



Original Research Article

Aerobic Bacteriological Study with their Antibiogram in Infants with Acute Diarrhoea in North East Karnataka, India

Sunil Kumar D Chavan^{1*} and K.H. Harshan²

¹Department of Microbiology, Raja Rajeswari Medical College, Bangalore-560074, India

²Department of Microbiology, Sree Gokulam Medical College and Research foundation, Venjaramoodu, Trivandrum, India

*Corresponding author

ABSTRACT

The high incidence of diarrhoea in less than 1 year of age necessitates the periodic assessment of the spectrum of the enteric pathogens and their microbiological susceptibility, which aids in the rational use of the antibiotics. Two hundred cases of diarrhoea were enrolled in the study. A detailed clinical history was recorded in the predesigned proforma. Samples were subjected to both macroscopic and microscopic examination, later hanging drop and gram's staining was done. Suspected pathogens were identified by standard methods and antibiotic sensitivity was done using Kirby Bauer disc diffusion method. Most cases were frequently observed in 7 to 12 months age group (73.13%) and with male children getting affected more. The causative enteric pathogens were isolated in 31.05% of cases. *Escherichia coli* was isolated in 98.42% (Enteropathogenic *E. coli* was 29.47%) of cases. Antibiotic susceptibility pattern of Enteropathogenic *E. coli* was ampicillin (16.07%), ciprofloxacin (85.71%), cotrimoxazole (37.5%), furazolidine (37.5%), chloramphenicol (46.42%), tetracycline (37.5%), gentamycin (85.71%), cefotaxime (94.64%), nalidixic acid (26.78%) and norfloxacin (87.5%). The most common etiology of acute diarrhoea in less than 1 year in infants is *Escherichia coli* of which enteropathogenic *E. coli* is the commonest.

Keywords

Enteropathogenic
E. coli,
Diarrhea

Introduction

Diarrhoea may be defined as deviation from established bowel rhythm, characterized by an increase in frequency and fluidity of stools. In other words, if passage of stools occur 3 or more times a day. In the health institutions, up to one third of total paediatric admissions are due to diarrhoeal diseases and up to 17% of all deaths in

indoor paediatric patients are diarrhoeal related. According to WHO, children alone constitute 3.5 to 8 million diarrhoeal deaths per year, worldwide.

In the study carried out in rural and urban areas of 11 states of India (1991), it was noticed that the diarrhoeal episodes occurred

at 1.5 episodes per child per year in urban area and 4.57 episodes per child per year in rural areas. *Escherichia coli*, *Vibrio cholera*, *Shigella*, *Salmonella*, *Rotavirus* and parasites are the major postulated causes of acute diarrhoea throughout the world.

Diarrhoea is a major public health problem in the developing countries. An estimated 1.8 billion episodes of diarrhoea occur each year and 3 million children under the age of 5 years die of diarrhoea, 80% of these deaths affect children under the age of 2 years.

The maximum number of patients was below the age of 12 months with maximum incidence in between 7 and 12 months followed by age group of 0–6 months. It was also observed that EPEC was more predominant isolate among the 29% of bacterial enteropathogens and common serotypes were 086, 0119, 0126, 0127 and 0128. The other organisms were *Pseudomonas aeruginosa*, *Proteus* species and *Klebsiella* (Khanna *et al.*, 1996).

The study was conducted to find out the prevalence of acute diarrhoeal diseases due to aerobic bacteria in infants by isolation and identification of pathogenic bacteria from stool samples and to study the antibiotic sensitivity pattern of the isolates.

Materials and method

The study was conducted at Basaveshwara Hospital, Gulbarga. A total of 200 cases of acute diarrhoea were taken up for the study during Jan 2011 to Dec 2011. Infants aged between 1 month and 12 months were included for the study. Diarrhoeal cases of 1 to 15 days of duration were included for the study. Only those samples that are taken under aseptic precautions in the hospital were included for the study. The stool samples were examined macroscopically for

consistency, colour, presence of mucus, blood and parasites. Microscopic examination of each sample was done for the presence and number of faecal polymorphonuclear leucocytes/hpf, presence of red blood cells and fat globules. Samples were subjected to hanging drop and Gram's stain. Direct plating of the stool sample was done over Mac Conkey agar, xylose lysine deoxycholate agar and thiosulphate citrate bile sucrose agar. A part of the sample was inoculated into Selenite-F broth and alkaline peptone water for enrichment of *Salmonella*, *Shigella* and *Vibrio cholerae*. The inoculated plates were incubated aerobically at 37°C for 24-48 hours. Serotyping was done with specific antisera for *Shigella*, *Vibrio cholera*, *Salmonella* and *Escherichia* (polyvalent EPEC) antisera. The sensitivity was performed over Mueller Hinton agar plates by disc diffusion method recommended by Kirby – Bauer.

