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Health Education Intervention Program of Food Services Staff for Provision of Safe Food in Tanta Hospitals

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ABSTRACT: Food borne diseases are associated with preparation of food under unhygienic conditions or prepared and kept for several hours at ambient temperatures before it is served and left overnight without refrigeration and served the following day. **Objective:** This work aimed at improving knowledge and practice of food services staff regarding provision of safe food for hospitalized patients in Gharbia governorate through a health education intervention program. **Methods:** all food services staff working in Tanta University hospitals (n=25) and Health Insurance Hospitals (n=127) were the target of the study. They answered a questionnaire sheet that included personal data and knowledge and practices of the food services staff regarding food safety at the start of the study (pre-intervention) and at the end of a health education intervention program (Post- intervention). A health education intervention program was applied for food services staff categorized as having low (40-59%) or very low score (<40%). It had been applied in 5 sessions in the form of large group discussion. This program was conducted over a period of two and half months, one session weekly. **Results:** Food services staff with low and very low score regarding knowledge on food safety was 22.37 % and 17.10 respectively. Concerning Practice of food safety, 20.39% of staff had low score and 18.42% had very low score. Age, sex, years of work, place of work and job title had no statistically significant association concerning knowledge and practice of food safety measures. There was statistically significant improvement of knowledge and practice of food services staff up to six months after health education intervention program at 5% level of significance. The percent of improvement ranged from about 32-95% for knowledge and 39-72% for practice. **Conclusion:** Findings highlighted the importance of providing health education in food and personal hygiene to food services staff and incorporating the same in existing guidelines for food establishments laid down by civic agencies in Tanta and elsewhere.

INTRODUCTION

Food safety is a fundamental human right. It is defined by the FAO/WHO as the assurance that food when consumed in the usual manner does not cause harm to human health and well being (WHO, 2006)[1]. Negligence and/or mistakes

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during processing, storage, transport of food, and food products can lead to human suffering worldwide[2]. The use of latest technologies in food, sciences such as the development of genetically modified foods and irradiated foods without sufficient scientific data may pose tremendous risk to families, communities, societies, populations, and nations. Many people, particularly those living in developing countries may not be sufficiently educated or informed about food safety and why is it important to good health and prosperity[1, 3,4].

The importance of proper diet for hospitalized patients and the detrimental effect that improper diet could have on the recovery is emphasized. The food may be a source of food borne infections or intoxication through its contamination with micro-organisms or toxic substances[5]. Food borne diseases are associated with preparation of food under unhygienic conditions or prepared and kept for several hours at ambient temperatures before it is served and left overnight without refrigeration and served the following day. Also mishandling of food could contribute to the risk to patients[6].

Food contaminated by microorganisms, its toxins or chemical toxic substances, emerge in hospitals as specific kind of epidemic food poisoning. Occurrence of food poisoning in hospitals is facilitated by several facts such as; centralized food preparation, kinds of food, staff carriers, an unfavorable hygienic regime in the kitchens and at places where food is shared, and crossing of clean and unclean paths in a kitchen, carelessness and non-education[7]. Epidemiological and surveillance data suggest that faulty practices in food processing plants, food service establishments, and home play a crucial role in the causal chain of food-borne diseases. This issue has also proved to be critical in some nosocomial food-borne outbreaks[8-12]. Hence, a major goal of the hospital is to provide safe food to

patients who frequently are at higher risk of acquiring infections and their complications[13, 14].

Food hygiene in the hospital can acquire peculiar features. 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. The perception or fear about poor food hygiene practices might result in patients rejecting the meals supplied by the hospital catering[13,14]. In nosocomial outbreaks of infectious intestinal disease, the mortality risk has been proved to be significantly higher than the community outbreaks and highest for food-borne outbreaks[6]. On the other hand, further peculiar concern arises from the common involvement in the role of food services staff or nurses or domestic staff. They are not specifically trained about food hygiene. They can be engaged in receipt, distribution, serving of ready made foods, and supervision of these services[15].

