

**A STUDY OF PATHOGENIC BACTERIA COMMONLY ASSOCIATED
WITH GASTROENTERITIS IN SCHOOL CHILDREN IN ABEOKUTA SOUTH LOCAL
GOVERNMENT AREA OF OGUN STATE, NIGERIA**

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ABSTRACT

The prevalence of gastrointestinal tract infection was investigated and assessed among secondary school students in Abeokuta South Local Government of Ogun State, Western Nigeria. Two hundred (200) stool samples were collected, analyzed microbiologically, and sensitivity testing carried out on the isolates. The prevalence of the isolated coliforms were *Escherichia coli* (18%), *Salmonella* species (19%), *Shigella* species (5%), *Proteus* species (36%) and *Klebsiella* species (22%). All bacteria isolated were found to grow well on Blood, Nutrient and MacConkey Agars. Most of the isolates were sensitive to antibiotics such as Ampicillin, Tetracycline and Ofloxacin.

Keywords: Pathogenic bacteria, Gastroenteritis, antibiotics, Ogun state.

INTRODUCTION

At birth the intestine is sterile but organisms are soon introduced with food. In breast-fed children, the intestine contains large numbers of lactic and *Streptococci* and *Lactobacilli*. In bottle fed children, a more mixed flora exists in the bowel, and lactobacilli are less prominent. As food habit develop toward the adult pattern, the bowel flora changes. Diet has a marked influence on the relative composition of the intestinal and faecal flora (Dumont, 1969).

The causes of gastrointestinal infections and their immediate management have been a primary interest of physicians and Gastroenterologists dealing with gastroenteritis in the recent years. These gastrointestinal infections influence small intestinal obstruction. They do so by damaging the enterocytes and by producing enzyme deficiencies. In many patients, chronic gastritis is associated with decreased production of acid and enzymes; the epithelial cells lining the stomach wall are altered in shape, arrangement and cellular contents and there are fewer acid secreting cells. The common gastroenteritis may be caused by bacteria or viruses that may enter the body by way of the mouth and intestinal tract. The term food poisoning is sometimes applied to severe causes of acute gastrointestinal upset. Bacteria infection transmitted by food account for

most epidemic outbreaks of gastroenteritis and are associated with vomiting, diarrhea and other related pathological changes in human.

In general, there are three ways in which the indigenous microflora may contribute to the development of specific enteric infections. The microbial population of the gut tend to resist invasion by pathogenic bacteria, alteration of the "normal" intestinal flora may increase susceptibility to colonisation by pathogens. Secondly, microorganisms often present in the healthy intestine may themselves become pathogenic and cause enteritis. Finally, since many of the enteric bacteria possess a "transfer factor" capable of transferring antibiotic resistance from one species or strain to another, the normal enteric flora may alter the susceptibility of pathogens to antibiotics (Olukoya and Daini, 1988).

Members of the family Enterobacteriaceae make up a large part of the aerobic microflora of the intestinal tract of man. These includes the intestinal commensals (the Coliforms and species of *Proteus*) as well as the enteric pathogen of the *Salmonella* and *Shigella* genera and related species, intestinal *Streptococci* species *Bacteroides*, *Clostridia*, various yeast (including *Candida albicum*) and occasionally pathogenic *Staphylococci*. The *Vibrio* of cholera may be isolated from cases of this disease. Many cases

of acute infection diarrhoea are due to virus, however the pathogenic bacteria causing gastroenteritis would be examined in this paper.

The genus *Shigella* are pathogenic bacteria causing bacillary dysentery in human. It is very difficult to isolate *Shigella* in stool specimen because *Shigella* may die off rather rapidly after the specimen is collected. Samples suspected should therefore be inoculated to appropriate culture media soon after collection. The *Salmonella* is composed of organisms causing enteric fever and typhoid fever. The symptoms includes fever, nausea, vomiting, abdominal pain, watery fowl smelling diarrhoea and sometimes headache chills occurs. *Escherichia coli* is a normal flora of the intestinal tract of man but is now widely accepted that certain serotypes of *Escherichia coli* are responsible for outbreaks and sporadic cases of infantile diarrhoea particularly in the newborn. The germs *Klebsiella* may cause enteritis in children although is also a normal flora of the intestine and likewise the *Proteus* and *Providencia*. The organisms *Staphylococcus aureus* is usually responsible for such symptoms like abdominal cramp, vomiting and diarrhoea in staphylococcal food poisoning which usually appear within one to five hours after contaminated food is ingested. This is due to enterotoxin of the staphylococcal bacteria.

MATERIAL AND METHODS

Culture media:

Commercially produced media (Nutrient, MacConkey and Blood agars) with instruction for preparations were used in this study. Each medium was prepared in accordance to the company directive (OXOID-UNIPATH LTD. BASINISTOKE,

HAMSHIRE, ENGLAND). Each powdered agar was weighed inside a 1 litre flat bottom flask and 1 litre of distilled water was added and mixed thoroughly. This was placed in a boiling water bath to melt the agar. It was sterilised by autoclaving at 121°C for 15 minutes at 15 pound per square inch pressure which was finally poured into petri-dishes and allowed to solidify at room temperature. For blood agar, it was cooled to 45 – 50°C and 7 per cent of sterile defibrinated sheep blood added. The petri-dishes containing the agar were stored at 4°C in the refrigerator until they were ready for use.

Specimen collection:

200 stool samples were randomly collected from students in various secondary schools located in Abeokuta South Local government area of Ogun State into a wide mouthed sterile screw capped plastic containers. The freshly passed stool specimens were transported to the laboratory for immediate analysis.

