



International Journal of Advanced Community Medicine

E-ISSN: 2616-3594
P-ISSN: 2616-3586
IJACM 2019; 2(2): 96-102
Received: 07-03-2019
Accepted: 09-04-2019

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Knowledge, attitude and practices of food safety among food handlers in Ismailia city hospitals, Egypt

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DOI: <https://doi.org/10.33545/comed.2019.v2.i2b.13>

Abstract

Background: Foodborne diseases and threats to food safety constitute a growing public health problem. WHO estimates that foodborne and waterborne diarrheal diseases taken together kill about 2.2 million people annually, 1.9 million of them children and about 70% from developing countries.

Aim of this study: Was to improve quality of life of hospitalized patients.

Methods: This cross sectional study was conducted on 132 workers in food catering services in Ismailia city hospitals to assess their knowledge, attitude and practice about food safety. Data were collected by using a predesigned questionnaire adapted from WHO including two components: the first one is a self administered questionnaire to assess the baseline level of knowledge and attitude while the other one is an observational checklist to evaluate their practices about food safety and food hygiene.

Results: The majority of the study participants 82.6% of them didn't know the correct answer regarding the duration they should rub their hands during hand washing and only 33.3% of them were aware of the importance of washing hands after handling raw meat. Moreover, 59.1% of them were ignore why raw foods have to be kept separate from cooked foods and 64.4% also were un aware of the proper temperature of cooking chicken. Regarding their practices only 40.9% of them were always washing their hands before handling food and only 25.8% of them were always Storing separately raw & cooked foods. Moreover 46.2% of them were most of the time thawing food as much as needed and 47% were most of the time using separately equipment & supplies for raw & RTE food.

Conclusion: This study showed that there is an identified gap in knowledge and correct practices among food handlers and that there is a need for raising awareness about food safety by education programs regarding food safety and safe food handling practices.

Keywords: Knowledge, attitude, practice, food safety

1. Introduction

Food is vital for life but can only serve such an important purpose if it is safe and secure to ingest. Food can be defined as an edible substance whether in natural or manufactured state which, from a public health perspective form part of the human diet. Understanding the necessity of access to healthy and nutritionally sound foods is important for all ^[1].

Food borne illnesses have been described as one of the most widespread problems in the world as it is an important and growing public health and economic problem in many countries ^[2]. Diseases spread through food are common and persistent problems that result in appreciable morbidity and occasionally in death ^[3].

Especially in hospitals, food hygiene requires attention to detail in relation to all preventive measures to minimize the hazards of food poisoning, particularly given the presence of "consumers" (hospitalized patients at risk) who often are more vulnerable than healthy subjects ^[4]. In hospital catering, food-services staff are the main food handlers, although nurses and other domestic staff may distribute or serve meals. Food-services staff in hospitals represents a potential source of nosocomial foodborne outbreaks, since they may possibly introduce pathogens into foods during every phase from purchase to distribution ^[4, 5]. The core messages of the Five Keys to Safer Food are: (1) keep clean; (2) separate raw and cooked; (3) cook thoroughly; (4) keep food at safe temperatures; and (5) use safe water and raw materials. The poster has been translated into more than 40 languages and is being used to spread WHO's food hygiene message throughout the world ^[6].

Food safety is directly related to the harmful substances present in it. Any substance that is reasonably likely to cause harm, injury or illness, when present above an established

acceptable level, is a food safety hazard. Food hazards in foods may arise from different sources. They can be natural components of the food itself, they can arise from contamination of the food during any stage of the production, processing, storage and distribution or can be a result of decomposition and deterioration of the food items. In most countries regulatory bodies have established acceptable limits for all types of hazards [7].

Food hygiene in the hospital can acquire peculiar features: indeed, many patients could be more vulnerable than healthy subjects to microbiological and nutritional risks; large numbers of persons can be exposed to infections and possible complications; gastroenteritis can impair digestion and absorption of nutrients and the perception or fear about poor food hygiene practices might result in patients rejecting the meals supplied by the hospital catering [8].

Methods

The study was conducted at four hospitals in Ismailia city which were Suez Canal university hospital, Ismailia general hospital, Ismailia chest hospital and Ismailia fever hospital. During the period from December 2014 and March 2015.

