

Evaluating the Effect of Food Safety Educational Program among Food Handlers at Students' Hostels, Cairo University

Heba Magdy Sharaa

Community Health Nursing, Faculty of Nursing, Cairo University, Cairo, Egypt

Abstract: Food safety is the utilization of various resources and strategies to ensure that all types of foods are properly stored, prepared and preserved so they are safe for consumption. Empowering food handlers with the needed knowledge and practices of safe food are necessary to achieve proper health of the community. The aim of this study was to evaluate the effect of education program about food safety among food handlers working in the selected students' hostels at Cairo University, in addition to assessing students' satisfaction about the service offered. Design, a quasi – experimental research design (pre/post test) was utilized in this study. The study conducted at four students' hostels belonging to Cairo University (El-Giza students' hostel, Bolak El-Dakror students' hostel, El-Kasr El-Einy students' hostel, El-Agouza students' hostel). Sample, the study was carried out on 60 food handlers working in the selected students' hostels. Also, 240 stakeholders from students who benefit from the service offered in university hostels were included in the study. Three tools utilized in the current study. These tools were developed by the researcher. The first tool is a self-administrated questionnaire that divided into three parts: first part includes personal data about food handlers; second part includes assessment of knowledge of food handlers about safe food, third part includes assessment of food handlers' reported practices regarding safe food. Second tool: includes assessment of students' satisfaction about services offered. Third tool: observation checklist for work environment. A statistically significant difference was found in food handlers' knowledge score, pre and post educational program (pre 31.7% and the post is elevated to 85%). Also, a statistically significant difference was found in food handlers' practice score, pre and post educational program (pre 76.7% and the post is elevated to 85%). It was found also that 24.3% of the students were highly satisfied about the service offered inside student hostels. The study concluded that, the educational program was effective in improving the knowledge and practices of food handlers which will have positive effect on students' health. The study recommended that the educational program of safe food handling should be provided to all food handlers in different students' hostels.

Key words: Food Handlers • Food Safety • Education Program • Students' Hostels

INTRODUCTION

Food-borne related illnesses have increased over the years and negatively affected the health and economic well-being of many developing nations [1]. The World Health Organization (WHO) states that about 1.8 million persons died from diarrheal diseases in 2015, mainly due to the ingestion of contaminated food and drinking water. Food poisoning occurs as a result of consuming food contaminated with microorganisms or their toxins, the contamination arising from inadequate preservation methods, unhygienic handling practices, cross-contamination from food contact surfaces, or from

persons carrying microbes in their nails or skin. Unhygienic practices during food preparation, handling and storage creates the conditions that allows transmission of disease causing organisms such as bacteria, viruses and other food-borne pathogens [2]. Additionally, many reported cases of food-borne viral diseases have been attributed to infected food-handlers involved in catering services [3].

Proper food handling practices can significantly reduce the risk of foodborne illness. Food handling is any aspect of the operations in the preparation, transportation, storage, packaging, wrapping, exposure for sale, or delivery of food. Safe food handling is

important in our daily lives. Improperly handled or served food, will cause illness, disability or even death [4, 5]. According to Elsherbiny *et al.* [6], food safety is defined as the conditions and measures that are necessary along the food production chain to ensure that it is safe, sound and fit for human consumption. Food is considered safe when it is free from chemical, biological or physical hazards that may result in illnesses or even death to the consumers.

Food safety is a concern as it poses risks to the population, especially to vulnerable groups such as infants and young children, adolescents, elderly individuals and those with immunodeficiency disorders [7]. The wide attention given to food safety is also due to the upward trend of food borne illness incidence rates over the past 20 years. Food borne diseases and threats to food safety constitute a growing public health problem. Researchers estimated that food borne and waterborne diarrheal diseases taken together kill about 2.2 million people annually, 1.9 million of them are children & adolescents and about 70% from developing countries [8, 9].

Every year, approximately 2.2 million people, a majority of whom are adolescents living in developing countries, die as a result of food and water contamination [10]. Food poisoning diseases like typhoid fever occur in 16.6 million people and cause 600, 000 deaths every year around the world. Contaminated foods are seen as being responsible for nearly 76 million infections, 325, 000 hospital cases and 5000 deaths every year [11]. According to data from the Centers for Disease Control and Prevention (CDC), it was estimated that, one out of every six persons was infected with food-borne illness (48 million people) and that food-borne illnesses resulted in 128, 000 hospital cases and 3000 deaths [12, 13].

Studies have confirmed the existence of pathogenic microbes on food handlers' hands and therefore they are considered an inevitable source of food borne diseases [14]. Furthermore, previous studies have demonstrated the essential role of inadequate food handlers' knowledge, attitude and practice in the occurrence of food poisoning [15, 16]. Understanding of good personal hygienic practices and cross contamination methods, are critical food borne illness prevention concepts for food handlers to know. Offering education and training to food handlers about food safety inside the kitchen and restaurants, will lead to improving their knowledge and correct practices, preventing food borne illness and improving consumers' health [17].

