



Original Research Article

Food safety and hygiene among food handlers at princess Nourah Bint Abdulrahman University canteens

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There is increased chance of food contamination due to handling by many individuals during the process of storage, preparation, and serving which affect consumer health. Food handlers at Princess Nourah University play a big role in assuring food safety as they serve 53000 students who regularly eat readymade or fast cooked meals from the university's canteens. To assess food handlers' knowledge, attitude, and practices about food safety and their relationship to work satisfaction in Princess Nourah University canteens and restaurants. A cross-sectional study was conducted among food handlers working in the two main food services' canteens in PNU. Seventy two food handlers were recruited from PNU canteens using a purposive sampling technique from 19 December 2017 to the end of February 2018. It was found that 100% of the participants had good level of knowledge about food safety measures, 58.31% had good level of attitude toward food safety measure. Also, 73.61% had good level of practice and 52.7% were satisfied with their work. There was no significant relationship between work satisfaction and knowledge, attitude, and practice of food handlers (P value > 0.05). Food handlers at Princess Nourah University need training programs to improve their attitude and motivate them to better practice.

Key words: Food safety, work satisfaction, food handlers.

INTRODUCTION

Foodborne illnesses are among the most common problems facing public health. The World Health Organization reported that almost 1 in 10 people around the world suffers from foodborne illness each year, as a result of the consumption of contaminated and unsafe food containing harmful bacteria, viruses, parasites or chemicals (WHO, 2017). Also, the European food safety authority report submitted by 27 European Union Member States in 2010 states that most foodborne illnesses have a direct relation to catering food, estimated by 48.7% (EFSA and ECDC, 2010). Many studies have shown that outbreaks of foodborne illnesses occur during food processing, preparation or storage (Lee, Abdul Halim, Thong and Chai, 2017). Moreover, the poor personal hygiene of the food

handlers could be one of the reasons for food poisoning and illness (Nee and Sani, 2014).

The WHO has defined Food safety as a choice for protecting consumers from the risks of foodborne diseases and assures that when the food is prepared, it will not cause sickness or harm (WHO, 2015). Food handlers who neglect proper food safety practices were identified as the main cause of food contamination (Al-Shabib et al., 2016). Five risk factors of food handling were identified by the Center for Disease Control and Prevention that can add to foodborne illnesses and include lack of hygiene and sanitation of the food handlers (Aziz and Dahan, 2013). Previous studies showed that the practice of food handlers is affected by many factors at their workplace such as the

level of work satisfaction, and the relationship between the employees and their supervisors (Nee and Sani, 2011).

According to a study conducted in the USA, it has been shown that improper hygiene of food handlers (97%) caused an outbreak of foodborne diseases (Howes et al., 1996). In a study conducted in Malaysia, food handlers had a good knowledge of personal hygiene by 93.85%. On the other hand, they had poor knowledge about the guidelines of food storage and preparation temperatures by 28%. In addition, their attitude was positive towards food safety and hygiene by 76.9% and foodborne prevention and control by 70.8% (Nee and Sani, 2011).

Nationally, a study conducted at King Saud University showed a high rate of the respondent's knowledge, attitude, and practices (KAP) where 95% agreed that handling food safety is important to avoid contamination and diseases and 96.6% maintained good personal hygiene and safe practices such as wearing uniforms and caps (Al-Shabib et al., 2016).

The most common places that record large numbers of food poisoning and foodborne diseases are schools and universities (Nee and Sani, 2014). In rush hours, canteen kitchens are forced to provide a large number of meals, that may lead to the non-compliance of food handlers with food safety and hygiene rules (Nee and Sani, 2014). In Princess Nourah University (PNU), food services comprises of 30 restaurants and canteens serving 53000 students (Princess Nourah University, 2017). Food handlers should have enough knowledge and skills to ensure the safety of daily consumed prepared food in universities (Nee and Sani, 2011).

In Princess Nourah University, there are no studies conducted on food safety culture among the employed food handlers.

The main objective of this study was to assess the Knowledge, Attitude and Practice levels of food handlers and their relation to work satisfaction in PNU canteens and restaurants.

MATERIALS AND METHODS

Study design, setting and duration

This study is cross-sectional and was conducted among food handlers working at PNU canteens, Riyadh from 19 December 2017 to the end of February 2018.

Sample size and technique

Researchers recruited 72 participants through purposive sampling technique.

