

ORIGINAL ARTICLE

Assessment of Knowledge, Attitude, and Practices of Food Handlers on Food Safety in Selected Tertiary Hospitals in Metro Manila, Philippines

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ABSTRACT

Background: Food safety plays a significant role in the management and recovery of hospitalized patients. This study has assessed knowledge, attitude, and practices of food handlers on food safety in selected tertiary hospitals in Metro Manila, Philippines.

Methods: In a cross-sectional analytical design, the knowledge, attitude, and practice levels of 50 food handlers on food safety in four tertiary Metro Manila hospitals were assessed, and the relationship of knowledge, attitude, and practices with sociodemographic characteristics was investigated using a self-administered questionnaire.

Results: Food handlers were shown to have fair knowledge ($69.73 \pm 11.3\%$), positive attitude ($87.8 \pm 7.6\%$), and good practices ($84.3 \pm 7.8\%$) on food safety. They had good knowledge on personal hygiene (99%) and cross-contamination (89%), but had poor knowledge on foodborne diseases (42%) and storage temperatures (31%). The majority of the food handlers reported good food safety practices, food safety control, and food storage. No significant association was demonstrated between sociodemographic characteristics and knowledge, attitude, and practices of food handlers regarding food safety. A correlation was observed between attitude ($p=0.4431$) and practices ($p=0.0013$) of food handlers on food safety.

Conclusion: Food handlers in hospitals in Metro Manila reported positive attitude and good practices on food safety. Improvement in quality of food services through constant and holistic training and evaluation of food handlers seems essential. The strict compliance to food safety standards should be undertaken to ensure the safety and quality of food served to people.

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Introduction

Foodborne diseases refer to illnesses caused by ingestion of food and water contaminated with microorganisms or chemicals (1, 2). Food safety

refers to the assurance that food will not cause the consumer any harm if prepared and/or consumed in accordance with the use for which it is intended (3, 4). The World Health Organization (WHO) reports

showed that 600 million people in the world have become sick due to consumption of contaminated foods. Of these cases, 420,000 people died every year (1). The concept of food safety is essential in all food establishments, especially among hospitals which cater to patients that are at higher risk of complications. These patients with weakened immune systems are more susceptible to foodborne diseases; such as salmonella, typhoid fever, and rotavirus infections which illustrated a surge of these cases in the first quarter of 2023 (5).

Despite the existence of food safety standards, barriers such as the lack of motivation, lack of trust, inefficient management systems, and lack of knowledge have hindered the implementation of food safety within various businesses (6). To address these barriers, a knowledge-based approach is often used by providing new information through training which is assumed to directly lead to changes in behavior and practices. This relationship is presented in the knowledge, attitude, and practice (KAP) model of health education which suggests that an individual's behavior or practice is dependent on their knowledge and attitude (7). Training is useful to reinforce knowledge on food safety standards for the food handlers (8). Previous studies showed higher scores on knowledge with a correlation to the rules in preparation of safe foods among participants who attended food safety training (9, 10).

Nonetheless, knowledge alone is not sufficient to change practices. Attitude also plays an essential role in influencing food safety practices (11). It encompasses emotional, motivational, perceptual, and cognitive convictions that exert either favorable or unfavorable influence on an individual's conduct or actions (12). Attitude is influenced by one's belief and values which in turn motivates an individual to behave in a particular way in response to the situation. Having positive attitude can result in certain practices or behaviors which can be observed in response to a situation (13). As the interplay of knowledge, attitude, and practices of food handlers is crucial in improving compliance with food safety standards, this study assessed knowledge, attitude, and practices of food handlers on food safety in selected tertiary hospitals in Metro Manila, Philippines.

Materials and Methods

This cross-sectional analytical study was conducted from March to May 2019 among 50 food handlers from four tertiary hospitals in Metro Manila, Philippines. This study refers to tertiary hospital as a hospital which has capabilities for providing medical care to cases requiring sophisticated

diagnostic and therapeutic equipment and expertise of trained specialists, with teaching, training, and research functions (14). The sample size computation was based from a population of 20 food handlers per hospital with a 300-bed capacity as stated in the revised standards and organizational structure and staffing pattern of government hospitals (6). Setting the α at 0.05 and the desired margin of error of 3, the minimum sample size was 50 with a statistical power of 87%. The study was given approval by the Our Lady of Fatima University Institutional Ethics Review Committee (OLFU-IERC). All respondents gave their informed consent prior to the start of the study.