Knowledge about food safety provides a basis for intervention strategies at all stages of production and consumption with the aim of prevention of food borne diseases. These intervention strategies include inspection by governmental agencies, and educational campaigns directed at food services staff, process operators, and people preparing foods[16, 17]. Observed decreases in the incidence of food-borne infections over the past several years have been attributed to new government regulations, voluntary control measures put into place by industry, and increased attention of food safety issues from consumer groups and the media, as well as enhanced food safety educational efforts aimed at consumers and workers who handle food[18]. So community health nurses efforts are necessary to ensure that workers receive training in safe handling

practices awareness of the hygienic principals , such as the proper use of equipment and utensils, kitchen hygiene, safe methods of preparation, cooking of foods, safety methods of food storage, and personal hygiene of workers are considered a corner stone of most public health programs. Effective teaching requires not only adequate knowledge of food borne diseases or sources of food contamination, but also communication skills.

A variety of instructional methods are available for training employees in the workplace such as face-to-face classroom lectures, videos, distance education materials, and printed brochures and manuals. Another method that has gained in popularity within the last several years and has been demonstrated to be effective when compared to traditional methods is the use of computers to deliver training materials, known as computer-based instruction (CBI)[19]. Hence**, this work aimed at** improving knowledge and practice of food services staff regarding provision of safe food for hospitalized patients in Gharbia Governorate through health education intervention program.

MATERIAL AND METHODS

Study design: An intervention study assessing knowledge and practice of food services staff regarding provision of safe food for hospitalized patients before and after application of a health education intervention program.

Study setting: this study was carried out in Tanta University hospitals and Tanta Health Insurance hospitals in Gharbia governorate, Egypt. In both hospitals, the meals are plated individually according to patient needs, stored and transported in either a heated or cooled state and delivered to wards for immediate distribution. Approval was taken before conduction of the study from the local health authority of Ministry of Health and Population and Manager of Tanta

University Hospital.

Target population: all food services staff working in the selected hospital kitchens were the target of the study. The total number of the study sample was 152 persons, 25 food services staff from Tanta university hospitals and the rest (127) from Tanta health insurance hospitals. They all subjected to a base line score to select those with low and very low score who subsequently subjected to health education intervention program. A written consent was signed by each participant in the study after full details of the study were discussed.

Methods of study: A pre-designed questionnaire sheet was prepared and used to collect the required data from food services staff. The questionnaire sheet was answered three times; at the start of the study (pre-intervention), at the end of a health education intervention program, and six months later (Post- intervention).

This questionnaire sheet included the following data:

1. Personal data; including name, age, sex, education, occupation, years of experience, and job title.
2. Knowledge and practices of the food services staff regarding food safety including:

a. Safe kitchen condition: buildings and facilities, location of the kitchen and its surrounding environment, cleaning and waste disposal, utensils used, and waste receptacles.

b. Food storage: contamination of foods before purchase and after cooking, the maximum storage period for raw meat, chicken and fish in freezer and outside refrigerator and hazards of contamination.

c. Preparation and cooking of food which include: food preparation surfaces, slicing and mincing machine, food utensils, cleaning of food

equipments and utensils, and use of safe water supply.

d. Personal hygiene: health certificates, health status of food services staff, hand washing and drying, cuts and wounds, and bad habits of food services staff.

Knowledge and practices of handlers regarding food safety were measured using the following scoring system:

- Right answers were scored 1, 2, or 3 according to number of items in the question.
- Wrong answers were scored (zero).

Score was considered as follows:

- High if the food handler got score of 80% or higher.
- Middle 60% - <80%.
- Low 40% - 59%.
- Very low <40%.

Health education program:

Health education intervention program was applied only for food services staff categorized as having low (40-59%) or very low score (<40%) in the base line score. Health education sessions were conducted at Ibn Sena meeting room of Tanta university hospital and at El-Mebarra meeting room of health insurance hospital. These meeting rooms were comfortable with good ventilation, away from noise and supplied with all required facilities including audio-visual aids. Health education program was applied in 5 sessions for each group in the form of face to face large group discussion. Each session covered about 45 minutes. Several audiovisual aids were used such as flip charts, pictures, posters, videos and handouts. This program was conducted over a period of two and half months, one session weekly.