Pilot Study

Researchers conducted a pilot study among 10 food handlers before starting the study to test the clarity of the questionnaire and some modifications were done

accordingly. All food handlers who participated in the pilot study were not included in this study.

Data collection tools

Researchers collected data using structured questionnaires (Akabanda et al., 2017; Beriales et al., 2017). The questionnaire consisted of five sections (i) Characteristics of participants which included age, nationality, education level, work experience, participation in food safety training programs and work satisfaction which was assessed through 7 questions. (ii) Food safety knowledge of food handlers included 20 questions regarding the 6 main domains about food contamination, cross contamination, suitable temperature for keeping food, food handler's health status, personal hygiene and foodborne diseases. (iii) Food safety attitude of food handlers which included 14 questions about their attitude toward hygiene practice, cross-contamination, food storages, handling raw and cooked food and others. (iv) Food safety practices and hygiene by food handlers, this part included 14 questions about hand washing, cross-contamination, food storage, food handling and food shelf life.

Knowledge, attitude and practice (KAP) and work satisfaction cut off were taken at 50%, where $\leq 50\%$ was considered to be poor or unsatisfied, and more than 50% was considered to be good or satisfied.

Ethical consideration

This study was carried out after getting permission from the Institutional Review Board of Princess Nourahbint Abdulrahman University. With IRB Log Number 17-0226.

Prior to commencement of the study, the participants were assured about the confidentiality of their data and that it will only be used for the purpose of the research.

Data management

Researchers entered and analyzed data using the Statistical Package for Social Sciences (SPSS) version 22. Fifteen incomplete questionnaires were excluded from data entry. Data were represented using descriptive tables and pie charts. Chi square test was used to determine the association between the work satisfaction level of the food handlers and their KAP level.

RESULTS

Table 1 Shows the characteristics of food handlers employed at PNU, most participants were Filipino (55.5%) and only 38.9% were Saudi, 45.8% of them were in the 20 to 29 age group. The level of education for the majority of the sample was between high school and higher education by 37.5% and 47.2%, respectively. Almost 59.7% had a working experience less than 5 years, 1.4% from 11 to 15 years and 1.4% more than 15 years. Majority of

Table 1. Characteristics of the food handlers employed at PNU

	NO.	%
Age		
• 20-29	33	45.8
• 30-39	26	36.1
• >40	13	18.1
Nationality		
• Filipino	40	55.5
• Indian	1	1.4
• Saudi	28	38.9
• Other	3	4.2
Education level		
• No formal education	1	1.4
• Primary school	3	4.2
• Secondary school	7	9.7
• High school	27	37.5
• Higher education	34	47.2
Working experience		
• < 1 year	16	22.2
• 1-5 years	43	59.7
• 6-10 years	11	15.3
• 11-15 years	1	1.4
• > 15 years	1	1.4
Training programs		
• Yes	51	70.8
• No	21	29.2
Work satisfaction		
• Satisfied	38	52.78
• Unsatisfied	34	47.22
Total	72	100

participants (70.8%) had taken a food safety training program and half were satisfied (52.78%).

Table 2 Food safety and hygiene knowledge of food handlers employed at PNU. In terms of food contamination, 100% of the participants had good knowledge about methods of food contamination, personal hygiene and food handlers' health status. On the other hand, majority of participants had good knowledge about cross contamination, suitable temperature for keeping food and food borne diseases by 80.6, 76.4 and 76.4%, respectively.

Table 3 Shows the food safety and hygiene attitude among food handlers employed at PNU. The highest scored question was about the importance of wearing mask and gloves where 100% of the participants agreed on it. On the other hand, the lowest score question was about Food handlers being a source of foodborne outbreaks, and only 75% agreed on it.

Table 4 Shows food safety and hygiene practice among food handlers employed at PNU. The participant's level of practice in food safety was assessed in areas including preparation, storage, and personal hygiene. Majority of participants (80.6%) reported that they do not prepare the meals prior to someone placing an order. All participants (100%) used gloves during the preparation and

distribution of foods. A large proportion of the participants (98.6%) washed their hands before or after using gloves, changed their gloves regularly and wore a mask for hygiene purposes. Also, most of them wore aprons (95.8%). Almost all participants (97.2%) checked the shelf life of foods at the time of delivery. Also, majority of participants reported that they do not use nail polish or wear jewelry when handling food 89.9 and 84.7%, respectively.

Table 5 Shows the association between work satisfaction and KAP. There was no significant association between work satisfaction and KAP at p value >0.99, 0.129 and 0.988, respectively.

