

DETERMINATION OF MICROBIAL LOAD IN RESTAURANT FOODS SOLD WITHIN OZORO ISOKO NORTH, DELTA STATE OF NIGERIA

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ABSTRACT

Samples of foods were collected from the different restaurant within Ozoro metropolis to determine the microbial quality. 10 samples were collected from five various sites. From the analysis *Escheerchia coil*, *Staphylococcus aureus*, *Bacillus spp*, *Lactobacillus spp*, *Pseudomonas aeruginosa*, *Rhizopus spp*, *Aspergillus spp*, and *Mucor spp* were isolated. The total bacteria and fungi count ranged from 1.0×10^3 cfc/g. Those foods whose counts ranged from 1.0×10^3 to 3.5×10^3 cfc/g were acceptable with reference to hazard analysis critical control point, therefore, present finding call for the more stringent supervision by the public health department of the local government authority, staff and the general public from the further occurrence of food poisoning.

Keywords: Microbial Load, Restaurant, Food Quality.

1. INTRODUCTION

Food is any substance normally eaten or drunk by living things. The term food also includes liquid drinks. Food is the main sources of energy and of nutrition for animals, and is usually of animals or plant origin. There are 4(four) basic food energy sources, fats proteins, carbohydrates and alcohol (Wikipedia, 2018).

Microbial load is the total number of bacteria and fungi in a given quantity of water or soil or on the surface of food or an environment. The presence of the bacteria and fungi may not be related to the presence of disease causing organisms (Odika, 2011).

There is a wide variety of restaurant food, but are not limited to sandwiches, kebabs, sushi, take away foods and bakery products. A Restaurant foods usually include a number of ingredients which may or may not be cooked due to the variety of restaurants foods. The interpretation of microbial result obtained from testing must account for the method of processing and the individual components of the food (FSANZ, 2001).

Raw foods especially restaurant vegetables salads. Sprouts have been implicated in outbreak of food borne diseases in both developed countries like USA, China and developing countries like Ghana and Nigeria (Kumar et al., 2006).

In countries where local restaurants foods is prevalent, there is commonly a lack of information on the incident of food borne disease related to the local restaurant foods (WHO, 2001).

In Nigeria, food are sold at all public places and road side shops. However, there consumption, quick method of cleaning and handling could often prove to be a public health threat. There are reports of food-borne diseases associated with the consumption of unhygienic foods at several places in Nigeria. Hazards analysis and critical point (HACCP) conducted for some selected local food restaurants and fast food se involve microbial analysis of food samples indicative of personal hygiene and environmental sanitation showed the presence of *E.coli* in almost all the sample salmonella and *stigella* in knife, hand rinse and dish washer (Sheth et al., 2005).

Local food restaurants usually make use of simple facilities like wheelbarrows, trays, mat, tables and make shift stall, thus further increasing the risk of contamination from raw materials and equipment additional processing condition, improper handling and prevalence of unhygienic condition contributes substantially to the entering of bacteria pathogen (Mahale et al., 2008).

There are basically two major sources in which microbes can get into our foods these sources includes the primary or natural sources and the secondary or artificial sources. The primary or natural sources include the surrounding soil, water, dust particles.

The micro-organism found in these sources are *Bacillus spp*, *Salmonella spp*, *Aspergillus spp*, *Penicillium spp* and Yeast (Cliffs, 2000).

The secondary or artificial sources include food handlers, food utensils and the food handlers garments. Macro-organism presents in this sources are variety of organism (Cliffs, 2000).

This pathogens can cause two types of food borne illness-the diarrhea type and the emetic or vomiting type. The diarrhea type occurs within 8 to 16 hours eating food and last for about 24 hours. Food involved vary from starch, vegetables, meat products, cereal foods, sauces, puddings spices (Food Safety Information Council, 2003)

2. THE STUDY AREA

Ozoro is the administrative headquarters of Isoko North Local government area of Delta State. It is located in the Southern part of Nigeria and is inhabited by an ethnic group of the same name, the Isoko people. Ozoro region is in the tropical rain forest area of the Nigeria Delta. The region experiences high rainfall and high humidity most of the year. The climate is equatorial and is marked by two distinct seasons. The dry season lasts from about November to April and is significantly marked by the cool harmattan dusty haze from the North-east winds. The rainy season May to October with a brief dry spell (Wikipedia 2018).

