Journal of Health, Medicine and Nursing
ISSN 2422-8419 An International Peer-reviewed Journal
Vol.38, 2017

Effectiveness of Food Safety and Hygiene Training Program for Hospital Food Services Staff in Holly Makkah

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Abstract
Foodborne diseases have been increasing in recent years, with a greater impact on the health and economy of developing countries. Food can be a potential source of infection and disease, right from the point of procurement to the point of consumption. It is more likely in the food service establishments where mass food is prepared. Hygienic practices at procuring, preparing and serving are essential. Food handlers specially play a major role here.
The aim of this study was to assess the knowledge, attitudes and practices of food service staff regarding food safety and hygiene, before and after food safety education program in hospital.
A cross-sectional design was used to assess the knowledge, attitudes and practices about food safety of the food services staff for the purpose of the study before and after a nutrition education program in a systemic sample of a hospital at holy Makkah were assessment by means of a questionnaire survey.After obtaining approval, the questionnaire was addressed to all food services staff.
The study included 107 food handlers. Sixty of them (56.1%) were males and 47 were females (43.9%). Their age ranged between 22 and 56 years. Almost half of them (49%) were at least university graduated. Most of them (80.4%) were workers whereas (13.7%) were dieticians. Data analysis was carried out using the Statistical Package of the Social Science (SPSS) version 20. Overall mean percentage of knowledge before an educational intervention was 56.1% and after an intervention it became 77.7%. This difference was statistically significant, $p<0.001$.
It is concluded that the overall knowledge, attitudes and practices scores were higher regarding personnel hygiene, however, it need reconsideration regarding food-borne diseases and sanitation Since the education, training of those handling food would improve the status of food hygiene knowledge.
Keywords: Food Safety, Hygiene, Training Program, Hospital Food Services and Services Staff.

1. Introduction:

Food safety is an area of public health action to protect consumers from the risks of food poisoning and foodborne diseases, acute or chronic. Food safety education is most effective when messages are targeted toward changing behaviors most likely to result in foodborne illness (Medeiros LC *et al*, 2001).Training can overcome many safety and sanitation problems that result from uninformed or misinformed employees. Effective training experience leads to increased safety and sanitation awareness and improved safety and sanitation procedures (Hui YH*et al*, 2003). . Food safety education: education dealing with the practices that keep food safe from environmental and bacterial contamination. Nutrition and food safety are intertwined, and there are many examples of this relationship. For instance, food-borne pathogens can affect nutritional status by decreasing appetite and reducing absorption of important nutrients from the gut. Short term diarrheal diseases are sometimes associated with the loss of some enzyme activity namely lactase—which is important for digestion and absorption of lactose in nutritious dairy products (Woteki et al, 2001). Food can be profoundly altered by preparation and alternations, and as a consequence influence palatability, material structure, nutrient content, and alert food safety issues (Fischer et al. 2007).The implementation of the HACCP system, universally adopted as a proactive method to prevent foodborne disease, does require a team approach and an understanding of the rationale for monitoring procedures by all staff and underscores the need for continuous training. Providing tailored scientifically sound and updated knowledge and identifying factors that could contribute to generate positive attitude and motivate behavior change in a definite setting could help to minimize foodborne hazard in hospital catering and enhance the practical utility of hygiene training for the personnel involved in food service

functions (Buccheri C, et al. 2007).
The aim of this work was to study the effectiveness of a training program for the hospital foodservice staff in the improvement of food safety and hygiene knowledge

2. Materials and Method

2.1 Research design

A cross-sectional design was used to assess the knowledge, attitudes and practices about food safety of the food services staff for the purpose of the study before and after a nutrition education program in a systemic sample of AL-Noor Specialist Hospital at holy Makkah were assessment by means of a questionnaire survey. After obtaining approval, the questionnaire was addressed to all food services staff. Questionnaire was considered in tow form (English and Arabic) to gather information from food services staff sample which includes ten items: demographic and social characteristics, knowledge about Facility design, layout of food services establishments and toilets, practice about Food Supply, practice about washing
Cleaning, drying equipment and utensils, waste disposal and elimination of insects, Health food practices, knowledge about diseases that may be transmitted through food as well as information on food presentation**.**

2.2 Study population

107 staff in food services, with Different level of occupation (Dietitian, Chef, Supervisor…etc.) Attended to our program In the Hospital.

