



Demographic Profile and Clinical Features of Acute Gastroenteritis Associated with Rotavirus & Non-Rotavirus Diarrhoea in Eastern Odisha Region--A Hospital Based Study

* Dr Dillip Kumar Dash

M.D, Associate Professor, Department of paediatrics, IMS & SUM Hospital, Bhubaneswar, * Corresponding author

Dr Bibhudatta Dash

Senior resident, department of paediatrics, IMS & SUM Hospital, Bhubaneswar.

Dr Nareshchandra Acarya

Senior resident,,Department of paediatrics, IMS & SUM Hospital, Bhubaneswar

ABSTRACT

Background: Acute gastroenteritis caused by bacteria, virus and parasite is an important cause of childhood morbidity and mortality in developing and developed countries. Rotavirus has been recognized as the most common pathogens causing acute gastroenteritis among children. However, there is still no valuable data about infections of rotavirus and non-rotavirus in children in eastern odisha region. The aims of the present study are to determine the incidence, clinical manifestation and complication of rotavirus and non-rotavirus associated acute gastroenteritis in children.

Methods: Fecal specimens and clinical data were collected from 247 children under 5 years of age with acute diarrhea admitted to IMS & SUM Hospital Bhubaneswar, Odisha over duration of one year between November 2015 and October 2016. Virus surface antigen was detected by ELISA method by Rotaclone kit test (Meridian bioscience). Rotaclone which utilizes monoclonal antibodies in a solid phase sandwich type EIA which was highly sensitive (100%) and specific (97%) for rotavirus antigen.

Results: Of the 247 specimens 111 (34.3%) were positive for rotavirus & other 136 were taken as non-rotavirus group. A peak number of rotavirus infections show a double peak in a calendar year i.e. during the cold season from November to January and June to September. The clinical picture of rotavirus gastroenteritis was characterised by a high frequency of vomiting even more than 10 times in a day and which is mostly present during first two days of diarrhoea. Severe dehydration with shock occurred in 11% of all patients more in rotavirus group with no relation to age and it was mostly isotonic. Abdominal pain and bloody stools were highly significantly increased in children with non-rotavirus group as compared to rota virus group.

Conclusions: The present study showed that rotavirus diarrhea is till the important causative agent of pediatric diarrhea in eastern odisha during this period. Proper clinical evaluation can prevent over judicious use of antibiotic and its complication for Rotaviral diarrhea. Parent's education and awareness regarding Rotaviral diarrhea and availability of vaccination will reduces the hospital admission and its complication.

KEYWORDS : Rotavirus, Acute gastroenteritis, non-rotavirus, Clinical symptoms

Introduction

Rotavirus is the most common cause of acute gastroenteritis (AGE) in children younger than five years of age worldwide. Each year two million children younger than five years are hospitalized with rotavirus AGE and an estimated 527,000 children die^[1, 2, 3]. Together they account for approximately one in six deaths among children younger than five years^[1, 2, 3]. The majority of these deaths occur in developing countries^[5, 23]. Rotavirus causes about 30-50% of diarrheal diseases in young children and the prevalence of severe rotavirus disease has remained high^[6, 7] despite improvements in sanitation. An explanation for this may be that improved hygienic practices and oral rehydration therapy have resulted in a greater decline of hospitalization from bacterial and parasitic diarrheal diseases than hospitalization from rotavirus disease^[4, 24]. Rotavirus belongs to the Reoviridae virus family and the virion comprises of three concentric protein layers. The outer capsid consists of two proteins, VP7 and VP4 that are used to classify rotavirus strains into G (glycoprotein) and P (protease sensitive) genotypes respectively^[8, 12]. Of the 12 G and 15 P genotypes known to infect humans, genotypes G1P[8], G2P[4], G3P[8], G4P[8] and G9P[8] cause over 90% of rotavirus disease worldwide^[10]. Vaccination has been suggested as a public health strategy to prevent rotavirus infection and reduce the burden of disease^[11]. Rotavirus vaccine was recommended for routine use among young children in the USA in 2006. Currently, the World Health Organization recommends including rotavirus vaccines in national immunization programs in regions where the efficacy data suggest a significant public health impact and where appropriate infrastructure and financing resources are available^[13]. This study not only described the epidemiological features of rotavirus and non-rotavirus infections but also compared the clinical peculiarity and severity of symptoms between rotavirus and non-rotavirus. The aims of the present study are (1) to determine the incidence of rotavirus and non-rotavirus associated acute gastroenteritis in eastern odisha region (2) to provide useful epidemiological and clinical data

which may help for the treatments. There are limited data on rotavirus disease burden among children in odisha and there is a need for data on prevalence of rotavirus diarrhea especially in our setting. So we conducted a pilot study in our medical college / hospital which is a tertiary care hospital with the objective to estimate the prevalence of diarrhea due to rotavirus among hospitalized children younger than 5 years of age.

