

*Full Length Research Paper*

# Food hygiene knowledge, attitude and practices among hospital food handlers in Elmanagil City, Sudan

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**Food borne diseases (FBDs) can occur due to the health status of the food handlers. The present study aimed to assess food hygiene knowledge, attitude and practices among hospital food handlers of EIManagil City, Sudan. A cross-sectional study was administered to evaluate knowledge, attitudes, and practices, in food hygiene among hospital food handlers through a questionnaire. The food handlers expressed a level of knowledge, attitude, and practice of 70.1, 63.81 and 74.40%, respectively. The food handlers lacked knowledge regarding the transmission of hepatitis A virus and the working of infected food handler. They demonstrated poor attitude regarding the continuous evaluation of their health status, as well as the importance of training courses in the prevention of food contamination. They exhibited a low practice rate regarding removing nail polish and covering the head while preparing food. Statistically significant differences were found when comparing the educational level with washing the utensils with a detergent, along with wearing gloves while working. It was concluded that the hospitals food handlers in EIManagil expressed moderate level of knowledge, positive attitude, and good practice in food hygiene. Generally, there is an urgent need to improve on food hygiene in health care systems in Sudan. Food hygiene training programs should be implemented among health care food handlers.**

**Key words:** Attitude, Elmanagil City, food handlers, food hygiene, hospitals, knowledge, practice.

## INTRODUCTION

Food-borne diseases (FBDs) have been reported by the World Health Organization to be one of the main causes of morbidity and mortality in developing countries (WHO, 2015). Factors such as unhygienic practices, insufficient sanitation, inadequate cooking, improper storage, cross-contamination and purchasing food from unsafe sources can lead to food poisoning. Improper food handling practices are the most common factor associated with FBD outbreaks (Nyachuba, 2010; Koopmans and Duizer, 2004; Al Suwaidi et al., 2015). In African countries, FBDs

have a negative health impact in hospitals. In Sudan, there is a considerable public health burden due to FBDs. Many different pathogens and toxins are known to cause FBDs, with newer ones occasionally emerging, especially among restaurant workers. Pathogenic organisms are carried widely among food handlers in Sudan. In one study, 30.1% of food handlers were found to be carriers of pathogenic organisms, such as *Staphylococci*, *Salmonella*, and *Shigella* in addition to other pathogens (Saeed and Hamid, 2010), hence the food handlers

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**Table 1.** Demographic characteristics of participants.

Characteristics	Number	(%)
<b>Gender</b>		
Male	84	84
Female	16	16
<b>Age (years)</b>		
< 21	25	25
21-30	32	32
31-40	22	22
41-50	11	11
> 50	10	10
<b>Marital status</b>		
Single	56	56
Married	44	44
<b>Education</b>		
Not educated	1	1
Primary	68	68
Secondary	10	10
High education	21	21
<b>Length of servicing (years)</b>		
<1	26	26
1-5	51	51
6-10	13	13
>10	10	10

may play a key role in the spread and transmission of food communicable diseases. FBDs occur for many reasons, but most cases are related to the health status of the food handler and his/her personal hygiene, knowledge, attitude and practices (Mudey et al., 2010). A food handler is anyone who handles food, whether preparing or serving it (Isara and Isah, 2009). Personal hygiene, such as hand washing, wearing gloves and masks, covering the head and sanitizing/cleaning surfaces, could be a preventive procedure to reduce FBDs in hospitals. Food handlers could also play a significant role by implementing food hygiene measures to ensure food safety (Mudey et al., 2010). In hospitals, medical staffs as well as patients and their relatives consume food from the hospital kitchen, so there should be some level of awareness regarding the health status of food handlers in hospitals (Aycicek et al., 2004). Generally, Food handlers in the hospitals of Sudan, do not have sufficient food-hygiene-related awareness or knowledge regarding the implementation of food safety measures (Honua, 2018). Implementing food safety measures can reduce the risk of FBD occurrences among hospital staffs, patients and even people who eat at hospitals. Therefore, the aim of this study is to assess food hygiene knowledge, attitude and practices among food handlers in EIManagil city, Sudan.