2.3 Data collection procedures and tools

All data were collected in the period (2014-2015). Participation was voluntary, and the questionnaires were answered anonymously and individually.

2.4 Health Education Program

2.4.1 Educational Media

The education Media was contained several ways to educate the food services staff including:

2.4.1.1 Lecture by Social media presentation (power point)

The important topics included: The importance of food safety, Types of microbial food poisoning, the most common food for the occurrence of food poisoning and foodborne illness. Suitable conditions for the growth of bacteria , Important examples of the causes of food borne illness (Staphylococcal Intoxication, Salmonellosis , Botulism and Vibrio cholera poisoning), The proper methods to save the cooked and raw food , Cleaning and disinfect of fruits and vegetables , Personal hygiene and health of workers. An effective way to wash your hands with soap and water, Cleaning of tools , cutting and preparation boards **.**

2.4.1.2 Brochure

- A pamphlet was used to pass information about the important topics.
- Brochure about the effective way to wash your hands with soap and water.

2.4.1.3 Visual Presentation

We presented three video relating to our program include Personal Hygiene, Environmental Hygiene and Food Handling Practices

2.5 Statistical analysis

Descriptive statistics were used to present the data on demographic characters, knowledge of food hygiene and food safety. Categorical Variables were expressed as percentages and frequencies. Data analysis was carried out using the Statistical Package of the Social Science (SPSS) version 20. McNemar's test was applied to compare between pre and post health education groups. Paired t-test was used for comparison between mean knowledge percentage before and after intervention. P value at or less than 0.05 was considered statistically significant.

3. Results and discussion

3.1 Demographic characteristics of the participants

The study included 107 food handlers. Sixty of them (56.1%) were males and 47 were females (43.9%). Their age ranged between 22 and 56 years with a mean ±SD of 30.7±6.2 years. Almost half of them (49%) were at least university graduated. Most of them (80.4%) were workers whereas (13.7%) were dieticians.

Table 1. Demographic characteristics of the participants (n=107).

Demographic characteristics	categories	Frequency	Percent
Gender	Male	60	56.1
	Female	47	43.9
Age (years) (n=105)	≤30	66	62.8
	31-40	30	28.6
	> 40	9	8.6
Mean ±SD	22-56 30.7±6.2		
Education Level (n=102)	Illiterate /read & write	12	11.8
	Primary School	12	11.8
	Diploma	28	27.4
	University/above	50	49.0
Job (n=102)	Supervisor	6	5.9
	Dietitian	14	13.7
	Worker	82	80.4

3.2 The evaluation of food services staff` knowledge regarding food hygiene and safety before an educational intervention

It has been shown that most outbreaks of food poisoning result from improper food handling practices (Clayton et al., 2002). Food workers in many settings have been responsible for foodborne disease outbreaks for decades (Greig et al., 2007). There is an urgent need for awareness programs for foodservice employees to improve their food safety knowledge (Webb M et al., 2015).

In the current study, overall mean percentage of knowledge before the training program was significant increased from 56.1% to 77.7% after the training ($p<0.001$). This finding confirmed what has been reported by (Park SH et al., 2010) who found that Employee knowledge of the intervention group showed a significant improvement in their score. It increased from 49.3 before the training to 66.6 after training. This result is also supported by the study carried by Waggoner that showed that food safety knowledge for staff was improved from 19.0 ± 0.1 at Pretest vs. 16.7 ± 0.2 at Posttest (Waggoner SK et al., 2004). Also Soon JM reported that Meta-analysis values for nine food safety training and intervention studies on hand hygiene knowledge among food handlers were significantly higher than those without training (Soon JM et al., 2012). In this context, another study found that Overall knowledge and compliance with standards of behavior improved significantly between pre- and post-training (Roberts KR et al., 2008). So, food handlers should attend proper training in the basic principle of food safety and rules of personal hygiene in order to improve their knowledge in food handling. However, on the other hand some other studies have shown that food safety training alone was not sufficient to improve hygiene attitude and practices of food handlers. The results shown that no significant difference in the scores of the study group between the first visit (pre-training) and the second visit (post-training) ($p >0.05$) (Kirby et al., 1997). In addition other study showed that no statistically significant difference between the trained and untrained groups with respect to health inspection scores including Potentially hazardous foods maintained below 5°Cor above 60°C, Food is protected from contamination at all times while being stored or displayed, Thermometers used to verify food preparation and storage temperatures, Adequate supply of potable water is provided for duration and type of event, Operator has provided suitable hand washing station for booth workers, Garbage is stored in suitable receptacles, Food handlers are maintaining good personal hygiene practices and Food contact surfaces washed / rinsed / sanitized after each use and following any operations when contamination may have occurred (Mancini R et al., 2012).