2.1 Sample Collection

The samples were collected at Ozoro Delta state in five various cooked food in different restaurants, two samples from each restaurant. The restaurant food are moi-moi and beans from restaurant A, Egusi soup (Mellon) and Jollof rice from restaurant B, Starch and banga soup from restaurant C, Stew and Ogbolor soup from restaurant D, Salad and plantain from restaurant E.

3. MATERIALS AND METHOD

3.1 Preparation of Media

Nutrient Agar:

Materials: cotton wool, Aluminum foil, conical flask, Autoclave, Sterile water.

7g of nutrient agar was suspended in 250ml of distilled water. It was shaken carefully so as to dissolve completely. Cotton wool was wrapped in aluminum foil and was used to cover the mouth of the conical 2 flask which was transferred to the autoclave for sterilization. It was autoclave for 15mins at 121⁰C. After autoclave, the conical flask was placed on the laboratory bench so as to allow it to cool to 47⁰C before dispensing about 15-20ml into the sterilized petri dishes.

MAC Conkey Agar

This agar is used for differentiating intestinal organism into lactose and non-lactose fermenting organism. 13g of the MC conkey agar was dispensed into 250ml of sterile water in conical flask. It was properly mixed and the mouth of the conical flask was covered with cotton wool wrapped in aluminum foil before transferring into the autoclave for autoclaving at 121⁰C for 15mins. It was then placed in the working bench and allowed to cool at about 47⁰C about 15-20 was dispensed into the sterile petri dishes which were allowed to solidify

Potatoe Dextrose Agar (pda)

10g of the PDA was dispensed into 250ml of sterile water in a conical flask. Then it was shaken properly to dissolve all the powder. It was cover with cotton wool wrapped with aluminum foil and placed in an auto clave for auto calving at about 121⁰C for 15mins after which the conical flask was placed on a sterile laboratory bench and allowed to cool at about 47⁰C before pouring 25-20ml of the agar in a sterile petri dishes. It was then allowed to solidify.

Microbiological Evaluation:

The microbial statuses of the different cooked food collected from different restaurant were investigated.

Characterization of Bacteria Isolate

Identification was done by consideration of the culture morphological biochemical characteristics of each isolates and in accordance to the district and the eighth edition of Bergey's manual of determinative bacteriology.

Biochemical Characterization

Biochemical characterization of the isolate colonies was carried using standard protocols. Identification was carried out according to Bergey's Manual.

4. RESULT AND DISCUSSION

A total of ten cooked food samples were examined in this research study. The samples collected aseptically in sterile container after been tested revealed pathogenic contamination with fecal coalition in majority of them. Bacterial enumeration revealed a high count of fecal streptococci indicating poor bacteriology of the cooked food. The significant result of bacterial/fungal enumeration are presented in the table below

Table 1: Restaurant 1

Samples	BACTERIAL COUNT			Fungal Count
	N/A (cuf/g)	Mac (cuf/g)	CLEO(cuf/g)	PDA (cuf/g)
A	1.0X10 ⁻³	1.1X10 ⁻³	Nil	Nil
B	2.0x10 ⁻³	1.0x10 ⁻³	1.5x10 ⁻³	1.8x10 ⁻³

Table 2: Restaurant 2

Samples	BACTERIAL COUNT			Fungal Count
	N/A (cuf/g)	Mac (cuf/g)	CLEO(cuf/g)	PDA (cuf/g)
A	1.5x10 ⁻³ Nil	1.2x10 ⁻³		Nil
B	1.1x10 ⁻³	Nil	1.0x10 ⁻³	1.3x10 ⁻³

