



Food Contamination from Catering Services in Khartoum Teaching Hospital

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Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

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ABSTRACT

Food poisoning is a term used to describe an illness brought about by eating food or drink contaminated with harmful microbes. The three scientific causes of food poisoning are bacteria, viral or chemical "either naturally occurring in food or introduced" Pathogenic organisms are thought to be widely distributed among food handlers and bacteria can be found everywhere; in the environment, on our bodies, the soil, water, air and in the food we eat. Many types of bacteria are useful and essential to our health and survival but there are certain strains of bacteria known as pathogenic bacteria that are harmful to humans this study aimed to assess the prevalence of some pathogenic bacteria due to poor food catering services and study possible contamination causes when food not consumed immediately. This study was conducted in Khartoum teaching hospital, mostly in dietetic units. This hospital has about 50 food services workers and 400 beds. A total of 65 different samples (ready to eat food and swab samples taken from workers hands and utensils) were collected and sent for bacteriological culture. The results obtained in this study varied and the

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dominant bacteria isolated were *Staphylococcus* species (55.6%), *Escherichia coli*, *Micrococcus*, *Aerococcus viridians*, *Staphylococcus epidermidis* and *Corynebacterium* species. These were present in samples of ready to eat food taken from wards (95%) and the hospital kitchen (85%). Approximately 48% of swab samples were also positive. We concluded that the bacteria isolated from different samples are an indication of poor hygiene practices of the catering system in the intended hospital. We suggest that food should be brought to the patients immediately to avoid any microorganism growth. Food workers must strictly follow food hygiene and safety regulations.

Keywords: Food hygiene; food contamination; hospital; Khartoum.

1. INTRODUCTION

Food is defined as any substance containing nutrients, such as carbohydrates, proteins and fats that can be ingested by living organisms and metabolized to provide energy and body tissue [1]. Bacterial foodborne infections occur when food contaminated with bacteria is consumed and the bacteria continues to grow in the intestines setting up an infection which cause illness [2]. Intoxication involves food poisoning in which the organism found in the food grows and releases a toxin. When the toxin is ingested along with the food it gives rise to Food Poisoning Syndrome. Bacterial toxins that produce intoxication are the exotoxin types of either enterotoxin (affecting the gut) as in staphylococcal intoxication or neurotoxin (affecting the nervous system) as in botulism. Another category of intoxication are the mycotoxicoses (due to ingestion of mycotoxins) and the disease is caused by algal toxins (i.e. shell fish poisoning). Generally, intoxications have short incubation periods. The most common symptoms of food poisoning are nausea, vomiting, diarrhea, stomach pains, abdominal cramps, loss of appetite, fever, muscle pains and chills. Most cases develop symptoms between 1 and 3 days after eating the contaminated food [3]. Food safety is a scientific discipline describing handling, preparation, and storage of food in ways that are capable of preventing foodborne illness. This includes a number of routines that should be followed to avoid potentially severe health hazards [4]. Hygiene refers to a set of conditions and practices that help to maintain health and prevent the spread of diseases [5]. In the recent century hospital catering has become nationalized and the feeding of patients has become the responsibility of catering officers instead of nursing staff. This is because diet plays an important role in the treatment of some diseases and prevents complications of other disease related diets such as diabetes, hypertension, renal failure etc. [1]. Catering services that

handle food frequently (food handlers) as well as utensils may cause food hygiene problems if strict regulations are not followed. A poor catering system in a hospital can have a direct effect on the patients who are usually more susceptible to food borne infections and could potentially suffer serious complications. Therefore, highly qualified food staff in hospitals is essential in order to improve the patients' health and keep them well nourished [2]. Washed, rinsed and sanitized surfaces and utensils may look sparkling clean yet bacteria may be still present and in large numbers. Cleaning is the physical removal of food and/or soil from surfaces and does not necessarily mean microorganism free. Sanitizing agents differ in the amount of contact time required as well as their concentration and temperature requirements. When using combination products, such as detergent-sanitizers, cleaning and sanitizing must be done in two separate steps. First use the detergent-sanitizer to clean, then prepare another solution of the same agent to sanitize [3]. The reason we conducted this study is that most of Sudanese communities suggest that hospitals' catering services are inadequate in quality and some of them do not accept prepared food offered by them. Therefore we decided to investigate the reasons behind this.

