

(RESEARCH ARTICLE)



The effect of training of food handlers in hospitals kitchen in Khartoum State, Sudan

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Abstract

An interventional research was conducted in the kitchens of Khartoum state hospitals 2021 on the impact of training of food handlers in (12) hospitals with (56) food handlers to identify food hygiene requirement. Training was done before and interventions training after. Questionnaires were filled out with food handlers and interview with nutrition supervisor about kitchens. The data was statistically analyzed by using the Statistic Package for Social Sciences (SPSS) program version 25; the Paired Samples T Test and Chi-Square Test was used and there is an improvement at the level of indication 0.000 at the level (0.05). The results showed that the majority of food handlers were females (75%), the lack of quality of kitchens in buildings, equipment, utensils, hand facilities, no periodic inspection for raw materials and no any training about food safety and hygiene for all food services staff. The study concluded that training has an effective impact on kitchen quality. The study recommended that the ministry of health and hospitals to design kitchens with standardization and provide training to all workers periodically.

Keywords: Food Handlers; Training; Foodborne; Kitchen; Hospital

1. Introduction

Food covers any unprocessed, semi-processed, or processed item that intended to use as food or drink. This includes any ingredient incorporated into a food or drink, and any substance that comes into direct contact with a food during processing, preparation, or treatment [1].

Food Hygiene is the efforts made to safeguard food from becoming health hazard and to prevent early spoilage and contamination by handling of food. It is the procedures applicable to the processing of food in such a way that the products derived there are safe and wholesome for human use. The general principle of food hygiene is to ensure that food products are safe, wholesome and fit for human consumption [2].

Food handlers play an important role in ensuring food safety through the food chain from production to consumers. Approximately 10 to 20% of food-disease outbreaks are due to contamination by the handler. Mishandling of food and disregard of hygiene measures enable pathogens to come into contact with food and, in some cases, to survive and multiply in sufficient numbers that may cause illness in consumers. Personal hygiene and environmental sanitation are key factors in the transmission of food-borne diseases. Investigations of outbreaks of foodborne disease throughout the world show that in nearly all instances, they are caused by failure to observe satisfactory standards in the preparation, processing, cooking, storing or retailing of food [3].

Kitchens should be part of a structured and organized department that provides nutritional assistance by preparing high quality meals with standards of food safety [4].

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A study to assess knowledge, attitudes, and behavior concerning foodborne diseases and food safety issues amongst formal food handlers conducted in Italy observed that the majority of food handlers who had attended a training course had knowledge and a positive attitude toward foodborne diseases control and preventive measures. The positive attitude is not support when asked about self-reported behaviors and when observed during food preparation for practice of hygienic principles [5].

Hence, there is a great need for training and increased awareness among food services staff in hospitals concerning safe food handling practices.

Good food hygiene in the hospital kitchens can reduce the risk of infection from foods contaminated with foodborne pathogens derived from food handlers and illness due to bacterial toxins. Foodborne diseases present a serious challenge to public health in both developing and developed countries. Studies undergone in both developing and developed countries have indicated that the majority of reported foodborne diseases originate in food service establishments [6].

Foodborne illnesses are prevalent in all parts of the world. Contaminated food contributes to 1.5 billion cases of diarrhea in children annually, resulting in more than three million premature deaths, according to the World Health Organization (WHO). Those deaths and illnesses shared by both developed and developing nations. For example, in the United States, the Centers for Disease Control and Prevention (CDC) estimates that foodborne diseases cause approximately 76 million illnesses annually among the country's 290 million residents, as well as 325,000 hospitalizations, and 5,000 deaths [7].

The WHO African Region was estimated to have the highest burden of foodborne diseases per population. More than 91 million people are estimated to fall ill and 137 000 die each year. Diarrheal diseases are responsible for 70% of foodborne diseases in the African Region. Non-typhoidal Salmonella, which can be caused by contaminated eggs and poultry, causes the most deaths, killing 32 000 a year in the Region—more than half of the global deaths from the disease. There is 10% of the overall foodborne disease burden in this Region caused by Taenia sodium (the pork tapeworm) [8].

Chemical hazards, specifically cyanide and aflatoxin, cause one quarter of deaths from foodborne diseases in the Region [8].