In our study the majority of Food service staff had high basic level knowledge about most Personnel hygiene items this significantly improved after implemented of education program as follows .They knew that they have to wash their hands before handling raw foods (93.5.5% Vs. 92%), they have to wash their hands after handling raw foods (97.2% Vs. 91.6%), they have to use gloves when handling or food distribution to patients (98.1% Vs. 89.7%), they have to wash your hands before handling cooked foods (%99.1 Vs. 85%). they have to use the

mask in the preparation and processing area or food distribution to patients (%97.2 Vs. 74.8%).
While majority of them failed in the identification of specific disease or pathogens which could be transmitted via foodsbefore the training it improved for all items after the training to (77.6%- 90.7%). Lack of knowledge among the food service staff about foodborne pathogens were also found by Abdelhafez (2013),
On the contrary, other study found that the participants had good knowledge on definition of foodborne diseases with mean score of 73.85% (Sharif L et al., 2012). Therefore an effective education programs to promote safer food handling practices and other averting behaviors can increase the awareness of microbial pathogens

The Food service staff 'level of knowledge regarding Premises sanitation section was ranged from 50.5% to 79.4% before the training it increased to the range from 83.2% to 93.5% after the training.

The lack of purchasing and receiving programs that may foster food safety are considered a problem. It should be necessary for hospitals to set up purchasing policies, or quality standards to receive safe food supplies. Receiving procedures for raw materials should also be set up to include visual inspection, temperature measurement, and other methods of quality testing for potentially hazardous ingredients before the materials enter the operation. (Ramírez E et al., 2011).In our study the comparison of the scores between the pre training and post training showed significant difference in the level of food safety knowledge for all items. It increased from (48.6%, 75.7% and 76.6%) to (79.4%, 93.5% and 91.6%) respectively. Existing research suggests that a substantial proportion of foodborne illness is attributable to improper food handling, preparation, and consumption practices by Improper practices include, but are not limited to, inadequate cooking, inadequate cooling and storage of foods, cross contamination of raw and cooked foods, and consumption of raw, undercooked, or unsafe food. Thus, food handling and preparation behaviours are important means to reduce foodborne illness (Lin CT et al., 2004).

Food service staff in the hospital should endeavour to maintain good personal hygiene at all times as this will minimize food contamination. In addition the higher level of education and training enhances the practice of food hygiene and safety (Isara AR, et al., 2013). Our finding showed that the percentage scores from food safety knowledge before and after the training regarding Safety practices of food processing are showed improvement. The knowledge percentage scores for each question before training ranged from a minimum of 22.4% to a maximum of 79.4%. After the training it ranged from a minimum of 60.7% to a maximum of 97.2%.

Critically, cross-contamination from food contact surfaces could result in contamination of food; thus, attention needs to be given to training and supervision to ensure proper hand washing and appropriate cleaning and sanitation procedures to reduce or eliminate cross contamination (Sneed J et al., 2004). The process of decontamination chosen should be appropriate for the infection risk associated with the intended use of the equipment. Cleaning is an essential prerequisite to disinfection and sterilization and can be performed manually or mechanically(Lewis S et al., 2004).The results showed that the most parameters of washing, cleaning and drying equipment and tools had low percentage score before training as follows the appropriate time of washing and cleaning of tools and kitchen equipment (43.0%). There is no need to disinfect tools after cleaned because the cleaning process will ensure they are free of microbes (54.2 %). Correct application of equipment cleaning procedures do not reduce the risk of transmission of infection to patients (32.7%).it improved after training to (85.0%, 76.6% and 73.8) respectively.