The study was carried out using a validated self-administered questionnaire adopted from Abdullah Sani and Siow (15) with a Cronbach Alfa of 0.70. The original questionnaire was in English, and thus translation was done to the local vernacular language of the region which was Filipino. The questionnaire was divided into four parts including (i) sociodemographic characteristics, (ii) food safety knowledge, (iii) food safety attitudes, and (iv) food safety practices. The first part contained 10 items which collected data on age, sex, educational level, occupation, employment status, work experience, and participation to food safety training.

The second part consisted of 15 statements that assessed food safety knowledge on personal hygiene, cross-contamination, foodborne diseases, critical temperatures, and foodborne disease agents. Questions on knowledge were given a score of either 2 (for correct answers) or 0 point (for incorrect answers). Respondents who had weighted scores of 25 to 30 were classified as having good knowledge, 19 to 24 were classified as fair, and 0 to 18 were classified as having poor knowledge. The third part consisted of 20 statements focused on attitudes to safe food handling, food safety training/knowledge, and personal hygiene. The last part consisted of 20 questions regarding self-reported food safety practices that were rated on a 4-point Likert scale. Statements indicating positive attitude/good practice were scored as 1=strongly disagree/never; 2=disagree/rarely; 3=agree/sometimes; and 4=strongly agree/always. Responses to statements in a negative form were scored as 4=strongly disagree/never; 3=disagree/rarely; 2=agree/sometimes; and 1=strongly agree/always. Weighted scores of 64 to 80 were classified as having positive attitude/good practice, 48 to 63 as neutral/fair, and 0 to 47 were classified as having negative attitude/poor practice.

Statistical analysis of data was performed using STATA (Version 15.1, College Station, Texas 77845 USA). Spearman's Rank-order Correlation

was used to determine the relationship between knowledge, attitude, and practices. The Chi-square test was utilized to identify the association of sociodemographic variables to food safety KAP. A *p* value of less than 0.05 was considered significant.

Results

The sociodemographic characteristics of the food handlers were summarized in Table 1. Most of the food handlers were male (82%) with a mean age of 41.02±10.84 years. About 42% of the food handlers were graduated from high school, 36% had finished college, 18% took up vocational courses, and 4% managed to finish only until elementary school. Majority of the food handlers (62%) worked as food servers and were permanent employees of the hospital (68%); while 32% were contractual employees. Twenty-six food handlers (54%) were in the food services industry for more than 10 years and 90% of the food handlers were professionally trained.

The responses of food handlers on food safety knowledge were shown in Table 2. Most of the food handlers were aware of the definition of cross-

contamination and the usage of gloves for reducing the risk of transmission for infectious disease, with 92% and 98%, respectively. Approximately 78% of the food handlers were aware of the definition of foodborne diseases. However, half of them did not know that *Staphylococcus aureus* was related to foodborne diseases. Majority of the food handlers (99%) answered the questions regarding personal hygiene correctly (Figure 1). The food handlers had moderate knowledge (68%) on statements related to temperature control. Only 9 food handlers (18%) were aware that 4°C to 63°C was not the temperature of danger zone, with majority of the food handlers (48%) stating that they did not know or were not sure of the answers. The food handlers in general were scored poorly on storage temperature, specifically on the correct temperature of chillers, hot, and cold ready-to-eat-foods, while 21%, 13% and 13% of the food handlers answered correctly.

Table 3 shows the responses of food handlers regarding statements on food safety attitudes. The responses of food handlers showed a positive level of attitude towards food safety. Most of the food handlers (84%) strongly agreed that safe food

Table 1: The association of sociodemographic characteristics with knowledge, attitude, and practices of food handlers.