In Sudan there are few studies done on food handlers but the statistics of the Sudan ministry of health in 2017 according to the discharged patient report, estimated that, food poisoning causes 3149 illnesses, and 2 deaths, typhoid fever causes 10381 illnesses, and 3deaths, dysentery causes 25474 illnesses, and hepatitis A viruses 872 illnesses, and 22 deaths.

Food safety training identified as a way to assure public health, yet evidence supporting the effectiveness of training has been inconclusive. However, WHO indicates that education of food handlers to improve their hygiene-related knowledge and practice is of paramount importance in the prevention and control of food borne diseases [9].

Perhaps a study which investigated the effect of training of food handlers toward microbial quality of food in hospital kitchens through intervention training program could help resolve situation.

The hospital kitchens viewed as the major sources of contaminations from poor sourcing and handling practices that include undercooking, poor personal hygiene, and use of unclean equipment, inappropriate storage and incorrect holding temperatures. This is indicators to source of foodborne diseases in hospital kitchens.

Moreover, the food handlers do not receive any special training on food hygiene practices and foodborne diseases, except the knowledge that taken from the head of the department. In addition, to assess the efficacy of an educational training in order to form a basic for decision-making, policy formulation and planning towards the prevention of foodborne diseases in Khartoum state governmental hospitals.

This study is aimed to identify food hygiene requirement in hospital kitchens and to identify the food hygiene knowledge, attitude and practices of the food handler's pre- and post-training.

2. Material and methods

This study targeted food handlers (who handle food and contact with food surface) together with supervisors in the nutritional department in governmental hospital kitchens. First, a listing all hospital kitchens in Khartoum state

hospitals that obtained from the ministry of health. Then stratified according to their localities Khartoum, Omdurman and Bahri. A stratified random sampling was selected hospitals. Twelve (12) hospitals participated in the study, 41.7% (5) Khartoum locality (Ibn Senna, Dermal, Abdalalfadual Almaz, AL academy, Turkish), 33.3% (4) Omdurman locality (Mohamed Alamin Hamid, Omdurman teaching, Aboanga, Abosed), and 25% (3) Bahri locality (Bahri teaching, Alshohada and Omdwaban). Second, the sample of food handlers selected according to Kothari, (2004) if a population is relatively small and all the respondents reached at serve time [10]. Table (1) shows the respondents availability.

Table 1 Respondent's availability in hospitals

Hospital's code	Number of heads	Number of food handlers available	Total
A	1	4	5
B	1	2	3
C	1	2	3
D	1	1	2
E	1	4	5
F	1	7	8
G	1	8	9
H	1	2	3
I	1	3	4
J	1	17	18
K	1	3	4
L	1	3	4
Total	12	56	68

The data was collected using different methods. Firstly, a questionnaire, interview and observational checklist which designed to collect primary data from the selected sample and then secondary data was collected using available published information in books, journals, reports, internet and studies in different sources. The questionnaire was designed for collect data from food handlers on food hygienic practices, contain socio-demographic status, length in work, attending courses on HACCP and food borne diseases, information about food handlers' knowledge on food borne diseases, personal hygiene, cross contamination, food contamination, cooking, cleaning, time and temperature and food storage. The questionnaire included (19) knowledge and (10) attitude. Closed- ended questions will be used. Face-to-face interviews with supervisors in the hospital kitchens selected in Khartoum state. The interviews were in this study to identify awareness of the interviewees toward food hygiene practices. The interviews take place within the food premises and each interview approximately 10-to15 minute. The questionnaire includes (31) questions such as general information about the food premises such as the number of bed, estimated number of meals distributed, the number of food services staff, the HACCP system implementation status. The observational checklist for food handlers practices in hospitals kitchen. Observation checklist contain (12) items. Such as wearing uniform during work, hand washing, habits during work, used separate kitchen utensils to prepare raw and cooked food, time, temperature, and work during sick (fever, vomiting, and diarrhea). Computer through package software Statistical Package for the Social Sciences (SPSS Version 25) was used to analyzed data the tables, graph, and chi-square test and t-test to the cut-off point $P < 0.05$ statistical level of significance will be carried out for testing levels of significance.

