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PREVALENCE OF ROTAVIRUS IN ACUTE PEDIATRIC PATIENTS ADMITTED TO A TERTIARY CARE HOSPITAL IN MANGALORE

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# ABSTRACT

Acute diarrhoea is one of the most important causes of morbidity and mortality in young children, among which Rotavirus has a worldwide distribution, and is found in both developed and developing countries. The greatest burden of diseases is in Africa, India and South Asia. This study was therefore done to determine the prevalence and factors associated with Rotavirus infection among paediatric age group(0-14 years) during a one year period at KMC, Mangalore. One hundred and sixty five paediatric patients with acute diarrhoea were recruited. Samples were investigated for bacterial, viral, fungal and parasitic enteropathogens using microscopic examination, bacterial culture techniques and IVD Rotavirus Stool Antigen Detection ELISA kit. Out of 165 stool samples tested for various causative agents of gastroenteritis, a total of 87 (52.8%) samples yielded organisms and in the other samples 78 (47.3%) the pathogens were unidentified. Rotavirus was the most common pathogen among the various diarrheagenic agents in pediatric age group to be isolated 35 (21.2%) followed by bacterial pathogens 32 (19.4%), *Candida albicans* 8 (4.8%) among the various *Candida* species 13 (7.9%) and *Cryptosporidium*spp 8 (4.8%) being commonest among various parasitic pathogens 12 (7.3%). Rotavirus is prevalent in our area and is one of the commonest causes for acute gastroenteritis with severe dehydration, but the good news is that it is a vaccine preventable disease and since there was no mortality reported, the children could mostly be managed at home with the oral rehydration therapy. These data will be essential for planning and including the available vaccination strategies in the immunization schedule and for better sanitation program in this part of the country.

Keywords: Rotavirus; Paediatric diarrhea; Acute diarrhea

## 1. INTRODUCTION

Ranging from mild annoyances during vacations to devastating dehydrating illness that can kill within hours, acute gastro-intestinal illness rank second only to acute upper respiratory illness as the most common disease worldwide. Acute diarrhoea is one of the most important causes of morbidity and mortality in young children. Rotavirus is one of the leading causes of viral gastroenteritis in children throughout the world, especially in the developing countries. It is estimated that Rotavirus is responsible for 24 million outpatient visits, 2.4 million hospital visits and 611,000 deaths annually with 80 per cent of these taking place in poorer countries [1]. In India, 350,000 children, under 5 die every year due to acute diarrheal diseases, out of which one third of them is due to Rotavirus gastroenteritis. The prevalence of Rotavirus diarrhoea (RVD) in India has been found to vary between 7 to 71 % in hospitalised children  $\leq$  5 years of age with acute gastroenteritis [2]. The common organisms causing diarrhoea among bacteria are Shigella, Salmonella, E.coli, Campylobacter spp, V.cholera etc. Many species of protozoan parasites live in the gastrointestinal tract, infecting some 3.5 billion individuals worldwide. Three species are of particular importance: Entamoebahistolytica, Giardia lamblia, and Cryptosporidium parvum.

The present study is the first comprehensive survey to assess the prevalence of Rotavirus and evaluate various factors associated with RVD among childrenaged less than 14 years in Kasturba Medical College and hospital, Mangalore.

## 2. MATERIALS AND METHODS

### 2.1. Study population

A total of 165 stool samples from symptomatic paediatric patients up to 14 years of age suffering from gastroenteritis (more than 3 loose stool per day for 2-3 days), admitted to Kasturba Medical College Hospital-Attavar, Kasturba Medical College Hospital-Ambedkar Circle, GovtWenlock Hospital and Lady Goschen Hospital and other peripheral hospitals in Mangalore city, by random sampling method during a one year period from Oct 2010 to Oct 2011.Diarrhea patients age <14years attending the outpatient department or inpatient department were included. Children with chronic diarrhea and persistent diarrhea were excluded.

## 2.2. Sample collection and processing

Fresh stool samples were collected in sterile wide mouth containers (Hi-Media, Mumbai) transported within 30 min to the department of Microbiology for processing. If there was a delay, the unprocessed samples was kept at 4°C and tested within 24 hours of collection. Samples that could not be tested within this time were frozen at -20°C until used.

