

## Bacterial and parasitic profile of paediatric diarrhoea and dysentery in a tertiary care hospital in South India

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### Abstract

**Aim:** Diarrheal disease is a frequent disease among paediatric age group especially in developing countries. Dysentery, a sign of invasive enteric infections, is associated increased morbidity and mortality. This study was undertaken to study the bacterial and parasitic causes of childhood diarrhoea and dysentery.

**Materials and Method:** The study was conducted in tertiary care centre in children aged between 1-11 years of age, attending the out-patient clinic with complaints of diarrhoea or dysentery. Fresh stool samples was collected and presence of bacterial infections were identified by culture in MacConkey medium, Sorbitol MacConkey medium (SMAC) and Deoxycholate citrate agar (DCA). Parasites were identified by saline and iodine mount preparations.

**Results:** Out of the 60 stool specimens, 8(13%) showed presence of bacterial pathogens with diarrheogenic *E.coli* 4 (6.6%), *Salmonella typhi* 2(3.3%) and *Shigella flexneri* 2(3.3%). Among the 9(15%) parasites isolated, *Ascaris lumbricoides*, 3(5%), *Giardia lamblia*, 2(3.3%), *Enterobius vermicularis*, 2(3.3%), *Ancylostoma duodenale* 1(1.7%), and cysts of *E.histolytica*, 1(1.7%) were obtained. The bacterial isolates showed increased resistance to Ampicillin(60%), Ciprofloxacin (50%) and Cotrimoxazole(50%). Both *E.coli* & *Shigella flexneri*, yielded one ESBL producer each.

**Conclusion:** This study has highlighted the common enteropathogens in pediatric age in our region and hence the necessity to undertake control measures by personal hygiene and environmental sanitation.

**Keywords:** Pediatrics, Diarrhea, Dysentery, Diarrheogenic *E.coli*, *Salmonella typhi*, *Ascaris*

### Introduction

Diarrheal disease is a frequent disease among paediatric age group especially in developing countries.<sup>(1)</sup> Dysentery, a sign of invasive enteric infections, is associated with increased morbidity and mortality. Despite widespread use of oral rehydration therapies (ORT) and an increased understanding of the pathogenesis of diarrhoea, 2.5 million children still die from these illnesses every year, almost all of them in developing countries.<sup>(2)</sup>

As per WHO, diarrhoea is defined as the frequency of more than two unformed watery stools in a day or any voiding of watery stools if accompanied by fever, abdominal pain or vomiting. Blood in stool could indicate an acute diarrhoeal illnesses or dysentery, irrespective of frequency.<sup>(3,4)</sup> Diarrhoeal disorders can further be divided into acute and chronic, allowing some categorisation of causes (panel 1) and associated management. Acute diarrhoeas, the most usual form of diarrhoeal illness, have an abrupt onset, resolve within 14 days, and are mostly caused by infections. Chronic diarrhoeas last for at least 14 days.<sup>(5)</sup>

Diarrhoeal diseases can be caused by many species of microbes that some time lead to dysentery. For many years, Salmonellae and Shigellae were thought to be the only bacteria that caused diarrhoeal diseases, but it is now clear that some strains of *Escherichia coli* cause the same symptoms. *Campylobacter*, *Vibrio*, *Aeromonas* and *Pseudomonas* were also reported to cause diarrhoeal diseases. Diarrhoeal diseases and dysentery

are also caused by *Entamoeba histolytica* (amoebic dysentery), *Cryptosporidium* species.<sup>(6)</sup>

Infectious diarrhoea is a leading cause of morbidity and mortality worldwide, affecting mainly infants.<sup>(1)</sup> Approximately 12 million children in developing countries die before the age of five years and 70% of these are due to five health problems including diarrhoea.<sup>(2)</sup> Unhygienic and unsafe environments place children at risk of death.<sup>(3,4)</sup> Inadequate availability of water and lack of access to sanitation contribute to about 1.5 million child deaths and around 88% death from diarrhoea per year.<sup>(3,4)</sup> The incidence of diarrhoea due to ETEC was found to be highest among the 0-2 years old.<sup>(5)</sup>

Intestinal parasitosis affect around 3.5 billion people globally and 450 million are ill due to these infections the majority being children.<sup>(6)</sup> In some Tropical areas the prevalence reaches about 100%.<sup>(7)</sup>

Rotavirus is the leading cause of diarrhoea hospitalization among children worldwide.<sup>(8)</sup> In developing countries 870,000 children die from rotavirus diarrhoea annually, which reflects an urgent need to develop vaccine.<sup>(9)</sup>

Intestinal parasitic infections have always been an important public health problem in the tropics, particularly in developing countries like India. Intestinal parasites may increase susceptibility to infections with other intestinal pathogens.<sup>(7,8)</sup> It is therefore important to identify the problem and tackle it in the interest of public health. Hence the current study

was done to study the bacterial and parasitic causes of childhood diarrhoea and dysentery.