Microbial analysis

In this study, direct plating procedure was employed for cultivation of pathogens in each stool specimen by streak plate method. Each specimen was inoculated onto prepared MacConkey, Blood and Nutrient agar plates, incubated at 37°C for 18 hours for growth and further investigation of the isolate. Identification of the pathogenic bacteria isolated were carried out with the following biochemical tests: morphological appearance on media, Gram staining technique, motility, catalase, coagulase, urease and methyl red tests.

Finally, sensitivity tests were carried out on the isolated bacteria in each stool sample with a view of knowing the antibiotics the organism is

Table - 1 : The coliforms isolated from stool samples of students of Abeokuta South Local Government

Age Group (Years)	Student Samples (%)	Pathogenic bacteria isolated				
		<i>Escherichia coli</i>	<i>Salmonella</i> species	<i>Shigella</i> species	<i>Proteus</i> species	<i>Klebsiella</i> species
14-17	35	8	7	5	9	6
18-21	26	6	4	-	13	3
22-24	23	3	5	-	10	5
25 above	16	1	3	-	4	8
Total	100	18	19	5	36	22

Table - 2 : Biochemical tests on coliforms isolated

Biochemical tests	Coliform isolated				
	<i>Escherichia coli</i>	<i>Salmonella</i> species	<i>Shigella</i> species	<i>Proteus</i> species	<i>Klebsiella</i> species
Motility test	+	+	-	+	+
Catalase test	+	-	-	-	-
Coagulase test	-	-	-	-	-
Urease test	-	-	-	+	+
Methyl red test	+	+	+	+	-

Key: + = Positive; - = Negative

Table - 3 : Antibiotic sensitivity patterns on isolated pathogenic bacteria

Etiology (Coliform)	Drug of Choice (Sensitive)
<i>Escherichia coli</i>	Ampicillin, Tetracycline, Ofloxacin
<i>Salmonella</i> sps.	Ampicillin, Ofloxacin
<i>Shigella</i> sps.	Ampicillin, Tetracycline, Ofloxacin
<i>Proteus</i> sps.	Ampicillin, Ofloxacin
<i>Klebsiella</i> sps.	Ampicillin, Tetracycline

sensitive or resistant to the multodiscs used contain the following antibiotics: Ampicillin (AMP) – 25mcg, Cephalexin (CX) – 25mcg, Gentamicin (GEM) – 10mcg, Nitrofurantoin (F) – 200mcg, Contrimoxazole (COT) – 50mcg, Ofloxacin (FX) – 10mcg, Tetracycline (TE) – 50mcg and Cefuroxime (CXM) – 30mcg.

RESULTS

A total of 200 secondary school students of various age groups were involved in the study. The highest percentage of students was in the age group 14 – 17 years (35%) while the least (16%) was 25 years and above (Table 1).

On MacConkey agar plates, *Salmonella* species and *Shigella* species produce colourless and transparent colonies, *Escherichia coli* and *Klebsiella pneumoniae* produced red colonies. Finally, *Proteus* species exhibited swarming activities. Table 1 shows prevalence of bacteria isolated in the stool of the school pupil examined with *Escherichia coli* (18%), *Salmonella* species

(19%), *Shigella* species (5%), *Proteus* species (36%) and *Klebsiella* species (22%).

The standard biochemical reactions for definitive identification of the isolated bacteria pathogens are shown in Table 2. Also, the antibiotic sensitivity pattern performed on the isolated bacteria are shown in Table 3.

DISCUSSION AND CONCLUSION

A total of two hundred stool samples of pupils in Abeokuta South Local Government area of Ogun State were examined and diagnosed for pathogenic bacteria causing gastrointestinal tract infections. The isolates were important to both symptomatic and asymptomatic students.

All the samples examined possessed different intestinal bacteria which suggests that some food intake and environmental factors in Abeokuta South Local Government may be responsible (Ojo and Mafiana, 2001). The isolation of intestinal pathogens from stool specimens of

asymptomatic students indicates merely a transient "passenger" from the environment, a "colonisation" or an infection" which has not ripened enough to produce pathological changes (Lu and Ouyang, 1997).

The higher frequency of pathogenic coliforms in younger students in this study may be due to the fact that there is an increase in development of protective immunity with age (Tanyigna *et al.*, 1997). The prevalence of *Shigella* infection was very low because *Shigella* isolated were small compared to other pathogens, although the rate of *Shigella* infections are highest where sanitation is poor and is mostly common in children under five years of age (O'Brien, 1982).

In this study some students interviewed complained of pathological change within their body before stool were collected. Some complained of severe abdominal cramps, diarrhoea with blood,

diarrhoea, fever, headache, abdominal tenderness and cough, loss of appetite and dehydration. It was from these students that *Salmonella* species (19%) and *Shigella* species (5%) were isolated and were promptly referred to experience medical officer for treatment. Most of the isolates were sensitive to antibiotics such as Ampicillin, Tetracycline and Ofloxacin while they were generally resistant to Gentamicin, Nitrofurantoin, Cefuroxime, Cotrimoxazole and Cephalexin.

The sources of these infections in Abeokuta South Local Government pupils were through faeces, food, water and flies. Hence sanitary measures should be directed against infected food handlers, contaminated water and improper sewage disposals. The spread of intestinal disease can be checked by the use of well processed water for drinking, cooking all food properly and washing of hands before food, control of flies and other insects is also very important.

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