## MATERIALS AND METHODS

A cross-sectional study was performed from July 2016 to July 2018 in EIManagil City, Sudan, to evaluate the knowledge, attitude and practices related to food hygiene among hospital food handlers. EIManagil is a city in Al Jazirah State, Sudan, where the agricultural sector is the main practice of the population. The target population included food handlers in hospital kitchens and cafeterias at EIManagil Teaching Hospital. The distribution of the socio-demographic data for the hospital food handlers at EIManagil included gender, age, marital status, educational level and work experience. A questionnaire was used to gather data on the demographic variables and food-hygiene-related knowledge (22 items), attitude (16 items) and practices (10 items) of the participants. Consent was obtained from all subjects under study, and approval was taken from the National Ethics Committee of the Ministry of Health of Sudan. IBM SPSS Statistics was used for Windows (version 21; IBM Corp., Armonk, NY, USA) for data entry and analysis. Categorical data are presented as numbers and percentages. Chi-squared test also was used to study the associations between the variables of higher levels in knowledge, attitude and practices and the educational level of the food handlers. *P*-value of < 0.05 was considered as statistically significant.

## RESULTS

Table 1 shows the distribution of the socio-demographic data for 100 food handlers at EIManagil Teaching

**Table 2.** Level of food hygiene knowledge of hospital food-handlers in EIManagil city, Sudan.

Knowledge	Correct	Incorrect	Do not know	Knowledge × education
	(%)	(%)	(%)	P-value
The correct storing temperature for foods is 2-5°C.	70	25	5	0.425
Equipment location allows easy cleaning.	60	10	30	0.536
Washing utensils with detergent makes them free of bacteria.	80	17	3	0.000
Separate room for kitchen employees prevents food contamination.	63	12	25	0.111
Eating and drinking at the work place increase the risk of food contamination	71	15	14	0.245
Handwashing sink(s) equipped with soap and disposable paper towels will prevent food contamination.	77	20	3	0.943
Washing hands before work reduces the risk of food contamination.	88	7	5	0.827
Typhoid fever is a disease caused by contaminated food.	66	15	19	0.470
Providing storage area for cleaning equipment will prevent food contamination (50%).	50	15	35	0.491
Using gloves reduces the risk of food contamination.	90	7	3	0.022
Food items can be obtained from only trusted source.	73	7	20	0.001
Food Contaminated can be discovered by the changes in color, odor or taste.	82	12	6	0.553
Adequate ventilation and exhaust systems will improve food quality.	67	21	12	0.491
Cleaning using detergents will reduce the risk of food-borne diseases	82	5	13	0.890
Water contamination causes food poisoning.	87	8	5	0.039
Unwashed vegetables are risk of food-borne diseases.	86	4	10	0.873
Salmonella is pathogens transmitted through food contamination.	56	14	30	0.647
Hepatitis A virus is pathogen transmitted through food contamination.	49	10	41	0.812
Toilets contamination can effect on food quality.	77	13	10	.408
Normal skin and nose of healthy persons are source of food pathogens.	71	24	5	0.757
The health status of food handlers should be checked periodically.	54	35	11	0.383
When Injured or infected, the worker to should take leave from work.	43	27	30	0.786
Mean	70.1%	14.7%	15.2%	

Hospital as follows; among the study population, 84 (84%) were males and 16 (16%) were females. Our results show that, most of the participants (32 participants, 32%) were in the 21–30 years' age group, followed by the <21 years' age group (25 participants, 25%) and 31-40 years' age group (22 participants, 22%). Also, among the study population, 56 (56%) were married and 44 (44%) were unmarried. Primary education constituted the most frequent educational category investigated (68 participants, 68%), followed by higher education (21 participants, 21%). The most frequent category of servicing years for the food handlers was 1–5 years (51 participants, 51%), followed by less than one year (26 participants, 26%), whereas the least frequent category was more than 10 years (10 participants, 10%), followed by 6-10 years (13 participants, 13%) (Table 1). The food handlers in the study population expressed a moderate level of knowledge, with a mean of 70.1%. Among the study population, according to Table 2, the level of knowledge of the food handlers was high regarding the notion that wearing gloves reduces the risk of food contamination (90.0%), followed by the notions that washing hands before work reduces the risk of food contamination (88%) and that water contamination causes food contamination (87%). Also the knowledge of