The first session covered knowledge regarding safe kitchen condition and food storage. The second session covered knowledge regarding preparation and cooking of food, and personal hygiene in addition to refreshment about topics

covered in the previous session. The third session covered the practice of food services staff regarding safe kitchen condition and food storage. The fourth session covered the practice of food services staff regarding preparation and cooking of food and personal hygiene in addition to refreshment about topics covered in the previous session. The last session include, learning and training of common practices, video about hand washing and proper preparation, cooking and storage of food. Common problems facing food services staff during work and interfere with good practice were discussed with all participants during sessions. At the end of the last session a reminder was distributed to all participants. All food services staff who participated in health education intervention program answered the original questionnaire sheet for the second time at the end of the last session then six months later.

Planning of this intervention program covered a period of three months from 1st of July to the end of September 2007 then implemented from 1st of October to 15th of December 2007 and the last answered questionnaire was in half of June 2008.

Statistical analysis:

Data were collected, presented, and statistically analyzed using SPSS soft ware version 11(20). Quantitative data were analyzed using mean, standard deviation, and students't' test. Qualitative data were analyzed using chi square test. Z test was used for comparing proportions before and after intervention. The level of significance used was 5% level.

RESULTS

Table (1) showed personal data of food services staff according to their base line scoring in knowledge about food safety in hospitals. The majority of handlers with low and very low score (about 70%) were between 30-50 years old. Food services staff with middle and high level of education had the highest scoring level.

Sex, years of work, place of work, and job title had no statistical significant difference concerning scoring level.

Table (2) explained personal data of food services staff relative to their base line scoring of attitude about food safety in hospitals. Food services staff aged 30 to less than 50 years old constituted about 75% of those with low score and about 70% of those with very low score. More or less 40% of food services staff with low and very low score was less than middle education. Cookers and workers had the highest level of low and very low score (50.00 and 37.50%) for cookers and (41.18% and 54.17%) for workers respectively. Sex, years of work, and place of work has no significant effect on scoring level.

Table (3) showed distribution of food services staff with low and very low score according to knowledge of food safety before and after intervention program and six months later. There was statistically significant improvement of knowledge of food services staff with low and very low score after health education intervention program at 5% level of significance. Regarding safe kitchen condition, the highest percent of improvement was in question no. (7) and (8) that reached about 70% improvement. Concerning food storage, question no. (4) and (6) showed about 50% improvement. As regards preparation and cooking of foods question no. (4) showed 94.88% improvement followed by question no. (2) that showed 61.9% improvement. Concerning personal hygiene, question no. (4) revealed 72.38% improvement followed by question no. (3) that showed 61.45% improvement. Six months later, there was still significant statistical difference from base line at all questions.

Table (4) presented distribution of food services staff with low and very low score according to practice of food safety before, after intervention program and six

months later. There was statistically significant improvement of practice of food services staff with low and very low score after health education intervention program at 5% level of significance. Regarding safe kitchen condition, question no. (1) showed 72.52% improvement followed by question no. (4) (61.98%) improvement. Concerning food storage, question no. (5) and (6) showed about 67% improvement. As regards preparation and cooking of foods question no. (7) showed about 69% improvement followed by question no. (5) 63.41% improvement. Concerning personal hygiene, question no. (4) revealed 72.15% improvement followed by question no. (7) that showed 62.28% improvement. Six months later, there was still significant statistical difference from base line at all questions.

DISCUSSION

Educational and regulatory measures have been found to be effective in reducing food-born diseases in hospitals. On the other hand, a comprehensive and well funded regulatory system alone cannot prevent food-born diseases[6]. Food services staff in the present study answered a predesigned questionnaire sheet containing personal data and knowledge and practice regarding food safety in hospitals. From the results of the questionnaire the authors concentrate on weak points concerning knowledge and practice of staff in planning the message of health education program. Health education sessions were planned in group discussion to allow exchange of ideas between participants and enhance: brain storming to gain satisfaction in adoption of good practices. This also minimizes drop out cases, only four cases (6.67%) during two and half months and 9 cases (15%) after six months. This contributes to good improvement in knowledge and practice after intervention reached up to 95% improvement. Also, distribution of

reminders at the last session shares in continuation of such improvement six months after intervention.