Pests pose a significant health risk. In addition to being carriers of disease-causing organisms, pests also can contaminate food with foreign materials. Inadequate control can lead to pest infestations and serious consequences for the consumer health. The success of an organized sanitation program depends on the participation of all plant personnel. Training is also a key element for such a program to be successful. All supervisory personnel should share the responsibility of stimulating the interest of workers under them (Hui Y Het al, 2003). Food safety training of food handlers resulted in increases in the score percentages of pest control knowledge parameters and waste disposal from (50.5%, 53.3% and 63.6) to (75.7%, 75.7% and 81.3) respectively.

Table 2. Comparison of knowledge regarding food hygiene and safety before and after food Safety and hygiene training program.

Questions	Before training	After training	P - value
	Number Correct N (%)	Number Correct N (%)	
Personnel hygiene			
Do you have to wash your hands with soap and water then sanitizer	79 (73.8)	100 (93.5)	<0.001
Do you have to wash your hands before handling raw foods	99 (92.5)	100 (93.5)	0.906
Do you wash your hands after handling raw foods	98 (91.6)	104 (97.2)	0.146
Do you have to wash your hands before handling cooked foods	91 (85.0)	106 (99.1)	0.038
Do you have to use gloves when touching food or during food distribution to patients?	96 (89.7)	105 (98.1)	0.022
It Should be Avoid the follows during food preparation (Smoking, Sneezing, coughing, tasting food with fingers and touching the nose, hair, and the food)	38 (35.5)	71 (66.4)	<0.001
Do you have to wear a head cover when you touch food or during food distribution to patients?	81 (75.7)	102 (95.3)	<0.001
Do you have to use a mask in the area of preparation and processing or distribution of food for patients	80 (74.8)	104 (97.2)	<0.001
Premises			
There is no negative consequence of the small gaps on grounds, if cleaned on daily basis	54 (50.5)	94 (87.9)	<0.001
It is recommended that the walls and roofs made of materials that easy to be cleaned	69 (64.5)	92 (86.0)	0.001
Toilets must be far from the area of foods preparation	85 (79.4)	100 (93.5)	0.004
Toilets must be supplied with running water and there is no problem if the toilets do not have a soap and detergents	63 (58.9)	89 (83.2)	<0.001
Receiving of food ingredients			
Should the food handlers to check the food to make sure that it is not spoiled as well as validity dates	82 (76.6)	98 (91.6)	0.006
Transport vehicles should be equipped with refrigerator and freezer	81 (75.7)	100 (93.5)	0.001
It is possible to receive food with external defect in case of not expired food?	52 (48.6)	85 (79.4)	<0.001
Safety practices of food processing			
The refrigeration and freezing temperatures can be measured only by the temperature monitor that fixed in cooling and freezing rooms	54 (50.5)	40 (37.4)	0.099
Which of the following is the correct temperature of the refrigerator? (1C°, 1-4 C°, 5-9-8C°, 12C° & 13-16C)	45 (42.1)	82 (76.6)	<0.001