In students' hostels, appropriate food handling procedures by food handlers, together with proper

hygienic conditions in the kitchen are basic concepts for prevention of food borne diseases (FBDs) among university students. These hostels are considered as crowded places where big numbers of students are available and they have their daily meals inside. Food is produced in large quantities and if not properly prepared and served can cause outbreaks and result in disruption of the services provided by the hostel. In addition, ensuring good sources of food, proper inspection and storage, are the most important practices that must be monitored regularly by health [18-20].

It is important that food handlers inside students' hostels to follow proper hygienic practices during preparation and handling of food, as hand hygiene, usage of personal protective equipment (PPE) [clean coats, head covers, gloves and masks], in addition to ensuring clean and healthy environmental conditions inside the kitchens of hostels as: cleaning of equipment used, sanitary waste disposal, healthy food storage and getting rid of any insects. Food safety education and training for food handlers is crucial in improving their practices during food handling process and consequently help in preventing food born diseases [21-23]. So, the aim of the current study was to evaluate the effect of education program about food safety among food handlers working in the selected students' hostels at Cairo University, as well as assessing students' satisfaction about the service offered.

MATERIALS AND METHODS

Research Design: Quasi – experimental research design (pre/post test) was utilized in this study, where the food handlers sample served as their own control. Data were collected two times: before and one month after implementation of the program on the study group.

Sample: All food handlers (n=60) from the four selected students' hostels, were involved in this study. Informed consent was given to respondents prior to data collection. Also, 240 stakeholders from female students who benefit from services in university hostels were included in the study. These students were selected using simple random technique.

Setting: The study was conducted at four students' university hostels:

- El-Giza students' hostel, Bolak Eldakror students' hostel, Elkasr el Ainy students' hostel, El-Agoza students' hostel.

These students' hostels were selected as these hostels belong to Cairo University, which is considered as the great university in Giza governorate. The hostels' restaurants are arranged nearly in the same manner. These restaurants are composed of 4 rooms: one big kitchen, 2 storerooms and one bathroom. The kitchen composed of 4 big Furnaces and 3 large basins for washing vegetables, cleaning dishes and hand washing, in addition to 2 big tables, 3 Suction machines, 3 big baskets and fire extinguisher.

Tools of Data Collection: Three tools were utilized in the current study; they are developed by the researcher after extensive review of literature. They are as following:

First Tool: Assessment Sheet of Food Handlers' Knowledge and Practices Regarding Food Safety. It Is Composed of 3 Parts:

- First part includes demographic data about food handlers as their gender, age, educational level, marital status and type of work.
- Second part includes questionnaire about knowledge of food handlers. This part was applied pre and post program application.

Aim of this part, to assess the knowledge of food handlers about food safety.

This part includes 15 questions related to the knowledge about food safety, food pollution sources and healthy food handling inside the kitchen.

Scoring System: The scores of questions ranged between 1 and 0. For every correct answer, a score of "1" was given, while score "0" was given for every incorrect or unanswered questions.

Regarding true and false questions: True was given a score of (1) and false was given a score of (0).

Third part includes questionnaire about reported practices of food handlers. This part was also applied pre and post program application.

Aim of this part, to assess reported practices of food handlers regarding food safety.

This part includes 22 questions about practices performed by food handlers in the kitchen of students' hostel before, during and after preparing food.

Scoring System: Questions of this part were answered with three points: never, sometimes and always. Each correct practice (always) was given a score of "1" while incorrect practices (never or sometimes) were given a score of "0".

All knowledge and self-reported practices scores were converted into percentages and the mean scores obtained were considered sufficient if above 50% and insufficient if below 50% (for knowledge) and satisfactory & unsatisfactory (for practice).

Second Tool: Students' Satisfaction Scale: This tool was applied after program implementation.

Aim of the Tool: To assess the students' satisfaction about food services offered at students' University hostels.

This tool includes nine questions related to students' satisfaction about food amount, hygiene level, the food quality, etc.

Scoring System: The responses were graded on three points scale: agree, sometimes and disagree. The scores of questions ranged as follow: for "agree" answer, it was given score of (3), "sometimes", was given score of (2), while "disagree" was given score of (1).

Third Tool: Observation of Work Environment

Aim of this Tool: To assess environmental work conditions inside the kitchen and the restaurant of students' hostels.

- This tool includes 14 statements about the work environment inside the kitchen of students' hostels, where food is handled and prepared for students. Items observed like: lighting system, ventilation, water resources, electric source and waste disposal system.

Scoring System: The scores of statements ranged between (1) if the item present and (0) if not present.

Tool Validity and Reliability: The questionnaire was validated through conducting a pilot study on 10% of food handlers, to ensure the clarity of the content of tools. This pilot sample was included in the study as no modifications were done to the tools. Also content validity was done by distributing the tools on five experts in occupational health nursing field, to confirm the questionnaire's accuracy based on their feedback. Cronbach alpha coefficient of internal consistency was used to estimate the reliability of the questionnaire. Alpha coefficient of the instrument was 0.74.