The study was a cross sectional study that was conducted on 132 workers in food catering services in Ismailia city hospitals to assess food handler's knowledge, attitude and practice about food safety.

Data were collected by using a predesigned questionnaire adapted from WHO including two components: the first one is a self administered questionnaire to assess the baseline level of knowledge and attitude while the other one is an observational checklist to evaluate their practices about food safety and food hygiene. The study participants were including department's officers, nutritionists, supervisors, food handlers, chefs, waiters, Stores keepers and cleaners who work also for the catering companies

All statistical analyses were performed using the SPSS statistical package for social science version 16.

Results

This study included 132 participants distributed as; 70 at Suez Canal University Hospital, 30 at Ismailia General Hospital, 15 at Ismailia Chest Hospital and 17 at Ismailia Fever Hospital.

Regarding general characteristics of the studied participants, their age ranged from 22 to 61, with a mean of 37.5 years. The majority of food handlers were males (52.3%). The majority of the participants (59.1%) had high secondary school education (technical education), 6.8% secondary school education and 26.5% university education. Regarding working experience, 53% of the participants had less than 10 years of working experience in food handling, 26.5% had working experience more than 10 years and 20.5% had working experience more than 20 years. Most of them were technicians; 42.4%, while 14.4 % as cooks, 10.6% supervisors and 13.6 % others who work as cleaners and assistants who sometimes assisted in the food preparation and distribution among the studied participants, 53% of them were from university hospital, 22.7% of them were from general hospital, 12.9% of them were from fever hospital and 11.4% were from chest hospital (table 1).

Regarding food safety knowledge table 2 shows the participants' responses for the questions on the food safety knowledge pretest. When each question was analyzed individually. The majority of the study participants 82.6% of them didn't know the correct answer regarding the duration they should rub their hands during hand washing and only 33.3% of them were aware of the importance of washing hands after handling raw meat. Moreover, 59.1% of them were ignore why raw foods have to be kept separate from cooked foods and 64.4% also were un aware of the proper temperature of cooking chicken.

The majority of the respondents (72%) were aware of how leftover foods should be Stored to the next day, only 60.6% of them were aware of the safest way to defrost foods although 53.8 % of them only were aware by the concept of cross contamination. The majority of the food handlers (78%) were not aware of the correct temperature for a refrigerator and 65.2% of them knew the place to store chemicals However 66.7% and 71.2% didn't know the correct way to wash dishes, equipment and utensils and the best way to dry them after washing respectively.

Figure (1) shows the results on sources of information on food safety and HACCP by the study participants. The results show that about sixty nine percent (68.9 %) of the respondents learned about HACCP and Food hygiene primarily from the educational courses, mass media (15.9%), and other sources (15.2%) which includes public health officers, hygiene campaigns and various social forums.

About 97% of all studied participants need for more information about food safety in the future (figure 2).

Regarding Differences between characteristics of the studied participants regarding knowledge score there was a statistical significant difference between age, educational level, working activity and working experience regarding knowledge score with P-value less than 0.05 except the difference regarding knowledge score with gender and place of work which was not statistically significant with P-value more than 0.05. (Table 3).

Regarding attitudes of the studied participants towards different food safety issues with mean score 14.0 ± 3.3 , about 19.7 % of the study participants were agree with issue that frequent hand washing during food preparation is worth extra time while 64.4% of them were agree that improper storage of foods may be cause of health hazard to consumers and moreover 86.4 % of them were agree that it is important to throw away foods that have reached their expiry date (table 4).

Regarding the participants' observation for each question on the food safety. Only 40.9% of them were always washing their hands before handling food and only 25.8% of them were always Storing separately raw & cooked foods. Moreover 46.2% of them were most of the time thawing food as much as needed and 47% were most of the time using separately equipment & supplies for raw & RTE food. 100% of the study participants were never use food thermometers during cooking in addition only 27.3% of them were properly clean, sanitize and store equipment (table 5).

Table 1: General characteristics of the studied participants (n=132).