DISCUSSION

Knowledge on Food safety

All participants were aware of the food contamination aspect and majority of them (80.6%) answered questions about cross-contamination correctly. Similar to a study conducted in Riyadh, at King Saud University, their participants showed good knowledge about cross-contamination by 63.4% (Al-Shabib et al., 2016). In contrast

Table 2. Food safety and hygiene knowledge of food handlers employed at PNU

	Good		Poor	
	NO.	%	NO.	%
Food contamination	72	100	0	0
Cross contamination	58	80.6	14	19.4
Temperature	55	76.4	17	23.6
Personal Hygiene	72	100	0	0
Food handlers health status	72	100	0	0
Foodborne diseases	55	76.4	17	23.6

Table 3. Food safety and hygiene attitude among food handlers employed at PNU

I believe that:	Agree		Neutral		Disagree	
	NO.	%	NO.	%	NO.	%
Well-cooked foods are free of contamination.	63	87.5	4	5.6	5	6.9
Proper hand hygiene can prevent food-borne diseases.	67	93.1	1	1.4	4	5.6
Raw and cooked foods should be stored separately to reduce the risk of food contamination.	68	94.4	0	0	4	5.6
It is necessary to check the temperature of refrigerators/freezers periodically to reduce the risk of food contamination.	69	95.8	1	1.4	2	2.8
Defrosted foods should not be refrozen.	62	86.2	5	6.9	5	6.9
The health status of workers should be evaluated before employment.	71	98.6	1	1.4	0	0
Wearing masks and gloves are an important practice to reduce the risk of food contamination.	72	100	0	0	0	0
Wearing caps and adequate clothing is an important practice to reduce the risk of food contamination.	66	91.6	3	4.2	3	4.2
Safe food handling is an important part of my job responsibilities.	71	98.6	1	1.4	0	0
Learning more about food safety through training courses is important to me	69	95.8	3	4.2	0	0
Long and painted fingernails could contaminate food with foodborne pathogens.	64	88.9	2	2.8	6	8.3
Food handlers can be a source of foodborne outbreaks.	54	75	9	12.5	9	12.5
Knives and cutting boards should be properly sanitized to prevent cross contamination.	69	95.8	0	0	3	4.2
Food handlers who have wounds or cuts on their hands should not touch foods without gloves.	71	98.6	1	1.4	0	0

Table 4. Food safety and hygiene practice among food handlers employed at PNU

	YES		NO	
	NO.	%	NO.	%
Using gloves during preparing and distributing of foods.	72	100	0	0
Hands washing hands properly before or after using gloves.	71	98.6	1	1.4
Changing the gloves regularly between serving meals.	71	98.6	1	1.4
Wearing an apron while working.	69	95.8	3	4.2
Wearing a mask when distribute unwrapped foods.	71	98.6	1	1.4
Eating or drinking at workplace. *	27	37.5	45	62.5
Wearing nail polish when handling food. *	8	11	64	89.9
Wearing jewelry when handling food. *	11	15.3	61	84.7
Preparing a meal in advance (i.e., from one shift to another). *	14	19.4	58	80.6
Properly clean the food storage area before storing new products.	69	95.8	3	4.2
Using the sanitizer when washing service utensils.	63	87.5	9	12.5
Covering all wounds or cuts on hands completely with waterproof wound strip.	67	93.1	5	6.9
Taking sick leaves and report to the manager while ill.	67	93.1	5	6.9
Checking the shelf life of foods at the time of delivery	70	97.2	2	2.8

*reversed scoring questions

Table 5. Association between work satisfaction and KAP of food handlers employed at PNU

	Work satisfaction				p(value)*
	Satisfied		Unsatisfied		
	NO.	%	NO.	%	
Knowledge					
- Good	38	54.1	34	100	>0.99**
- Poor	0	0	0	0	
Attitude					
- Good	19	45.2	23	54.8	.129
- Poor	19	63.3	11	36.7	
Practice					
- Good	28	52.8	25	47.2	.988
- Poor	10	52.6	9	47.4	

*Statistical Test of significance, pearson's Chi square.

** Fisher exact

to other studies conducted in Turkey, food handler's had poor knowledge about personal hygiene. Only 21.2% identified its importance in preventing cross-contamination (Baş et al., 2006).

