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Bacterial Contamination of Food Handlers at Various Restaurants in Kano State Metropolis, Kano Nigeria

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A B S T R A C T

Hands are the major source of contamination, which can never be totally free of microorganism especially bacteria. Food can become contaminated via dirty hands if there is lack of proper hygiene among the food handlers when handling food. Human hands are in regular contact with the surrounding environment and a variety of pathogens can reach the mucous membranes in the mouth, nose, eyes and genitals of human being through the hands and consequently contribute to food borne illness outbreaks**.** This research was designed to determine the level of bacterial contamination among food handlers working at various restaurants in Kano state metropolis, Kano Nigeria. Total of 135 samples were collected from the palm of food handlers 0f 15 different restaurants, in which each sample obtained were cultured, bacteria isolated, identified and characterized according to standard procedure. Result shows that among 8 different species of bacteria isolated and identified, *Escherichia coli* has the occurrence of 20.3%, *Enterobacter* spp 15.4%, *Shigella* spp 14.7%, *Staphylococcus aureus* 14.7%, *Salmonella* spp 13.9%, *Klebsiella* spp 11.9%, *Streptococcus* spp 6.2%, and *Vibrio* spp with occurrence of 2.8%. The result of this research shows the occurrence of pathogenic bacteria on the hands of food handlers working in these various restaurants. These indicate the poor hygiene practice of the food handlers, which in turn may serve as a source of infection to the food consumers.

Introduction

Hands are the major source of contamination, which can never be totally free of microorganism especially bacteria. Food can become contaminated via dirty hands if there is lack of proper hygiene among the food handlers when handling food (Anuradha and Dandekar, 2014).

Although contaminated surfaces can serve as possible reservoirs for pathogenic microorganisms, studies have suggested that surfaces are not directly associated with transmission of food-borne infections to individual and the source of transmission from surfaces to patients is mainly via hand contact with the surface (Assefa *et al*.,

2015). Human hands are in regular contact with the surrounding environment and a variety of pathogens can reach the mucous membranes in the mouth, nose, eyes and genitals of human being through the hands and consequently contribute to foodborne illness outbreaks (Tan *et al*., 2013). Food handlers are the individuals playing a major role in ensuring food quality and safety throughout the sequence of producing, processing, storage, preparation and service. Consequences of food-borne outbreaks via the food handlers is a common and continual problem worldwide. Outbreaks of food born illness have been linked to improper food handling practice at food serving establishment (Thidarat *et al*., 2011).

Almost 75% of food borne illness outbreaks is assumed to be related to improper food handling practices by employees in food establishments (Gizaw *et al*., 2013). The improper food handling practices have attributed by lack of adequate food safety knowledge. In developing countries, up to an estimated 70% of cases of diarrheal diseases are associated with the consumption of contaminated foods (Andargie *et al*., 2014).

Approximately 10 to 20% of food-borne disease out breaks are due to contamination by the food handle (Cheesbrough). Food handlers are those who directly engages in the handling of food, or handle the surfaces which likely to come in contact with food, for food business.

The aim and objective of this research is to access the level of bacterial contamination among food handlers working at various restaurants in Kano state metropolis, Kano Nigeria. To isolate and identify some pathogenic bacteria from the hands of food handlers.

Materials and Methods

Study Area

The study sites were various restaurants located in Kano state metropolis, Kano Nigeria.

Sample Collection

Total of 135 samples were collected from 15 different restaurants located in Kano state metropolis, Kano Nigeria. Three individuals were sampled from each restaurants and the sample collected in triplicate from each individual, collecting 9 samples from each restaurant. These samples were collected from different parts of palm of each food handlers for bacteriological analysis.

A sterile cotton swab stick was moisture in a normal saline and various parts of palm of food handler were swabbed by gentle rolling the swab stick at different part of the palm. Caution was taken not contaminate the swab, and it was place back in to its container and sealed with adhesive tape and labeled.

Sterilization of Apparatus and Glassware used

All apparatus and other glass wires used for the performance of this practical were sterilized using autoclave at 121^{0}c for 15 minutes. This in order to avoid contamination during the conduct of the practical

Media Preparation

Various selective and differential media were prepared. Media prepared include- MacConkey agar, mannitol salt agar, thiosulphate citrate bile salt sucrose agar, brilliant green agar, Eosin methylene blue agar and blood agar.

Inoculation of the Culture Media

Each sample collected was inoculated on to various selective and differential media use for the isolation of different bacterial species. This was done by tricking the surface of the agar medium using the swab stick containing the sample. And the plates were incubated at 37^0c for about 24 hours.

Plate Reading

Various plates incubated were observed after 24 hours incubation, in which morphological characteristics, color and texture of the colonies grown on these media were observed.

Identification of the Isolates

Gram Staining Technique

Base on Gram reaction bacteria isolated were grouped in to Gram positive and Gram negative by their ability for retaining the primary stain (Gram positive) and others loses the primary stain and retained secondary stain(Gram negative).

Method

Smear of each isolate were made on a clean glass slide and fixed over Bunsen flame. A dried and fixed smear was covered with crystal violet for 1 minute It was rapidly washed with clean water. The smears were then covered with Grams iodine for 1 minute. Then the smears were decolorized using alcohol and flushed immediately with water. Smear were also covered with safranine reagent for 2 minutes, then washed with water. Then slides were dried.

Microscopic Examination

One drop of emersion oil was placed on these dried smears on the glass slide and observed under x100 objective. Gram reaction and morphological characteristics of the organism were observed and recorded.

Biochemical Identification

After identification of the Gram reaction of the isolates, the colonies were also subjected to various biochemical tests for the confirmation of the species of bacteria isolated.