Overall Scores (%)	n (%)	Knowledge		Attitude		Practice	
		69.73±11.30		87.80±7.6		84.3±7.8	
		%	<i>P</i> value	%	<i>P</i> value	%	<i>P</i> value
Age							
Young adult	17 (34)	69.02	0.5065	89.93	0.3537	86.99	0.1367
Middle-aged adult	28 (56)	70.95		85.85		82.14	
Older adult	5 (10)	65.33		84.25		87.25	
Sex							
Male	41 (82)	70.24	0.5266	88.11	0.0482*	85.18	0.0662
Female	9 (18)	67.41		82.36		80.28	
Education							
Elementary	2 (4)	66.67	0.4196	76.88	0.0125*	78.13	0.156
High school	21 (42)	66.03		86.49		82.74	
College	18 (36)	73.70		90.97		87.29	
Vocational	9 (18)	71.11		82.92		83.33	
Position							
Cook	16 (32)	71.25	0.5583	87.11	0.7732	84.30	0.2468
Food server	31 (62)	68.60		87.18		84.96	
Dietary aide	1 (2)	66.67		92.50		80.00	
Meat cutter	2 (4)	76.67		82.50		76.25	
Employment							
Permanent	34 (68)	70.78	0.4173	86.84	0.9254	84.49	0.6774
Contract	16 (32)	67.50		87.58		83.91	
Length of service							
Less than 1 year	1 (2)	60.00	0.6207	88.75	0.1215	81.25	0.143
1-5 years	15 (30)	69.78		86.00		85.58	
6-10 years	8 (16)	67.50		93.44		88.75	
More than 10 years	26 (52)	70.77		85.67		82.31	
Training							
Yes	45 (90)	69.78	0.7785	87.19	0.833	84.11	0.4854
No	5 (10)	69.33		86.00		86.00	

Table 2: Responses of food handlers regarding knowledge on food safety (n=50).

Statements	Correct	Incorrect	Don't know
	n (%)	n (%)	n (%)
Personal hygiene			
One of the basic aspects in foodservice personal hygiene is that employees must often wash their hands	50 (100)	0 (0)	0 (0)
Washing hands properly before handling food reduces the risk of contamination	50 (100)	0 (0)	0 (0)
After washing the hands, employees should avoid touching their hair	48 (96)	2 (4)	0 (0)
Cross-contamination			
Use of gloves while handling food reduces the risk of transmitting infection to patients	49 (98)	1 (2)	0 (0)
Correct application of cleaning procedures of equipment increases the risk of infection transmission to patients	38 (76)	11 (22)	1 (2)
The definition of cross-contamination is the transfer of harmful substances or microorganisms to food from other foods or from a non-food-contact surface, such as equipment, utensils, or hands	46 (92)	1 (2)	3 (6)
Foodborne diseases			
Foodborne illnesses are diseases that are carried or transmitted to people by food	39 (78)	2 (4)	9 (18)
Temperature control			
The most important factors to control the growth of bacteria are temperature and time	49 (98)	1 (2)	0 (0)
The temperature danger zone for foods is 4°C to 63°C	9 (18)	17 (34)	34 (48)
Under running water that is 21°C or less is an acceptable method for thawing frozen food	35 (70)	8 (16)	7 (14)
Food that are prepared too early and kept in room temperature for prolonged time will cause the growth of microorganisms	42 (84)	7 (14)	1 (2)
Foodborne disease agent			
Is <i>Staphylococcus aureus</i> related to foodborne diseases?	21 (42)	4 (8)	25 (50)
Storage temperature			
Which of the following is the correct temperature for a chiller?	21 (42)	29 (58)	
Which of the following is the correct temperature for storage of hot ready-to-eat food?	13 (26)	37 (74)	
Which of the following is the correct temperature for storage of cold ready-to-eat food?	13 (26)	37 (74)	