Table 3: Restaurant 3

Samples	BACTERIAL COUNT			Fungal Count
	N/A (cuf/g)	Mac (cuf/g)	CLEO(cuf/g)	PDA (cuf/g)
A	1.2x10 ⁻³	1.0x10 ⁻³	1.1x10 ⁻³	2.1x10 ⁻³
B	4.5x10 ⁻³	4.8x10 ⁻³	1.8x10 ⁻³	2.1x10 ⁻³

Table 4: Restaurant 4

Samples	BACTERIAL COUNT			Fungal Count
	N/A (cuf/g)	Mac (cuf/g)	CLEO(cuf/g)	PDA (cuf/g)
A	1.9 x10 ⁻³ Nil	1.6x10 ⁻³		1.9x10 ⁻³
B	2.8 x10 ⁻³	4.2x10 ⁻³	9.9 x10 ⁻³	2.8x10 ⁻³

Table 5: Restaurant 5

Samples	BACTERIAL COUNT			Fungal Count
	N/A (cuf/g)	Mac (cuf/g)	CLEO(cuf/g)	PDA (cuf/g)
A	4.1 x10 ⁻³	4.2 x 10 ⁻³	4.6 x 10 ⁻³	4.4x10 ⁻³
B	1.3 x10 ⁻³	1.8x10 ⁻³	1.1x10 ⁻³	1.3x10 ⁻³

Table 6: Characterization and Identification of Bacterial Isolates

MORPHOLOGY							BIOCHEMICAL TEST							
Sample	Gram Staining			Cell Shape			Cata	coa	cit	Lac	Oxid	Indole	Mot	Pentative result
	N/a	Mac	Cleo	N/a	Mac	Cleo								

Table7: Restaurant One

A	+	+	+	Rods	Rods	Rods	-	-	-	Acid/g	Acid/g	-	++	E.Spp
B	+	+	+	Rods	Long Chain	Cocci	+	+	-	Acid	Acid	-	-	staphylococcus

Table 8: Restaurant two

A	+	+	+	Long	Rods	Cocci	+	+	-	Acid/g	Acid/g	-	-	staphy
B	+	+	+	Long Chain	Rods	Cocci	+	+	+	Acid/g	Acid/g	-	Nil	Lactobacillus spp

Table 9: Restaurant Three

A	+	+	+	Long	Rods	Rod	+	+	-	Acid/g	Acid/g	-	-	Staphy Aureus
B	+	+	+	Long Chain	Rods	Rods	-	-	-	Acid/g	Acid/g	-	+	E. spp

Table 10: Restaurant Four

A	+	+	+	Rods	Cocci	Rod	+	-	+	Acid/g	Nil	-	-	Staphy Aureus
B	+	+	+	Rods	Rods	Rods	+	-	Nil	Nil	Nil	-	-	Pseudococcus spp

Table 11: Restaurant Five

A	+	+	+	Rods	Rods	Rod	+	-	+	Acid/g	Nil	+	-	Bacillus
B	+	+	+	Rods	Rods	Rod	-	-	-	Acid/g	Acid/g	-	+	E. spp