Ethical and Legal Consideration: An official permission was taken from the administrators of the students' hostels

that belong to Cairo University. The researcher then met the managers of each university hostel, who permit the meeting with food handlers working inside the kitchen and restaurants of those hostels. Before distributing the questionnaire, food handlers were informed that their answers are confidential, their participation in the study is voluntary, their rights and anonymity are secured through coding the data.

Phases of Program Implementation: After obtaining all the needed permissions, the researcher conducted a meeting with food handlers working inside the kitchen and restaurants of students' hostels, to explain the purpose of the study. The aim of the program was to increase knowledge and improve practices of food handlers regarding food safety while they are working in the kitchen.

Assessment Phases: In this phase, tools were developed and pre-test assessment of food handlers' knowledge and practices was done through semi structured interview technique. The questionnaires were distributed by the researcher after careful explanation and encouragement to fill them. Besides, any questions raised by food handlers were answered by the researcher. Then sheets were collected and reviewed to detect any missing questions. At the same time, assessment of work environment (including the kitchen and restaurant of the hostel) was implemented by the researcher. The researcher tried to build a trustful relationship and keep relaxing atmosphere with food handlers to gain their cooperation and interest.

Planning Phase: This phase includes development of food safety education program in Arabic language after reviewing the related literature, in addition to determining teaching place inside each university hostel, arrangement of program sessions, teaching methods and handouts. The researcher used simple teaching methods such as lectures and discussion. The media used were as power point presentation, boosters and booklets regarding safe food knowledge and practices.

Implementation Phase: In this phase, the program was implemented on three sessions per week for every university hostel. The first session concerned with obtaining background knowledge and practices of safe food handling. The second session concerned with giving health teaching about food safety knowledge and practice. The third session concerned with continuing education and demonstration of correct practices, in

addition to answering any question raised by food handlers. Sessions were given in the form of teaching classes and duration of each session ranged between 30-45 minutes, followed by 10 minutes summary and revision. Participation, open discussion and role play were the main teaching methods utilized. Competitions among food handlers were done to help them to gain the best possible knowledge regarding food safety.

Evaluation Phase: In this phase, post-test was carried out for the entire group of food handlers one month after completing the educational program sessions. The purpose of evaluation was to assess the change in students' knowledge and practices regarding food safety. Also, assessment of students' satisfaction about service offered inside restaurants of each student hostel was done after implantation of the program.

Statistical Design: The data will be scored, tabulated and analyzed by computer using the "statistical package for the social sciences "(SPSS) program version 20. Descriptive as well as inferential statistics were utilized to analyze data pertinent to the study. Data were presented as number, percentage, mean and standard deviation. Chi-square test and paired T-test were used to compare between pre and post-test data, the association between study variables. Bivariate correlation analysis was used to determine the correlation between knowledge level and practices of food handlers. P-value was considered statistically significant when $P < 0.05$.

RESULTS

The Study Results Will Be Presented in the Following Sequence:

Part 1: Personal characteristics of food handlers working in the selected university hostels (N=60).

Part 2: Percentage distribution of food handlers according to their level of knowledge and practices regarding food safety pre and post program (N=60).

Part 3: Distribution of students' satisfaction regarding service offered at the selected students' hostels (N=240).

Part 4: Environmental assessment of kitchen and restaurants of the selected the students' hostels.

Part 5: Relation between study variables.

Table 1: Distribution of food handlers according to their personal characteristics (N=60)

Personal characteristics	N	%
Age		
<40	25	41.6
40+	35	58.4
Gender		
Males	38	63.3
Females	22	36.7
Marital Status		
Married	45	75
Single	4	6.7
Widowed	5	8.3
Divorced	6	10
Residence Place		
Urban	40	66.7
Rural	20	33.3
Years of experience		
< 5 years	21	35
5years +	39	65
Total	60	100

Table (1) indicates that 58.4% of food handlers aged less than 40 years, 63.3% of them were males. The same table also showed that 75.0% of food handlers were married, while 6.7% of them were single. Regarding residence place and years of experience, 66.7% of food handlers were living in urban areas, while 65% of them had got more than five years of experience.

Figure (1) indicates that 46.7% of food handlers were working as cooks, while 8.4% of them were nutrition specialists and 3.3% of them were storeroom workers.

Figure (2) specifies that 40.0 % of food handlers had got secondary level of education, while 6.7% of them had high level education.

Figure (3) indicates that food handlers' knowledge level has been improved significantly after program implementation.

Figure (4) denotes that practice level of food handlers has been improved after program implementation.

Figure (5) specifies that 24.3% of the students were highly satisfied about the service offered inside students' hostels.

Table (2) points out that El-Giza and Bolak El Dakror students' hostels had got the highest percent score of environmental cleanliness (78.5%) , followed by Elkasr el Ainy student hostel (50%) and El-Agoza student hostel (35.7%).

Table (3) indicates that there is a highly significant relation between the mean knowledge score of food handlers and their mean practice score, pre and post program application (P value=.000).

Table (4) demonstrates that there is a significant correlation between age and experience years of food handlers and their knowledge & practice, pre and post program application.

