rather than cooking at home (Noor Azira et al. 2012). Therefore, maintaining cleanliness of food premises is important protecting customers from foodborne diseases. Thus, it is crucial to understand the knowledge, attitude and practice towards hygiene of food utensils among food handlers to reduce spreading of bacterial contamination.

Numerous studies have been carried out to determine the level of knowledge, attitude and practice among food handlers (Manes et al. 2012; Tan et al. 2013). Nonetheless, limited data on knowledge, attitude and practice of food utensils' hygiene among food handlers are available, especially from rural areas. Moreover, the microbiological analysis is required to determine the type of bacteria and cleanliness of food utensils. The purpose of this study was to evaluate the association between knowledge, attitude and practice among food handlers and bacterial contamination on food utensils specifically *Staphylococcus aureus*, *Escherichia coli* and total coliform.

MATERIALS AND METHODS

STUDY DESIGN

The cross-sectional study was conducted from May until November 2016 and involved 75 food premises in Kuala Pilah, a rural area in Malaysia. Two approaches were used for this study. One approach was interviewing 134 food handlers and the other was swabbing food utensils. The respondents were selected purposively with technical help from assistant environmental health officer during their routine food premise inspections. Swabbing was used to identify the presence of *S. aureus*, *E. coli* and total coliform on food utensils. A total of 225 utensils (knives (75), chopping boards (75) and dish plates (75)) from the food premises were randomly chosen.

QUESTIONNAIRE DESIGN

The questionnaire on the hygiene of food utensils was adapted and modified from a previous study by Soares et al. (2012), Food Act (1983) and Food Hygiene Regulations (2009). The content was validated with a food quality and safety expert. Pre-test and pilot test were administered among 32 food handlers from various types of food premises in Rembau, Malaysia. The Cronbach alpha was 0.72 for knowledge, 0.85 for attitude and 0.71 for practice. The demographic information consisted of age, sex, nationality, race, level of education, work experience, administration of typhoid vaccine and food handler training course.

The knowledge section contained 11 items with true, false and do not know answer options. Each correct answer was scored 1 mark and subsequently combined to get a total score. Respondents were asked to provide answers for 13 items in attitude section using 5-point Likert scale: disagree/strongly disagree = 1, do not know = 2 and agree/strongly agree = 3. This system of scoring was assigned for positive items and vice versa for negative items. The practice section demonstrated the frequency of hygiene practices. It consisted of 11 items on a 5-point Likert scale: never = 1, rarely = 2, sometimes = 3, often = 4, and always = 5. For both attitude and practice part, the correct answers were combined to get a total score. The marks for knowledge, attitude and practice were converted to a percentage to get the KAP results of the respondents. The scores for knowledge, attitude and practice were grouped into two categories. Scores below 75% were considered as insufficient whereas those above 75% was noted as sufficient. The cut-off point was high because more than 70% of food handlers had attended food handler training course.

MICROBIOLOGICAL SAMPLING OF FOOD UTENSILS

Swabbing was performed on knives, chopping boards and dish plates to examine the presence of *S. aureus*, *E. coli* and total coliform. Samples from clean food utensils that were frequently used and rinsed using ordinary methods were chosen. The 3M™ Quick Swab (3M, U.S.A) containing Letheen broth was used for swabbing. The desired area (10 × 10 cm) was rubbed consistently with the swab. The samples were then transported in a cool box with ice packs (0°C-4°C) and analyzed within 24 h in the Microbiological Laboratory at Faculty of Science and Technology, Universiti Kebangsaan Malaysia.

The swab samples were inoculated onto 3M™ Petrifilm™ *E. coli*/Coliform Count Plates (3M, U.S.A) and 3M™ Petrifilm™ *Staph* Express Count Plate (3M, U.S.A). The AOAC Official Method 991.14 was used for incubation of *E. coli* and coliform while AOAC Official Method 2003.07 was used for enumeration of *S. aureus*. Colony counts were reported as log CFU/cm^2.

STATISTICAL ANALYSIS

Data collected were analyzed using SPSS software, version 24.0. Pearson's chi-square ($\chi2$) and Fisher tests were used to identify associations between knowledge, attitude and practice levels with microbiological results. Besides, logistic regression was used to identify whether the level of food handlers' knowledge predicted the presence of *E. coli* and total coliform on food utensils. The results with p-value < 0.05 were considered statistically significant.

