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Development and Assessment of Health Education Program Regarding Food Safety Among Food Handlers at Ain Shams University Hospitals, Cairo, Egypt

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Abstract---Background: Food safety at hospitals is of significant importance for the recovery and wellbeing of patients. Reasons beyond unsafe food at hospitals may be related to consumption of food contaminated with microorganisms or their toxins, which may result from unsafe sources, inadequate cooking or unhygienic practices during food preparation, handling and storage. Objectives: to identify the baseline knowledge and food handling practices of food safety among the food handlers in Ain Shams University Hospitals (ASU), and to develop a health education program about food safety for the food handlers and assess its outcome in ASU Hospitals. Method: one arm intervention study was carried out at the kitchens of ASU hospitals. All food handlers (n=75) in ASU hospital kitchens were recruited in this study. The study was carried out in three phases, the

first phase was evaluation of baseline knowledge and practices of participants using self-administered questionnaire and on site observation checklist (Pre-intervention phase), the second phase was health education program for food handlers (Intervention phase) which included several activities such as power point lecture, demonstration, playing video, interactive discussion and distribution of brochures. The third phase was evaluation of knowledge and practices after receiving health education program (Post-intervention phase) using the same tools as pre intervention phase. Results: The study showed that the majority of respondents (49.3%) had poor knowledge regarding food safety measures, and 10.7% of them had insufficient food safety practices. There was an improvement in food safety knowledge scores as it was 5.33 ± 3.31 in the pre intervention, then improved to 5.92 ± 2.28 , 7.21 ± 2.47 and 9.80 ± 1.92 immediately, 3 and 6 months after intervention respectively. A statistically significant difference was found when comparing food safety knowledge scores pre intervention with each time period post intervention ($p < 0.001$). Results also, showed that food safety practices scores was 8.35 ± 2.06 , improved to 9.20 ± 1.77 , 10.27 ± 1.23 & 11.40 ± 0.70 before intervention, and immediately, 3 months and 6 months after intervention respectively. Also, there was a statistically significant difference in food safety practice scores when comparing food safety practice scores pre intervention with each time period post intervention ($p < 0.001$). Conclusion & Recommendations: This study showed that training of food handlers on food safety has a significant impact on their knowledge and practices regarding this issue. We suggested that food safety intervention through continuous training programs must be done at regular basis even during normal working hours, so that corrective steps can be taken immediately after failures are identified. Meanwhile, periodic application of educational guidelines at university hospital kitchens should be provided at regular basis to improve food handlers knowledge and practices about safety food measures.

Keywords---knowledge, food handling practices, food safety, health educational program.

Introduction

Food safety is defined by the World Health Organization (WHO) as methods and procedures for ensuring that food is produced, preserved, distributed, and consumed safely, whereas unsafe food is defined as food that includes dangerous microorganisms such as bacteria, viruses, parasites, and chemical compounds (Aung et al., 2019). WHO reported that every year, there is one in ten people fall ill globally due to consuming unsafe food, resulting in 420,000 deaths. The global burden of foodborne diseases affects individuals of all ages, in particular persons living in low-income countries (WHO, 2021). The Middle East and North African countries including Egypt are classified as having the third-highest estimated burden of foodborne diseases per population. Annually, an estimated 100 million

people living in these regions fall ill with a foodborne illness. (Faour-Klingbeil&Todd, 2020).

A significant proportion of foodborne diseases at hospitals were attributable to food handler's practices including improper food processing practice, preparation, storage, lack of personal hygiene, and safety food measures (Sharif et al., 2013; Soliman et al., 2018). Centers for disease control and prevention (CDC) reported that approximately 20% of food-related infections are due to food handlers (Assefa et al., 2015). Public health problem and most foodborne illnesses' cases can be prevented by following the principles of food safety in all steps, from production to consumption (Saeed, Osaili &Taha, 2021). Although, food production should meet minimum standards including sufficient refrigeration facilities, training of food handlers and exclusion of infectious handlers from work, awareness with good personal hygienic practices, cross contamination, and the importance of temperature are all critical food borne illness prevention concepts for food handlers to know (Awad Allah et al., 2017). A good understanding of these concepts and implementation of these measures will help decreasing food outbreaks.