Results

A total of 237 children (137 boys and 100 girls) with gastroenteritis aged 1 month to 5 years were studied with age groups as depicted in **table-1**. Patient with severe vomiting with diarrhoea, some dehydration & severe dehydration were admitted & studied in the present study. Patients with gastroenteritis were divided into two main groups according to the rotavirus antigen detection i.e. rotavirus (group 1) and non-rotavirus (group 2). The age distribution of the two groups of patients was similar. The rotavirus group consists of 111 children. The clinical picture of rotavirus gastroenteritis was characterised by a high frequency of vomiting sometimes more than 10 times in a day and which is mostly present during first two days of diarrhoea (**Table 3 & 4**). Maximum number cases in rotavirus group found in 7 to 12 month of age group (**Table 1**). Patients with rotavirus gastroenteritis sought medical advice earlier in the course of the disease (mean 2.1 days) than those with other infections. The mean duration of rotavirus illness did not differ between the two groups (4.56 days vs. 5.27 days) but relatively more number of (n-12) prolonged diarrhoea cases seen in non-rotavirus. Temporary secondary lactose intolerance was found in 23 patients (**Table 2**). Profuse watery, odourless diarrhoea > 10 episodes per day commonly present in rotavirus groups (**Table-5**). In particular, children with non-rotavirus group had prolonged diarrhoea for up to three weeks. Abdominal pain and bloody stools were highly significantly increased in children with non-rotavirus group compared to rota virus group (**Table-2**).

There were no significant differences in the occurrence of respiratory symptoms between the groups. There were no significant differences between the groups in the duration of fever and vomiting. Severe dehydration with shock occurred in 11% of all patients, more in rotavirus group with no relation to age, and it was mostly isotonic. Out of 126 tested patients, three had hypernatremia (sodium >150 mmol/l) and two had hyponatraemia (sodium <130 mmol/l). Ninety two per cent patients admitted to hospital required intravenous fluid therapy because of dehydration or severe symptoms. Antibiotics were prescribed for fifteen patients with suspected bacterial gastroenteritis. Urinary tract infections, confirmed by positive culture, and were found in six patients. Seasonal pattern of presentation is mostly found in rotavirus group with a peak seen in November to February and June to September in a calendar year (Figure 1)

Table 1: Age distribution and Duration of rotavirus diarrhea in children in eastern odisha region

Age distribution in months	Number of positive cases in rota group	%positive	Number of positive cases in non- rota group	%positive
1—6	18	16.21	19	13.97
7—12	45	40.50	27	19.85
13-36	33	29.72	15	11.02
37—60	15	13.51	75	55.14
Duration of diarrhea in days				
0-2	46	41.44	58	42.64
3-4	29	26.12	32	23.52
5-7	26	23.42	23	16.91
8-10	08	7.2	14	10.29
>10 days	2	1.8	09	6.61

Table 2: Presence of other symptoms & complication in rotavirus diarrhea in children in eastern odisha region.

Other symptoms present	Frequency in rotavirus group	Percent	Frequency in non- rotavirus group	Percent
Fever	62	55.85	73	53.67
Respiratory symptoms	06	5.40	16	11.76
Respiratory symptoms and fever	03	2.7	14	10.29
Electrolyte imbalance & ABG abnormality	18	16.21	9	6.61
Blood in stool	1	0.9	14	10.29
Persistence Diarrhea	3	2.7	12	8.82
Shock	9	8.1	4	2.9

Table 3: Duration of vomiting in rotavirus & non-rotavirus diarrhea in children in eastern odisha region.

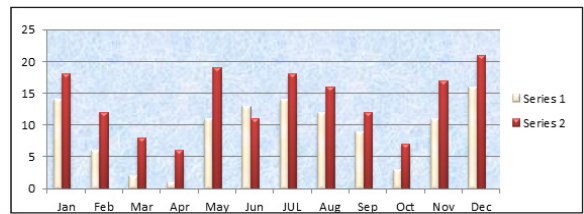
Duration of vomiting in days	Number of positive	%positive	Frequency in non- rota group	Percent
No Vomiting (34)	14	12.61	20	14.70
0-2	87	89.69	93	68.38
3-4	08	8.24	15	11.02
>5	02	2.06	8	05.8
Total	97	100	136	100

Table 4: Frequency of vomiting in rotavirus diarrhoea in children in eastern odisha region.

Vomiting	Number of positive cases	Percentage positive	Frequency in non- rota group	Percent
Vomiting >10 times daily	17	15.31	12	08.82
Vomiting >5 times daily	16	14.41	47	34.55

Vomiting <5 times daily	64	57.65	41	30.14
No Vomiting	14	12.61	36	26.47
Total	111		136	100

Figure 1 Monthly distribution of rotavirus and non-rotavirus infections between February 2011 and January 2012.