In the present study age, sex, education, occupation, years of work, and place of work were not significant factors affecting neither knowledge nor practice. However, some food risky behavior was more common within older age, lower level of education, those with more years of work and among workers. On contrary, a study on 290 food services staff in 36 hospitals in Italy (2001) showed that knowledge about food-borne pathogens was significantly higher among those with a higher educational level and those who have attended continuing education courses on food hygiene and hospital food-borne diseases. This may explain the difference in results between the two studies[21]. In the same study conducted in Italy, younger staff had significantly better knowledge and practices, but this was not statistically significant in the present study[21]. In the present work, female respondents were less likely than males to wash their hands after touching raw food and before touching cooked food and to separate kitchen utensils. This finding disagree with other surveys on consumer's food safety perception and behaviours, that found risk perception and protective practices more common in the female gender[2,7,18,22]. Also, surveys have produced inconsistent results with regard to the relation between food safety behaviours and education level, e.g. some risky practices being more common within higher education and income level[22]. This is in agreement with the results in the present study.

For the prevention of food-borne outbreaks adhering to food safety measures among food services staff is vital[23]. Several food-borne outbreaks in hospitals that were attributed to improper food handling have been reported. In the United Kingdom (1995) an outbreak of

Clostridium perfringens food poisoning affected 38.6% of patients in two hospital wards was reported where the incriminated food was roast pork. This was attributed to too large cuts in one hand and equipment to ensure rapid cooling of cooked meat was not installed in another[24].

An outbreak of *Salmonella enteritidis* food poisoning was recorded in Mexico City (2001) among tertiary care hospital workers and was properly caused by *Salmonella* contaminated foodstuffs due to inadequate cooking[25]. Another outbreak of *Salmonella entritidis* was recorded in Spain (2004) in 22 inpatients. Deep fried beef rissoles were implicated as the vehicle of infection and inadequate cooking was again the contributing factor[26].

The present study revealed that after health education intervention program, there was an improvement in the overall food safety knowledge and practice. Utensils used in the hospitals were made of aluminum and were washed with unheated tap water before training. After training they were washed with warm water and detergent. Disinfection was not practiced in any hospital before or after training. Brougham (1998) stated that all utensils must be washed in warm water containing an adequate amount of suitable detergent and then disinfected[22].

The most important factors related to food-borne diseases are the lack of knowledge on the part of food services staff or consumers and negligence in safe food handling[6]. The present study showed that there was a gap between food handler's knowledge and food safety practices followed in the hospitals. Their knowledge score was usually higher than the corresponding practice score both before and after intervention. Nevertheless, the study revealed safe storage practices involving temperature control and correct handling of food using adequate clothing and gloves, but respondents fared worse when they were asked about cross-

contamination, refreezing and handling unwrapped food with cuts or abrasions on hands. This might be the consequence of lack of specific training, empiric adoption of safe attitudes and behaviours based upon skill in the working and domestic setting, perpetuation of traditional approaches and erratic achievement of information through informal sources. Comparable results have been obtained from previous studies[21,26].

In a study that assessed the knowledge, attitudes and practices of food services staff regarding food hygiene in Shiraz, Iran (2004) showed that they had little knowledge regarding the pathogens that cause food-borne diseases and the correct temperature for the storage of hot or cold ready-to-eat foods. Most of them had positive attitudes but disparity between attitude and practice was noted[23]. The improvement of knowledge and practices of food services staff after launching the training program could consequently improved the bacteriological profile of most meals served to patients. However, cross-contamination mediated by the inadequately sanitized utensils and/or by the food services staff who were not following hygiene standards could occur.

Vegetables can become contaminated with microorganisms capable of causing human diseases while still in the field or during harvesting or post-harvest handling in food services establishments[27]. El-Derea H. *et al*., (2008) found that bacteriological analysis of the majority of patients' meals of plant origin revealed contamination with higher microbial loads before and after health education intervention program[28]. The highest aerobic mesophilic coliform and staphylococci counts were among raw salad served in hospitals. They attributed that to the preparation of the salads using bare hands, the use of inadequately cleaned raw vegetables and their storage until service at a temperature that permits multiplication of bacteria[28]. All of these

factors were covered by health education intervention program in the present study and showed significant improvement in both knowledge and practice just after and also six months after intervention.