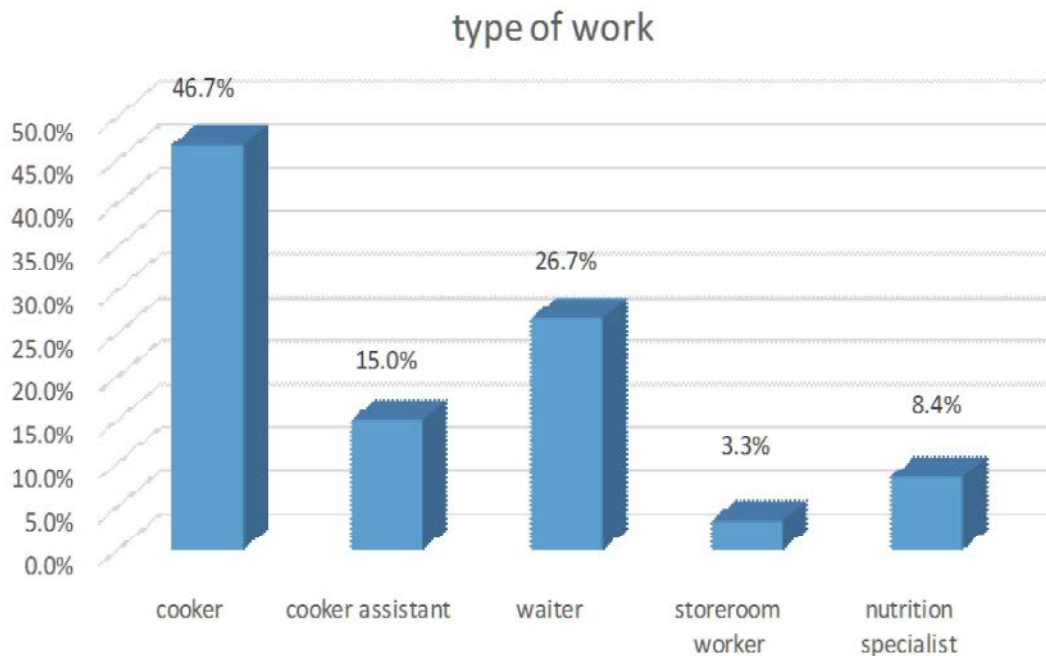


Fig. 1: Percentage distribution of work types among food handlers at the selected students' hostels. (N=60)

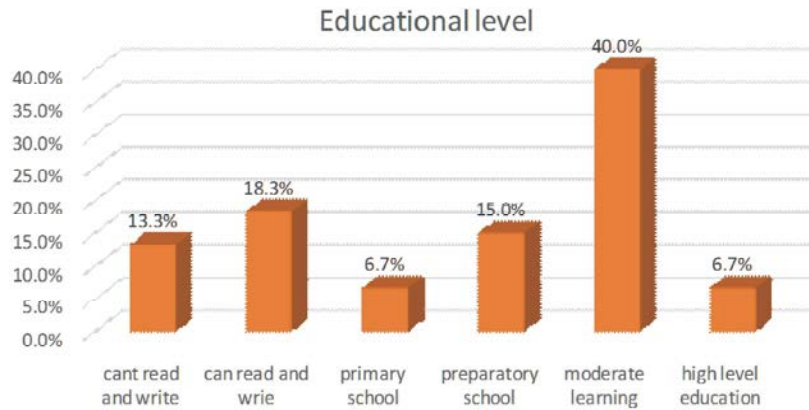


Fig. 2: Percentage distribution of educational level of food handlers at the selected students' hostels. (N=60)

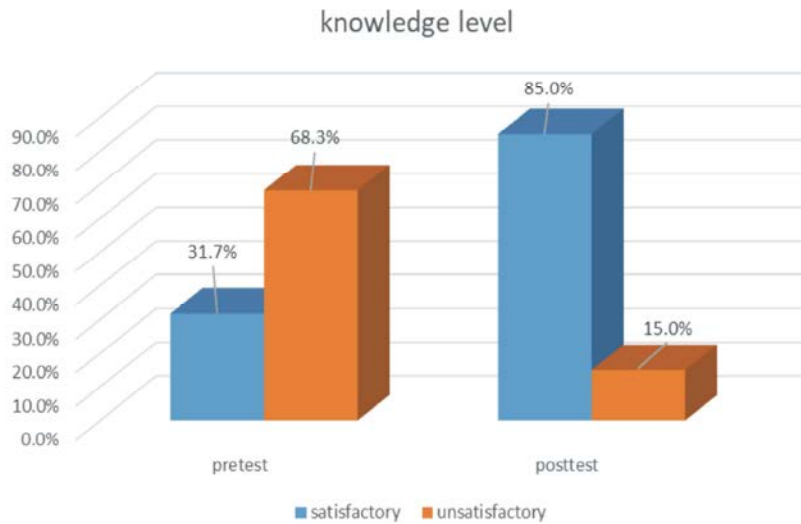


Fig. 3: Percentage distribution of food handlers' knowledge level regarding food safety, pre and post program implementation (N=60)