General Characteristics		
Age (years)	Mean ± SD	37.5 ± 9.5
	Range	(22-61)
Gender Frequency (%)	Male	69 (52.3)
	Female	63 (47.7)
Educational level Frequency (%)	Illiterate	5 (3.8)
	Read and write	3 (2.3)
	Primary education	2 (1.5)
	Secondary education	9 (6.8)
	High secondary education	78 (59.1)
Working experience (years)	University degree	35 (26.5)
	Mean ± SD	10.5 ± 8.8
Working activity Frequency (%)	Range	(1-33)
	Technician	56 (42.4)
	Cooker	19 (14.4)
	Supervisor	14 (10.6)
	Dietitian	13 (9.8)
	Assistant cooker	12 (9.1)
	Others	18 (13.6)
Place of work Frequency (%)	University hospital	70 (53)
	General hospital	30 (22.7)
	Fever hospital	17 (12.9)
	Chest hospital	15 (11.4)

Table 2: Knowledge among the studied participants (n=132).

Question	True		False	
	N	%	N	%
Personal hygiene				
When washing your hands, you should rub your hands together with soap for at least	23	17.4	109	82.6
Why is it important to wash your hands after handling raw meat?	44	33.3	88	66.7
Using gloves during preparing food is to	48	36.4	84	63.6
Good personal hygiene practices include all of the following EXCEPT	79	59.8	53	40.2
Which of the following is necessarily needed for wearing disposable gloves?	85	64.4	47	35.6
When you suffer fever, diarrhea, or vomiting, what will you do?	41	31.1	91	68.9
Subtotal score* (6)	2.4 ± 1.8			
Food storage				
In the refrigerator, where should cooked foods be stored?	14	10.6	118	89.4
Which of the following is a food labeling requirement?	45	34.1	87	65.9
Subtotal score* (2)	0.4 ± 0.6			
Food hygiene, handling & Serving				
During food preparation and refrigeration, raw and cooked food must be separated because	54	40.9	78	59.1
When you cooking chicken, the internal temperature should be at least	47	35.6	85	64.4
Which of the following is the temperature affecting the most rapid growth of bacteria?	27	20.5	105	79.5
Which of the following is the proper holding temperature in cooked foodfoods?	42	31.8	90	68.2
The safest way to thaw (defrost) foods is	80	60.6	52	39.4
Potentially hazardous foods (time/temperature control for safety foods) are	40	30.3	92	69.7
Cross-contamination is	71	53.8	61	46.2
What is usually the riskiest step in food preparation?	24	18.2	108	81.8
Cooked leftovers that will be stored to the next day must	95	72.0	37	28.0
Subtotal score* (9)	3.6 ± 2.3			
Cleaning & sanitation				
Which is the correct way to wash dishes, utensils and equipment?	44	33.3	88	66.7
What are some of the food contact surfaces that must always be washed and sanitized?	96	72.7	36	27.3
Drying of utensils and equipment after washing should be by	38	28.8	94	71.2
Subtotal score* (3)	1.3 ± 0.9			
Environmental hygiene				
Where must you store chemicals such as cleaners and sanitizers?	86	65.2	46	34.8
The correct temperature for a refrigerator is	29	22.0	103	78.0
Smoking is unacceptable practice in kitchen because	59	44.7	73	55.3
Subtotal score* (3)	1.3 ± 0.9			
Total knowledge score*(23)	9.2 ± 5.3			

*(Mean ± SD)

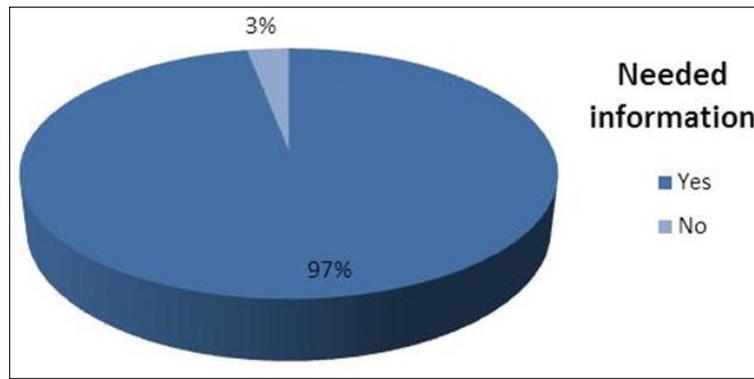


Fig 1: Sources of information of food safety among the studied participants (n=132).