RESULTS AND DISCUSSION

DEMOGRAPHIC DATA OF RESPONDENTS

Table 1 shows that 61.2% of 134 respondents were female and only 7.5% aged under 20 years old. Majority of respondents working in the food premises were Malaysians (89.6%) and Malay (85.8%) since the study location was in a Malay rural area. Respondents could be categorized as

experienced because 60% had been working for more than 5 years (Parry-Hanson Kunadu et al. 2016). Almost 70% of respondents has received typhoid vaccine and attended food handling courses. According to the Food Act 1983 and Food Hygiene Regulations 2009, each food handler has to get typhoid vaccine and attend food handling training courses if they want to be involved in food handling activities. Failure to comply with these regulations is an offense and liable to legal action.

KNOWLEDGE OF RESPONDENTS

The median score for respondents' knowledge on the hygiene of food utensils was 80%; thus, categorized as sufficient. A total of 72.4% respondents selected the correct answer that cross contamination is the main causal factor for foodborne diseases, as indicated in Table 2. Besides that, 87.3% knew that dirty food utensils and the unclean environment in food premises effect the cleanliness of food utensils.

Surprisingly, 64.2% respondents had chosen wooden chopping boards rather than plastic, albeit knowing that cracked wooden chopping boards encourage the growth of bacteria (80.6%). Wooden chopping boards are not recommended because the surfaces are difficult to clean and wash thoroughly, especially when it's cracked. Rodriguez et al. (2011) had demonstrated that chopping boards have a high microbial load if not washed thoroughly.

Additionally, respondents (76.9%) knew that use of dirty dish cloths increased the risk of food contamination. Proper cloth materials to wipe food utensils are important because bacteria can cross contaminate from a dirty surface to a clean one (Koo et al. 2013). Furthermore, approximately more than 90% of respondents identified the correct answers for proper cleaning and storage of food utensils.

TABLE 1. Demographicdata of respondents

Characteristic		n (%)
Age (years)	< 20	10 (7.5)
	21–40	53 (39.6)
	> 41	71 (52.9)
Gender	Male	52 (38.8)
	Female	82 (61.2)
Nationality	Malaysian	120 (89.6)
	Others	14 (10.4)
Race	Malay	115 (85.8)
	Chinese	11 (8.2)
	Indian	8 (6.0)
Working experience (years)	< 5	54 (40.0)
	≥ 5	80 (60.0)
Typhoid vaccine	Yes	123 (91.8)
	No	11 (8.2)
Food safety training	Yes	99 (73.9)
	No	35 (26.1)

TABLE 2. Frequency distribution of knowledge among respondents

Item	Correct answer, n (%)	Incorrect answer, n (%)
Cross contamination is the main factor of food poisoning	97 (72.4)	37 (27.6)
Clean food utensils reduce the risk of foodborne disease	132 (98.5)	2 (1.5)
Unclean environmental conditions such as dust affect the cleanliness of the food utensils	117 (87.3)	17 (12.7)
Cutting board made of wood is better than plastic	48 (35.8)	86 (64.2)
Dish clothes can be a potential source of food contamination	103 (76.9)	31 (23.1)
The cracked wooden cutting board encourages the growth of bacteria	108 (80.6)	26 (19.4)
Food contamination is caused by using the same food utensils for raw and cooked foods	107 (79.9)	27 (20.1)
Wooden utensil such as wooden cutting board can absorb water easily	115 (85.8)	19 (14.2)
Poor cleaning of food utensils increased the risk of foodborne poisoning	122 (91.0)	12 (9.0)
Proper storage of food utensils can prevent from the presence of pests	130 (97.0)	4 (3.0)
Total	[a]80.0 ± 18	

[a]Total (median ± standard deviation) score of respondents

ATTITUDE OF RESPONDENTS

The median score for the attitude of respondents towards food utensils' hygiene was 86.9% and is categorized as sufficient. Most respondents agreed to the importance of having good knowledge on food utensils' hygiene (98.5%) and being responsible to clean food utensils as part of their routine work (100.0%). Good attitudes lead to a reduction of food contamination and foodborne diseases risks. Only a small percentage of respondents (5.2%) were not sure whether rusty food utensils could be used in food handling and food preparation. As a matter of fact, rusty food utensils should be discarded because it might cause cross contamination. From the observation, the rust on knives' surface may also provide a rough area and difficult to clean, which leads to the growth of bacteria.

The percentage of respondents who disagreed with the usage of the apron to wipe food utensils was 94.1%. They knew aprons function to protect food from being indirectly contaminated by food handlers' body. This finding is supported by Lues and Van Tonder (2007), who indicated that *S. aureus*, *E. coli* and total coliform were present on food handlers' apron leading to cross contamination of food. About 95.6% respondents disagreed that tables and dish plates should be wiped using the same cloth. Different clothes must be utilized for wiping tables and food utensils to reduce bacterial contamination. Nevertheless, 46.3% respondents were unsure whether they should not store food utensils on the floor. Food utensils might be contaminated if the respondents stored on the floor because food utensils have direct contact with food. The contamination occur due to the splashing of dirty water when the respondents stepped on the watery and greasy floor while walking (Table 3).