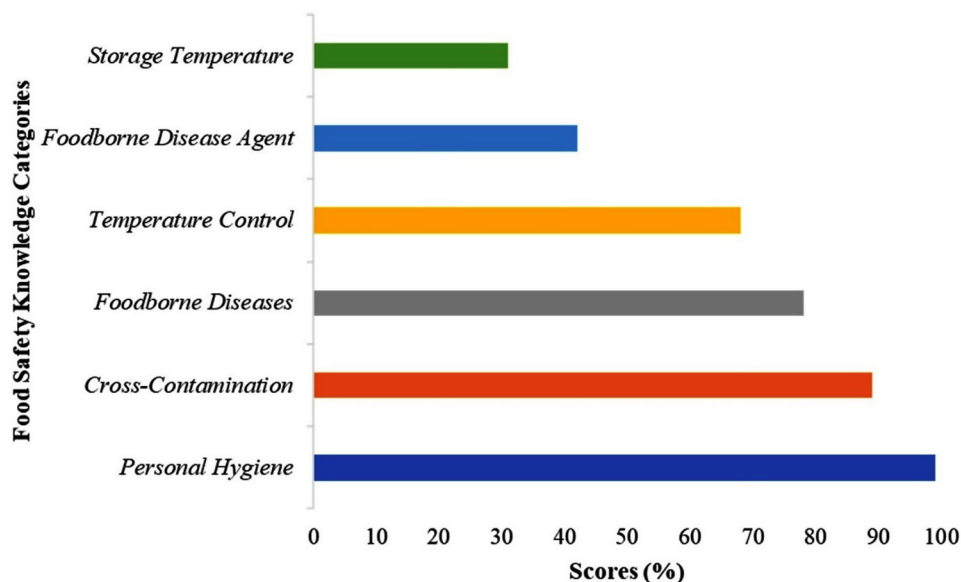


Figure 1: Respondents' correct answers (%) according to different knowledge categories.

handling was an important part of their job, while 86% strongly agreed that ensuring safety of food was the responsibility of all food handlers. Majority of the food handlers (72%) strongly agreed to the

statement that food safety knowledge was important. Almost all of the food handlers (98%) were willing to gain more knowledge on food safety and were also willing to attend trainings regarding food safety.

Table 3: Attitude of food handlers on food safety (n=50).

Statement	Strongly disagree	Disagree	Agree	Strongly agree
	(%)	(%)	(%)	(%)
Safe food handling is an important part of my job responsibilities	0	0	16	84
I think that the responsibility of all food handlers is to ensure that food is safe to be served	0	0	14	86
Knowledge about food safety is important to me	0	0	28	72
I am willing to obtain more food safety knowledge	0	2	32	66
I am willing to attend training course regarding food hygiene/safety	0	2	40	58
I believe that good personal hygiene can prevent foodborne illness	0	0	30	70
I am willing to change my food handling behaviors when I know they are incorrect	0	0	42	58
Producing safe food is more important than tasty food	0	6	40	54
I think that the foodservice owner/manager should educate employees on personal hygiene and sanitation continuously	0	8	44	48
I believe that food safety knowledge is also beneficial in my personal life	0	0	34	66
I will take a leave when I am sick, have a fever or a cold	0	2	44	54
Using caps, masks, protective gloves, and adequate clothing reduces the risk of food contamination	0	2	20	78
Washing hands before handling raw or cooked food reduces the risk of food poisoning	0	0	38	62
Food handlers with abrasion or cuts on fingers or hands should still handle food	40	42	16	2
Improper storage of food is hazardous to health	10	6	40	44
Raw food should be kept separately from cooked food	2	2	34	62
Defrosted food may be refrozen only once	8	12	58	22
It is important to know the temperature of the chillers and freezers to ensure food safety	0	0	38	62
It is necessary to check temperature settings of chillers and freezers regularly	0	0	40	60
I use different clean clothes to mop dining tables and food utensils	0	2	32	66

A great number of food handlers showed positive attitudes toward preventive measures to control cross-contamination such as taking a leave when getting sick (98%), using protective clothing and equipment when working (98%), washing hands when handling food (100%), separating raw from cooked foods (96%), and using different clean clothes to clean tables and utensils (98%). The majority of the food handlers reported disagreement to the negative statement of “food handlers with abrasion should still handle food”, with 40% strongly disagreed, while 42% of food handlers disagreed. More than half of the food handlers (58%) agreed that defrosted foods can be refrozen only once, 22% strongly agreed, 12% disagreed, and only 8% strongly disagreed. Most of the food handlers had positive attitudes towards temperature control, wherein 62% strongly agreed and 38% agreed that knowing the chillers and freezers temperature was important to ensure food safety. In addition, a total of 100% of food handlers expressed their agreement with the statement of “it is necessary to check temperature settings of chillers and freezers regularly”.