In France (2005), a study in a university hospital showed that 10% of patients' meals, all of which were salad, had total viable bacteria counts above the recommended levels [29]. At the same time, another study in Costa Rica (2004) revealed that all tested salad samples were positive for faecal coliforms[30].

Food distribution to hospital wards plays a critical role in the safety of hospital food[31]. Moreover, for immune-compromized patients the potential risk for food to cause infection is ever greater and hospitals may impose dietary restrictions to limit pathogen exposure[32]. Improper practices during food distribution detected in the present study included: sharing of utensils for raw and cooked foods and thawing of frozen food at room temperature. Similar behaviours are described in several previous studies and confirm that cross-contamination is a poorly perceived food safety issue[21,22,25,33].

The present study showed that food safety knowledge and food handling practices among food services staff were unsatisfactory before training. However, the health education intervention program improved all aspects of the food safety issues in both knowledge and practice. This improvement continued for six months after intervention. This may be attributed to the distribution of reminder at the last session and solving all problems facing practice of food safety.

In a study in Delhi, India (2008), the researchers recorded significant increase in knowledge of food services staff three months after health education intervention program about hand hygiene measures; namely washing hands before handling food and keeping nails cut and clean. However, washing hands after toilet and

smoking and consistent use of soap at the workplace improved after health education but not to the desired extent[34].

CONCLUSION AND REECOMMENDATIONS

So, ensuring that hospital patients are not at risk of food-borne infections and continuous in service training should be launched for all food services staff in both food safety knowledge and practices. All hospital food service staff should be aware that a careful personal hygiene is a key measure to prevent food contamination and spread of enteric diseases. Collectively, there are five keys to safer food; keep clean, separate raw and cooked food, cook thoroughly, keep food at safe temperatures and use safe water and raw materials. Finally highlight the importance of providing health education in food and personal hygiene to food services staff and incorporating the same in existing guidelines for food establishments laid down by civic agencies in Tanta and elsewhere.

Table (1): Personal data of food services staff according to their base line scoring of knowledge about food safety in hospitals.

Personal data	High score (15.79)		Middle score (44.74)		Low score (22.37)		Very low score (17.10)	
	N (24)	%	N (68)	%	N (34)	%	N (26)	%
Age:								
20-	8	33.33	20	29.41	5	14.71	3	11.54
30-	6	25.00	17	25.00	11	32.35	9	34.62
40-	3	12.50	11	16.18	13	38.24	9	34.62
50-	7	29.17	20	29.41	5	14.71	5	19.23
$\chi2_3$ (<40 vs 40+) = 0.93 (p = 0.82)								
Sex:								
Male	13	54.17	37	54.41	16	47.06	13	50.00
Female	11	45.83	31	45.59	18	52.94	13	50.00
$\chi2_3$ = 0.58 (p = 0.90)								
Education: Less than middle education	7	29.17	23	33.82	17	50.00	14	53.85
Middle education	14	58.33	39	57.35	13	38.24	10	38.46
Higher education	3	12.50	6	8.82	4	11.76	2	7.69
$\chi2_6$ = 6.63 (p = 0.36)								
Years of work:								
-10	8	33.33	20	29.41	7	20.59	8	30.77
-20	5	20.83	15	22.06	8	23.53	7	26.92
-30	4	16.67	14	20.59	9	26.47	5	19.23
30+	7	29.17	19	27.94	10	29.41	6	23.08
$\chi2_3$ (<20 vs 20+) = 1.21 (p = 0.75)								
Place of work: University hospital	5	20.83	6	8.82	7	20.59	7	26.92
Health insurance hospital	19	79.17	62	91.18	27	79.41	17	73.08
$\chi2_3$	6.39 (p = 0.09)							
Job: Supervisor	5	20.83	5	7.35	3	8.82	2	7.69
Cooker	10	41.67	33	48.53	17	50.00	11	42.31
Worker	9	37.50	30	44.12	14	41.18	13	50.00
$\chi2_3$ = 3.91 (p = 0.27)								

Table (2): Personal data of food services staff relative to their base line scoring of attitude about food safety in hospitals.