3. Ethical Considerations

The research approval was obtained from the university and was obtained from the Khartoum state ministry of health research department that have authorizing data collection from hospitals. The participants were asked to participate in the study voluntarily. The participants have right to withdraw at any time without any deprivation from research benefit. Confidentiality was guaranteed by not indicating participant names in data collection tool. Each participant was informed about the objective of the study and privacy during interview was ensured. Questionnaire and training program was filled with participants in their rest time without any interruption to their work.

4. Food Hygiene Intervention

The training interventions involved lectures, videos, demonstrations, leaflets, posters, and slideshow. The training methods are building accordance to 5keys WHO, Safe food handling (A training guide for managers of food establishments) and HACCP guidelines. For effective training, a small group one to ten food handler was trained at a time (10-15minute) [11]. Training was done within a period of one week for each hospital in their hospital kitchens.

5. Results and discussion

Table 2 The hospital kitchens (n=12)

Statement	Yes		No	
	Frequency	%	Frequency	%
Adequate ventilation	6	50.0	6	50.0
Adequate lights	8	66.7	4	33.3
Washing hand	2	16.7	12	83.3
Room change	3	25.0	9	75.0
Food storage procedure	3	25.0	9	75.5
Any procedure for personal hygiene	3	25.0	9	75.0
HACCP system	0	0.0	12	100.0
Food hygiene operating procedure	0	0.0	12	100.0
Continuing education courses on HACCP	0	0.0	12	100.0
Continuing education courses on food hygiene	0	0.0	12	100.0
Use critical control point's tree	0	0.0	12	100.0
Clean and disinfect surfaces and equipment	8	66.7	4	33.3
Check foods temperature	1	8.3	11	91.7
Inspection of raw materials	5	41.7	7	58.3
Microbiological testing of the kitchen	0	0.0	12	100.0
Microbiological testing of the food	0	0.0	12	100.0
Microbiological testing of the surfaces	0	0.0	12	100.0
Microbiological testing of the equipment	0	0.0	12	100.0
Microbiological testing of the utensils	0	0.0	12	100.0
All workers have medical certificate	10	83.3	2	16.7
Every six months	9	75.0	3	25.0
Every year	1	8.3	11	91.7
Other (specify)	0	0.0	0.0	0.0
Release any food handlers if ill	12	100.0	0	0.0
Diarrhea	3	25.0	0	0
Fever	5	41.7	0	0
Other (specify)	4	33.3	0	0
Very poor condition	5	41.7	0	0
Poor condition	3	25.0	0	0
Average condition	2	16.7	0	0
Good condition	1	8.3	0	0
Very good condition	1	8.3	0	0

Data presented in Table (2) shows that an adequate ventilation in 6(50%), an adequate lights 8(66.7%), only two hospitals (16.7%) had washing hand facility and three hospitals had food storage and personal hygiene procedure

(25.0%) These results agree with the study that conducted in Kenya by Nyamari, 2013, which aimed to identify gaps with regard to status of the hospital kitchen, status and storage of equipment, some aspects of personal hygiene and sanitation and vector control [12].

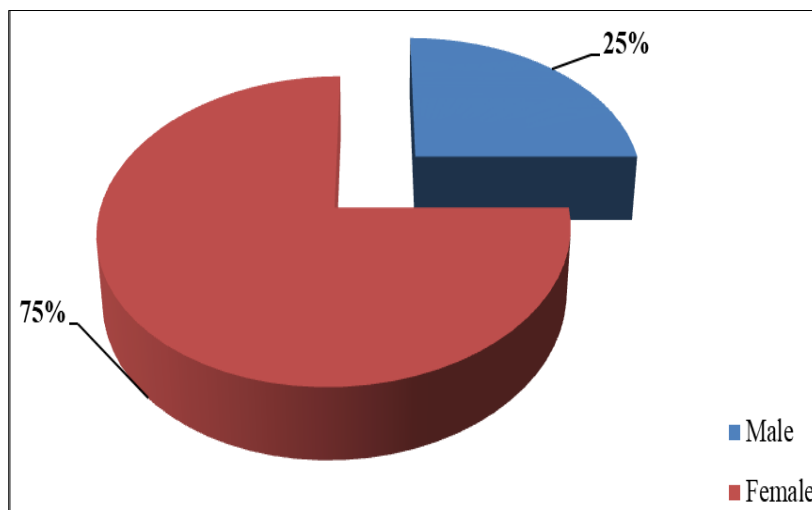


Figure 1 Distribution of food handlers by sex (n=56)

The majority of food handlers are females (75%) and (25%) were male.