### 2.3. Enteropathogen detection

Macroscopic examination of stool samples was done for presence of worms or worm segments, consistency, colour, presence of mucus & blood. All the samples were examined microscopically for pus cells, RBC's, ova in saline mount & cysts in iodine mount. Protozoa like *Cryptosporidium* was identified by Modified acid fast staining. Fresh stool samples was directly cultured onto Deoxycholate Citrate Agar, Thiosulphate Citrate Bile Salt agar(TCBS), MacConkey agar (Himedia, India) and added to enrichment media, selenite F broth & incubated at 37°C for 24 hours . The samples incubated in selenite F broth was subcultured onto MacConkey agar media for another 24 hours at 37°C and the routine biochemical reactions and serotyping using specific antisera were done accordingly.*E.Coli*was sent for serotyping to CRI, Kasauli.

The presence of Rotavirus was detected by the IVD Rotavirus Stool Antigen Detection ELISA kit M/S IVD Research Inc, USA.

**Ethics:** Permission for conducting this study was sought by the institutional ethics committee

# 3. RESULTS

Table 1: Prevalence of various diarrhoegenic pathogens with speciation isolated from pediatric stool samples during the study (n=87)

Pathogens isolated	No of
	patients
	n=165(%)
Bacterial aetiology:Diarrheagenic E coli	13(7.9)
EPEC	4(2.4)
EIEC	4(2.4)
ETEC	2(1.2)
VTEC	1(0.6)
Salmonella typhimurium	1(0.6)
Shigellasonnie	3(1.8)
Shigellaflexneri	7(4.2)
V cholera O1serotype Ogawa biotype El tor	1(0.6)
Parasitic aetiology: Cryptosporidiumspp	8(4.8)
TrichurisTrichuiria	3(1.8)
Ascarislumbricoides	2(1.2)
Hookworm	1(0.6)
Fungal aetiology:Candida albicans	8(4.8)
Candida krusei	3(1.8)
Candida glabrata	1(0.6)
Candida tropicalis	1(0.6)
Viral aetiology: Rotavirus	35(21.2)

Out of 165 cases, 8(4.8%) cases had multiple enteropathogens, out of which 3 were *Cryptosporidiumspp & Candida* spp, 1 was *Trichuristrichuiria & Ascarislumbricoides*, 1 was *Trichuristrichuiria*, hookworm & 3 were Rotavirus & EPEC.

# Table 2: Clinical features and factors associated with RVD (n=35)

Characteristics	No. (%)
Age (in years)	
< 1	17(48.6)
1-5	11(31.4)
6-10	3(8.6)
11-14	2(5.7)
Gender	
Male	24(68.6)
Female	11(31.4)
Diarrhoea	
Watery	25(71.4)
Mucoid	10(28.6)
Bloody	0(0)
Fever>38.50C	12(34.3)
Vomiting	12(34.3)

Fig. 1- Seasonal distribution of Rotavirus infection in the children with acute gastroenteritis



Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

### 4. DISCUSSION

In our study the overall rank order of common enteropathogens as per Table 1 were Rotavirus (21.2%)>Bacterial pathogens (19.4%)>Parasitic infection (8.5%)>Candida spp (7.9%). Rotavirus was the predominant diarrhea causing agent in the pediatric age group which has correlated with studies of Zafer Kurugol *et al* [3], Ayman Johargy *et al* [4], Jane S Nakawesi *et al* [5] and Bettina Essers *et al* [6].

In the present study, out of 165 pediatric stool samples, the prevalence of Rotavirus diarrhea in children less than 14 years was 21.2% and in children less than 5 years was 17% and 130 (78.9%) were ELISA negative Rotavirus. In the United Kingdom, Rota virus infection prevalence was found to be 36% in children under 16 years of age [7]. While the prevalence rate of Rotavirus in different cities of South Africa

varied from 13% to as high as 55% in under 5 yearof age[8] and in the USA the rate was 6.8% in children less than 6 years of age [9].

The prevalence of childhood Rotavirus diarrhea were comparable with other studies done in India as follows in Delhi it varied over a wide range between 6% to 45% [10, 11] and among studies done in Sothern India, in Vellore 18% was seen [12]. In Chandigarh, Rotavirus was detected in 16-19 per cent of instances of acute gastroenteritis in children < 5 year of age [13]. In eastern India, the prevalence of Rotavirusinfection was high in Bangladesh (41.8%) [14]. In Kolkata the incidence of rotavirus associated diarrhoea varied from 5-22 per cent. On the other hand, in Manipur the incidence was as high as 41 per cent [15]. In the western states of India, in Pune, Rotavirus was detected in 28-30 per cent of children ≤5 year of age with acute diarrhoea [16]. This variation may be due to the duration of the study, number of children studied and the seasonal variation of Rotavirus diarrhoea in different regions of the country. Most of the studies have used ELISA for detection of Rotavirus.