Personal data	High score (15.13)		Middle score (46.05)		Low score (20.39)		Very low score (18.42)	
	N (23)	%	N (70)	%	N (31)	%	N (28)	%
Age:								
20-	7	30.43	18	25.71	6	19.35	5	17.86
30-	5	21.74	20	28.57	9	29.03	9	32.14
40-	4	17.39	13	18.57	11	35.48	8	28.57
50-	7	30.43	19	27.14	5	16.13	6	21.43
$\chi2_3$ (<40 vs 40+) = 0.35 (p = 0.95)								
Sex:								
Male	13	56.52	36	51.43	17	54.84	13	46.43
Female	10	43.48	34	48.57	14	45.16	15	53.57
$\chi2_3$	0.65 (p = 0.89)							
Education:								
Less than middle education	7	30.43	29	41.43	12	38.71	13	46.43
Middle education	12	52.17	38	54.29	13	41.94	13	46.43
Higher education	4	17.39	3	4.29	6	19.35	2	7.14
$\chi2_3$ (Less than middle education vs Middle education and higher) = 1.44 (p = 0.70)								
Years of work:								
-10	7	30.43	21	30.00	6	19.35	9	32.14
-20	5	21.74	15	21.43	8	25.80	7	25.00
-30	4	17.39	14	20.00	9	29.03	5	17.86
30+	7	30.43	20	28.57	8	25.80	7	25.00
$\chi2_3$ (<20 vs 20+) = 0.86 (p = 0.84)								
Place of work:								
University hospital	4	17.39	7	10.00	6	19.35	8	28.57
Health insurance hospital	19	82.61	63	90.00	25	80.65	20	71.43
$\chi2_3$	5.32 (p = 0.15)							
Job:								
Supervisor	5	20.83	6	7.35	2	8.82	2	8.33
Cooker	10	41.67	33	48.53	16	50.00	12	37.50
Worker	8	37.50	31	44.12	13	41.18	14	54.17
$\chi2_3$	4.42 (p = 0.22)							

Table (3): Distribution of food services staff with low and very low score regarding knowledge of food safety before, after and six months after intervention program.

Knowledge about:	Percent of correct answer				
	Before intervention N = 60	Improvement after intervention N=56	z	Improvement six months later N = 51	z
a. Safe kitchen condition:					
1. Where is the best site of kitchen?	51.67	39.40	4.66*	30.69	3.40*
2.Is there waste products in or around kitchen?	36.67	38.33	4.15*	26.08	2.74*
3. Is it easy to clean kitchen wall and floor and how?	48.33	32.03	3.59*	24.22	2.59*
4. Is hot water essential in the kitchen?	45.00	51.43	6.03*	45.2	5.0*
5. Is good ventilation essential?	48.33	39.17	4.49*	32.06	3.49*
6. Is suitable light essential?	40.00	40.36	4.42*	34.51	3.65*
7. Is aluminum utensils suitable for all types of food?	28.33	60.96	6.64*	52.06	5.47*
8. What are the best method of cleaning kitchen	40.00	57.21	6.72*	48.24	5.22*
b. Food storage:					
1.Are raw foods contaminated before purchase?	36.67	36.54	3.95*	22.16	2.33*
2. What is the maximum storage period for raw meat, chicken and fish in freezer?	33.33	45.24	4.90*	31.37	3.30*
3. What is the harm of storage of food for long period of time?	46.67	33.69	3.75*	21.96	2.33*
4. What time is cooked food left outside refrigerator?	45.00	49.64	5.78*	41.27	4.51*
5. What is the importance of storing cooked food in refrigerator?	46.67	42.62	4.89*	33.73	3.65*
6. Do organisms grow in cooked food stored at room temperature?	50.00	48.21	5.86*	40.20	4.54*
c. Preparation and cooking of food:					
1. What is the importance of using bleach solution in washing green vegetables?	41.67	51.19	5.83*	36.76	3.92*
2. What are the sources of contamination?	16.67	61.90	6.68*	32.35	3.66*
3. What are the contamination physical signs on meat, chicken and fish?	23.33	46.31	5.00*	27.65	3.02*
4. Are all organisms killed during cooking?	3.33	94.88	10.21*	79.02	8.48*
5. Are citric foods cooked in aluminum utensils?	50.00	42.86	5.07*	26.47	2.87*
6. What is the right method of defrosting meat and fish and its importance?	46.67	49.76	5.88*	31.76	3.42*
d. Personal hygiene:					
1. Do you have health certificates? What is its importance?	56.67	43.33	5.59*	33.53	3.92*
2. Is it important to use an apron or special clothes? Why?	51.67	37.62	4.41*	28.73	3.16*
3. Is it important to use a head cap? Why?	35.00	61.43	6.92*	53.24	5.69*
4.Is it important to clean hands after handling raw meat and fish? And why?	13.33	72.38	7.80*	45.49	5.03*
5. What do you do if you have a hard injury? And why?	40.00	52.86	5.99*	28.63	3.01*
6. Do you tort food by spoon during cooking? Why?	53.33	46.67	5.87*	34.90	3.98*
7. What is the importance of avoiding sneezing?	58.33	39.88	5.15*	24.02	2.74*