PRACTICE OF RESPONDENTS

The median score for respondents' practice towards hygiene of food utensils was 91.8%, hence categorized as sufficient. Most of the respondents do not utilize same knives to cut meats and fruits (80.6%) and have never used their apron to wipe dish plates, knives and chopping boards (93.3%). Besides that, most do not wash (91.8%) or store (94.8%) food utensils on the floor. These positive practices are probably due to 70% of respondents had attended food handling training and practices. Attending food training courses is compulsory (Food Act 1983; Food Hygiene Regulations 2009) to ensure the safety of food stuff and it is important for food handlers to practice what they learned (Soares et al. 2012).

A total of 45.5% of respondents always make sure food utensils are cleaned before starting their daily tasks, washed before preparing food and properly cleaned. Some respondents expressed they never engaged in negative practices during food preparation such as used cracked wooden chopping boards (76.9%) and food utensils that easily absorb water (56.0%) (Table 4).

PRESENCE OF *S. AUREUS*, *E. COLI* AND TOTAL COLIFORM

The presence of knives that contaminated with *S. aureus* (75.4%) and total coliform (66.4%) was higher compared to *E. coli* (6.7%). Respondents observed cleaning knives using a dish cloth during food preparation and might be contributed to the presence of the bacterial contamination on the knives. They still used rusty knives although it is not recommended to be used for food preparation. The rusty knives' surface may provide a rough area, which leads to the growth of bacteria. It is evident that respondents neglected to practice

TABLE 3. Frequency distribution of attitude among food handlers

Item	Strongly agree/ agree, n (%)	Uncertain, n (%)	Strongly disagree / disagree, n (%)
I believe it is my responsibility to keep the food utensils clean daily	134 (100)	0 (0)	0 (0)
I feel knowledge of proper food utensils cleaning is important in food safety	132 (98.5)	2 (1.5)	0 (0)
Rusty food utensils can affect the food safety	122 (91.1)	7 (5.2)	5 (3.7)
Cracked wooden chopping boards can be used during food preparation	26 (19.4)	20 (14.9)	88 (65.7)
Knives for raw and cooked foods should be separated	124 (92.6)	5 (3.7)	5 (3.7)
Apron can be used to wipe dish plates, knives and chopping boards	5 (3.7)	3 (2.2)	126 (94.1)
The same dish clothes can be used to clean dish plates and dining table	4 (2.9)	2 (1.5)	128 (95.6)
All food utensils should be washed and cleaned before food preparation	132 (98.5)	2 (1.5)	0 (0)
Food utensils can be washed on the floor	7 (5.2)	13 (9.7)	114 (85.1)
Food utensils should be ensured proper clean after washing	128 (95.5)	4 (3)	2 (1.5)
Food utensils can be stored on the floor	11 (8.2)	62 (46.3)	61 (45.5)
Food utensils that is easy to absorb water like a wooden chopping boards can cause bacteria growth	107 (79.8)	15 (11.2)	12 (9.0)
Fingers wound should be covered with waterproof dressings before touching the food utensils	113 (84.3)	5 (3.7)	16 (12.0)
Total	[a]86.9 ± 8.3		

[a]Total (median ± standard deviation) score of respondents

TABLE 4. Frequency distribution of practice among food handlers

Item	n (%)				
	Always	Often	Sometimes	Rarely	Never
Do you make sure the food utensils are cleaned before starting your daily tasks?	61 (45.5)	64 (47.8)	5 (3.7)	2 (1.5)	2 (1.5)
Do you use cracked wooden chopping boards during food preparation?	1 (0.7)	7 (5.2)	9 (6.7)	14(10.4)	103 (76.9)
Do you use the same knives to cut the meats and fruits?	0 (0)	0 (0)	12 (9.0)	14(10.4)	108 (80.6)
Do you use the apron to wipe dish plates, knives and chopping boards?	4 (3.0)	4 (3.0)	0 (0)	1 (0.7)	125 (93.3)
Do you wash food utensils before preparing food?	61 (45.5)	52 (38.8)	10 (7.5)	1 (0.7)	10 (7.5)
Do you wash the food utensils on the floor?	2 (1.5)	3 (2.2)	3 (2.2)	3 (2.2)	123 (91.8)
Do you ensure that food utensils are properly cleaned after washing?	61 (45.5)	56 (41.8)	6 (4.5)	1 (0.7)	10 (7.5)
Do you store food utensils on the floor?	2 (1.5)	0 (0)	2 (1.5)	3 (2.2)	127 (94.8)
Do you use food utensils that easily absorbed water like a wooden chopping board?	1 (0.7)	5 (3.7)	30 (22.4)	23 (17.2)	75 (56.0)
Do you always keep a place to store food utensils covered from pests?	62 (46.3)	47 (35.1)	7 (5.2)	3 (2.2)	15 (11.2)
Do you touch food utensils with uncovered wounded fingers?	1 (0.7)	0 (0)	3 (2.2)	5 (3.7)	125 (93.3)
Total				[a]91.8 ± 8.8	