1.1 Aims

The aim of this study was to assess the prevalence of pathogenic bacteria caused by poor food catering services and to look into the factors that promote the stability of the catering services system. This work took place in the hospital of Khartoum, Sudan, in 2008.

2. METHODOLOGY

This study was conducted in Khartoum teaching hospital in Khartoum City, which is a highly populated city in Sudan. The city is located in the heart of Sudan at the confluence of the White

Nile and the Blue Nile. The state is surrounded by River Nile State in the north-east, in the north-west by the Northern State [6]. The hospital catering services were initiated in the early 50s and the kitchens were designed with optimal characteristic to meet the catering needs at that time. Unfortunately, no updates have been introduced to meet current needs. Additionally, the kitchens have no warm water and the refrigerator room was not operational for many years. All food was cooked on a daily basis with no appropriate storage of any ready to eat food [7].

A total of 65 samples were collected. 40 samples were ready to eat food samples including kwash milk, lentils, vegetables, salad, minced meat, custard, tamia, porridge and cheese. 25 swab samples were taken from workers hands and utensils. All samples were collected and placed directly in sterilized bottles and closed immediately. All of samples were send off to be cultured on bacteriological culture media.

The samples were seeded on different bacteriological culture media and incubated at 37°C from 24 h. Bacteria were grouped on the basis of their Gram and/or Ziehl–Neelsen staining. The biochemical tests described in Bergey's Manual of Systematic Bacteriology [8] were used for the identification of bacteria.

3. RESULTS AND DISCUSSION

The following are the results of the laboratory analyses of the different samples that collected randomly from Khartoum teaching hospital Dietary unit (ready to eat food samples, utensils and workers' hands).

Table 1 shows that approximately 75% of food samples that were taken directly from the hospital kitchen were positive when cultured 95% of ready to eat food samples which taken from the wards were also positive. This result confirms poor hygienic practices during food handling especially in wards where food may stay around for a long time and allow for bacteria growth.

3.1 Types of Ready to Eat Food Samples and Sources of Collection

Table 2 shows the different types of isolated bacteria from ready to eat food samples. *Staphylococcus aureus* was present in 55.6% of the samples, which may be a public health hazard. Multiple studies have reported that enterotoxins produced from *Staphylococcus* species are a leading cause of foodborne diseases like skin infections and pneumonia and are responsible for the rise of nosocomial infections [9]. Other types of isolated bacteria included *Staphylococcus epidermidis* (19.4%) followed by *Micrococcus viridians* (13.9%), *Corynebacterium* sp. (8.3%) and *Aerococcus viridians* (2.8%).

Table 1. Samples collected for bacterial analysis

Sample source	Cooked food	Sample no	No of positives samples	Percentage
Wards	kwash milk, lentils, vegetable, salad, minced meat, custard, tamia, porridge, cheese	20	19	95%
Kitchen	Jam, fowl, lentils, cheese, juice, minced meat, custard, vegetable soup	20	15	75%
Total		40	34	85%

Table 2. Bacterial species isolated from samples

No of samples	Types of bacteria	No of positives samples	Percentage of isolates in the total of positives sample's
40	<i>S. aureus</i>	20	55.6%
	<i>A. viridian</i>	1	2.8%
	<i>S. epidermidis</i>	7	19.4%
	<i>M. varians</i>	5	13.9%
	<i>Corynebacterium</i> sp.	3	8.3%