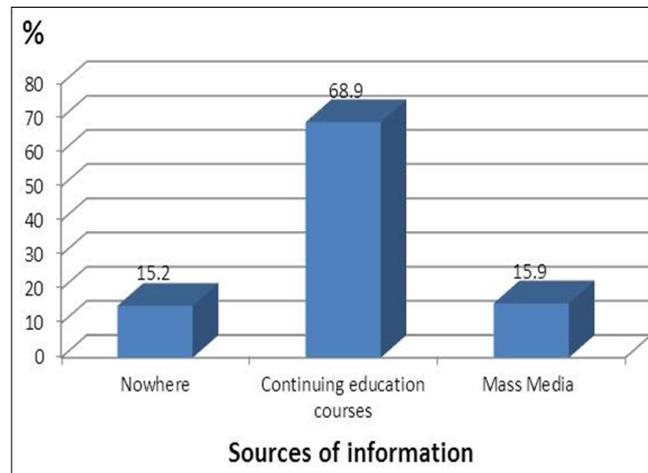


Fig 2: Need for food safety information among the studied participants (n=132).

Table 3: Differences between characteristics of the studied participants (n=132) regarding knowledge score.

Variable	Knowledge score Mean ± SD	P-value
Age		
Less than 30 years	6.5 ± 4.4	<0.0001*
30-	9.2 ± 4.7	
40-	10.2 ± 5.3	
≥ 50	12.7 ± 6.0	
Gender		
Male	8.9 ± 5.8	0.600**
Female	9.4 ± 4.7	
Educational level		
Less than high secondary school	3.3 ± 2.3	<0.0001*
High secondary education	8.3 ± 4.1	
University degree	14.2 ± 4.4	
Working experience		
< 10 years	7.5 ± 4.5	<0.0001*
10-	10.1 ± 5.2	
≥ 20 years	12.2 ± 5.8	
Working activity		
Technician	8.2 ± 3.8	<0.0001*
Cooker	11.9 ± 4.9	
Supervisor	13.6 ± 3.8	
Dietitian	15.6 ± 4.5	
Assistant cooker	6.4 ± 4.7	
Others	3.3 ± 2.1	
Place of work		
University hospital	9.1 ± 6.1	0.173***
General hospital	9.7 ± 4.1	
Fever hospital	10.8 ± 4.1	
Chest hospital	6.8 ± 5.2	

*ANOVA test is statistically significant at level of confidence of 95%.

**t- test is not statistically significant at level of confidence of 95%.

***ANOVA test is not statistically significant at level of confidence of 95%

Table 4: Attitude among the studied participants (n=132).

Question	Agree		Not sure		Disagree	
	N	%	N	%	N	%
Frequent hand-washing during food preparation is worth the extra time	26	19.7	2	1.5	104	78.8
Raw food should be kept separated from cooked food handling raw meat?	80	60.0	30	22.7	22	16.7
Defrosted food should not be refrozen again	48	36.4	49	37.1	35	26.5
Using cap, masks, protective gloves and adequate clothing reduce the risk of food contamination	66	50.0	41	31.1	25	18.9
Is it important to know the temperature of the refrigerator/freezer to reduce the risk of food spoilage?	101	76.5	10	7.6	21	15.9
Is it necessary to check at regular intervals of time the thermometer setting of refrigerators and freezers?	96	72.7	17	12.9	19	14.4
Improper storage of foods may be cause of health hazard to consumers	85	64.4	19	14.4	28	21.2
Food-services staff with abrasion or cuts on hands should not touch unwrapped food	47	35.6	60	45.5	25	18.9
I think it is important to throw away foods that have reached their expiry date	114	86.4	7	5.3	11	8.3
I think it is unsafe to leave cooked food out of the refrigerator for more than two hours	26	19.7	84	63.6	22	16.7
Total Attitude score* (20)	14.0±3.3					

*(Mean ± SD)

Table 5: Practices among the studied participants (n=132).