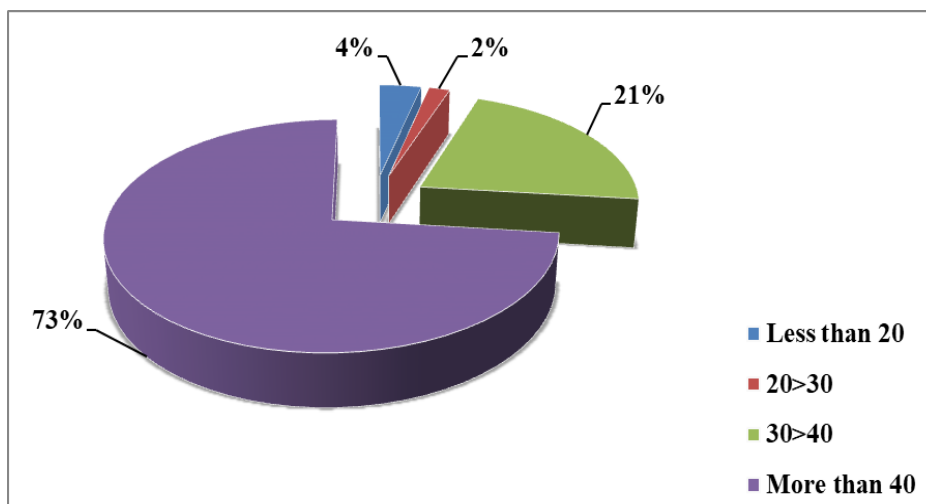


Figure 2 Distribution of food handlers according to age (n=56)

The most respondent is age more than 40 years (73%) and the less than 20 years is (3.6%)

All 12(100%) none of the hospitals adopted any educational courses on HACCP trainings or food hygiene for food handlers and not used critical control point's tree. This finding agree with the study that conducted in Kenya by Wandolo, 2016 which aimed to carry out a comparative study of training on food safety and hygiene in TVET and University Hospitality schools and their impact on hygiene practices in the hospitality industry[13]. The HACCP prerequisites were not used in most of the institutions. In several studies, food service workers that received training had better hygiene scores and safe food handling practices than those that did not receive training. Eight (66.7 %) of the hospitals had clean and disinfect surfaces and equipment and four (33.3%) had not clean and disinfect. only one hospitals kitchen had check foods temperature (8.3%) that done through observation. Foods were not to be in the danger zone (between 5^{0c} and 60^{0c}) longer than necessary. If food is not chilled or frozen during storage; and heated to temperatures between 70 and 80 before consumption, then there are high chances of growth and subsequent ingestion of pathogens and for this reason needed to check foods temperature. Five (41.7 %) of the hospitals had inspection of raw materials and seven (58.3%) had not inspection and this indicated to some hospitals were not aware about used it in their kitchens. Only one hospitals kitchen had check foods temperature (8.3%). The routine inspections wanted to

prevent foodborne illness by ensuring safe food handling and preparation. This study finding that the hospital kitchens were not inspected often. (100%) none of the hospitals had any microbiological testing for their kitchens. Microbiological testing is very important to reduce foodborne illness and the most studies suggested taking samples from kitchens to microbial quality testing. Across sectional descriptive study conducted in Sudan by Omer, 2017 to determine the status of food safety and hygiene in 16 hospitals the results confirm that the microbial tasting was vital issues in hospitals kitchens [14]. The table shows that 10 (83.3%) of the hospitals kitchens had medical certificate and two (16.7%) had no certificate. Nine (75.0 %) of the hospitals check certificate every six months and one (8.3%) every year. The data presented that all (100%) of the hospitals release food handlers when ill. The five (41.7%) fever, four (33.3%) any other symptoms and three (25.0%) diarrheas. Five (41.7 %) of the hospital’s kitchen had very poor food safety practice and one (25.0%) had poor practice in kitchens.