Results and Discussion

A total of 200 stool samples were processed during the study period of one year for bacterial pathogens.

Table 1 shows that the highest number of cases was encountered between 7 and 12 months of age group. Male preponderance was noted. Of the 200 cases 132 were males and 69 females. Male : female ratio – 1.9:1.

Table 2 shows out of 200 samples received, culture was positive in 190 cases and no growth was present in 10 cases. Out of the total 190 organisms, 187(98.42%) strains of *Escherichia coli* and other organism like *Klebsiella sp* were also isolated respectively.

Table 3 shows of the 190 culture positive samples 59 organisms were identified as possible etiological agents, the prevalence rate of the isolated organisms was 31.05%.

Although 187 strains of *E. coli* were isolated and submitted to serotyping with polyvalent EPEC antisera, 56(29.47%) were identified as EPEC and 3 strains of *Klebsiella* was isolated with a prevalence of 1.57%,

Table 4 shows enteropathogens isolated from 190 culture positive showed highest incidence of EPEC in 7–12 months of age and the incidence showing lower in higher age group, followed by *Klebsiella* sp in less than 1 year age group.

Table 5 reveals the antibiotic sensitivity of 56 enteropathogenic *E. coli* isolated, it is seen from the table that they are highly sensitive to cefotaxime 53 (94.64%) and are sensitive to ciprofloxacin 48(85.71%), gentamicin 48(85.71%), norfloxacin 49 (87.5%). The organisms showed higher resistance to ampicillin, chloramphenicol and nalidixic acid.

Table.1 Age distribution of cases

Age in months	Males		Females		Total		M:F
	No.	%	No.	%	No.	%	
0-6	35	17.41	19	9.45	54	26.86	1.8:1
7-12	97	48.25	50	24.87	147	73.13	1.9:1
Total	132	65.67	69	34.32	201	100	1.9:1

Table.2 Showing various organisms isolated in 190 cases

Organism	Number of organisms isolated	Percentage (%)
<i>Escherichia coli</i>	187	98.42
<i>Klebsiella</i> species	3	1.57
Total	190	100.00

Table.3 Pathogens isolated in 190 cases of stool samples

Pathogen	No. isolated	Percentage (%)
EPEC	56	29.47
<i>Klebsiella</i> sp	3	1.57
Total	59	31.05

Table.4 Isolation rate of enteropathogens in different age groups

Pathogens	Age in months				Total	
	0-6		7-12			
	No.	%	No.	%	No.	%
EPEC	25	12.43	31	15.42	56	29.47
<i>Klebsiella</i> sp	3	1.49	0	0	3	1.57

Table.5 Table showing susceptibility pattern of isolates

Antibiotics	Number of isolates	Percentage (%)
Ampicillin	9	16.07
Chloramphenicol	26	46.42
Co-Trimoxazole	21	37.5
Ciprofloxacin	48	85.71
Furazolidine	21	37.5
Tetracycline	21	37.5
Gentamycin	48	85.71
Cefotaxime	53	94.64
Nalidixic acid	15	26.78
Norfloxacin	49	87.5

Diarrhoea in infants and children ranks among the leading cause of morbidity and mortality. Assessment of the bacteriologic pattern of diarrhoea from time to time may be of considerable importance, not only in isolating the causative agent but also as a tool in therapeutic approach, to reduce the morbidity and mortality. Important advances have been achieved over the last few years in the field of diarrhoea research.