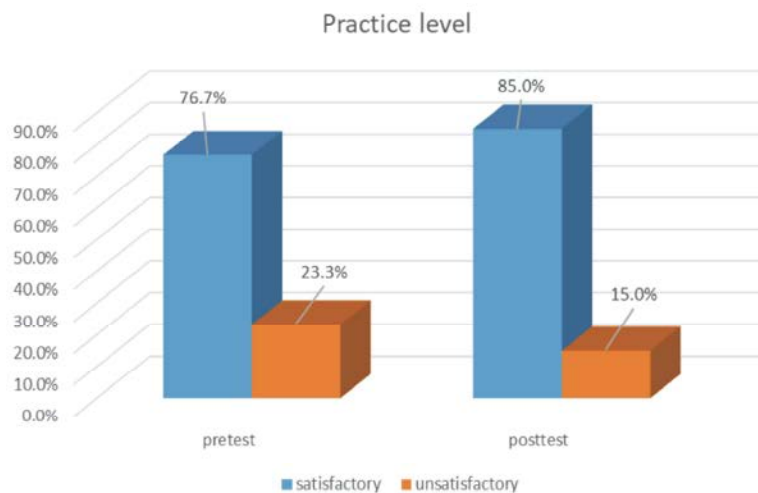


Fig. 4: Percentage distribution of food handlers' practice level regarding food safety, pre and post program implementation (N=60)

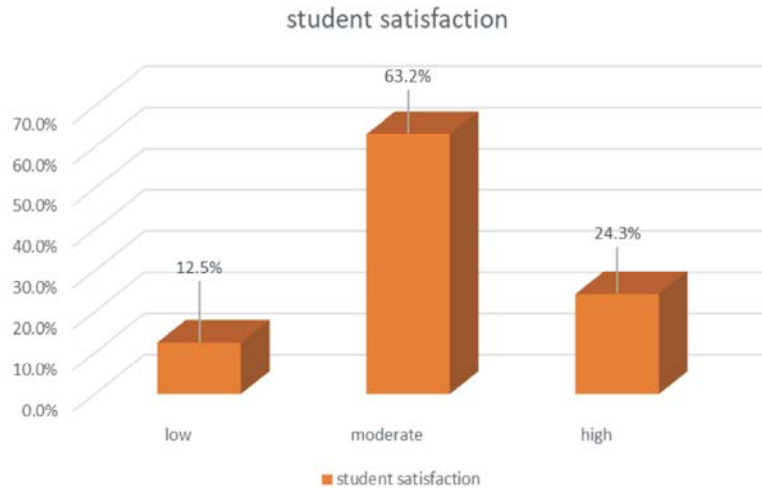


Fig. 5: Percentage distribution of students' satisfaction regarding service offered at the selected students' hostels (N=240)

Table 2: Percentage distribution of environmental assessment of the selected students' hostels

Environment characteristic	El-Giza students' hostel		Bolak Eldakror students' hostel		Elkasr el Ainy students' hostel		El-Agoza students' hostel	
	No	%	No	%	No	%	No	%
Total environmental cleanliness	11	78.5%	11	78.5%	7	50%	5	35.7%

Table 3: Correlation between food handlers' mean knowledge and practice scores, pre and post program implementation (N=60)

Variables	Pretest		Posttest		Paired t-test	
	Mean	SD	Mean	SD	t	p
Knowledge	9.80	5.028	18.08	4.018	- 11.904	.000
Practice	13.48	5.030	18.87	4.405	- 8.384	.000

* Significant at P < 0.05

Table 4: The correlation between food handlers' demographic characteristics (age and experience years) and their knowledge and practice, pre and post program implementation

Variables	Pearson Correlation	Knowledge pre-test	Practice pre-test	Knowledge post-test	Practice post-test
Age	r	.362	.308	.284	.287
	p	.004*	.004*	.003	.003*
Experience years	r	.295	.296	.259	.325
	p	.002*	.002*	0.02*	.003*

* Significant at P < 0.05

Table 5: Correlation between food handlers' gender, educational level, residence place and type of work with their knowledge before and after program application (N=60)

Demographic variable	Categories	Mean	SD	Test result	P-value
Gender	Male	17.82	4.386	.68**	.13
	Female	18.55	3.334		
Educational level	Can't read and write	20.00	2.070	1.412*	.001
	Can read and write	18.45	3.417		
	Primary school	20.50	1.291		
	Preparatory school	17.11	4.702		
	Secondary level	16.92	4.662		
Residence place	High level education	20.00	2.160	1.61**	.001
	Rural	16.84	4.787		
Type of work	Urban	18.63	3.564	.826*	.537
	Cooker	17.96	4.041		
Cooker assistant	16.67	4.031			
Waiter	18.69	3.790			
Storeroom worker	15.50	9.192			
Nutritional specialist	20.00	2.160			

*means one way ANOVA, **means independent t-test.