* Significant at 5% level.

Table (4): Distribution of food services staff with low and very low score according to practice of food safety before, after and six months after intervention program.

Practice about:	Percent of correct answers				
	Before intervention N = 60	improvement after intervention N=56	z	improvement six months later N = 51	z
a. Safe kitchen and hygiene: 1. How many times daily you clean using soap and water?	20.34	72.52	7.82*	40.78	4.40*
2. How do you clean utensils used for cutting raw meats and vegetables?	33.90	55.39	6.08*	25.49	2.69*
3. What is the type of cutting board used?	49.15	50.85	6.21*	34.02	3.72*
4. What are the precautions during using insecticides?	23.73	61.98	6.67*	23.73	2.63*
b. Food storage: 1. Do you store raw meat and fish before use and where?	47.46	41.83	4.80*	21.96	2.33*
2. Are you store cooked food in common or separate places?	44.07	39.86	4.44*	19.41	2.04*
3. Do you store large amount of food for long period?	38.98	57.45	6.55*	26.37	2.77*
4. How do you make sure that leftover food is safe before feeding?	18.64	56.36	6.06*	40.49	4.40*
5. Is cooked food left at room temperature before use?	22.03	67.26	7.24*	52.84	5.57*
6. Where you store green vegetables and fresh fruits?	30.51	65.92	7.30*	50.39	5.30*
c. Preparation and cooking of food: 1. How do you clean cutting board before food preparation?	33.90	51.81	5.65*	35.29	3.71*
2. How do you clean meat knife before using it?	35.59	51.91	5.70*	43.43	4.58*
3. What is the best method of washing raw vegetables and fruits?	35.59	53.70	5.92*	19.90	2.10*
4. How many times you use frying oil?	18.64	60.93	6.43*	30.69	3.44*
5. What are signs of spoilage of beans?	16.95	63.41	6.80*	22.55	2.67*
6. How and where are eggs cooked?	25.42	58.51	6.29*	22.06	2.43*
7. How do you cook frozen meat, chicken or fish?	20.34	68.95	7.41*	25.10	2.84*
d. Personal hygiene: 1. Do you have health certificates?	50.85	42.01	4.98*	48.04	5.62*
2. Do you use an apron or special clothes?	44.64	44.65	5.28*	36.76	3.92*
3. Do you use a head cap?	35.00	52.50	5.70*	33.63	3.53*
4. How you clean hands after handling raw meat and fish?	13.56	72.15	7.74*	57.25	6.15*
5. What do you do if you have a hard injury?	40.68	52.18	5.91*	18.82	1.98*
6. Do you tort food by spoon during cooking?	54.24	45.76	5.79*	25.10	2.76*
7. What is the importance of avoiding sneezing	55.93	62.28	5.35*	21.47	2.36*

* Significant at 5% level.

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