Diarrhoea was commonly seen in children less than 1 year of age more frequently in infants between 7 and 12 months of age accounting for 73.13% of cases. The high incidence below the age of 1 year is

explainable, because at this age the child starts crawling and puts everything into mouth and is susceptible to infection. This result was consistent with the range mentioned by others like Khanna *et al.* (1996), Joshi *et al.* (1980) and Bhat *et al.* (1986) respectively.

We also observed that there was preponderance of males in cases of diarrhoea with a ratio of 1.9:1. This was consistent with the observation mentioned by Pande (1975), Khatua *et al.* (1984) and Ogunsanya *et al.* (1994).

In the present series the isolation rate of

enteric bacteria was 31.05%. These results are consistent with other studies like Khatua *et al.* (1984) and Khanna *et al.* (1996). Whereas higher isolation rate has been shown by other studies like - Ogbonnaya Ogbup *et al.* (2008) respectively.

In the present study higher proportion of EPEC were seen in 0–12 months age group, that may be due to the fact that colonization of gut with EPEC generally occurs at the time of weaning. In the present study, Prevalence of EPEC was 29.47 % (56 cases in 200 cases studied). Prevalence similar to the present study has been found in studies conducted by Khanna *et al.* (1996) and Ogbonnaya Ogbup *et al.* (2008) showed higher rate of EPEC in infants.

The antibiotic pattern of the bacterial pathogens isolated showed different patterns of sensitivity and resistance. In the present investigation, antibiotic susceptibility pattern of Enteropathogenic *E. coli* was ampicillin (16.07%), ciprofloxacin (85.71%), cotrimoxazole (37.5%), furazolidine (37.5%), chloramphenicol (46.42%), tetracycline (37.5%), gentamycin (85.71%), cefotaxime (94.64%), nalidixic acid (26.78%) and norfloxacin (87.5%). Similar susceptibility pattern were observed by Lankeshwar Tewari and Surendra (1982) and Usha P. Kamlakar (1995).

As a public health measure to reduce the disease burden, an integrated package of immunization services and other childcare programmes need to be implemented in addition to well-focussed health education messages to improve treatment seeking behaviour for childhood diarrhoea as well as personnel and environmental hygiene. We conclude that the etiologic spectrum of acute diarrhoea vary among different age of patients. The need to etiologically define the diarrhoeal episode and establish the

antimicrobial susceptible pattern for effective clinical management.

Reference

- Basic laboratory procedure in clinical bacteriology, WHO, Geneva, 1992.
- Bern, C. *et al.* 1992. Magnitude of the global problem of diarrhoeal disease. *Bull. WHO*, 70(6): 705–714.
- Bhat, P. *et al.* 1986. Invasive bacterial diarrhoea in Bangalore. *Indian J. Paediatrics*, 53: 811–816.
- Colle, G.J. *et al.* 1996. Practical medical microbiology, 14th edn, Churchill livingstone.
- Joshi, C.K. *et al.* 1980. A study of bacterial infantile diarrhoea. *Indian J. Paediatrics*, 47: 307–310.
- Khanna, S. *et al.* 1996. Bacteriological profile of acute diarrhoea in Amritsthar. *Indian J. Med. Microbiol.*, 14(1): 33–35.
- Khatua, S.P. *et al.* 1984. Bacterial etiology of diarrhoea in children with special reference to *Campylobacter fetus* *jejuni*. *J. Indian Paediatrics*, 21: 49–52.
- Lankeshwar Tewari, Surendra, 1982. Some observation on the biochemical behavior and antibiotic susceptibility pattern among *E. coli* isolated from infantile diarrhoea cases. *Indian J. Microbiol.*, 22(3): 167–172.
- Ogbonnaya Ogbu *et al.* 2008. Aetiology of acute infantile diarrhoea in the south-eastern Nigeria: an assessment of microbiological and antibiotic sensitivity profile. *Internet J. Third World Med.*, 7(1).
- Ogunsanya, T.I. *et al.* 1994. A study of etiological agents of childhood diarrhoea in Lagos, Nigeria. *J. Med. Microbiol.*, 40: 10–14.

Pande, R.C. 1975. Bacteriology of infantile diarrhoea and gastroenteritis in Allahabad. Pp. 169–177.

Usha P. Kamlakar, EPEC in children and young adults. *Indian J. Pathol. Microbiol.*, 38(2): 153–154.