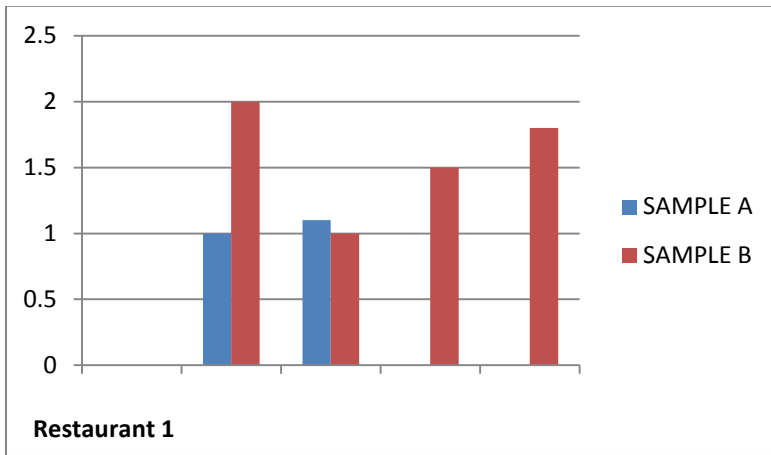


Fig. 1: Bacterial count for Restaurant 1

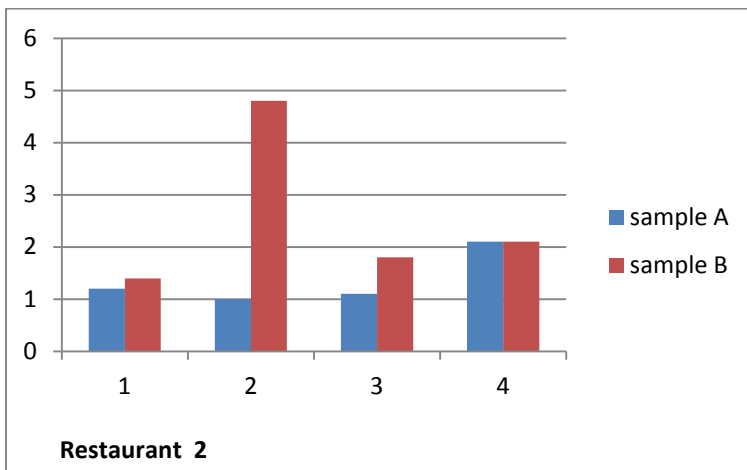


Fig. 2: Bacterial count for Restaurant 2

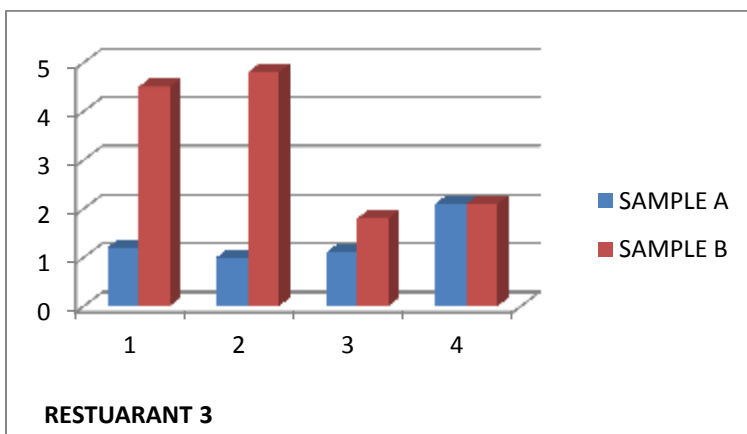


Fig. 3: Bacterial count for Restaurant 3

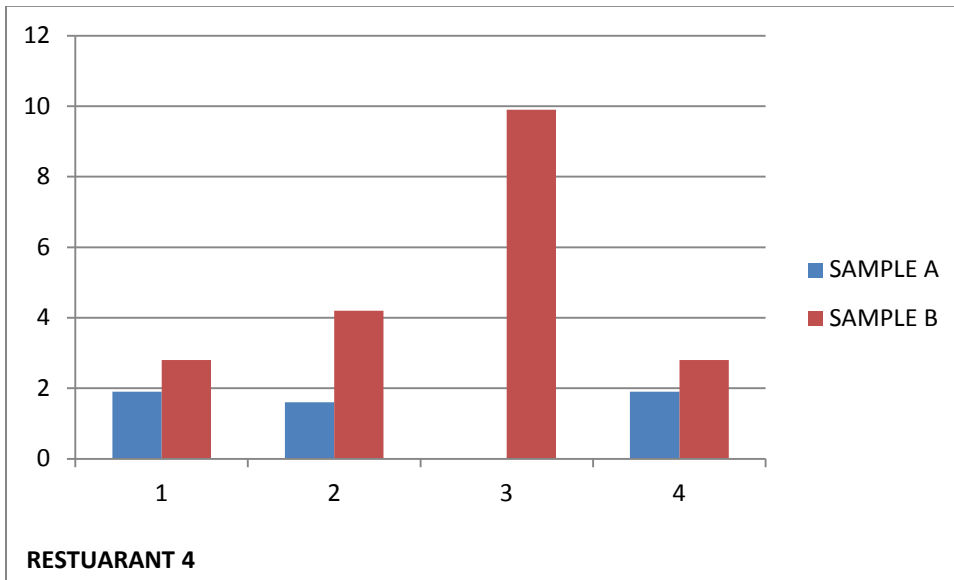


Fig. 4: Bacterial count for Restaurant 4

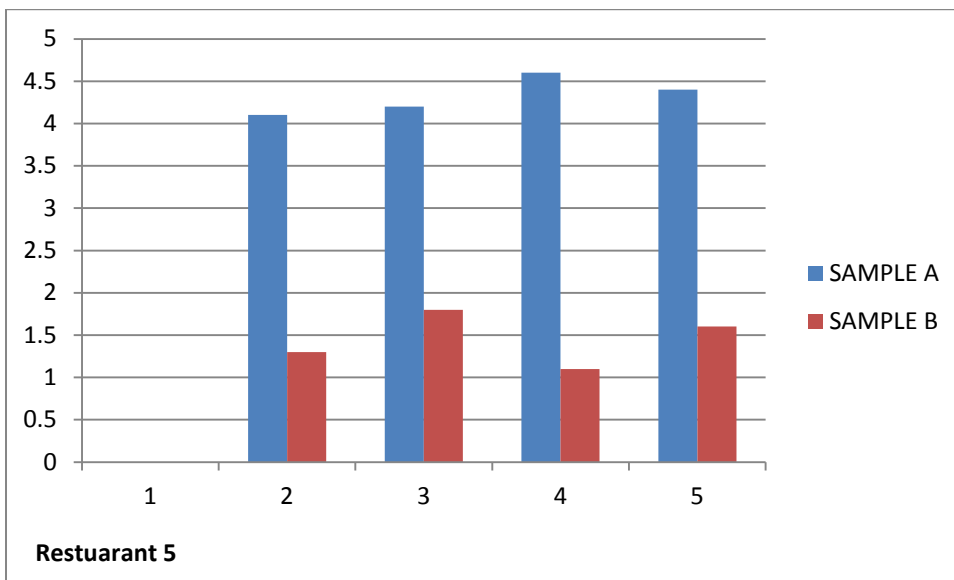


Fig. 5: Bacterial count for Restaurant 3

Quality characteristics of samples obtained

The food quality and characteristics was obtained through questionnaire in which consumers regard the taste and other sensory characteristics of food, health, convenience and the preparation process (e.g. color, taste, appearance, moisture content, texture etc.) are the most important determinants of food quality sold in different restaurants according to the consumers.

The table below illustrates their response:

Table 11: Respondents answer.

Quality and Characteristics of Food samples	Percentage (%)
Color and appearance	75
texture	70
Taste and flavor	80
Odor	5

