

# Etiology of bacterial and parasitological pediatric diarrhoea in a tertiary care hospital

Shiv Kumar Chandrakar<sup>1</sup>, Animesh Panda<sup>2</sup>, Smita Bawankar<sup>3</sup>, Dhruva Hari Chand<sup>4</sup>

<sup>1</sup>Associate Professor of Pathology, CCM Medical College & Hospital, Durg, <sup>2</sup>Assistant Professor of Microbiology, CCM Medical College & Hospital, Durg, <sup>3</sup>Assistant Professor of Microbiology, CCM Medical College & Hospital, Durg, <sup>4</sup>Demonstrator of Microbiology, CCM Medical College & Hospital, Durg

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## ABSTRACT

**Background:** Before starting to discuss about Diarrhoea, we have to remember diarrhoea is one of the main causes of morbidity and mortality in children. **Aims & Objective:** The aim of this study was to determine the prevalence of intestinal parasitic and bacterial infections as cause of childhood diarrhoea. **Materials & Methods:** During the study period, a total of 116 stool samples were collected and processed. Examined grossly and microscopically for presence of ova/cyst. They were also cultured on MacConkey agar and *E. coli* isolated were identified by standard biochemical tests. **Results:** Out of 116 stools samples, *Entamoeba histolytica* (63.33%) and *Giardia lamblia* (23.33%) were more common parasitic cause diarrhoea among children by either ova or cyst. *E.coli* (74.13%) was common bacterial cause of diarrhoea among children. *E. coli* isolated in pure culture and sent for sero typing to Central Research Institute (CRI), Kasauli. Maximum percent were found to be pathogenic *Escherichia coli* i.e. *EPEC* 22.5%. **Conclusion:** According to the result, the most common cause of bacterial diarrhoea is *E.coli*. *EPEC* were more prevalent followed by *EHEC*. Thus, macroscopic and microscopic stool examinations as well as culture were important for finding out the course of diarrhoea in childhood.

**Key words:** *EPEC*, Diarrhoea, Intestinal parasites, Bacterial & CCMMCH, Durg

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## INTRODUCTION

The World Health Organization defined diarrhoea 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.<sup>1,2</sup>

Infectious diarrhoea is one of the greatest causes of morbidity and mortality worldwide. The usual manifestations are vomiting, diarrhoea and abdominal discomfort. Amongst the various enteric bacterial pathogens, diarrhoeagenic strains of *Escherichia coli* (*E. coli*) are considerably responsible for causing bacterial diarrhoea.<sup>3</sup>

*Campylobacter*, *Vibro*, *Aeromonas* and *Pseudomonas* were also reported to cause Diarrhoeal diseases. Diarrhoeal diseases and dysentery are also caused by *Entamoeba histolytica* (amoebic dysentery), *Cryptosporidium spp.* In clinical

bacteriology, the *Shigellae* are treated beside the *Salmonellae*, for both are intestinal pathogens and are isolated from faeces as non-lactose fermenting colonies on MacConkey agar media. Biologically, however, they are more closely related to the *Escherichiae*, with which they share antigens and some strains of which cause invasive, dysentery-like infection of the intestinal mucosa.<sup>4</sup> Intestinal parasitic infections have always been an important public health problem in the tropics, particularly in developing countries like India, where the humid climate, the insanitary environment, and poor socioeconomic conditions contribute to the problem. Intestinal parasites may increase susceptibility to infections with other intestinal pathogens. In India malnutrition, unhygienic conditions, improper disposal of sewage and non availability of potable water supply in rural and urban areas are responsible for high rate of intestinal parasitic infections. It is therefore important to identify the problem and tackle it in the interest of public health.<sup>5,6</sup>

### Address for Correspondence:

Dr. Animesh Panda, Assistant Professor of Microbiology, CCM Medical College & Hospital, Durg, (C.G.).

Phone: 7898968485, E-mail: animeshpanda48@yahoo.com

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The main Aims and objectives of the study were to study the bacterial as well as of parasitic cause of childhood diarrhoea and to study the prevalence of diarrhoeagenic *Escherichia coli*.