Question	Always		Most of the time		Sometimes		Never	
	N	%	N	%	N	%	N	%
Personal hygiene								
Checking self-health condition every day	2	1.5	19	14.4	59	44.7	52	39.4
Checking cleanness of clothes, hair restraints & shoes before work	11	8.3	37	28.0	61	46.2	23	17.4
Washing hands before handling food	54	40.9	54	40.9	22	16.7	2	1.5
Receiving foods right after delivery & storing them in store area after removing their package	37	28.0	55	41.7	39	29.5	1	0.8
Subtotal score* (12)	6.2 ± 2.5							
Food storage								
Checking temperature of the frozen/refrigerated foods & having problems rejecting them	22	16.7	56	42.4	51	38.6	3	2.3
Checking & verifying whether temperatures of refrigerators & freezers are appropriate	30	22.7	54	40.9	41	31.1	7	5.3
Recording temperature log...	22	16.7	46	34.8	51	38.6	13	9.8
Taking temperature of foods in cooking ...	0	0.0	0	0.0	0	0.0	132	100.0
Storing separately raw & cooked foods...	34	25.8	61	46.2	36	27.3	1	0.8
Subtotal score* (15)	7.1 ± 2.4							
Food hygiene, handling & Serving								
Thawing food as much as needed	22	16.7	61	46.2	49	37.1	0	0.0
Cooking it immediately, if not, storing it in refrigerator after thawing	18	13.6	27	20.5	72	54.5	15	11.4
Washing & sanitizing fresh vegetables & fruits before use	28	21.2	88	66.7	16	12.1	0	0.0
Labeling foods with use-by date in storing RTE & processed foods	43	32.6	50	37.9	37	28.0	2	1.5
Using separately equipment & supplies for raw & RTE food	25	18.9	62	47.0	44	33.3	1	0.8
Not handling RTE with bare hands	35	26.5	71	53.8	23	17.4	3	2.3
Not holding foods or utensils on the kitchen floor unit	81	61.4	43	32.6	7	5.3	1	0.8
Subtotal score* (21)	13.7 ± 3.0							
Cleaning & sanitation								
Labeling cleaning & sanitizing chemicals & storing them at safer place away from foods	69	52.3	54	40.9	9	6.8	0	0.0
Screening windows & vents for controlling pests.....	10	7.6	60	45.5	61	46.2	1	0.8
Cleaning & sanitizing knives, cutting board.	23	17.4	76	57.6	31	23.5	2	1.5
Clean & sanitize storing sanitized/clean equipment	36	27.3	64	48.5	29	22.0	3	2.3
Subtotal score* (12)	8.1 ± 2.1							
Total Practice score* (60)	35.0 ± 8.9							

*(Mean ± SD)

Discussion

This cross sectional study was used to assess the knowledge, attitude and practices about food safety of food handlers working at four hospitals in Ismailia city (Suez canal university hospital, Ismailia general hospital, Ismailia chest hospital and Ismailia fever hospital). The current study showed that the majority of the study participants, 82.6% of them didn't know the correct answer regarding the duration they should rub their hands during

hand washing and only 33.3% of them were aware of the importance of washing hands after handling raw meat. Moreover, 59.1% of them were ignore why raw foods have to be kept separate from cooked foods, about 64.4% of them also were un aware of the proper temperature of cooking chicken and only 31.1% of them knew that they should not be allowed to handle food when they had any symptoms associated with foodborne disease.

This was in agreement with the study of Marais *et al.*, 2008 found that the most poorly answered question (percentage of correct reply given by 25% of the food handlers) related to temperature control, knowledge regarding microorganisms and the wearing of gloves. The most satisfactorily answered question (percentage of correct reply given by 75% of food handlers) addressed general cleaning procedure. Nearly all food handlers knew that they should not be allowed to handle food when they had any symptoms associated with foodborne disease [9].

However the study of Sani and Siow, (2014) found that the majority of the respondents (96.4%) answered questions related to personal hygiene correctly. Only half of the respondents knew the answer for questions about cross-contamination (44.6%), temperature and time control (58.7%) as well as the definition of foodborne illness (66.1%). Most of them (98.2%) knew that it was necessary to always wash their hands when handling foods and avoid touching their body parts like hair after washing their hands (92.9%). About 97.3% stated that they knew washing hands properly can reduce the risk of contamination [10].