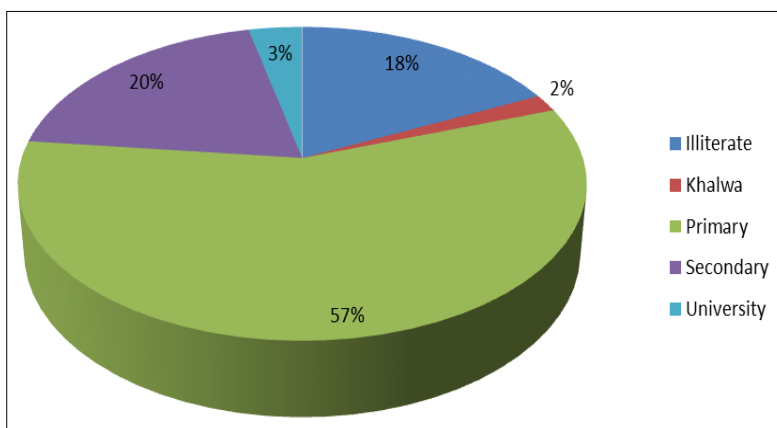


Figure 3 Distribution of food handlers according to education level (n=56)

The most respondents are Primary education level (57%).

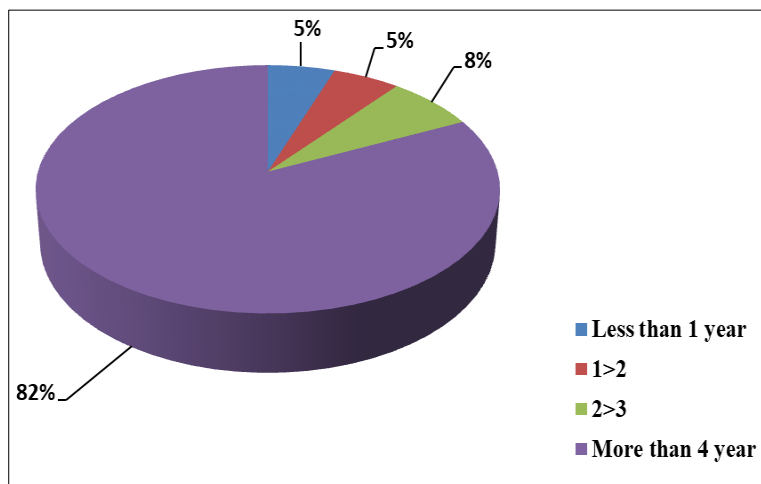


Figure 4 Distribution of food handlers according to work experience (n=56)

Forty-six (82 %) of the participants had more than 4 years of worked experience in food service establishment.

5.1. Socio-demographic characteristic of food service staff

The majority of the study females 42 (75%), while the remaining males 14 (25%). The findings of a similar study conducted in the U.S had 62.5% female against 37.5% males. This result agrees with most of the previous studies that show the higher percentage of the food handlers were females. The most respondent is age more than 40 years (73%) and the less than 20 years is (3.6%). The most respondents are Primary education level 32 (57%). The participants had more than 4 years of worked experience in food service establishment 46(82 %). The years of experience as an important factor in determining the level of performance that impact on the level of operation, concept and perception on food safety, knowledge and skills.

Table 3 Attending courses

NO	Statement	Before		After	
		Yes	No	Yes	No
1	Attending of HACCP courses	0.0(0)	100.0(56)	0.0(0)	100.0(56)
2	Attending of food handlers, a food safety courses	5.0(3)	95.0(53)	100.0(56)	2.0(1)
3	Attending of foodborne diseases	4.0(2)	96.0(54)	100.0(56)	0.0(0)

The data in (Table 3) shows that the food handlers were not attending food hygiene courses before from (5% to 100%), respectively after intervention and foodborne diseases courses (4% to 100%).