## MATERIALS AND METHODS

This study was conducted in Department of Microbiology CCM medical college kachandur. Fresh Stool specimens from 116 patients with age group from 1 to 11 years were received in Laboratory of Department of Microbiology and were included in this study during period of March 2014 to June 2015. Specimens were collected in special faeces collecting container (Hi media Pvt. Ltd). Patient data such as age, sex, address as well as information regarding sanitary facilities, past history of gastrointestinal illness, dietary habits was recorded at the time of receiving specimen.

Each stool specimen was examined by the following techniques for the presence of parasitic forms.

1. Gross examination: Stool was grossly examined for appearance as consistency, color and presence of blood or mucus.
2. Direct Microscopic examination were done by:
  - a) Saline preparation
  - b) Iodine preparation.
3. Stool samples were also examined after applying Formol-ether concentration technique.<sup>7</sup>

After Routine stool examination, bacterial culture was performed. When the specimen was formed or semi formed, a thick suspension was made of about 1 ml of sterile peptone water.<sup>8</sup>

A loopful of the emulsified faeces or fluid specimen was inoculated on agar plates. MacConkey agar was used and other media such as Deoxycholate Citrate agar for *Shigella* and *Salmonella* and the plates were incubated aerobically at 37°C overnight.

On the next day plates were examined for growth on MacConkey agar. Colonies were identified by colony morphology; gram stain of colony, motility test and different biochemical tests such as Indole, Citrate, Urease, TSI and PPA. Those which were identified as *E.coli* were sent to Central Research Institute. Distt.Solan: Kasauli (H.P) – 173204 for serotyping.

## RESULTS

All 116 stool samples which were processed showed presence of either parasitic form or bacterial infections or

both (refer Table 1). Out of total samples the infection were detected more in males (69) as compared to females (23), from Paediatric ward while that from PICU showed almost equal number from both gender.

From the Table 2. The total samples processed were from age group 1 year to 11 years. The age profile analysis showed that the age between 1-2 years showed maximum infection (25.86%), followed by 6-7 years (16.37%) and 10-11 years (12.93%) as shown in Table 2.

Table 3 shows that among 116 stool samples examined 30 (25.86%) samples were detected to have intestinal parasites. Out of 30 positive samples, 19 (63.33%) stool samples were positive for *Entamoeba histolytica* followed by *Giardia lamblia* 7(23.33%) and *H. nana* 1(3.33).

From the Table 4. Out of 116 bacterial isolates, 86(74.13%) were *Escherichia coli* (*E. coli*) followed by *Klebsiella*

**Table 1: Prevalence of parasitic and bacterial infections or both with respect to sex from paediatric ward (paedia) and PICU of CCM Hospital**

Wards	Male (n=84)	Female (n=32)	Total (N=116)	Percentage
Paedia	69	23	92	79.31
PICU	15	09	24	20.68

**Table 2: Prevalence of parasitic and bacterial infections or both with respect to age from Paediatric ward and PICU of CCM Hospital**

Age	Total no. of isolates	Percentage
1 to 2	30	25.86
2 to 3	7	6.03
3 to 4	3	2.58
4 to 5	4	3.44
5 to 6	10	8.62
6 to 7	19	16.37
7 to 8	6	5.17
8 to 9	11	9.48
9 to 10	11	9.48
10 to 11	15	12.93
Total	116	100.00

**Table 3: Prevalence of parasitic infections from stool sample (N=30)**

Name of parasite isolate	No. of isolates	Percentage
Cysts of <i>Entamoeba histolytica</i>	16	53.33
Cysts and trophozoites of <i>Entamoeba histolytica</i>	3	10
Cysts of <i>Giardia lamblia</i>	4	13.33
Trophozoites of <i>Giardia lamblia</i>	3	10
Ova of <i>H. nana</i>	1	3.33
Ova of <i>Taenia</i> species	3	10
Total	30	100

*spp.* 19(16.37%), *Pseudomonas spp* 6(5.17%) and *Proteus mirabilis* 5(4.31%) as shown in Table 4. Almost all the sample shows the bacterial infection which was followed by the parasitic infection as a mixed infections.