Series 1-Rotavirus group

Series 2- Non-Rotavirus group

Table 5 Clinical manifestations of rotavirus and non-rotavirus positive cases eastern odisha region

Clinical manifestations	Rotavirus	Percentage	Non-Rotavirus	Percentage
	Diarrhea (episodes/day)			
3-5	29	26.12	94	69.11
6-9	33	29.72	22	16.17
>= 10	39	35.13	20	14.70
Fever degree (°C)				
<37.5°C	49	44.14	33	24.26
37.5-38.5°C	43	38.73	68	50
>38.5°C	19	17.11	35	25.73

Discussion

The admission rate for children with gastroenteritis has not declined in recent years, and may even have risen [17,21]. The costs of rotavirus gastroenteritis contribute to a critical burden of disease in the pediatric population [16, 18, 19]. A recent update of the global burden of rotavirus disease put the median cost of hospital stay in EU-25 Member States at about €1,417 [19,20]. Based on previous studies, rotavirus infections caused 25 million clinical visits, 2 million hospital admissions and about 611,000 deaths annually worldwide in children, mainly in developing countries [22,23,24]. Several epidemiological surveys undertaken in China showed that the infection rates of rotavirus ranged from 28% to 65% [25,27]. Rotavirus is the leading cause of diarrhoea hospitalization among children worldwide [28,34]. Studies in the last decade estimate the annual mortality due to rotavirus in India to be between 90,000 and 153,000 [26]. Rotavirus infection ranges from asymptomatic infection to severe life threatening diarrhoea. It has been estimated that 29% of all diarrheal deaths in children <5 years of age is due to rotavirus and about 23% of rotavirus deaths are in the Indian subcontinent. In the study conducted by B.M. John et al [26]. (2014) 24% were found to be positive for rotavirus antigen in their stool samples. Saravanan et al., (2004) [15] from Chennai reported 22.6% positivity was associated with Rotavirus diarrhoea. Rotavirus accounts for close to 40% of hospitalizations for diarrhoea in India by G Kahn et al., (2012) [34]. Rotavirus infection affects 95% of children under the age of 5 years regardless of the socio-economic or environmental conditions and leads more frequently to dehydration than other etiologies [26]. Vaccination has been suggested as a public health strategy to prevent rotavirus infection and reduce the burden of disease [11]. Rotavirus vaccine was recommended for routine use among young children in the USA in 2006. Currently, the World Health Organization recommends including rotavirus vaccines in national immunization programs in regions where the efficacy data suggest a significant public health impact and where appropriate infrastructure and financing resources are available [13]. In Europe, rotavirus gastroenteritis can now be prevented by vaccination with two

vaccines (RotaTeq[®], Merck & Co. Inc, Whitehouse Station, NJ; Rotarix[®], GlaxoSmithKline Biologicals, Rixensart, Belgium) licensed in 2006. More recently, in a prospective study conducted in five European Union countries (France, Germany, Italy, Spain, and the United Kingdom) in children aged < 5 years, rotavirus accounted for 56.2% of all hospitalized community-acquired acute gastroenteritis cases, ranging from 33.2% in Italy to 64.4% in France^[29,30]. There also appears to be a substantial burden of rotavirus hospitalization among young children in the United States,^[32,33] with rotavirus accounting for about 18.4% of annual hospital admissions for acute gastroenteritis among children < 0.5 years of age^[17]. In our study, most admissions for acute rotavirus gastroenteritis were infants, with 16.21% aged less than six months, and youngest one is one month and 8 days. These figures are slightly lower than recent European surveillance data showing that rotavirus gastroenteritis ranged from 56.7% to 74.2% of cases of acute gastroenteritis in infants aged 6 to 23 months, and from 18.1% to 31.9% in infants aged < 6 months^[30]. The present study found a clear seasonal pattern of acute rotavirus gastroenteritis that peaked in winter, i.e., December to February, followed by early spring i.e. March to May, respectively which is in contrast to similar study conducted in Nepal 2006^[9]. Indeed, seasonality of rotavirus has been observed in different parts of the world; thus, it would be better for future studies to analyze samples from a "season" rather than a "calendar year". Similar results 25.67% were reported by ManoharBadur *et al.*^[31]. (2015) for rotavirus by ELISA.

Conclusion

In conclusion, the comparative study of this clinical manifestation and investigation has shown that rotavirus and non-rotavirus diarrhoea associated with different clinical patterns & outcome. An experienced clinician would be able to arrive at a presumptive diagnosis through a detailed case history, physical examination, routine laboratory tests, and knowledge of the seasonal occurrence of different pathogens. This presumptive diagnosis can then lead to choice of relevant methods for confirming the causative agent and starting appropriate treatment. This study highlights that rotavirus diarrhoea accounts for a large proportion of diarrheal disease in hospitalized children less than 5 years in eastern odisha and this high prevalence of rotavirus diarrhea with regard to public health is very important for its awareness and availability of preventive measure including vaccination.

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