the food handlers was poor in terms of four food contamination scenarios: (i) when a worker gets injured or infected, he/she should take a leave from work (43%); (ii) hepatitis A virus is a pathogen transmitted through food contamination (49%); (iii) providing a storage area for cleaning equipment prevents food contamination (50%); and (iv) the health status of food handlers should be checked periodically (54%). Differences between the educational levels and knowledge variables (e.g., washing the utensils with a detergent makes them free of bacteria; wearing gloves reduces the risk of food contamination; food should be obtained only from a trusted source) were found to be statistically significant ( $p < 0.05$ ) (Table 2). All food handlers in our study expressed positive attitude with a mean of 63.8%. Among the study population, as shown in Table 3, the level of attitude among food handlers toward food contamination was high regarding the notion that wearing a mask prevents contamination (87%), followed by the notions that wearing gloves prevents contamination (86%), that food contamination is caused by pathogenic bacteria (84%) and that food handlers could be a source of food-borne outbreaks (82%). Our results show that, the attitude of the food handlers was poor regarding the following food contamination scenarios: the health status

**Table 3.** Level of food hygiene attitude of hospital food-handlers in EIManagil city, Sudan.

Attitude	Agree (%)	Disagree (%)	Do not know (%)	Attitude × Education (Pearson chi test)
				p-value
Well-cooking of foods prevents contamination.	73	15	12	0.689
Contaminated food is due to presence of pathogenic bacteria.	84	11	5	0.545
<i>S. aureus</i> is one of pathogenic bacteria causing food-borne diseases.	50	12	38	0.117
Continuous Hand washing can prevent food-borne diseases (74%).	74	11	15	0.464
Wearing masks prevents contamination (87%)	87	8	5	0.892
Raw foods should be stored separately from cooked food.	53	7	40	0.108
Wearing gloves prevents contamination.	86	9	5	0.774
The health status of workers should be continuously evaluated.	39	20	41	0.370
Checking the temperature of refrigerators prevents contamination.	54	17	29	0.803
Wearing caps is an important practice to prevent contamination.	62	25	13	0.857
The best way of thawing the frozen meat, is using cold water.	47	23	30	0.300
Knives and cutting boards could be a source for cross contamination.	63	21	16	0.568
Dish towels can be a source of food contamination.	72	10	18	0.270
Food handlers can be a source of foodborne outbreaks.	82	5	13	0.001
Fingernails could be a source of foodborne pathogens.	50	25	25	0.137
Training courses is important to prevent contamination.	45	15	40	0.910
Mean	63.8%	14.6%	21.6%	

**Table 4.** Level of food hygiene practices of hospital food-handlers in EIManagil city, Sudan.

Practice	Yes (%)	No (%)	Practice × Education (Pearson chi test)
			p-value
Do you cover your head during food preparation?	55	45	0.459
Do you wash your hands properly during your work?	85	15	0.429
Do you wear gloves while working?	86	14	0.822
Do you use a mask during your work?	75	25	0.483
You do not eat, drink, and smoke at your work place?	80	20	0.257
Do you remove fingernails paint while working?	25	75	0.905
Do you properly clean the surfaces at your work place?	83	17	0.428
Do you use the detergents while washing the surfaces at your work place?	85	15	0.000
Do you properly wash vegetables and fruits?	95	5	0.000
Do you check the expiry date of foods before receiving?	75	25	0.876
Mean	74.4%	25.6%	

of all workers should be continuously evaluated (39%); training courses are important to prevent contamination (45%); the best way to thaw frozen meat is to use cold water (47%); fingernails are a potential source of food-borne pathogens (50%); and *Staphylococcus aureus* remain one of the pathogenic bacteria that cause food-borne diseases (50%). The difference between the educational level and the notion that food handlers could be a source of food-borne outbreaks was statistically significant ( $p < 0.05$ ) (Table 3). All food handlers at hospitals in EIManagil expressed good practice in food