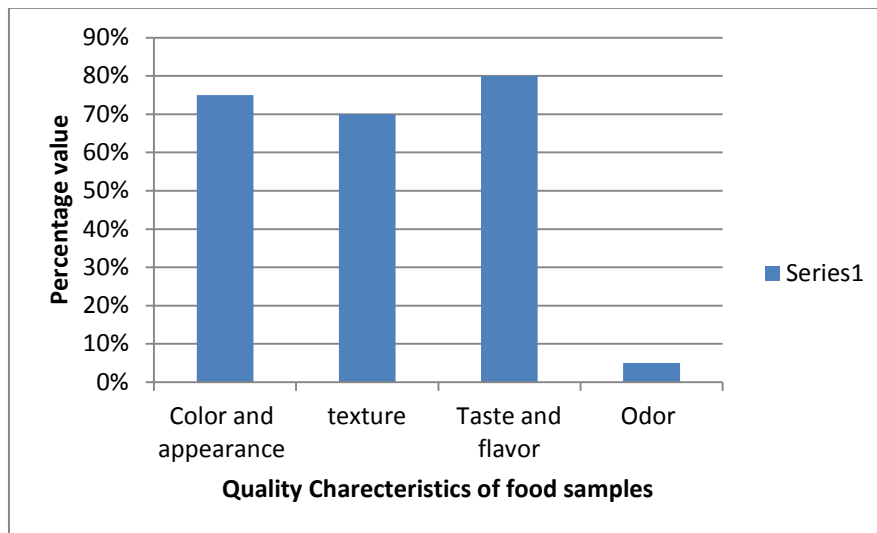


Figure 6. Quality Charecteristics of food samples

Restaurant one		Restaurant two	
Sample	Name of food	Sample	Name of Food
A	Moi-moi	A	Egusi Soup
B	Beans	B	Jellof Rice

Restaurant three		Restaurant four	
Sample	Name of food	Sample	Name of Food
A	Starch	A	Stew
B	Banga Soup	B	Ogbolor

Restaurant one	
Sample	Name of food
A	Salad
B	Fried Rice

5. DISCUSSION

Pathogenic bacteria are the most common known causes of food contamination and food borne illness. From the analysis, the bacteria isolated; *E. spp*, *staphylococcus aureus*, *Bacillus Spp*, *Pseudococcus aureus*, *pseudomonas auruginosa* and *Lactobacillus* (Ajata et al., 2009).

E.spp, *Bacillus* causes acute gastroenteritis. These infection causes severe body diahoea and abdominal cramps and watery diarrhea which makes the body loses fluids and electrolyte. (dehydration). This infection can also cause a complication called hemolytic uremic syndrome in which the red blood cells are destroyed and the kidneys fails. Hemolytic uremic syndrome is the principal causes of acute kidney failure in children (Bean et al., 1990).

Naturally, *staphylococcus aureus* can be described as opportunistic pathogen as it can cause an array of acute infection such as boil, conjunctivitis etc. the presence of *staphylococcus aureus* is also implicated in the food poisoning which are characterized by vomiting and diarrhea within six hours of consumption of contaminated food due to the presence of entero-toxin produced by *staphylococcus aureu* (Eric et al., 2010).

The major source of this organism to the sample could be the hands, skin and nose of food handlers. Talking, coughing and sneezing produces a large droplets which could settle in the processing of foods and organism present in this droplet could multiply. Food borne disease can be prevented by adequate hygiene practice during the preparation of food (Scott; 2002).

In order to ensure that food borne disease are prevented, preparation and storage of foods sold in restaurant must be done in safe and hygiene environment Ajata et al., 2009).

However, the pathogens isolated in this research work are similar to the microorganisms reported by Bankole et al., 2005) and that of (Imonah, 2010).

However, there is the need for educating the vendors and hired helps on safe food handling practice and proper hygienic practices, particularly proper hand washing

6. CONCLUSION AND RECOMMENDATION

It was found out from the analysis that samples were contaminated by *E. spp*, *Staphylococcus aureus*, *Lactobacillus spp*, *Bacillus spp*, *Pseudococcus spp*, *Rhizopus*, *Aspergillus*, *Muco spp* which indicated possible health hazard such as food intoxication and infection.

Incidence of these micro-organisms in food can be reduced or eradicated by the practice of good personal hygiene by food handlers and prevention of the already prepared food from dust and other sources of contamination such as showcasing in glass enclosure.

It is therefore recommended that personal hygiene should be practice when preparing food, also restaurant foods like salad, beans, moi-moi, plantain etc should be avoided when bad odour or colour changes in them are observed. Utensils used for eating should be clean and free from contaminants.

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