5.2. Knowledge of food handlers

Table 4 Knowledge of Food Handlers

NO	Statement	Before			After		
		Yes	No	Don't know	Yes	No	Don't know
1	Patients and staff are at equal risk for food poisoning	39.0(22)	47.0(26)	14.0(8)	2.0(1)	98.0(55)	0.0(0)
2	Typhoid fever can be transmitted by food	38.0(21)	48.0(27)	14.0(8)	100.0(56)	0.0(0)	0.0(0)
3	Bloody diarrhea can be transmitted by food	63.0(35)	30.0(17)	7.0(4)	100.0(56)	0.0(0)	0.0(0)
4	Hepatitis disease can be transmitted by food	45.0(25)	37.0(21)	18.0(10)	100.0(56)	0.0(0)	0.0(0)
5	Washing hand before handling food reduce the risk of contamination	94.0(53)	4.0(2)	2.0(1)	100.0(56)	0.0(0)	0.0(0)
6	Wearing gloves during handling food reduce the risk of transmitting infection to consumers	84.0(47)	11.0(6)	5.0(3)	98.0(55)	2.0(1)	0.0(0)
7	Wearing gloves while handling food reduce the risk of transmitting infection to food services staff	88.0(49)	7.0(4)	4.0(3)	98.0(55)	2.0(1)	0.0(0)
8	Proper cleaning and sanitizing of utensils increase the risk of food contamination	31.0(17)	64.0(36)	5.0(3)	7.0(4)	93.0(52)	0.0(0)
9	Drinking and eating during food handling increase the risk of contamination	63.0(35)	28.0(16)	9.0(5)	93.0(52)	7.0(4)	0.0(0)
10	Food prepared in advances the risk of food contamination	50.0(28)	41.0(23)	9.0(5)	5.0(3)	95.0(53)	0.0(0)

11	Reheating cooked of foods can contribute to food contamination	43.0(24)	48.0(27)	9.0(5)	95.0(53)	5.0(3)	0.0(0)
12	Improper cooking of food causes foodborne illnesses	89.0(50)	4.0(2)	7.0(4)	100.0(56)	0.0(0)	0.0(0)
13	Raw and cooked foods should be kept separate	88.0(49)	7.0(4)	5.0(3)	100.0(56)	0.0(0)	0.0(0)
14	Contaminated foods always have change in colour	75.0(42)	18.0(10)	7.0(4)	0.0(0)	100.0(56)	0.0(0)
15	Contaminated foods always have change in odour	82.0(46)	13.0(7)	5.0(3)	0.0(0)	100.0(56)	0.0(0)
16	Contaminated foods always have change in taste	77.0(43)	16.0(9)	7.0(4)	50.0(28)	50.0(28)	0.0(0)
17	Cross contamination is when microorganisms from a contaminated food are transferred by the hands to another food	75.0(42)	23.0(13)	2.0(1)	100.0(56)	0.0(0)	0.0(0)
18	Cross contamination is when microorganism from a contaminated food are transferred by the kitchen utensils to another food	95.0(53)	3.0(2)	2.0(1)	100.0(56)	0.0(0)	0.0(0)
19	Freezing kills all the bacteria that may cause foodborne illness	55.0(31)	29.0(16)	16.0(9)	2.0(1)	100.0(55)	0.0(0)
20	Improper storage causes health hazards	95.0(53)	3.0(2)	2.0(1)	100.0(56)	0.0(0)	0.0(0)
21	Microbes are on the skin, in the nose and mouth of healthy food handlers	70.0(39)	19.0(11)	11.0(6)	100.0(56)	0.0(0)	0.0(0)
22	During illness, it is necessary to take leave from work	94.0(54)	6.0(2)	0.0(0)	100.0(56)	0.0(0)	0.0(0)

5.3. Knowledge of food handlers

In this study, the data in (Table 4) shows that. The patient and staff are equal expose to food poisoning (30% to 98%), respectively after intervention and typhoid fever (62% to 100%), bloody diarrhoea can be transmitted by food (21% to 100%), and hepatitis A (31% to 100%). Washing hand before handling food reduce the risk of contamination (94% to 100%), Wearing gloves during handling food (84% to 98%), Wearing gloves while handling food (88% to 98%), proper cleaning and sanitizing of utensils(35% to 93%), Drinking and eating during food handling (38% to 93%), Food prepared in advances the risk of food contamination (50% to 95%), Reheating cooked of foods can contribute to food contamination (57% to 95%), Raw and cooked foods kept separated (88% to 100%), Contaminated foods always have change in colour, odour and taste (75%, 82% and 77%) to (100%), Cross contamination by hands and utensils (75% and 95%) to (100%), Freezing kills all the bacteria(45% to 98%), Improper storage (95% to 100%), microbes can be found in the skin, mouth and nose of healthy food handlers (70%to 100%), and leave work During illness (94% to 100%).