Table 6: Correlation between food handlers' gender, educational level, residence place and type of work with their practice before and after program application (N=60)

Demographic variable	Categories	Mean	SD	Test result	P-value
Gender	Male	19.61	4.880	.61**	.02
	Female	18.32	3.497		
Educational level	Can't read and write	20.25	1.982	1.286*	.01
	Can read and write	19.18	3.995		
	Primary school	22.00	1.155		
	preparatory school	18.67	4.555		
	Secondary learning	17.46	5.357		
	High level education	21.00	1.414		
Residence place	Country side	17.79	5.159	1.27**	.08
	Urban	19.35	4.029		
Type of work	Cooker	18.82	4.884	.622*	.683
	Cooker assistant	17.67	3.937		
	Waiter	19.56	4.066		
	Storeroom worker	15.50	7.778		
	Nutritional specialist	21.00	1.414		

*means one way ANOVA, **means independent t-test

Table (5) shows that there is a significant relation between food handlers' knowledge about food safety and their educational level and residence place before and after program application.

Table (6) indicates that there was a significant relation between food handlers' practice regarding food safety with their gender and educational level before and after program application.

DISCUSSION

Food safety is an increasingly important public health issue since years ago until now. There has been a sharp increase in concern for the safety of food among the wealthy members of various societies; however, the problem of food borne illnesses occurs within the developing countries. More cases were apparent on consuming unhealthy food which affects the people especially young adolescents and university students, although various efforts have been done by health personnel to overcome this problem. Unfortunately, still many people did not realize the importance of knowledge and correct practices about food safety [17].

The results of the current study showed that more than half (58.4%) of food handlers aged less than 40 years, nearly two thirds (63.3%) of them were males, more than quarter of them (40.0 %) had got secondary level of education, three quarters (75.0%) were married, while two thirds of them (66.7%) were living in urban areas and 65% of them had got more than five years of experience. Nearly same results were found in a cross sectional study, done by Elsherbiny *et al.* [6], on 132 workers in food

catering services in Ismailia city hospitals, to assess their knowledge, attitude and practice about food safety. It was found that 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. Regarding working experience, 53% of the participants had less than 10 years of experience in food handling. Most of them were technicians (42.4%), while 14.4 % were cooks.

The current study revealed that food handlers' knowledge and practice level have been improved significantly after program implementation, with highly significant relation between the mean knowledge score of food handlers and their mean practice score, pre and post program implementation. This result was supported with a study done by Norazmir *et al.* [24], to examine the level of food safety knowledge and practices from two secondary school students and to identify the correlation between food safety knowledge levels with practices in Johor, Malaysia. It was found that students' knowledge on food safety was good for both schools and 79.1% of them were included in good practice range. Results also showed that a high level of food safety knowledge and practices was possessed by both groups, male and female students.

In the same line, another study by Wahdan *et al.* [23], to assess the food safety practices of food handlers in governmental hospitals of Gharbia Governorate, Egypt and to design, implement and evaluate the effect of an intervention program on these practices. The study concluded that there is a significant effect of the intervention program on food safety practices among

food handlers. Also, there was a relation between food handlers' knowledge score and their practice score; this means with the increased knowledge level, there would be an improvement in their practice level. Therefore, it is recommended to conduct regular training courses to all food handlers as part of their continuous education in order to improve their practices toward food handling.

Another study by Ngivu [22], which conducted to determine the impact of food handlers' food safety training on infection control compliance and particularly on food safety standards compliance. It was demonstrated that food handlers' knowledge and practices had been improved significantly after application of the training on infection control measures associated with food handling. In addition to a significant relation between food handlers' knowledge score and their practices' score.

The current study pointed out that 24.3% of the students were highly satisfied about the service offered inside the kitchen and restaurant of students' hostel. Similar result was found by a study by Ekpoh [25], who conducted a study to investigate students' satisfaction with service delivery in universities in Akwa Ibom and Cross River States, Nigeria. The findings of this study showed that 30 % of students were moderately satisfied with service delivery in students' hostel aspect of health, cleanliness and transport services. The findings also indicated that 20% of students were dissatisfied with services delivery inside restaurant of the hostel. In the same line, another study done by Suki and Chowdhury [26] to investigate whether location, facilities and quality of on-campus hostels affect students' attitude living in on-campus hostels and their satisfaction with hostel life. It was found that the majority of students (80%) were not satisfied about the service offered inside hostels. Satisfaction of students living in hostels is affected by hostels' quality, hostels' facilities and hygienic level especially concerning kitchen and restaurants of these hostels.

The results of the current study represented a significant correlation between age, educational level, residence place and experience years of food handlers with their knowledge & practice regarding food safety. There were a varying results demonstrated by many studies in this area of research. A study done by Dora-Liyana *et al.* [27], the purpose of this study was to evaluate the knowledge, attitude and practices (KAP) towards food safety among 134 food handlers from seven boarding schools in the Northern Region of Malaysia. It was found that the food handlers had got

excellent knowledge, positive attitude and good self-reported practices regarding food safety and hygiene. The results also showed significant differences between genders of food handlers with their personal hygiene, cross-contamination knowledge and food safety attitudes, while there was no difference between genders in their self-reported practices. Self-reported food safety and hygiene practice scores were not affected by education level also.