### Materials and Method

This prospective study was conducted at a tertiary care hospital, Pondicherry for a period of 2 months from June to July 2015. The study was conducted with a sample size of 60, in children between 1-11 years of age, attending the outpatient clinic with the complaints of diarrhoea or dysentery. Consent was obtained from the parents or guardians of the patients. The patient details including age, sex, address, duration, presenting illness, duration of symptoms, past history of any similar complaints (gastrointestinal complaints and dietary habits) were noted.

Fresh stool samples were collected in a wide mouth containers under aseptic precautions. The container was labelled with patient's name, age and the date of collection. The microbiological investigations done included:

**1. Gross Examination:** On gross, the stool samples were noted for their colour, consistency, presence of blood or mucus, presence of adult worms or segments.

Stool samples were examined before and after concentration by Formol Ether concentration technique.

**2. Microscopic Examination:** Detection of parasitic cyst /trophozoite/eggs were done by

- Saline preparation
- Iodine preparation

- Modified acid fast staining for coccidian parasites.

**3. Culture & Antibiotic sensitivity testing:** The stool specimens were then processed by bacterial culture. For semisolid and solid specimens, a thick suspension was prepared with 1ml peptone water. The samples were inoculated in MacConkey medium, Sorbitol MacConkey medium (SMAC) and Deoxycholate citrate agar (DCA) and incubated at 37°C, overnight. The growths on the MacConkey agar was examined and any non lactose fermenting colonies were identified based on the standard biochemical tests. Growth in the DCA medium was then processed for Salmonella and Shigella by biochemical tests and agglutination with high titre sera. Growth in the SMAC was processed for enteropathogenic E.coli(EPEC).

The bacterial pathogens identified were tested for their antimicrobial susceptibility pattern by Kirby Bauer's Disc Diffusion method for the following drugs, Ampicillin, Gentamicin, Cotrimoxazole, Ciprofloxacin and Tetracycline.

### Results

The study was done for a period of two months involving 60 children in the age group of 1- 11 years with symptoms of diarrhoea/ dysentery presenting to our hospital. Males (56%) were more commonly affected than female children (44%). Children of less than 5 years (48%) were more commonly affected than of children of older age group (Fig. 1).