In the current study the majority of the respondents (72%) were aware about how leftover foods should be stored to the next day, only 60.6% of them were aware of the safest way to defrost foods although 53.8% of them only were aware by the concept of cross contamination. The majority of the food handlers (78%) were not aware of the correct temperature for a refrigerator and 65.2% of them knew the place to store chemicals. However 66.7% and 71.2% didn't know the correct way to wash dishes, equipment and utensils and the best way to dry them after washing respectively.

Although the study by Haapala and Probart (2004) also reported that their participants acquired more correct answers with the questions that are related to the washing of hands, thus, indicating good knowledge with respect to this theme. On the other hand, more than half of the respondents gave correct answer to the negatively formed question of 'correct cleaning procedures of equipment increase risk of infection transmission'. However, about 58.9% of them gave wrong answer or did not know that running water with temperature of ≤ 21 °C is an acceptable method for thawing of frozen food [11].

In the present study many of the food handlers were not aware of the importance of basic temperature control requirements in controlling microbial growth in food and if it is inadequately performed will lead to the proliferation of microbial hazards and thereafter food borne diseases as only 31.8% of the study participants were knew the proper holding temperature of cooked food

Moreover, this was in agreement with the study of Sani and Siow, (2014) who found that 82.1% of respondents thought that hot RTE foods are safe to be kept at temperatures below 60 °C, while 67.0% stated that cold RTE foods can be kept in temperatures above 5 °C for long periods of time. This finding shows that majority of respondents (64.3%) did not know the correct temperature danger zones for RTE foods is 5_ 60 °C.

This result was supported by Bas *et al.*, (2006) who stated that many of their respondents lacked of knowledge about critical temperatures for RTE foods, acceptable refrigerator temperature ranges and cross-contamination [12].

Similar findings by Buccheri *et al.*, (2010) reported that food handler' proportions as high as 82.0% and 24.2% did

not know the critical temperature of storing hot and cold RTE foods respectively [13].

Regarding attitude, in the current study only 35.6% of the study participants were agrees that Food services staff with abrasion or cuts on hands should not touch unwrapped food. However the study of Sani and Siow, (2014) reported that the statement of food handlers with abrasion or cuts on fingers and hands should not be handling foods was approved by 82.8% of the respondents [10].

Comparatively, Tokuc *et al.*, (2009) found that almost all (93.2%) of their food staffs were aware of the danger in touching food with cut hands or fingers [14]. But the most significant result was from Angelillo, *et al.*, (2001) who found that 99% of their food staffs did not touch food with cut hand or fingers [15].

In the current study about 37.1% of the study participants were unsure about whether defrosted foods should be refrozen.

Also Sani and Siow, (2014) found that many respondents were unsure about whether defrosted foods should only be refrozen once since lowest mean scores, 4.04 ± 1.07 was from this statement [10].

According to Abdul-Mutalib *et al.*, (2012), about 83% of the respondents are uncertain about refreezing defrosted food. Repeated thawing and refreezing food will increase the number of microorganism in the food item and hence might cause hazards [16].

In the current study half of the study participants agreed that using cap, masks, protective gloves and adequate clothing reduce the risk of food contamination.

However Sani and Siow, (2014) found that 93.7% agreed that using caps, masks, protective gloves and adequate clothing reduce the risk of food poisoning [10].

This result was paralleled to the study by Buccheri *et al.*, (2010), where they have also found that more than 90% of their respondents believe that the use of protective clothing, gloves and proper storage of foodstuffs are vitally important in reducing food spoilage and health hazards to consumers [13].

Regarding food safety practices the current study showed that only 40.9% of them were always washing their hands before handling food and only 25.8% of them were always storing separately raw & cooked foods. Moreover 46.2% of them were most of the time thawing food as much as needed and 47% were most of the time using separately equipment & supplies for raw & RTE food. 100% of the study participants were never use food thermometers during cooking in addition only 27.3% of them were properly clean, sanitize and store equipment

However Malhotra, (2008) Baseline self-reported hand-washing practices revealed low figures for washing hands after micturition (82.4%) and smoking (52.8%) and consistent use of soap at the workplace (24.3%) and after micturition (14.0%), which improved after health education but not to the desired extent [17].