WHO, (2020) indicates that food safety education and training are the most effective methods to prevent food borne outbreaks. Food handlers must not only know "what" to do, but also "how" and "why" it is being done. The majority of food handlers do not understand why food safety handling practices are important unless they are properly trained (Latif, Elkarmalawy&Esmail, 2013). Therefore, there is an urgent need to improve the food safety knowledge and practices of food handlers (Malavi,Abong&Muzhingi, 2021).

The community health nurse has a basic role in the prevention of foodborne diseases and promoting awareness regarding food safety through conducting active educational and training programs for food handlers (Mohamed et al., 2020).Previous study in Egypt recommended a provision of educational programs for all food handlers on a nationwide large scale to gain more knowledge and attention regarding prevention of food borne diseases (Awad Allah et al. 2017). Therefore, this study aims to improve the food safety knowledge and increases awareness among food service providers in hospital kitchens. Objectives: To identify the baseline knowledge and food handling practices of food safety among the food handlers in ASU hospitals' kitchens and to develop a health education program about food safety for the food handlers and assess its outcome in ASU hospitals kitchens.

Method

Type, place & population of the study: one arm intervention study was carried out at the kitchens of ASU hospitals. All food handlers (n=75) in the ASU hospital kitchens [Ain Shams Maternity Hospital (n=40), and Cardio Thoracic Hospital kitchen (n=35)] are recruited in this study. Study duration: The study was conducted in one year and seven months from August 2019 till to March 2021.Study tools: data were collected through self- administrated questionnaire and on- site observation checklists. 1- Self-administered questionnaire was adopted from Al-Mohaithef (2014). The questionnaire composed of two parts. The

first part was about socio-demographic characteristics & attending training courses before joining job, and the second part included 12 closed ended questions about food safety knowledge such as cross contamination, methods of transmission of E-coli, signs of contaminated food, importance of hand washing & using gloves, action taken by food handlers when doubting about the food safety & when diseased, appropriate temperature control for cooking, refrigeration & storage of safe food & the reason of non-smoking in working area. The correct response for each question was given score one (1), the total score of knowledge was 12.

2-On- site observational checklist that was constructed according to FAO/WHO standards (FAO/WHO, 2016), review of literature and ASU expert opinions. It assessed the extent to which food handlers are applying food safety standard operating procedures, and kitchen conditions in hospitals. The checklist of evaluation of kitchen conditions compliance composed of three domains: The First Domain included four subdomains: location, and surrounding environment (4 items), working area design, and construction (8 items), sanitary requirements of garbage and waste disposal (6 items), and sanitary requirement of pest control (5 items). The Second Domain included seven subdomains: food preparation surfaces (2 items), food utensils and equipment (2 items), cleaning of equipment (7 items) & hand washing facilities (7 item), The Last Domain included four subdomains: sanitary requirement of food receiving (4 item), sanitary requirements of food storage (15 item), and sanitary requirements of food preparation and temperature control (11 item), and sanitary requirement of food serving (3 item). The checklist of evaluation of food safety practices compliance composed of personnel hygiene of food handlers (4 items) & habits of food handlers (8 item). Full compliance for each item was given score one (1), the total score of kitchen conditions was 74 & total score of practices was 12.

Study phases

The first phase (Pre-Intervention phase): In the pre intervention phase, evaluation of baseline knowledge was carried out in august 2019 over a period of two weeks, using self- administered questionnaire, in which the food handlers answered the questionnaire under investigator supervision. Next month, in September 2019, on-site observation was carried out using a constructed checklist to evaluate food preparation and handling by each food handler together with kitchen conditions. This step was done over a period of one and half month. The second phase (Intervention phase): Training health education program composed of one hour session and was delivered for food handlers at the managers 'offices, according to the chefs' shifts. The program steps were implemented at each hospital separately. Two sessions were given at each hospital; one for those working at night shift (7-8PM) and the other one for those working during day shift (10 - 11AM). The attendees were 35 attendees in Cardio Thoracic Academy kitchen and 40 in AS Maternity Hospital kitchen. The health education topics were identified based on inadequacies in food safety knowledge and practice of the food handlers that was noted after analysis of data gathered in the pre-intervention phase,