Among 116 isolates 86(74.13%) were *Escherichia coli*. Of the 86/116 *E.coli* isolated 80 were sent for serotyping to CRI, Kasauli. Among all the sero type strain *Enteropathogenic E. coli (EPEC)* were 22.5%, untypable *E. coli* (28.75%) and *Enterotoxigenic E. coli (ETEC)* were 5% as shown in Table 5.

## DISCUSSION

The present study showed that prevalence of parasitic and bacterial infections were most common between the age group 1-2 years (25.86%) and 6-7 years (16.37%). Out of the total 116 samples, *Entamoeba histolytica* (63.33%) was most common parasite followed by *Giardia lamblia* (23.33%). Microscopic examination of stool specimens continues to be the main tool used in the laboratory diagnosis of intestinal infections.

**Table 4: Prevalence of bacterial infections from stool sample**

Name of organism	No. of isolates	Percentage
<i>E. coli</i>	86	74.13
<i>Klebsiella spp.</i>	19	16.37
<i>Pseudomonas spp.</i>	6	5.17
<i>Proteus mirabilis</i>	5	4.31
Total	116	100

**Table 5: Serotypes characteristic of the diarrhoeagenic *E. coli* categories (N=80)**

<i>E. coli</i> strain type	O Serogroup	No. of strains	No.
ETEC	O8	2	4
	O166	1	
	O60	1	
	O18	2	
EPEC	O26	12	18
	O56	4	
	O157	3	
EHEC/STEC/VTEC	O87	1	12
	O116	1	
	O10	5	
	O113	1	
	O56	1	
	O	0	
EAEC	O136	1	4
		O143	
<i>E. coli</i>	O9	1	7
	O33	1	
	O30	2	
	O36	3	
<i>E. coli</i>	UT (untypable)	23	23
	Rough	6	
Non <i>E. coli</i>	-	6	6

Amongst the bacteria cause of diarrhoea, *E. coli* was (74.13%) followed by *Klebsiella spp* (16.37%). This study also showed that among the bacterial infections caused by *EPEC* (22.5%) was more prevalent followed by *EHEC* (15%) in children, which are the proven causes of childhood diarrhoea in developing countries.

In the study of Ogullesi Tinuadee et al (2006) shows that 23.3% had parasite in which *Entamoeba histolytica* 65.7% followed by *Ascaris lumbricoides* 18.6% and *Giardia lamblia* 7.1%.<sup>9</sup>

In the study of A. Samie et al (2009) shows that *Entamoeba histolytica* and *Cryptosporidium* species (34.2% and 25.5% respectively) were most commonly isolated parasites.<sup>10</sup> In study of Anuradha S. De. et al (2010) also shows that 43% were Diarrhogenic *E. coli* and among them 37.21% were *STEC*.<sup>11</sup>

Another similar study of Samer A Al- Hilali et al (2011) shows that 81.6% *E.coli* were isolated in which 3.4% were *EPEC*.<sup>12</sup> Where as in study of P. Rjendra et al (2012) shows that *Campylobacter* species are the main cause of bacterial gastroenteritis.<sup>13</sup>

## CONCLUSION

Diarrhoea in children could be multifactorial. Though easier methods of diagnosis and treatment are available for parasitic infestations, they are not yet eradicated. Hence continued surveillance is necessary for studying epidemiological factors for diarrhoeal diseases as well as methods of control. Diarrhoeal diseases can be minimized by educating community on proper personal hygiene and suitable local control strategies should be set up.

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**Authors Contribution:**

**AP, SKC-** Conceptualized study, literature search, statistically analyzed and interpreted, prepared first draft of manuscript and critical revision of the manuscript;  
**SB, DHC-** Concept, collected data and review of literature and helped in preparing first draft of manuscript.

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