Is raw foods should be kept separate from cooked foods?	83 (77.6)	99 (92.5)	0.006
Is it important to know the refrigerator temperature to prevent or reduce the risk of food contamination?	82 (76.6)	101 (94.4)	0.001
There is no problem of defrost frozen food and re-frozen it again	52 (48.6)	73 (68.2)	0.006
Cutting Boards for meat are different from those for fish and also different from those of the vegetables	85 (79.4)	104 (97.2)	<0.001
Food must be cooked until the internal temperature reaches at least to(70C° for 2 minutes. 55C° for 5 minutes or 35C° for 30 minutes)	28 (26.2)	96 (89.7)	<0.001
The best way to keep the non-occurrence of food poisoning from fresh fruits and vegetables is washed with (warm water with soap, cold water or antibacterial agents)	36 (33.6)	88 (82.2)	<0.001
Serving of meals			
You must separate the food cooked from raw food during the food presentation.	79 (73.8)	104 (97.2)	<0.001
Cooked food that will be stored for the next day should be allowed to (cool then placed in the refrigerator, leave at room temperature (Kitchen) or placed in the refrigerator while still hot	48 (44.9)	83 (77.6)	<0.001
When reheating cooked food should be (heated properly or warm it)	55 (51.4)	68 (63.6)	0.093
To keep cooked food should be placed at a temperature of not less than (40 °C, 50°C or 60°C)	24 (22.4)	100 (93.5)	<0.001
You must keep the salad until served it at (refrigerator temperature less than 5°C or room temperature)	64 (59.8)	99 (92.5)	<0.001
Microbes multiply quickly at room temperature rather than in the refrigerator temperature.	77 (72.0)	101 (94.4)	<0.001
In the proper condition bacteria multiply at interval time (10-15, second10-30 minutes.1-2 hour)	40 (37.4)	89 (83.2)	<0.001
Washing , cleaning and drying equipment and tools			
When should tools and kitchen equipment be washed , rinsed and cleaned after each use	46 (43.0)	91 (85.0)	<0.001
There is no need to disinfect tools after cleaned because the cleaning process will ensure they are free of microbes	58 (54.2)	82 (76.6)	0.002
Correct application of equipment cleaning procedures do not reduce the risk of transmission of infection to patients	35 (32.7)	79 (73.8)	<0.001
Dryness should be done by using Tissues	69 (64.5)	96 (89.7)	<0.001
waste disposal			
Pesticides can be stored within the food trading places as long as it is sealed	57 (53.3)	81 (75.7)	0.001
When take a round in kitchen and found that its free from insect is that mean its 100% clean?	54 (50.5)	81 (75.7)	0.001
It is not necessary to cover the containers of disposable waste as long as it is disposed regularly	68 (63.6)	87 (81.3)	0.006
Diseases that may be transmitted through food			

Hepatitis virus may be transmitted through food	37 (34.6)	83 (77.6)	<0.001
Clostridium botulinum may be transmitted through food	36 (33.3)	97 (90.7)	<0.001
Salmonella may be transmitted through food	64 (59.8)	97 (90.7)	<0.001
Cholera may be transmitted through food	47 (43.9)	96 (89.7)	<0.001
Staphylococcus aureus may be transmitted through food	39 (36.4)	95 (88.8)	<0.001

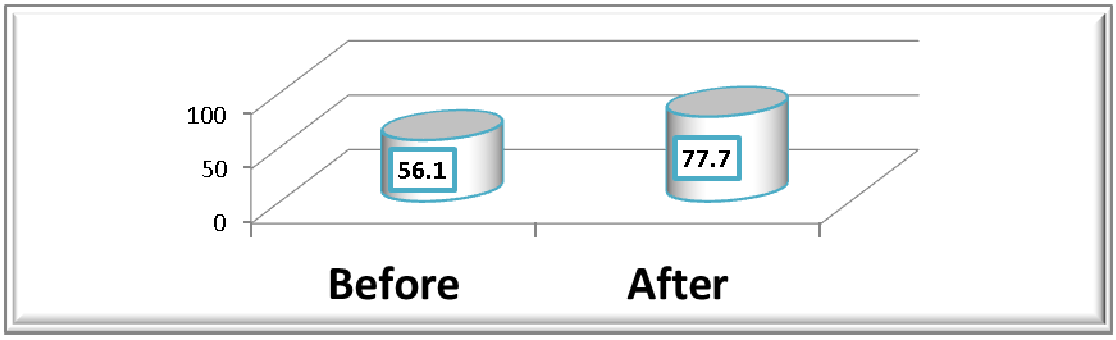

Figure 1. Comparison of mean knowledge percentage before and after food Safety and hygiene training program

4. Conclusion

The results of this study emphasizes the importance of the inclusion of training of food handlers in food safety and hygiene and support the assumption that the development of an education program for food handlers would increase food safety knowledge. The overall mean percentage of knowledge before an educational intervention was significant increased from 56.1% to 77.7% after an intervention ($p<0.001$).The overall scores were higher regarding personnel hygiene, however, it need reconsideration regarding food-borne diseases and sanitation. Continuous implementation of the food safety training is needed to increase food safety knowledge and improve food handling practices. In addition the retention of acquired knowledge and the changes of behavioural among staff should be monitored in order to design and implementation of the targeted training.

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