Session plan

The session contained several activities such as power point lecture, demonstration, playing video, interactive discussion and distribution of brochures. The power point lecture was started by a brief introduction on the purpose of training program to identify the principles of food contamination sources, and how to apply the basic knowledge to control hazards and prevent food poisoning; duration of lecture lasted 35 minutes. Outlines of lecture were: the main types of food contamination, appropriate methods to prevent contamination and stop bacterial growth, appropriate temperature for cooking and storing, the main rules of personal hygiene, correct way of hand washing ,and cleaning & disinfection methods. Then a short video about steps of washing hands (Hygiene practice) was played for 5 minutes, this videos was adopted from WHO, 2020. Five of food handlers were asked to demonstrate this practice in front of others (Learning by doing) for (10 minutes). Then interactive discussion were allowed for 10 minutes to exchange experiences. At the end of the session, brochures were distributed to illustrate examples of correct and incorrect practices, and steps of safe food handling

Reinforcement sessions were carried out also in both hospital kitchens 3 months later at December 2020. The session contained the same activities performed in the first time (power point lecture, demonstration, interactive discussion & distribution of brochures).The Third phase (Post-intervention phase): The program was evaluated on 3 time periods (immediately after the intervention in September, 2020, 3 months later in December, 2020 and 6 months after the intervention in March, 2021) by Completing the same Questionnaire & checklist used in the pre intervention phase for evaluation.

Pilot study

The questionnaire was checked by conducting a pilot among 15 food handlers at AS Hospital kitchen for internal medicine kitchen, to ensure clarity of questions, the wording of questionnaire, and to estimate the time needed to complete questionnaire.

Result

Demographic data

Table 1
Distribution of Food Handlers' working in ASU hospital kitchens by Socio-demographic Characteristics (N=75)

Socio-Demographic Data	No.	%
Age		
≤24 years	12	16%
25-<35 years	11	14.7%
35-<45 years	23	30.7%
45-59years	29	38.7%

Mean \pm SD	41.60 \pm 11.3	
Range	17 - 59	
Gender		
Male	33	44%
Female	42	56%
Educational level		
Preparatory level	50	66.7%
Secondary level	17	22.7%
University level	8	10.7%
Job title		
Main cook	31	41.3%
Cook	24	32%
Assistant cook	11	23.7%
Waiter / waitress	9	3%
Years of work Experience		
\leq One year	15	20%
2-5 years	20	26.7%
6-15 years	9	12%
16-25 years	31	41.3%
Received food safety training course		
Received	43	57.3%
Did not receive	32	42.7%

Table (1) shows that 38.7% of food handlers were in the age category from 45- 59 years with mean \pm SD 41.60 \pm 11.3. More than half (56%) of the studied group were females and 66.7% of the group did not complete secondary level of education. Approximately 40% of the group 41.3% worked as main cook with working experience ranged from 16 to 25 years. More than 50% of the total participants received training course about food safety before joining job.

Table 2
Knowledge and practice scores of food handlers as regard food safety measures
(N=75)

Total knowledge score	No.	%
Poor (<50%)	37	49.3%
Fair (50% - <75%)	28	37.3%
Good (\geq 75%)	10	13.3%
mean \pm SD	5.33 \pm 3.31	
Range	0-12	
Total practice scores		
Insufficient (<50%)	8	10.7%
Somewhat Sufficient (50% - <75%)	32	42.7%
Sufficient (\geq 75%)	35	46.7%

mean \pm SD	8.35 \pm 2.06
Range	0-12

Table (2) shows that the majority of respondents who had poor knowledge regarding food safety measures represented 49.3%% with mean score of Knowledge \pm SD was 5.33 \pm 3.31, and 10.7% had insufficient food safety practices with mean score of practice \pm SD were 8.35 \pm 2.06.