These finding agree with the research on the Safety of patient meals in tow hospitals before and after training of food handlers in Egypt by El Derea, 2003. There was a significant improvement in all knowledge [15]. Others study conducted in Nigeria by Isara, 2013to assess the knowledge, attitude and practice of food hygiene and safety among food service staff confirmed that the training programs for all food service staff to improve their knowledge and practice of food hygiene and safety [16].

These results disagree with the study that conducted in Nairobi, Kenya by Githiri, 2013. The food handlers performed well in knowledge items compared to the hygienic practice, which means that knowledge in food hygiene does not always result in a positive change in food handling practices. This indicates that there is need for educational programs to improve knowledge but also to emphasize on translation to practices [17].

The positive impact of the food hygiene training on knowledge of the food handlers in this study is similar to results from several previous studies. The finding results enhancing knowledge can change behavior, practice and effectiveness in microbial quality of hospitals kitchens.

5.4. Attitude of food handlers

Table 5 Attitude of Food Handlers

NO	Statement	Before			After		
		Yes	No	Don't know	Yes	No	Don't know
1	The health status of workers should be evaluated before employment	93.0(52)	5.0(3)	2.0(1)	100.0(56)	0.0(0)	0.0(0)
2	Proper hand hygiene can prevent food-borne diseases	96.0(54)	2.0(1)	2.0(1)	100.0(56)	0.0(0)	0.0(0)
3	Using cap, masks, protective gloves and adequate clothing reduce the risk of food contamination	96.0(54)	2.0(1)	2.0(1)	100.0(56)	0.0(0)	0.0(0)
4	Raw food should be kept separated from cooked food	95.0(53)	0.0(0)	5.0(3)	100.0(56)	0.0(0)	0.0(0)
5	Knives and cutting boards should be properly cleaned to prevent cross contamination	88.0(49)	3.0(2)	9.0(5)	100.0(56)	0.0(0)	0.0(0)
6	Is it important to know the temperature of the refrigerator/ freezer to reduce the risk of food spoilage?	55.0(31)	16.0(9)	29.0(16)	98.0(55)	2.0(1)	0.0(0)
7	Improper storage of food may be cause of hazard to consumers	93.0(52)	2.0(1)	5.0(3)	7.0(4)	93.0(52)	0.0(0)
8	Food handlers and any person with abrasion or cuts on hands should not touch food	91.0(51)	7.0(4)	2.0(1)	100.0(56)	0.0(0)	0.0(0)
9	Food handlers can be a source of foodborne outbreaks	73.0(41)	23.0(13)	4.0(2)	100.0(56)	0.0(0)	0.0(0)
10	Use the same knife to cut raw meat or poultry, and vegetables	50.0(28)	46.0(26)	4.0(2)	4.0(2)	96.0(54)	0.0(0)

5.5. Attitude of food handlers

A reducing in foodborne illness is effect by attitudes of food handlers towards food hygiene. Table (5) shows that the Health status of workers should be evaluated before employment and improper storage before from (93% to 100%), respectively after intervention and. Proper hand hygiene and Using cap, masks, protective gloves and adequate clothing (96% to 100%), raw food kept separated from cooked food (95% to 100%). Knives and cutting boards properly cleaned to prevent cross contamination (88% to 100%), it is necessary to check temperatures of refrigerators and freezers (55% to 98%). Food handlers and any person with abrasion or cuts on hands should not touch food (91% to 100%), Food handlers can be a source of foodborne outbreaks (73% to 100%) and use the same knife to cut raw meat or poultry, and vegetables (46% to 96%).

These results agree with the study that conducted in UK by Soon, 2011 to assess the extent to which food safety training or intervention strategies increased knowledge and attitudes about hand hygiene. Meta-analysis values for nine food safety training and intervention studies on hand hygiene knowledge among food handlers were significantly higher than those of the control (without training). Food safety training increased knowledge and improved attitudes about hand hygiene practices. Refresher training and long-term reinforcement of good food handling behaviors may also be beneficial for sustaining good hand washing practices [18].

The general attitudes of food handlers towards food hygiene in this study are satisfactory.