This is similar to the respondents in the study by Abdullah Sani and Siow [28] who performed their study to determine the level of knowledge, attitudes and practices of 112 food handlers in food service operation at the main campus of Universiti Kebangsaan Malaysia (UKM) regarding food safety. It was mentioned that female food handlers scored higher in food safety knowledge. Conversely, findings by Yardimci *et al.* [29], who made their cross-sectional study to determine the hygiene knowledge of the staff (N = 317) employed in kitchen and service departments of catering firms in Ankara. It showed that male food handlers having significantly higher mean scores on food hygiene knowledge, although the mean score difference between the male and female food handlers was small.

In agreement with the results of the current study, another study was conducted by Moreb *et al.* [2], to assess knowledge of 821 people living in the Republic of Ireland on food safety and their practices on preparing food at home. The results showed that, gender, age, place of residents, educational level and marital status showed significant relation with the knowledge of food safety practices among participants ($P < 0.05$).

Another study by Teffo and Tabit [30] was done to investigate the factors that influence food safety knowledge (FSK) and food safety attitudes (FSA) of employees involved in the preparation and/or the serving food from nine hospitals in the Capricorn District Municipality (CDM) in Limpopo Province, South Africa. It was pointed out that the majority of respondents possessed a satisfactory FSK outcome and good FSA outcome. Food handlers with higher levels of education, years of experience and job position did not necessarily possess better FSK and FSA outcomes. Also, there was a positive significant correlation between food safety knowledge and attitude outcomes. So, it was recommended that all food handlers working in the kitchen and restaurants, irrespective of their level of education, years of food handling experience or job description, should be subjected to continuous food safety training programs [31, 32].

CONCLUSION

The present study concluded that the program was effective in improving food handlers' knowledge and practice. There was a statistically significant difference between food handlers' knowledge and practice before and after program implementation. Regarding students' satisfaction regarding service offered inside students' hostels, it was found that 24.3% of them were highly satisfied about it. Furthermore, the findings showed that there was positive correlation between food handlers' total knowledge mean score and their total practice mean score pre and post program implementation.

Recommendations: Based upon the result of current research study the following recommendations are suggested:

- Education and training courses on safe food handling should be provided to all food handlers in different university students' hostels.
- Conducting regular visits by health authority personnel for inspection of food handlers, as well as safety restaurants' working environment.
- Development of food safety guidelines manual that must be distributed to food handlers to ensure following healthy food preparation standards and proper work environment inside the kitchens.
- Performing periodic in-service training on food safety for kitchen staff members to improve their knowledge and practice about safe food handling.

REFERENCES

1. World Health Organization WHO, 2017. WHO Fact Sheet. Available online: <http://www.who.int/mediacentre/factsheets/fs399/en/> WHO: Geneva, Switzerland.
2. Moreb, N.A., A. Priyadarshini and A.K. Jaiswal, 2017. Knowledge of food safety and food handling practices amongst food handlers in the Republic of Ireland. *Food Control*, 80: 341-349.
3. Gong, S., X. Wang, Y. Yang and L. Bai, 2016. Knowledge of food safety and handling in households: A survey of food handlers in Mainland China. *Food Control*, 64: 45-53.
4. Osaili, T., A. Al-Nabulsi and H. Krasneh, 2018. Food safety knowledge among foodservice staff at the universities in Jordan." *Food Control*, 89: 167-176.
5. Aslam, S., G. Umbreen, F. Jahangir, R. Bano and Z. Akhtar, 2020. Food Safety Knowledge and Practices among Food Handlers in Food Street Lahore. *International Journal of Medical Research & Health Sciences*, 9(5): 81-88.
6. Elsherbiny, N.M., S.A. Sobhy, L. Fiala and M.A. Abbas, 2019. Knowledge, attitude and practices of food safety among food handlers in Ismailia city hospitals, Egypt. *International Journal of Advanced Community Medicine*, 2(2): 96-102.
7. Soon, J.M., H. Singh and R. Baines, 2011. "Food-borne diseases in Malaysia: a review", *Food Control*, 22(6): 823-830.
8. Food and Agriculture Organization of the United Nations (FAO), 2019. Regional Overview of Food Security and Nutrition in Europe and Central Asia Food Sciences. FAO. 2019. Structural Transformations of Agriculture for Improved Food Security, Nutrition and Environment. Budapest. Licence: CC BY-NC-SA 3.0 IGO.
9. Pollard, C.M., X. Meng, S. Williamson, J. Dodds and C.W. Binns, 2013. Eating out is associated with self-reported food poisoning: a Western Australia population perspective, 1998 to 2009. *Public Health Nutrition*, 17(10): 2270-2277.
10. World Health Organization WHO, 2019. Fact sheets: Food safety. www.fda.gov/Food/GuidanceRegulation/
11. Fukuda, K., 2015. Food safety in a globalized world. *Bull World Health Organization* Apr 1; 93(4): 212.
12. CDC, 2014. Incidence and Trends of Infection with Pathogens Transmitted Commonly Through Food: Foodborne Diseases Active Surveillance Network, Morbidity and Mortality Weekly Report. 63(15): 328-332.
13. Courtney, S.M., S.E. Majowicz and J.A. Dubin, 2016. Food safety knowledge of undergraduate students at a Canadian university: results of an online survey. *BMC Public Health*, 16: 1147-1163.
14. Al-Shabib, N.A., S.H. Mosilhey and F.M. Husain, 2016. Cross-sectional study on food safety knowledge, attitude and practices of male food handlers employed in restaurants of King Saud University, Saudi Arabia. *Food Control*, 59: 212-217.
15. Zeeshan, M., H. Shah, Y. Durrani, M. Ayub, Z. Jan and M. Shah, 2017. A Questionnaire Based Survey on Food Safety Knowledge during Food Handling and Food Preparation Practices among University Students. *Journal of Clinical Nutrition & Dietetics*, 3(2): 1-8.