Table 3
Comparison of food safety Knowledge & practices scores pre intervention and after intervention among food handlers (N=75)

		Pre Program		After 6months Program		Chi-square test	P-value
		No. = 75		No. = 75			
Total score of all knowledge	Poor (<50%)	37	49.3%	2	2.7%	67.653	<0.001
	Fair (50-<75%)	28	37.3%	16	21.3%		
	Good (\geq 75%)	10	13.3%	57	76.0%		
Total Score of all Practice	Insufficient (<50%)	8	10.7%	0	0.0%	54.545	<0.001
	Somewhat Sufficient (50<75%)	32	42.7%	0	0.0%		
	Sufficient (\geq 75%)	35	46.7%	75	100.0%		

Table (3) shows that there was a statistically significant difference when comparing food safety knowledge & practices score before intervention & 6 months post intervention with improvement of poor knowledge scores and insufficient practice scores.

Table 4
Comparison of food safety knowledge pre intervention and after intervention among food handlers (N=75)

Total knowledge scores	Range	Mean \pm SD	ANOVA	P-value
			F	
Pre intervention	0 – 12	5.33 \pm 3.31	59.94	<0.001
Immediately post intervention	2 – 11	5.92 \pm 2.28		
3 months post intervention	2 – 11	7.21 \pm 2.47		
6 months post intervention	5 – 12	9.80 \pm 1.92		

Table (4) post hoc analysis using bonferoni shows that there was a statistically significant difference when comparing food safety knowledge before intervention with 3months & 6 months post intervention. However, there was a statistically significant difference among all time periods post intervention (immediately vs 3 months, immediately vs 6 months & 3 months vs 6 months).

Table 5
Comparison of food safety practices pre intervention and after intervention among food handlers (N=75).

Total practice scores	Range	Mean \pm SD	ANOVA	P-value
			F	
Pre intervention	3 – 12	8.35 \pm 2.06	69.53	<0.001
Immediately post intervention	5 – 12	9.20 \pm 1.77		
3 months post intervention	8 – 12	10.27 \pm 1.23		
6 months post intervention	9 – 12	11.40 \pm 0.70		

Table (5) post hoc analysis using bonferoni shows that there was a statistically significant difference when comparing food safety practice scores before intervention with each time period post intervention separately (pre intervention vs 3 months & pre intervention vs 6 months post intervention).Also, there was a statistically significant difference among all time periods post intervention (immediately vs 3 months, immediately vs 6 months & 3 months vs 6 months). Also, shows that there was no correlation between knowledge and practices among food handlers at the end of the health education program intervention ($p>0.05$).

Discussion

Diseases caused by foodborne diseases affect millions of people around the world each year. The real tragedy of food borne diseases happens in developing countries. (Alqurashi et al., 2019 & Okouret al., 2020). The world has made tremendous for the prevention of food borne diseases (FBDs) among patients, their companions, and hospital staff, effective food handling procedures by food handlers, as well as proper hygienic conditions in the kitchen, are essential. Food is produced in enormous numbers, and if not managed properly, outbreaks might occur, causing the hospital's services to be disrupted (Abebe et al., 2020).

Regarding socio-demographic characteristics of food handlers, the current study showed that 38.7% of food handlers were in the age category from 45-59 years with mean \pm SD 41.60 \pm 11.3. This was due to the new staff who are hired in ASU hospital mostly in adult age group. More than half of the studied group were females, as females are more represented in all nursing and food service occupations compared to males, this finding is in agreement with studies conducted in Egypt by Wahdan et al., (2019) and South Africa by Lesiba & Frederick, (2020) However, this finding is in disagreement with study conducted by Abdalfatah and Osman, (2020) who found that more than two-thirds of the study participants were males.. This disagreement can be clarified by cultural differences, as this study was conducted in upper – Egypt where the majority of food handling services are occupied by men.

Half of the studied group had less than secondary level of education. This may resulted from catering companies that tend to employ staff with low educational level to reduce the cost. In addition, the nutrition contract at

Egyptian hospitals usually doesn't require high qualifications to food handlers jobs compared with the professional jobs such as nutritionists and dieticians. Similarly, other studies in Egypt showed the same finding Al-Kandari et al., (2019) and Ahmed& Sayed (2021).