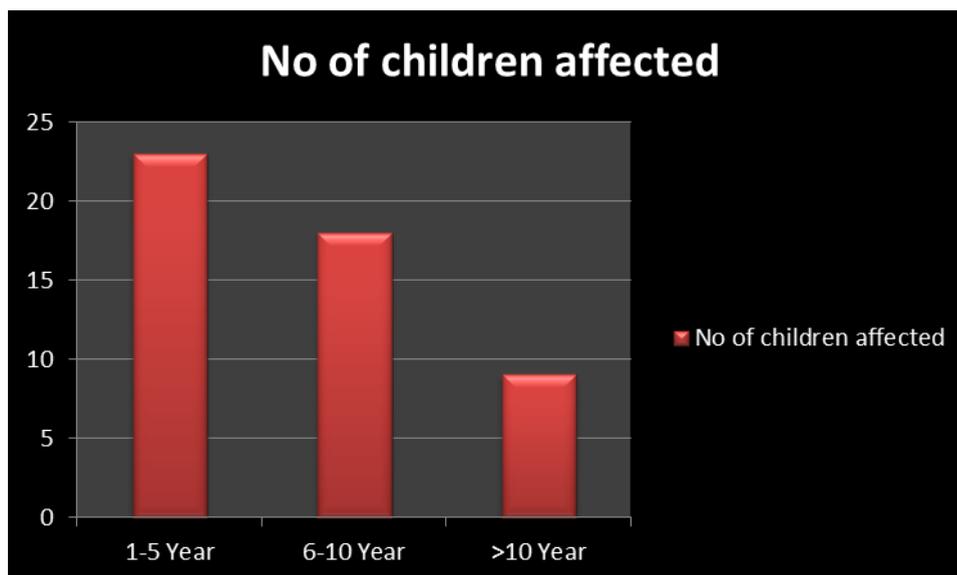


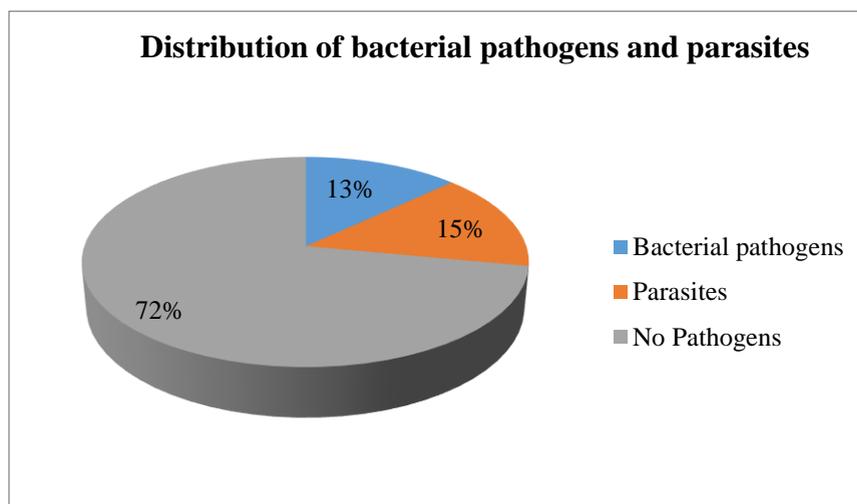
Fig 1: Age wise distribution of the study population

Fever was seen in 37% of the study group, abdominal pain in 43% of cases. About 53% of the study population had diarrhoea for more than 3 times a day and 38% of patients were with signs of dehydration on examination (Table 1).

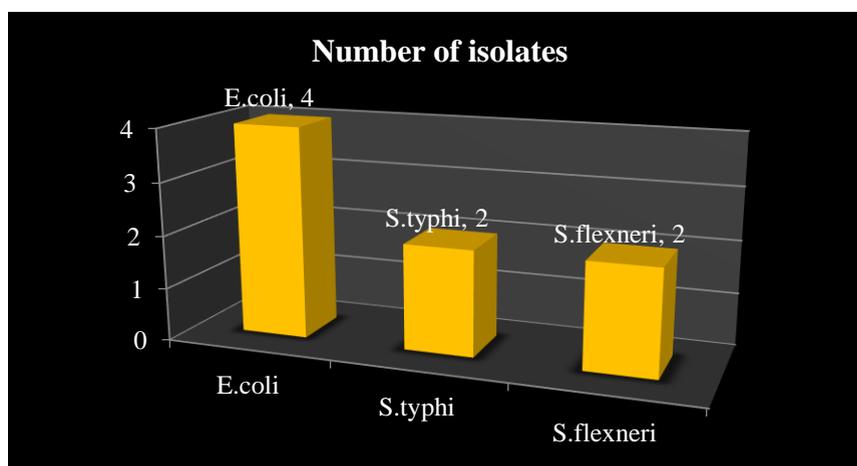
**Table 1: Clinical presentation of the study population**

Clinical features	Number in percentage(%)
Vomiting	13
Abdominal pain	43
Number of episodes of diarrhoea (>3 episodes)	53
Duration of illness --- 1 day	16
1-3 days	40
>3 days	27
Signs of dehydration	38

Of the 60 stool specimens processed, pathogens were isolated in 17(28%) samples comprising of bacterial pathogens 8(13%) and parasites 9(15%)(Fig. 2).

**Fig.2: Distribution of bacterial and parasitic pathogens**

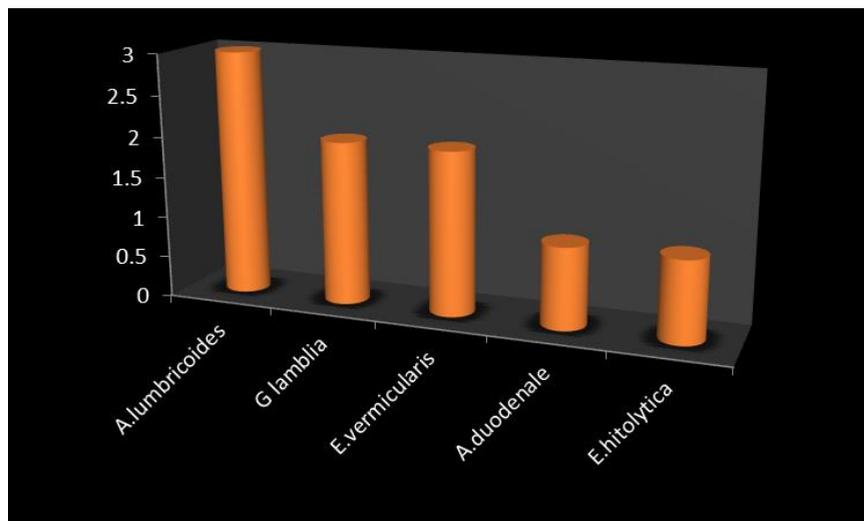
Among the 13 bacterial pathogens, diarrheogenic *E.coli*, 4(6.6%), *Salmonella typhi* 2, (3.3%) and *Shigella flexneri* 2(3.3%) were the isolated. There were no *V.cholera* isolates.(Fig. 3)

**Fig. 3: Different bacterial pathogens isolated in the study population**

The antibiotic sensitivity for the bacterial isolates was performed by Kirby-Bauer disk diffusion method. The bacterial isolates showed increased resistance to Ampicillin (60%), Ciprofloxacin (50%) and Cotrimoxazole(50%). Both *E.coli* & *Shigella flexneri*, yielded one ESBL producer each.