Biochemical test employed are: coagulase test, oxidase test, catalase test, indol test, methyl red test, vp test, bile solubility test, citrate utilization test, motility test, and test using triple sugar ion media

Results and Discussion

In this research the overall contamination level of bacteria was high. This indicated poor personal hygiene practice of the food handlers working in this various restaurants. The high contamination level in this research was in agreement with the findings of[8]. The result shows that about 89% of the food handlers were contaminated and it was revealed out that this contamination is largely due to the poor personal hygiene practice, lack of environmental sanitation and ignorance of health promotion practice.

High occurrence of *E. coli* and *Enterobacter* spp of 20.3% and 15.4% respectively from the hands of food handlers in this research indicated contamination of hands with fecal bacteria due the inadequate hand washing practice, which was in agreement with the findings of [10]. Which reported that intestinal bacteria *E. coli* and *Enterobacter* spp have the highest contamination level reaches about 22.2% and 17.8% respectively. And they revealed out that these bacteria can be transmitted from the

hands of these food handlers to the consumer's food, leading to food born infection. *Klebsiella* was also among the intestinal bacteria isolated with about 11.9%

contamination level, which also indicated contamination of hands from the fecal sources.

Table.3.1 Showing the Number of Positive Sample of Bacteria Isolated among the Various Restaurants

No: of sample collected from each restaurants=9

Sample Site	I	II	III	IV	V	VI	VII	VIII
A	3	2	3	1	2	1	0	0
B	3	1	1	2	0	2	0	1
C	3	2	3	1	2	1	2	0
D	2	1	1	2	2	1	0	0
E	2	1	1	2	1	2	1	0
F	1	1	1	2	1	2	1	1
G	3	2	2	2	2	1	0	0
H	1	1	1	1	1	1	0	0
I	1	2	2	2	2	1	0	0
J	2	2	1	1	1	0	1	0
K	2	2	2	0	1	1	1	1
L	1	0	0	0	0	2	1	0
M	1	2	1	2	1	0	1	0
N	1	1	0	1	2	1	0	0
O	3	2	2	2	2	1	1	0

Latter A-O representing restaurants in which the samples were collected
Name of bacteria isolated represented by roman number I-VIII
I= *E.coli,* II= *Enterobacter spp,* III= *Shigella spp,* IV= *Staphylococcus spp,* V= *Salmonella spp*, VI= *Klebsiella spp,* VII= *Streptococcus spp*, VIII= *Vibrio spp.*

Table.3.2 Shows the Occurrence of Bacteria Isolated from the Hands of Food Handlers. it could be Observed that *E. coli* has the Highest % Occurrence (20.3%) followed by *Enterobacter spp* (15.4%), while the least % occurrence was *Vibrio spp* having (2.8%)

Bacteria isolated	Total positive	Contamination rate in (%)
E. coli	29	20.3
Enterobacter spp	22	15.4
Shigella spp	21	14.7
Staphylococcus aureus	21	14.7
Salmonella spp	20	13.9
Klebsiella spp	17	11.9
Streptococcus spp	9	6.2
Vibrio spp	4	2.8
TOTAL	143	100

Table.3.3 Shows the Distribution of Contamination Level of each Restaurant, in Which Restaurant C and O Have the Highest Contamination Level of (9.8%) Each While Restaurant L has the Least Contamination Level of(2.8%)

Sample Site	Total positive	Contamination level in (%)
A	12	8.4
B	10	6.9
C	14	9.8
D	9	6.3
E	10	6.9
F	10	6.9
G	12	8.4
H	6	4.2
I	8	5.6
J	9	6.3
K	10	6.9
L	4	2.8
M	7	4.9
N	7	4.9
O	14	9.8
Total	143	100

Also this research shows that *Shigella* spp has about 14.7% contamination level signified poor hygiene practice of the food handlers, which when this bacteria transmitted to food may result in bacillary dysentery among the consumers. The hygienic situation of food handlers was further challenged by isolating *Staphylococcus aureus* with about 14.7% contamination level which may also spreads to the food and lead to staphylococcus food intoxication. Other intestinal bacteria isolated were *salmonella* spp with about 13.9% contamination level which also support the contamination of hands with fecal bacteria due to the inadequate hand washing practice of the food handlers, and consumption of this pathogen in the food may lead to typhoid fever infection. *Streptococcus* spp was also isolated in this research 6.2%, this indicated possible contamination of hands with the nasal origin. And when these bacteria ingested may result in pneumonia infection. *Vibrio* spp were also among the bacteria isolated but the contamination level was very low 2.8% indicate contamination with the fecal matter and probably the hands contaminated by touching contaminated raw food materials like vegetables. Consuming of this pathogen in the food may leads to gastroenteritis.

Distribution of the contamination level of each restaurants shows that restaurants C and O have the highest percentage of contamination 9.8% each. This indicated that food handlers working in these lack good personal hygiene and proper environmental sanitation. It was also observed that, it may be attributed to the way managers of these restaurants use to employ small children which some were even beggars (Almajirai) assigning them in the preparation as well as the serving of food. While restaurant L has the lowest percentage of contamination signified good personal hygiene proper environmental

sanitation among the food handlers working in this restaurants.

In conclusion from this research revealed that bacterial contamination among food handlers of these various restaurants was very high, because about 93% of the hands of food handlers were contaminated; E. coli has the highest percentage of 20.3% while vibrio has the lowest 2.8%. Therefore an effective measure of preventing the transmission of these pathogens from the hands of food handlers to the consumer's food has to be taken care of.

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