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Bacteria agents of diarrhoea in children under 5years of age in Ilorin.

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Abstract

Diarrhoea is one of the commonest childhood illnesses, and a major cause of childhood morbidity and mortality in developing countries. Bacteriological investigation of diarrhoea diseases was carried out among 128 children between the ages of 0-60 months using stool samples from three different hospitals with in Ilorin metropolis. Out of the 128 children,39 had bacteria associated diarrhoea. The prevalence of bacteria associated diarrhoea in this study was 23.2%.The bacteria isolated were Escherichia coli, Pseudomonas aeruginosa, Klebsiella Pneumoniae, Proteus vulgaris, Salmonella typhi and Campylobacter jejuni. Escherichia coli was the most frequently isolated bacteria in all age groups. Age group 13-24months had the highest occurrence of bacteria isolates, followed by 25 -36 months; with the least occurrence seen in 0-12 and 49-60 months. Bacterial pathogens were identified in 30.4% of the subjects while 69.5% yielded no bacteria growth. Antibiotics susceptibility test conducted revealed that the isolates were sensitive to Ciprofloxacin and Gentamicin and most of the isolates were resistant to Ceftazidime, Augmentin, Cefuroxime and Ceftriaxone. The high prevalence of E. coli is an indication of poor sanitation and personal hygiene. Efforts should be made to educate the mothers and the guardians in promoting good environmental sanitation and personal hygiene.

Keywords: Diarrhoea, prevalence, watery stool, susceptibility.

Introduction

Diarrhoea is one of the commonest childhood illnesses and remains one of the major causes of infant and childhood morbidity and mortality in developing countries. Diarrhoea is the second leading cause of death in children under five years old and is responsible for the death of about 760,000 children every year[1].Diarrhoea can be defined as passage of three or more loose watery stools per day or a more frequent than normal for an individual[1].

Diarrhoea is a symptom of an infection of the intestinal tract, which can be caused by a variety of bacteria, viral and parasitic organisms[2]. Among the causative agents of diarrhoea viruses such as *Rota viruses* are said to be the commonest, followed by bacteria such as *Escherichia coli, Campylobacter jejuni, Salmonella species, Vibrio cholerae, Yersinia enterocolitica and Aeromonas species*[3]. These agents of diarrhoea are usually faeco-oral in nature. Diarrhoea is both preventable and treatable. Poor hygiene, sanitation and consumption of contaminated water contribute to easy and frequent acquisition of enteric pathogens. Most patients with acute diarrhoea have three to seven movements of bowel per day with stool volume not less than one litre per day[4].

Diarrhoea which last for 14 days is regarded as persistent while diarrhoea that last for at least one month is regarded as chronic[5]. Studies in Lagos, Oshogbo, and Minna, have shown *E.coli* to be responsible for most cases of diarrhoea in children less than five years.[6,7,8].

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However in Lagos in 1989, *Rota virus* was the pathogen most frequently detected in association with *E.coli*[6]. This study was therefore conducted to determine the common bacteria agents of diarrhoea in children less than five years of age in Ilorin and their antimicrobial susceptibility pattern.

Methodology

Study Area

This study was carried out in three secondary health centre within Ilorin metropolis and these are Children Specialist Hospital, General Hospital and Adewole cottage Hospital all in Ilorin. The study was a cross sectional study conducted over a period of six months from February 2015 to July 2015.Children with acute diarrhoea aged 0-5years as defined by WHO but not on antibiotics within the last 72hours from time of sample collection were included in the study. Children within the age range with diarrhoea whose parents or guardian do not consent to participate, and willing parents who have commenced antibiotics for their children with in the last 72hours were excluded from the study. Healthy children from nursery and immunization clinic with no diarrhoea infection were also recruited as control. A total of 128 stool specimens of patients with diarrhoea and 100 specimens without diarrhoea were collected during the period of study.

Sample collection

A single faecal sample was collected from each child on the same day of patient's enrolment using wide mouth screw cap sterile containers. The containers were distributed to the mothers and they were taught how to collect the stool samples. This was done for 128 children under 60months old with diarrhoea. The specimens were transported immediately after collection to the microbiology laboratory of the University of Ilorin Teaching Hospital for analysis. Standard questionnaires were used to collect information regarding the risk factors for diarrhoea in the children and the respondents were mothers of eligible children.