Table 3. Bacteria present in food samples

	Types of samples	Bacteria isolated
1	Pots	Staphylococci
2	Wooden spoons	Staphylococci
3	Plate for meat storage	Staphylococci
4	Knives	Staphylococci
5	Plate for fruit storage	No growth
6	Salad Plate	No growth
7	Trays meals in hospital wards	Staphylococci
8	Juice cups	Staphylococci
9	Marble top for food processing	Staphylococci + <i>Escherichia coli</i>
10	Table for meat cutting	Staphylococci + <i>Escherichia coli</i>
11	Vegetable platter	no growth
12	Knife for cutting of all types of food	Staphylococci + <i>Escherichia coli</i>

3.2 Types of Bacteria Isolated from Different Ready to Eat Food Samples

Table 3 shows that negative isolated samples were only 25% and the dominant bacteria present were Staphylococci in addition to *Escherichia coli*. This result is an indicator of poor hygiene in food services since *Escherichia coli* normally lives in the intestines of humans and animals [7].

3.3 Utensils Samples Result

The different types of bacteria isolated from workers' hands belong to *Staphylococcus* species, which was the main type of organism collected from swab samples (38.5%). Other bacteria were *Escherichia coli*, which is an indicator of fecal contamination and poor hygiene. We observed that some worker washed their hands when asked to give a swab samples a practice not usually followed during food preparation.

3.3.1 Properties of isolated bacteria

Staphylococci is gram positive cocci on stained smears and is arranged in clusters or pairs. The colonies are white or creamy and b hemolytic and clear when stored at night at 4°C. *Staphylococcus aureus* grows on Chapman Stone medium. There are over 30 types of *Staphylococcus* species but *Staphylococcus aureus* causes most of staph infections including skin infections, pneumonia, food poisoning, toxic shock syndrome and blood poisoning bacteremia.

Escherichia coli is a type of bacteria that normally lives in the intestines of humans and

animals. However, some types of *Escherichia coli* can cause intestinal infections [7]. Symptoms of intestinal infection include diarrhea, abdominal pain and fever. More severe cases can lead to bloody diarrhea, dehydration, and even kidney failure. People with weakened immune systems, pregnant women, young children, and older adults are at increased risk for developing these complications. Most intestinal infections are caused by contaminated food or water. Proper food preparation and good hygiene can greatly decrease chances of developing an intestinal infection [7]. Previous studies by Marques and colleagues used microbiological analyses for samples taken from equipment, utensils and food workers' hands and the results showed that about 70% of samples were positive for bacterial presence [10].

Another study done in Khartoum Bahri hospitals revealed lower educational levels of food handlers and lack of knowledge and training in food hygiene and foodborne diseases. Some managers had never heard of HACCP [9].

All hospital kitchens use cold water with detergent only and not use drying racks for the cleaned and sanitized equipment. Most hospitals stored utensils in conditions that could easily expose them to contamination, did not have tankers for shortage and toilet facilities. Some of the hospital kitchens had floors in bad conditions (cracks on the floors) and inadequate lighting and ventilation. The hospital kitchens also lacked control of rodents and houseflies [11].

4. CONCLUSION

The results indicate that the hospital catering system may have a direct effect in food hygiene at the intended hospital. The number of positives

culture samples of ready to eat food, which were taken directly from the kitchen is less than from the rest of the sample taken from the wards. These show the increased chances of contamination when food is left a long time in the wards as well as poor food handling. There were similarities of isolated bacteria from the different sample sources indicating the possibility of cross of contamination. The presence of *Escherichia coli* is a strong indicator of poor hygiene and may indicate fecal contamination.

5. RECOMMENDATIONS

The kitchens and food preparation rooms should be kept in a good state with adequate ventilation and easy to be cleaned. Awareness of all workers of the food hygiene process and how to avoid hazards. Ongoing medical checkups for food workers. Food should be given to the patient in the right time to minimize the length of time left in the ward. Following catering system rules in all food processing. Kitchens and bathrooms should be away from each other.

CONSENT

It is not applicable.

ETHICAL APPROVAL

As per international standard or university standard, written approval of Ethics committee has been collected and preserved by the author.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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