This finding, showed that 41.3% of food handlers worked as main cook .Nearly about 41.3% of the food handlers had an experience ranged from 16 to 25 years. More than 50% of the total participants received food safety training course before joining job. This finding is in the same line with study conducted by Wahdan et al., (2019), who reported that half of food handlers in governmental hospitals of an Egyptian governorate had previous food safety training courses, and incongruent with the Taha et al., (2020) in Dubai, United Arab Emirates who found most of the total participants didn't receive food safety training course. This incompatibility could be explained as different criteria of health care setting in different countries.

In general, specific standards for hospitals that related to education, training, and awareness of emergencies and disasters are requested from healthcare staff. All hospitals staff should have fundamental skills and knowledge to provide patients with best services and as well to secure their life. The current study, showed that only (49.3%) of respondents had poor knowledge regarding food safety measures. Other studies in Northern Ethiopia (Tessema et al., (2014), and India (Kubde et al., (2016)) reported nearly similar percentages of poor food safety knowledge.

On the other hand, this finding is lower if compared to rates in Egypt (60%) by Mohamed et al., (2020) & by Elsherbiny et al., (2019) who found more than half of the study had poor food safety knowledge, This discrepancy might be explained as patient characteristics difference as age, male sex, residence, higher education are indicators of good food safety knowledge. Regarding food safety practices, the present study also revealed that 10.7% had insufficient practices. .The finding is lower if compared to studies done in Egypt by Mohamed et al., (2020), Abdalfatah and Osman, (2020), who reported less than half of the participants had insufficient food safety practices, in Ethiopia as it was (47.5%) by Tessema et al., (2014), (46.3%) by Alemayehu et al., (2020) & in Jordan (48.2%) by Ma'moun, (2017). also, is lower if compared to rates in Egypt by Elsherbiny et al., (2018) who reported that the majority of both university and governmental food handlers had insufficient practice regarding food safety measures (94.9% and 84.2%) respectively, in Ethiopia as it was (70%) by Gizaw & Teka, (2017), and it was (79%) by Mussama , (2018). The discrepancy might be due to variation in institutions where study participants were selected, having better resources and a suitable setup for food handling practice which might improve food handlers' practice.

In the current study we found that there was a statistically significant difference in the food safety knowledge and food safety practices before and after intervention. This indicates that all food safety knowledge and practice of food handlers improved after the health education program. This result is in agreement with other studies conducted by Abdalfatah & Osman (2020) & Mohamed et al., (2020) in Egypt. This could be explained as food safety training

and education are essential to ensure that food handlers have the awareness and knowledge necessary to comply with food hygiene demands (*Raji et al.*, 2021).

In current study we found that there was no correlation between knowledge and practices among food handlers at the end of the health education program intervention. However, other studies done by Gaber *et al.*, 2019 in Egypt, Ncube *et al.*, 2020, Akabanda *et al.*, 2017 in Ghana, and Yenealem *et al.*, 2020 in Gondar found a significant positive correlation between knowledge & practices. This incompatibility may be due to difference of food safety education & training methods as continuous training, evaluation tools & channels of health education. Food safety intervention operations must be continuous and monitored, even during normal working hours, so that corrective steps can be taken immediately after failures are identified. As a result, in order not to only alert the food handlers to the error, but also to instruct them on why and how important it is to change certain wrong behaviors. Complete the basic principles of food safety and hygiene as cleaning, cross- contamination, cooling and cooking is important to adopt a set of existing standards help organizations identify and control food safety hazard. These are requirements for providing audit and accreditation of food safety.

Conclusion

In the light of the present study results, one can conclude that, the implementation of the educational guidelines was significantly effective in improving the food handlers' knowledge, and practices regarding safety food measures in health care setting.

Recommendations

- Periodic application of educational guidelines at university hospital kitchens to improve food handlers knowledge about safety food measures.
- Conducting regular training programs to equip food handlers with skills regarding safety food measures.
- Food safety intervention operations must be continuous and monitored, even during normal working hours, so that corrective steps can be taken immediately after failures are identified.

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