Isolation and identification of isolates

The samples were examined macroscopically for consistency, colour and some atypical components of stool such as mucous blood and parasites. Red blood cells, ova of parasites and cystswere searched for using the light microscopy. A portion of the stool was aseptically transferred into a sterile enriched broth to study the incidence of bacteria enteric pathogens present in the diarrhoea stool samples. The enriched cultures were transferred to selective and differential agarmedium for isolation of different bacteria isolates. Mc Conkey, Deoxycholate Salmonella - shigella and Campylobacter blood-treeselective media were used. The biochemical identification was performed by the motility Iodole urease, catalase, oxidase tests, Simon citrate test and Hippurate hydrolysis test.

Antibiotics Susceptibility Test

The susceptibility testing was performed using the Kirby-Bauer disc diffusion method[9]. The results were expressed as susceptible, intermediate and resistant according to the criteria developed by National Committee for Clinical Laboratory Standards (NCCLS,2002).The following antibiotics were used. Ciprofloxacin(5µg), Ceftriaxone(30µg), Ceftaxidime (30µg), Nalidixicacid(30µg), Gentamicin(10µg). Augumentin(30µg) and cefuroxime(30µg). (oxoid product).

Statistical Analysis

All data were imputed into the computer. Statistical analysis was performed using the statistical package for the social sciences (SPSS) software version 16.0 and the results were expressed as percentage for the quantitative variables.

Results

The result revealed that 39(30.4%) children of the 128 patients examined had diarrhoea. Children under the age group of 13-24 months recorded the highest 10.0% positivity, and children 0-12 and 49-60 months recorded the least 4.0% positivity, table 1.

Table 1: Age distribution results of children with diarrhoea.

Age in month	No of sample.	No positive	%positivity
0-12	**58**	**5**	**4**
13-24	**44**	**13**	**10**
25-36	**16**	**9**	**7**
37-48	**4**	**7**	**5.3**
49-60	**6**	**5**	**4.0**
Total	**128**	**39**	**30.4%**

Of the 128 children recruited for this study, 66(51.6%) were males while 62(48.4%) were females. 22(56.4%)

males were positive for enteric pathogens and 17(43.6%) females were positive for enteric pathogens, table 2.

Table 2: Gender distribution of Children with diarrhoea

Sex	No and percentage examined	No and % of isolates
Male	**66(51.6)**	**22(56.4)**
Female	**62(48.4)**	**17(43.6)**
Total	**128(100)**	**39(100.0)**

The following bacteria were isolated in the stool samples, *E. coli* occurred in 53.8%(21/39). The frequency of occurrence of other organisms are

P.*aeruginosa 17.9%, K. pneumoniae 15.4%, P. vulgaris 7.7% and Salmonella and Campylobacter spp with 2.6%* respectively, table 3.

Table 3: Percentage distribution of the etiologic agents of diarrhoea

Isolates	Number	Percentage	%of distribution
E. coli	**21**	**53.8**	**16.4**
P. auruginosa	**7**	**17.9**	**5.5**
K. pneumoniae	**6**	**15.4**	**4.7**
P. vulgaris	**3.**	**7.7**	**2.3**
Salmonella spp	**1.**	**2.6.**	**0.7.**
C. jejuni	**1.**	**2.6**	**0.7**
Total	**39**	**100**	**30.3**

In table 4, the susceptibility pattern of bacteria isolates to some commonly used antibiotics was presented. While a good percentage were intermediate, many were resistant and others much were susceptible.

Table 4: Antimicrobial Susceptibility pattern of the bacteria Isolates

Organisms	**CIP**	**CAZ**	**AUG**	**GEN**	**CXM**	**TET**	**CRO**
E. coli	**S-80%**	**I-5%**	**S-25%**	**S-70%**	**S-65%**	**S-5%**	**S-95%**
	R-20%	**R-95%**	**I-35%**	**I-10%**	**I-25%**	**R-90%**	**R-5%**
			R-40%	**R-20%**	**R-10%**		
K. pneumoniae	**S-70%**	**R-100%**	**I-90%**	**S-50%**	**R-100%**	**S-19%**	**R-100%**
	I-30%		**R-10%**	**I-35%**		**I-4%**	
				R-15%		**R-77%**	
P. aeruginosa	**S-100%**	**R-100%**	**R-100%**	**S-67%**	**R-100%**	**R-100%**	**S-15%**
				R-33%			**I-10%**
							R-75%
P. vulgaris	**S-68%**	**I-5%**	**R-100%**	**S-75%**	**R-100%**	**R-100%**	**I-30%**
	R-32%	**R-95%**		**R-25%**			**R-70%**
Salmonella typhi	**S-75%**	**I-45%**	**R-100%**	**S-64%**	**R-100%**	**I-12%**	**S-20%**
	I-25%	**R-55%**		**I-30%**		**R-88%**	**I-30%**
				R-6%			**R-50%**
C. jejuni	**S-100%**	**S-100%**		**S-100%**	**S-100%**	**S-100%**	**R-100%**