The self-reported practices of food handlers were

demonstrated in Table 4. Good food safety practices were illustrated by the food handlers. Forty-eight food handlers (96%) reported to always wear a clean uniform and 98% reported wearing protective equipment when handling food. The current study also showed that food handlers reported good practices on food safety control such as separating cooked and raw foods, washing of raw foods, and cleaning work areas. Food handlers were noted to have good scores regarding practices towards food safety control (86%). Most of the food handlers (66%) reported to always use different chopping boards for raw and cooked food; while 94% stated that food handlers always washed raw foods before cooking. The majority reported that they never wore any jewellery or accessories; while handling foods. Good food storage practices were reported by most of the food handlers, in particular 60% of the food handlers stated to always pay attention on expiration dates, 54% stored chemicals in a non-food storage area, and 68% stored raw and cooked food, separately.

The calculated knowledge, attitude and practice scores among the food handlers were 69.73%±11.30%, 87.80%±7.6%, and 84.3%±7.8%, respectively (Table 1).

Table 4: Self-reported food safety practices among food handlers (n=50)

Statement	Never (%)	Sometimes (%)	Often (%)	Always (%)
Personal hygiene				
You wear a clean uniform when you work	0	0	4	96
Do you wear an apron, cap and shoe when you handle food?	0	0	6	94
Do you smoke, cough or sneeze when handling food?	82	12	2	4
Do you wear jewellery or any object that can contaminate food?	76	14	2	8
Do you wrap your wound and cover it safely while preparing food?	10	10	18	62
Hand-washing				
Do you wash your hands before handling food?	0	0	4	96
Do you wash your hands after touching raw food such as chicken and fish?	0	4	8	88
Do you wash your hands after using the toilet?	2	2	4	92
You wash your hands vigorously with soap and water before handling food	0	0	14	86
Glove usage				
Do you use gloves when you touch or serve food?	0	8	14	78
Do you wash your hands before and after using gloves?	6	8	18	68
Food safety control				
Do you use different chopping boards for raw and cooked food?	4	8	22	66
Do you use hot water and sanitizer when cleaning cooking utensils?	12	16	22	50
You use a separate clean utensil for each food item	0	12	28	60
You clean and sanitize work surfaces after each task	2	8	26	64
Do you report to the foodservice owner/manager/supervisor when you are in doubt about the safety of a previously cooked food?	0	14	32	54
You pay attention to expiration dates on food and do not use food that have passed the expiration date	4	4	32	60
You store chemicals in a non-food storage room	26	4	16	54
You store raw food items in an area separate from cooked food	8	4	20	68
You wash raw food before cooking it	0	2	9	94

Table 5: Spearman's correlation analysis of knowledge, attitude and practice of food handlers regarding food safety.

Variable	ρ	<i>P</i> value	Strength
Knowledge-Attitude	-0.0263	0.8563	Negligible
Attitude-Practice	0.4431*	0.0013	Moderate
Practice-Knowledge	-0.112	0.4387	Negligible

Furthermore, the table presents the association between sociodemographic characteristics of food handlers and their levels of KAP regarding food safety. Significant associations were found between KAP based on sex and educational attainment. Male food handlers displayed a higher level of attitude (88.11%; $p=0.04$) compared to female food handlers (82.36%). No significant differences were observed in knowledge and practices based on sex. In addition, food handlers with a college degree exhibited greater knowledge (73.7%) and attitude (90.97%) scores compared to those with an elementary (66.67%) or high school (86.49%) educational level. The differences in attitude were statistically significant ($p=0.0125$).

The results of Spearman's correlation analysis were shown in Table 5. The correlation coefficient between attitude and practices was 0.4431 ($p=0.0013$), indicating a moderate positive relationship between

these two variables. This finding suggests that food handlers who exhibited more positive attitudes toward food safety tended to demonstrate better food safety practices. The relationship between knowledge and attitude and between practices and knowledge was found to be non-significant. This implies that there was limited evidence to suggest a relationship between food safety practices and knowledge and attitudes toward knowledge among food handlers.