hygiene, with a mean of 74.4%. Table 4 presents the responses of the food handlers to the practice questions on food contamination. The highest-ranked practice among the respondents was the practice of properly washing vegetables and fruits (95%), followed by the practices of wearing gloves while working (86%); using detergents while washing any surface at the workplace (85%); washing hands properly during work (85%); properly cleaning the surfaces at the workplace (83%) and eating, drinking and smoking at the workplace (80%). In addition, the lowest-ranked food contamination

practice among the food handlers was the practice of removing nail polish while working (25%), followed by the practice of covering the head while preparing food (54%). Differences between the educational level and practice variables (e.g. using detergents while working, washing the surfaces and washing vegetables and fruits) were statistically significant ( $p < 0.05$ ), as shown in Table 4.

## DISCUSSION

Food handlers are regarded as the main source of food contamination, either through manual contact or through respiratory secretions. In particular, food handlers in hospitals may contaminate food and, hence, cause outbreaks of food-borne infections in hospitals (Maguire et al., 2000). The results indicated that the majority of the study subjects were men, which is in contrast to those of many studies that reported a higher proportion of females (Isara and Isah, 2009; Baluka et al., 2015). Regarding age distribution, results from similar studies carried out in India indicated that most food handlers ages were from the 15–30 years' age group (Prabhu and Shah, 2014). In total, 67.5% of the subjects had an educational level of primary school; thus, the performance of employees regarding food safety might not be satisfactory and, thus, may cause public health problems (Webb and Morancie, 2015). A larger number of participants (51%) had one to five years of experience working in food services, followed by participants with less than one year of experience (26 participants, 26%), which is similar to findings from Turkey (Bas et al., 2006). Having good knowledge of food-handling practices and hospital-related infections will definitely improve the experience of workers at hospital kitchens. The food handlers in the study population showed a moderate level of food hygiene knowledge. Similar to our results, it has been found in one study that food handlers had good knowledge regarding personal hygiene and the relationship of food-borne diseases (Hassan and Dimassi, 2014). In general, food handlers had sufficient knowledge regarding the purpose of wearing gloves and washing hands and the effect of water contamination, but they lacked knowledge regarding the transmission of hepatitis A virus and whether injured or infected food handlers should work. Similar studies showed that food handlers have poor knowledge regarding many food-hygiene-related issues (Allam et al., 2016; Akabanda et al., 2017). It is important that food handlers at hospitals be knowledgeable about food safety, food hygiene and infection control to make sure that the food is prepared and handled safely to the patients (Mudey et al., 2010; Lestantyo et al., 2017). In our study, food handlers expressed positive attitude towards food hygiene. Similar studies showed that all participants agree that food handlers should be regularly medically examined (Iwu et al., 2017; Bamidele et al.,

2015). It is very important that food safety training programs be implemented for food handlers working in the healthcare sector in Sudan, because education and training in hygienic practices may reduce the morbidity and mortality associated with FBDs in hospitals (Ansari and Khan, 2012). Statistically significant associations were found between the educational level and the attitude regarding the notion that food handlers are a potential source of food-borne outbreaks. In Dessie town, Ethiopia, Adane et al. (2018) reported a significant association between the availability of service training and medical check-up with the levels of food hygiene and safety practices. The attitude regarding thawing frozen meat using cold water was found to be poorly rated among the studied food handlers. Re-freezing food causes bacteria to multiply and could result in outbreaks of food-borne illnesses (Julie, 2012). The food handlers in the study population showed good food-hygiene-related practices. Similarly, it has been shown in a study (Park et al., 2010) that food handlers practiced cleaning and disinfection procedures properly. Other studies reported that some food handlers would even keep working even when they get sick (Mudey et al., 2010; Lestantyo et al., 2017). Statistically significant associations were found between the educational level and the practices of using detergents to clean surfaces while working as well as washing surfaces and washing vegetables and fruits before consumption. It can, hence, be concluded that food handlers at hospitals in Eimangil city expressed a moderate level of knowledge, positive attitude and good practices regarding food hygiene. There is an urgent need to improve the level of food safety in the healthcare system across Sudan. It is also important to implement food safety training programs for food handlers working in the healthcare sector to improve their knowledge, attitude and practices.

## CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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