In our study, 48.6% of Rotavirus diarrhea was identified in the age group of between 6 months to 1 year. This result is comparable to the findings of other studies [14, 17, 18]. 92%, 31% and 42.8% of Rotavirus diarrhoea was seen in children less than 2 years in a study by Selim Ahmed *et al* & Staat MA *et al*, Valentine Ngum Ndze *et al* respectively. It appeared that infants below 6 months of age were initially protected to some extent by maternal antibodies and through breast feeding against severe diarrhoea due to Rotavirus. The greater risks of infants and young children in the interim period of 6 to 12 months with declined levels of maternal antibodies to rotavirus infection have been documented and due to weaning away from breast milk to bottle feeds and other food items where the chances of acquiring infection is high.

#### Seasonal variations

In our study (Fig. 1), though Rotavirus diarrhoea was seen all through the year, an increase in the prevalence was noted during the winter season i.e. in the month of November, December and January. This has correlated with the other studies where the peak of Rotavirus diarrhea was noted in winter season [19, 20]. In some of the studies higher incidences have been reported during the rainy season while in others no seasonal variation has been found [20]. Analysis of seasonal variation pertaining to Rotavirus revealed that cooler months had increased rate of rotavirus associated diarrhoea than the hotter months. Incidence of rotavirus disease responds to changes in climate in the tropics, with the highest number of infections found at the colder and drier times of the year [21]. In a study from Punjab, *Rotavirus* infection has been observed throughout the year with maximum occurrence in November and another peak in the hot and dry months of May [22]. The maximum incidence in Pune occurred in winter and the minimum in the rainy season [23].

### Rotavirus severity

The classic triads of Rotavirus infection are fever, vomiting and diarrhea. In our study (Table 2) 17.8% of cases of Rotavirus had a triad of the clinical symptoms. A Rotavirus positive presentation of diarrhea alone was rare 8.9%, this correlated with the surveillance studies done [24]. Diarrhea was noted in more than half (71.4%) of the Rotavirus positive cases while mucoid stool was seen in 28.6% of Rotavirus positive cases. The data has correlated with a study done by Selim Ahmed et al [14] where 55.6% cases suffered from purging and 63.6% had vomiting which either preceded or followed diarrhea and was also seen in another study [17]. Like our study, significant association of nausea and vomiting with rotavirus diarrhoea is also evident in some other studies [14, 17]. These clinical symptoms lead on to dehydration which requires hospitalization. But in the majority of our cases these symptoms were mild to moderate for whom mostly they were either treated on OPD basis and the cases which required hospitalization recovered on treatment with intravenous fluid replacement therapy and was uneventful. This was seen in another study [25]. No mortality was reported in our study.

In a hospital-based study in Bangladesh it was reported that children infected with rotavirus had less severe dehydration than those infected with other enteropathogens [26]. Rotavirus was also found not to be associated with severe dehydration in several case-control studies. Conversely, some studies reported that rotavirus diarrhoea was particularly severe compared with infections by other enteropathogens [27]. In Mexico, Velazquez and his co-workers observed that children with one, two or three previous infections had progressively lower risk of both subsequent Rotavirus infection and diarrhoea than children who had no previous infection. In their study, no children had moderate to severe diarrhoea after two previous infections (asymptomatic or symptomatic). It was also observed that, subsequent infections were less severe than the first and the second infections were more likely to be caused by another serotype of Rotavirus. Rotavirus infection normally provides short term protection and immunity against subsequent severe illness and does not provide lifelong immunity.

# 5. CONCLUSION

The result of this study concluded that high frequency of the various enteropathogens among young children is prevalent in this region; it is mostly of viral origin, where Rotavirusranks first and poses a public health problem. Prevalence of Rotavirus is now known in this part of the country. Rotavirus diarrheabeing a vaccine preventable disease, can reduce the morbidity & mortality in children who are vaccinated, hence identification of these pathogens in the community becomes important.

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