Discussion

The aim of the present study was to examine the complex relationship between knowledge, attitudes and practices on food safety among food handlers. The results provided important insights into the relationship between these variables and shed light on the factors that can contribute to safe food handling among hospital food handlers. The findings showed

fair overall scores for knowledge on food safety. Particularly, statements regarding personal hygiene and cross-contamination were answered correctly by majority of the food handlers. This indicated that food handlers were aware of the importance of these areas in the prevention of foodborne diseases. Moreover, temperature control was illustrated to be essential to prevent the proliferation of bacteria in potentially hazardous foods. We showed that food handlers were scored poorly in statements regarding this area of assessment. Most of the food handlers did not know the correct range of the temperature danger zone, which was also observed in previous studies (15-17). The poor outcome on temperature control noted in the current study may be due to the fact that trainings provided for food handlers in the selected hospitals included only basic food safety principles and operational functions, while did not focus on specific temperature ranges for cooking and storage. Refresher and relatively short duration trainings may be needed to improve food safety knowledge and behavior among food handlers (17, 18).

While food handlers demonstrated a reasonable level of knowledge about food safety, their attitudes were mostly positive and their practices were described as good. This gap between knowledge and practice has been observed in various studies that highlights the complex nature of behavioral changes (16, 19, 20). It is possible that while food processors had the necessary knowledge of food safety principles, the translation of that knowledge into consistent safe practices could be influenced by various factors such as time constraints, workplace culture or individual risk perceptions. Therefore, interventions that focus solely on increasing knowledge may not be sufficient to ensure improved food safety practices. Instead, multifaceted approaches that target both attitudes and practices could produce more effective outcomes.

One of the key findings of this study was the significant positive association observed between food safety attitudes and practices. This finding is consistent with previous researches and emphasizes the critical role that attitudes played an important role in shaping an actual behavior (21, 22). The positive correlation between attitudes and practices implies that food handlers who had positive attitudes towards food safety were more likely to adopt safe food handling practices. This result underscores the importance of targeted interventions to improve food handlers' attitudes towards food safety, as these interventions could have a direct impact on improving the overall safety of the food handling processes.

Our study also examined the possible influence of sociodemographic variables on levels of knowledge,

attitudes and practices on food safety. Interestingly, the results showed that only sex and education had a significant impact on these scores. This finding differs from some previous studies which reported broader sociodemographic influences (11, 23-26). The observed influence of gender and education could be attributed to various cultural and contextual factors specific to hospital food handlers.

Several limitations of the present study are required to be mentioned. First, the study relied on self-reported data, which could result in response bias. In addition, the cross-sectional design of the study prevents the establishment of causal relationships between the variables. Future researches could adopt longitudinal designs to better understand the temporal dynamics between knowledge, attitudes, and practices on food safety. Furthermore, qualitative methods could provide deeper insights into the underlying reasons for the observed discrepancies between knowledge and practice. Due to the limited number of food handlers in a particular hospital, a small sample was included in this study. Finally, our study was conducted before the coronavirus pandemic, which may affect the generalizability of the results in the current and post-pandemic landscape.

Conclusion

In conclusion, this study contributes to the growing body of literature on the relationship between food safety knowledge, attitudes and practices among food handlers in hospitals. The significant relationship between attitudes and practices highlights the importance of promoting positive attitudes to improve safe food handling. The finding that sociodemographic variables, with the exception of sex and education, had minimal influence on the results highlighting a need for tailored interventions that take into account the unique characteristics of the target population. Ultimately, efforts to improve food safety among food handlers should include a holistic approach that considers knowledge, attitudes and practices to ensure the highest standards of food safety.

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Authors' Contribution

A.R.C.F. designed the research. J.M.C.A. conducted

the study, analyzed the data, and wrote the draft: A.R.C.F. had primary responsibility for final content. All authors read and approved the final manuscript.

Conflict of Interest

None declared.

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