16. Al-Suwaidi, A., H. Hussein, W. Al- Faisal, E. El-Sawaf and A. Wasfy, 2015. Hygienic Practices among Food Handlers in Dubai. *International Journal of Preventive Medicine Research*, 1:101-108.
17. Alqurashi, N.A., A. Priyadarshini and A.K. Jaiswal, 2019. Evaluating Food Safety Knowledge and Practices among Food service Staff in Al Madinah Hospitals, Saudi Arabia. *Safety*, 5: 9.
18. Baffour, P.A., K.B. Sekyere and E.A. Addy, 2013. Policy on hazard analysis and critical control point (HACCP) and adherence to food preparation guidelines: a cross sectional survey of stakeholders in food service in Kumasi, Ghana. *BioMedical Central Research Note*. 6: 442.
19. Trafialek, J. and W. Kolanowski, 2017. Implementation and functioning of HACCP principles in certified and non-certified food businesses: A preliminary study. *British Food Journal*, 119: 710-728.
20. Ayaz, W., A. Priyadarshini and A. Jaiswal, 2018. Food Safety Knowledge and Practices among Saudi Mothers. *Foods*, 7: 193.
21. Mohieldin, A., H.B. Salam, D. Adam and K. Albassir, 2015. Evaluation of food hygiene and safety practices in Bahri hospitals, -Khartoum -Sudan. *International Journal of Health Sciences*, 3:191-194.
22. Ngivu, J., 2016. Impact of food handlers' food safety training in a pediatric hospital in East Africa. *American Journal of Infection Control*, 44: S63.
23. Wahdan, I.H., Z.M. Gad, I.M. Habib and O.A. Elshabasy, 2019. Effect of an Educational Program on Food Safety Practices in Food Preparation and Handling Procedures in Governmental Hospitals of an Egyptian Governorate. *Journal of High Institute of Public Health*, 49(2): 90-96.
24. Norazmir, M.N., N. Hasyimah, S.A. Shafurah, S.B. Sabariah, D. Ajau and H. Norazlanshah, 2012. Knowledge and Practices on Food Safety among Secondary School Students in Johor Bahru, Johor, Malaysia. *Pakistan Journal of Nutrition*, 11(2): 110-115.
25. Ekpoh, U.I., 2018. Assessing university students' satisfaction with service delivery: implications for educational management. *Global Journal of Arts, Humanities and Social Sciences*, 6(6): 48-60.
26. Suki, N.M. and I.A. Chowdhury, 2015. Students' Attitude and Satisfaction Living in Sustainable On-Campus Hostels. *Malaysian Journal of Business and Economics*, 2(1): 35-47.
27. Dora-Liyana, A.L., N.A. Mahyudin, M.R. Ismail-Fitry, A. Ahmad-Zaki and H. Rasyuddin, 2018. Food Safety and Hygiene Knowledge, Attitude and Practices among Food Handlers at Boarding Schools in the Northern Region of Malaysia. *International Journal of Academic Research in Business and Social Sciences*, 8(17): 238-266.
28. Abdullah Sani, N. and O.N. Siow, 2014. Knowledge, attitudes and practices of food handlers on food safety in food service operations at the Universiti Kebangsaan Malaysia. *Food Control*, 37(1): 210-217.
29. Yardimci, H., G. Hakli, F.P. Cakiroglu and A.O. Ozcelik, 2015. Hygiene knowledge of food staff in catering industry: A sample from Turkey. *SAGE Open*, 1-7. <http://doi.org/10.1177/2158244015580376>.
30. Teffo, L.A. and F.T. Tabit, 2020. An assessment of the food safety knowledge and attitudes of food handlers in hospitals. *BMC Public Health*, 20: 311-323.
31. Akabanda, F., E.H. Hlortsi and O. Owusu-Kwarteng, 2017. Food safety knowledge, attitudes and practices of institutional food-handlers in Ghana. *BMC Public Health*, 17: 40-49.
32. Hamed, A.F. and N.A. Mohammed, 2019. Food safety knowledge, attitude and self-reported practices among food handlers in Sohag Governorate, Egypt. *East Mediterranean Health Journal*. (WHO) 25. Available at: <https://doi.org/10.26719/emhj.19.047>.