Nevertheless, practices in general need to be assessed by observation in addition to a questionnaire method. This is because it is difficult to measure the real behaviors without observation as staff could rate themselves more highly in comparison to what is actually seen in reality. Therefore, the true impact of the training could be seen as somewhat incomplete at this part of the study. In our study this couldn't be right as Staff practices were evaluated using observation checklist not as a self reported practices.

Conclusion

This study showed that there is an identified gap in knowledge and correct practices among food handlers and that there is a need for raising awareness about food safety by education programs regarding food safety and safe food handling practices.

References

1. Will M, Guenther D. Food Quality and Safety Standards as Required by EU Law and the Private Industry, with Special Reference to the MEDA Countries' Exports of Fresh and Processed Fruit & Vegetables, Herbs & Spices: A Practitioners' Reference Book. Deutsche Gesellschaft für technische Zusammenarbeit (GTZ), 2007.
2. Wheelock V. Food Safety in Perspective. *British Food Journal*. 2006; 93(31):36.
3. Tomohide Y. Food safety regulation in the united states: an empirical and theoretical examination. In *Independent Review*. 2010; 15:210-226.
4. Barrie D. The provision of food and catering services in hospital. *J Hosp Infect*. 1996; 33:13-33.
5. Maguire H, Pharoah P, Walsh B, Davison C, Barrie D, Threlfall EJ, Chambers S. Hospital outbreak of *Salmonella* Virchow possibly associated with a food handler. *Journal of hospital infection*. 2000; 44(4):261-266.
6. World Health Organization. Prevention of foodborne disease: Five keys to safer food. Assessed, 2014.
7. Ali I. *Food Quality Assurance Principles and Practice*. CRC Press. Washington DC, 2000.
8. Buccheri C, Casuccio A, Giammanco S, Giammanco M, La Guradia M, Mammìna C. Food Safety in hospital: Knowledge, attitudes and practices of nursing staff of two hospitals in Sicily, Italy. *BMC Health Services Research*. 2007; 7(1):45-56.
9. Marais M, Conradie N, Labadarios D. Small and micro enterprises—aspects of knowledge, attitudes and practices of managers and food handlers knowledge of food safety in the proximity of Tygerberg Academic Hospital, Western Cape. *South African Journal of Clinical Nutrition*. 2008; 20(2):50-61.
10. Sani NA, Siow ON. Knowledge, attitudes and practices of food handlers on food safety in food service operations at the Universiti Kebangsaan Malaysia. *Food Control*, 2014; 37:210-217.
11. Haapala I, Probart C. Food safety knowledge, perceptions, and behaviours among middle school students. *Journal of Nutrition Education and Behavior*, 2004; 33:71-76.
12. Baş M, Ersun AŞ, Kıvanç G. The evaluation of food hygiene knowledge, attitudes, and practices of food handlers' in food businesses in Turkey. *Food control*. 2006; 17(4):317-322.
13. Buccheri C, Mammìna C, Giammanco S, Giammanco M, Casuccio MGA. Knowledge, attitudes and self-reported practices of food service staff in nursing homes and long-term care facilities. *Food Control*, 2010; 21:1367-1373.
14. Tokuç B, Ekuklu G, Berberoğlu U, Bilge E, Dedeler H. Knowledge, attitudes and self-reported practices of food service staff regarding food hygiene in Edirne, Turkey. *Food Control*. 2009; 20(6):565-568.
15. Angelillo IF, Viggiani NMA, Greco R, Rito D. and the Collaborative Group. HACCP and Food Hygiene in Hospital: Knowledge, Attitudes, and Practices of Foodservices Staff in Calabria, Italy. *Journal of Infection Control and Hospital Epidemiology*. 2001; 22(6):1-7.
16. Abdul-Mutalib NA, Abdul-Rashid MF, Mustafa S, Amin-Nordin S, Hamat RA, Osman M. Knowledge, attitude and practices regarding food hygiene and sanitation of food handlers in Kuala Pilah, Malaysia. *Food Control*. 2012; 27(2):289-293.
17. Malhotra R, Lal P, Prakash SK, Daga MK, Kishore J. Evaluation of a health education intervention on knowledge and attitudes of food handlers working in a medical college in Delhi, India. *Asia-Pacific Journal of public health*. 2008; 20(4):277-286.