A large proportion of the participants (76.4%) answered questions related to time and temperature control correctly. In contrast, a study conducted among male food handlers in King Saud University, found that they had poor knowledge about basic temperature control and its importance in controlling microbial growth in food (Al-Shabib et al., 2016). This difference may be attributed to gender, as the participants in our study were females who tend to be more adherent to food safety measures than men; since women are generally responsible for all the cooking and planning of meals. However, a previous study found that female respondents have a significantly higher practice level compared to male respondents (Nee and Sani, 2011).

Also, a study conducted in Ghana showed that food handlers had poor knowledge about temperature and its effect on food safety (Akabanda et al., 2017).

In terms of foodborne diseases, our results indicate a good knowledge among our participants regarding foodborne diseases which is consistent with a study conducted in Kuala Pilah, Malaysia which reported that most of their food handlers had good knowledge about foodborne diseases (Abdul-Mutalib et al., 2012) and that was explained as due to the food safety training which majority of their participants had.

All participants in this study correctly answered questions about the health status of food handlers in the food service area, this was consistent with a study conducted in Ghana, as majority of their participants correctly answered questions that are related to the health status of food handlers (Akabanda et al., 2017).

Attitude toward food safety

A high percentage of our participants showed positive attitudes when handling food. Similar to a study conducted

in Ethiopia, 69.5% of their respondents reported good attitude towards food handling practice (Chekol et al., 2019). The vast majority of participants agreed that safe food handling is an important part of their job responsibilities and improper handling may cause them to lose their jobs. In contrast with a study conducted by Murat Bas in Turkey, it was reported that only 55% of their participants agreed that safe food handling is an important part of their job responsibilities (Baş et al., 2006).

Most of our participants agreed on the importance of wearing caps in reducing the risk of food contamination. Murat Bas's study mentioned that 82% of their participants agreed that to reduce the risk of food contamination wearing mask, gloves, apron and covering the hair while working is required (Baş et al., 2006).

A high percentage of the participants agreed that they should wear gloves if they have cuts or wounds, especially in the process of food preparation and distribution. Comparatively, a previous study reported that 85% of their food handlers were familiar with these circumstances (Zanin, 2015).

Food Safety Practice

Majority of the participants had good level of practices regarding food safety and hygiene. All study participants agreed on checking shelf life regularly and the majority of them do not prepare the food prior to someone ordering it. The reason might be related to the regulatory system for food safety supervision. A study conducted in Brazil showed that 82% of their participants agreed that they check the foods shelf life at the time of delivery. However, 80% of them agreed on preparing meals in advance which conflicts with our result, in the current study most of the canteens in PNU serve ready to eat foods that does not need any additional preparation (Soares, 2012).

All study participants wore gloves during the preparation and distribution of food, and a large proportion of them washed their hands before preparing food, changed their gloves regularly, and wore masks and aprons. Contrasted

with a previous study where their findings in the practice part showed a total difference, a high percentage (88%) reported that they do not use gloves and 61% do not wear mask or aprons when needed (Akabanda et al., 2017). It was explained in their study by factors that affect attitudes such as lack of motivation and continuous education to their participants which will subsequently affect their food safety practices.

Some studies suggest that the lack of food handler's knowledge about food safety can lead to wrong hygienic practices which may cause food contamination. As a direct relationship, our participants showed a good hygienic practice which could be explained as a result of their good level of knowledge.

Work satisfaction and its relation with KAP

In this study, there was no significant association between KAP levels and work satisfaction. This result could be explained by food handler's knowledge and attitude levels might be affected by their experience years and training programs. Also, their practice might be affected by the strict supervision.

On the contrary, a study conducted in Slovenia mentioned that food handlers' work satisfaction is a significant factor in the units of food supply chain. Also, employees with good working conditions significantly contribute to their high productivity and better practice (Jevšnik et al., 2008).

Conclusion

Food handlers in Princess Nourah university had good knowledge in the studied areas of food safety (food contamination, cross contamination, foodborne diseases, personal hygiene, temperature and food handlers' health status). They showed positive attitude and good practices toward food safety. Also, they had a high level of work satisfaction. There was no significant association between food handlers' level of knowledge, attitude and practices on food safety and hygiene with their work satisfaction.

Recommendations

Food handlers need regular and effective training programs to maintain their level of knowledge and to improve their attitude toward food safety measure; also, strict supervision is needed to assess their practice. On the other hand, further studies are needed to know the barriers behind the improper compliance of food handlers to food safety standards and practices.

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Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this manuscript.

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