S-sensitive, I-Intermediate, R-resistance,

GEN-Gentamicin, AZ- Ceftazidime, CRO-Ceftriaxone, CIP-Ciprofloxacin, CXM-Cefuroxime, TET – Tetracycline, AUG-Augmentin. Ciprofloxacin and Gentamicin are effective against most of the isolates. Ceftriaxone was sensitive only to *E. coli.* Resistance was seen in most of the organisms to Tetracycline, Augmentin and Ceftazidime. *Campylobacter* was sensitive to all except Ceftriaxone.

Discussion

Infectious diarrhoea is a major health problem in developing countries. Diarrhoea has been frequently observed in children below 2years of age as compared to other age groups[10]. This study established the prevalence and susceptibility pattern of *bacteria pathogens* in stool of children less than five years of age presenting with diarrhoea. The prevalence of *bacteria* associated diarrhoea in this study was 23.2%. This finding is similar to an earlier work by Ifeanyi *et al*[11] in Abuja who reported 22.4%prevalence and at variance with 53.4% reported by Okolo *et al* [12].Abdullahi *et al* [13] reported 40.67% prevalence in Kano and Olowe *et al* [7] reported a prevalence of 57.0% in Oshogbo. This change in the prevalence of these similar studies can be attributed to seasonal variations when these studies were carried out, because poor hygiene, sanitation and consumption of contaminated water all contribute to easy and frequent acquisition of enteric pathogens. The frequency of diarrhoea was more in the age group 13-24months while age group 0-12 and 49-60months recorded the least possibility of pathogensin the stool, which suggests an association between age and bacteriadiarrhoea. The reason for high incidence of bacteria isolates in 13-24months is that they are at oral stage of life. They pick virtually anything into their mouth and they cannot differentiate what not to put into their mouth at this age. The least frequency in the age group 49-60months is similar to findings in other studies[11, 1415]. In these age group, there is the less tendency to put objects into their mouths hence the less incidence of diarrhoea at this age group.

The study also shows the preponderance of bacterial pathogens of diarrhoea in the males 56.4% as against the 43.6% obtained in females. This finding is at variance with the outcome of the study by Okolo *et al*[12] where female children were more affected than male children. Males are known to be more active than females and are more exposed to risk factors that could precipitate diarrhoea.

Six bacteria species (*E. coli, P. aeruginosa, K. pneumoniae, P.vulgaris, Salmonella typhi and Campylobacter jejuni)* were isolated from the stools of these children that presented with diarrhoea. *E. coli, Pseudomonas and K. pneumoniae* were isolated at a high rate but *E.coli* being the predominant. This is similar to the findings of Ifeanyi *et al* [11], Celine *et al*[15], Galadima *et al* [8], Olowe *et al* [7] *and* Ajero *et al*[17]. *Bacteriapathogen* was identified in 30.4% of the subjects while 69.5% yielded no bacterial growth and this is a pointer that other agents might be responsible for the diarrhoea seen in the children. Other notable agents of diarrhoea in this study are *P. aeruginosa and K. Pneumoniae.* The only *Campylobacter* isolates was seen in a baby less than two years old with watery diarrhoea.

The assessment of the susceptibility pattern showed varied sensitivities. Majority of the isolates were sensitive to Ciprofloxacin and Gentamicinand most of the isolates were found to be resistant to Ceftazidime, Augmentin *and* Ceftriaxone and Cefuroxime. Campylobacter shows a remarkable sensitivity to all the antibiotics except Ceftriaxone. In this study, some of the isolates were resistant to more than one drugs, hence, they are multidrugresistant[17,18,19].

Conclusion

This study has shown *Escherichia coli* as the commonest cause of diarrhoea in children less than five years of age in Ilorin metropolis, and the isolates were sensitive to ciprofloxacin and gentamicin, other isolates were sensitive to ciprofloxacin and gentamicin and these two drugs can be used in the treatments of infantile diarrhoea in Ilorin metropolis except that ciprofloxacinis contraindicated in children because of its side effects. The high prevalence of *E. coli* and other isolates is an indication of poor sanitation and poor personal hygiene because they are faeco oral by their nature of transmission. Effort should be made to educate the mothers and the guardian on ways to combat this infantile diarrhoea by the promotion of good environmental sanitation and personal hygiene. Studies on other causative agents of diarrhoea in the study area should be investigated.

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