5.6. Practices of food handlers

Table 6 Practices of Food Handlers

NO	Statement	Before		After	
		Yes	No	Yes	No
1	wear uniform during working	14.0(8)	86.0(26)	93.0(52)	7.0(4)
2	wash your hands before touching raw food	54.0(30)	46.0(26)	98.0(55)	2.0(1)
3	wash your hands after touching raw food	61.0(34)	39.0(22)	96.0(54)	4.0(2)
4	wash your hands before touching cooked food	71.0(40)	29.0(16)	94.0(53)	6.0(3)
5	wash your hands after touching cooked food	71.0(40)	29.0(16)	96.0(54)	4.0(2)
6	use separate kitchen utensils to prepare raw and cooked food	48.0(27)	52.0(29)	80.0(45)	20.0(11)
7	thaw food at room temperature	34.0(19)	66.0(37)	7.0(4)	93.0(52)
8	check food temperature	0.0(0)	100.0(56)	0.0(0)	100.0(56)
9	use gloves during the distribution of ready-to-eat food	9.0(5)	91.0(51)	80.0(45)	20.0(11)
10	drink, eat, tobacco, or smoke in your work place	20.0(11)	80.0(45)	4.0(2)	96.0(54)
11	Work when you are sick (fever, vomiting, and diarrhea...etc.)	2.0(1)	98.0(55)	0.0(0)	100.0(56)
12	Use of proper waste disposal methods	95.0(53)	5.0(3)	98.0(55)	2.0(1)

5.7. Practices of food handlers

In evaluating the food hygiene practices of the food handlers before and after intervention (n=56), (Table 6) presented that wear uniform from (14% to 93%), respectively. Wash your hands before touching raw food (54% to 98%), wash your hands (71% to 94%), and Wash your hands after touching cooked food (71% to 96%). Use separate kitchen utensils to prepare raw and cooked food (48% to 80%), Thaw food at room temperature (66% to 93%). Not all food handlers were check food temperature because they are not having thermometer before or after intervention. Use gloves during the distribution of ready-to-eat food (9% to 80%), Drink and eat, tobacco, and smoke in your work place (80% to 96%), working if sick (98% to 100%) and use proper disposal methods (95% to 98%).

These results agree with Cross sectional study conducted to assess food safety practices and associated factors of food handlers in Ethiopia by Gizaw, 2013. Four hundred three food handlers were taken randomly. The overall level of food safety practices (good – 30.30%, fair- 47.60% and poor – 22.10%) was reported. There was an improvement in the food hygiene practices [19].

A study in USA suggested that improper food handling practices contributed to approximately 97% of foodborne illnesses in food-service establishments and homes [20].

6. Conclusion

The result of the building condition had very poor food safety practice and kitchens hygiene. Not had adequate lighting and ventilation, only two hospitals had washing hand facility and three hospitals had food storage and personal hygiene procedure. All the hospitals not adopted any educational courses on prerequisites of food safety and HACCP training before and addition not used critical control point's tree. Eight of the hospitals had clean and disinfect surfaces and equipment and four not had. Only one hospitals kitchen had check foods temperature. Only five of the hospitals had inspection of raw materials and seven not had inspection. All the hospitals not had any microbiological testing for their kitchens. Ten of the hospitals kitchens had medical certificate and two not had certificate and nine of the hospitals check every six months and only one every year. All of the hospitals release food handlers when ill with fever, diarrhea or any other symptoms.

The majority of the respondents were females 42 and males 14. Educational levels of food handlers are primary level and not take the mentioned above courses. The most respondent's age more than 40 years. The participants had more than 4 years of worked experience in food service establishment 46(82 %).The overall improvements in knowledge, practices and attitudes (KAPs).

Recommendations

The Ministry of Health should be design kitchens with standardization. Providing education about the HACCP system or /and food safety management to all manger and food service staff. Ministry of Health and hospitals managers establish monitoring procedures for the measurement of the critical control limit at each critical control point.

Compliance with ethical standards

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Disclosure of conflict of interest

Hilwa Hamid Bajin Salam and Dr. Ekram Adam Eldoom declare that they have no conflict of interest.

Statement of informed consent

The research approval was obtained from the university and was obtained from the Khartoum state ministry of health research department that have authorizing data collection from hospitals. The participants were asked to participate in the study voluntarily. The participants have right to withdraw at any time without any deprivation from research benefit. Confidentiality was guaranteed by not indicating participant names in data collection tool. Each participant was informed about the objective of the study and privacy during interview was ensured. Questionnaire and training program was filled with participants in their rest time without any interruption to their work.

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