[a]Total (median ± standard deviation) score of respondents

good behavior during cleaning food utensils. Doménech-Sánchez et al. (2011) reported that knives are dirtier than other kitchenware due to inappropriate cleaning procedures. Thus, the presence of *S. aureus*, *E. coli* and total coliform on knives were classified as unsatisfactory.

Hygiene of food utensils was classified as unsatisfactory if the presence of bacteria was above the recommended standard. The presence of *S. aureus*, *E.coli* and total coliform are categorized either as satisfactory (< 1.0 log CFU/cm^2) or unsatisfactory (> 1.0 log CFU/cm^2) based on previous reports (Mazni et al. 2013; Sneed at al. 2004). There are no established standards to determine food utensils' hygiene under the Food Act 1983 and Food Hygiene Regulations 2009. Therefore, recommended standards reported by the aforementioned scholars were used to determine the level of *S. aureus*, *E.coli* and total coliform presence on the food utensils.

Another important finding is more than 70% of the chopping boards were identified contaminated with *S. aureus* and total coliform due to improper practices of respondents during food preparation. Thus, the presence of these bacteria was categorized unsatisfactory. Unhygienic practice from the respondents such as sneezing, coughing or touching food utensil without washing hands might also probably contributed to the presence of *S. aureus* on cleaned food utensils.

In contrast, only 9.7% of the chopping boards were contaminated with *E. coli*. This indicated that respondents never ensure that the food utensils were properly cleaned after being washed. The presence of *E.coli* is the indicator of faecal contamination. Hence, effective cleaning is important, especially when chopping boards are used to prepare ready to eat foods (RTE).

Evaluation of dish plates' hygiene showed that 69.4% of the dish plates were contaminated with *S. aureus*, followed by 23.9% of total coliform and 3% of *E. coli*. This study suggested that knives, chopping boards and dish plates in every food premises are not suitable to be used in serving food directly to customers. Risk of the foodborne diseases might occur if use the contaminated food utensils. Effective cleaning is needed to keep the food utensils hygiene and safe to use during food preparation.

ASSOCIATION BETWEEN KNOWLEDGE, ATTITUDE, PRACTICE AND PRESENCE OF BACTERIA ON FOOD UTENSILS

Table 5 shows that there was significant association between level of knowledge with the presence of *E. coli* on chopping boards (χ^2 = 4.05, p = 0.04); and level of knowledge and presence of *E. coli* on dish plates (χ^2 = 9.34, p = 0.01). Similarly, there was also a positive association between level of knowledge among respondents and presence of total coliform on knives (χ^2 = 4.94, p = 0.03). Logistic regression statistical analysis showed that respondents with insufficient knowledge influence presence of total coliform on knives 0.4 times more compared to respondents that have sufficient knowledge (95% CI = 0.16, 0.95). In addition, odds ratio indicated that respondents with the insufficient knowledge that contribute to the presence of *E. coli* on dish plates are 11.9 times higher than respondents with sufficient knowledge (95% CI = 1.30, 108.95). This association proves that only knowledge contributes to the presence of bacteria and hygiene of food utensils.

TABLE 5. Logistic regression predicting knowledge of food handlers and presence of total
coliform and *E. coli* on food utensils

	β	Standard error	Wald	Adjusted odds ratio	95% CI	*p* value
Total coliform on knives	–0.96	0.46	4.31	0.40	0.16, 0.95	*0.04
E. coli on chopping boards	–1.12	0.66	2.88	0.33	0.09, 1.19	0.09
E. coli on dish plates	2.48	1.13	4.81	11.90	1.30, 108.95	*0.03
Constant	–0.23	1.30	0.32	9.43	–	0.001

Note: *Significant at *p*<0.05

CONCLUSION

The findings from this study showed that the median score of respondents for knowledge, attitude and practice of food utensils' hygiene were classified as sufficient (75%) and all swabbed knives, chopping boards and dish plates were contaminated with *S. aureus*, *E. coli* and total coliform. Subsequently, knowledge on food utensils' hygiene among food handlers influenced the presence of bacteria on food utensils. Thus, food handlers should be trained continuously to increase effective cleaning in their routine work especially when food utensils are used to prepare ready to eat foods (RTE).

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