The stool samples were examined for parasites by wet mount preparation using normal saline & Lugol's iodine both before and after concentration method using formal ether sedimentation technique. Parasites were the most common isolates (15%). Among the 9 parasites isolated, fertilised eggs of *Ascaris lumbricoides*, 3(5%), *Giardia*

*lamblia*, 2(3.3%), *Enterobius vermicularis*, 2(3.3%), *Ancylostoma duodenale* 1(1.7%), and cysts of *E.histolytica*, 1(1.7%) were obtained (Fig. 4). Around 2% of samples were positive for parasites only after concentration technique. None of the samples were positive for coccidian parasites by modified acid fast staining.



**Fig. 4: Different parasites isolated in the study**

## Discussion

Diarrhoea is defined as having loose or watery stools at least three times per day or more frequently than normal for an individual.<sup>(15)</sup> In a year approximately 5 million deaths occur annually and most of them occurring within first 2 years of life.<sup>(16)</sup> According to a report by National Institute of Cholera and Enteric Disease, Kolkata, (India), mortality rate due to diarrhoea in rural India is 9.3 per 1,000 population and the diarrhoeal deaths account for 22% of total rural deaths among 0 to six years age group children.<sup>(17)</sup>

In the present study it was observed that diarrhoea was more frequent among children in the age group of 1- 5 years(48%). Similar findings were reported in other studies showing higher infection rates among children less than 2 years (60%),<sup>(18)</sup> 77%.<sup>(19)</sup>

Similarly diarrhoea was reported more among the male (56%) population than females(44%) similar to other findings.<sup>(20,21)</sup>

The clinical presentation of diarrhoea was most commonly associated with abdominal pain(43%), followed by vomiting (13%). About 38% of the cases presented with signs of dehydration. Bacillary dysentery characteristically have severe abdominal pain, high fever, emesis and generalized toxicity.<sup>(6)</sup>

In the present study the prevalence of bacterial and parasitic infections was found to be 28%. There were a total of 17(28%) isolates both comprising of parasites 9(15%) & bacteria 8(13%) causing diarrhoea& dysentery in our study. Similar results were shown in the results in the studies done by Dhruva et al<sup>(23)</sup> and Ansari et al.<sup>(24)</sup>

Among the bacterial isolates *E.coli* (50%) was the most common isolate followed by *Salmonella typhi* (25%) and *Shigella flexneri* (25%). This was similar to

a study done by Nair et al.<sup>(22)</sup> In a study done by Dhruva et al *E.coli* was the most common bacterial isolate (84.62%) and *Endamoeba histolytica* was the most common parasitic pathogen isolated (66.6%). The prevalence of bacterial infection in other countries varies from 5.3% to 54%.<sup>(23)</sup>

*Shigella* species was detected in 3.3% of cases of diarrhoea. Similarly Mayo et al found In Tanzania found a prevalence of 5.7% and other studies done in various parts of India report a prevalence of 7.7%(Calcutta),<sup>(24)</sup> 3.2% (Mumbai).<sup>(25)</sup>

In the study of Ogullesi Tinuadee et al<sup>(26)</sup> (2006) shows that 23.3% had parasite in which *Entamoeba histolytica* 65.7% followed by *Ascaris lumbricoides* 18.6% and *Giardia lamblia* 7.1%. In our study parasitic eggs isolated were *Ascaris* (5%), *Giardia lamblia* (3.3%), *Enterobius* (3.3%), *Ancylostoma* (1.7%) and *E.histolytica* (1.7%).

The bacterial isolates showed increased resistance to Ampicillin (60%), Ciprofloxacin (50%) and Cotrimoxazole (50%). Both *E.coli* & *Shigella flexneri*, yielded one ESBL producer.

## Conclusion

This study has highlighted the common bacterial and parasitic causes of diarrhea in pediatric age in our region. Though these etiologies of diarrhoea can be identified by simple laboratory investigations, the diagnosis is delayed due to patient unawareness. Hence it is necessary to undertake continuous surveillance and control measures to eliminate these diseases. Control measures by proper personal hygiene and environmental sanitation should be emphasized to the public to control diarrheal diseases.

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**How to cite this article:** Arthi E, Raj AM, Abarna V, Rajkiran R. Bacterial and parasitic profile of paediatric diarrhoea and dysentery in a tertiary care hospital in South India. *Indian J Microbiol Res* 2017;4(4):358-362.