

Incidence and clinical profile of rotaviral infection among children below 5 years of age admitted with acute diarrhea in a tertiary care hospital of Tripura

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Received – 09 December 2017

Initial review – 28 December 2017

Published Online – 19 February 2017

ABSTRACT

Background: Acute diarrheal disease is a major cause of childhood morbidity and mortality. Rotavirus has been recognized as the most common cause of severe diarrhea in children. Data on rotaviral disease burden are needed across India to support reasonable, evidence-based decision regarding any intervention. **Objectives:** The objectives of the study were to study the incidence of rotavirus infection in acute diarrhea among children below 5 years and clinical profile of rotaviral diarrhea. **Materials and Methods:** This cross-sectional study was conducted in a teaching institution of Tripura from November 1, 2014, to April 30, 2016. Stool samples from 460 hospitalized children below 5 years admitted with acute diarrhea were tested for rotaviral antigen by ELISA method. Caregivers were interviewed, physical examination was conducted, assessment of dehydration was done, and cases were managed as per the WHO Guideline. **Results:** Out of 460 cases of acute diarrhea, 290 (63%) were male and 170 (37%) were female. In infants, 240 (52%) diarrheal cases were observed. Out of total 460 stool samples, 166 (36%) were rotavirus positive, and of these, 100 (60.24%) rotavirus positive cases were infant, and 102 (61.44%) were male children. Rotavirus infection was observed throughout the year, with peak (54.21%) during January–March (winter season). Clinically, 110 (66.26%) children had fever, 94% (156) cases had vomiting, and 63.25% (105) children of rotaviral diarrheal cases were admitted with some dehydration, and 33.13% (55) patients were admitted with severe dehydration. The mean duration of diarrhea (4.97 days) and mean duration of hospital stay (3.71 days) were significantly higher in rotaviral diarrhea as compared with non-rotaviral diarrhea. No death was observed. Out of 460 cases of acute diarrhea, only 6 (1.3%) cases had received rotaviral vaccine, and only one case (0.6%) among 166 rotaviral diarrheal cases had received rotaviral vaccine. **Conclusion:** This study highlights that rotavirus is a significant cause of acute diarrhea in this part of the country and mainly affects children below 12 months age.

Key words: Acute diarrhea, Dehydration, Rotavirus

Diarrhea remains one of the most common illnesses of children. Globally, it is the second most common cause of under-five death [1]. Diarrhea killed 760,000 under five children per year, of these 453,000 were due to rotavirus [2]. Recent estimation has shown that about 872,000 hospitalizations and 78,500 deaths occur due to rotavirus infections annually in India [3]. Globally, rotavirus is the leading cause of severe dehydrating diarrhea in young children, and most children are infected by this highly contagious virus by the age of 5 years. The majority of severe rotavirus gastroenteritis (RVGE) episodes occurs in low-income countries and affects children under 1 year of age [4]. Rotavirus is the most frequent causative agent for the most severe disease in children younger than 5 years of age. Rotavirus caused 15–30% of all the hospital admission and 7–15% diarrhea in the community [2,4]. The magnitude of RVGE is underestimated because many children with RVGE may not present for medical treatment, and those who do present are not asked for investigation especially in primary care centers.

Rotavirus belongs to family Reoviridae; a double-stranded

RNA virus [5]. As morbidity and economic burden associated with rotavirus is high and vary in the different regions present study was undertaken in an attempt to measure the incidence of rotavirus infection in acute diarrhea and its clinical profile in this region of the country.

MATERIALS AND METHODS

This Hospital based cross-sectional study was conducted in the Department of Paediatrics, Agartala Government Medical College, Tripura, in collaboration with the Department of Microbiology of the same College from November 1, 2014, to April 30, 2016. Ethical clearance from the Institutional Ethical Committee was obtained before recruitment. Children below 5 years of age admitted in pediatrics ward with acute diarrhea (≥ 3 episodes of loose or watery stool per 24 h) were included in this study. Children with a clinical diagnosis of dysentery and diarrhea more than 14 days of duration were excluded from the study. Total 460 children were registered for the study after informed

and written consent from parents. Clinical and demographic profiles were recorded as per predesigned pro forma. Assessment of the dehydration and management was done as per the WHO guideline.

Stool sample was collected in a sterile container and immediately sent to the microbiology laboratory for ELISA test; routine stool examination and other investigation were done as and when required. Ridascreen rotavirus (C0901) was used for the qualitative determination of the rotavirus in stool samples. Children enrolled in the study were followed up daily during the hospital stay and frequency of loose stool, hospital stay, complication, and outcomes were recorded. Data were analyzed using SPSS version 15.0 statistical software. Chi-square test and Fisher's Exact test were used to see significance association. $p < 0.05$ was considered as statistically significant.

RESULT

This study showed that the incidence of rotaviral infection in acute diarrhea was 36% (166) in children below 5 years of age. In this study, rotaviral diarrhea was observed in young as 3.5 months age and very few cases (2.4%) above 4 years of age were also observed. The majority of rotavirus cases was observed in children below 12 months of age, constituting 60.24% (Fig. 1). Rotavirus infection was higher in male children 61.44% (102) as compared with female 38.55% (64) children. Rotaviral (RV) infection was observed throughout the year, but the maximum cases were seen during cooler months than hotter months (Fig. 2).

The study revealed the lower rate of exclusive breastfeeding 43.97% (73) and vaccination with RV vaccine 0.6% (1) in this region. No statistically significant association was observed in RV and non-RV diarrhea with breastfeeding ($p=0.626$). It was observed that 94% (156) of rotavirus positive cases had vomiting during the onset of loose motion and in 67.46% (112) cases, vomiting persisted 1–2 days. Some dehydration (63.25%) to severe dehydration (33.13%) was commonly observed in children of RV diarrhea at the time of hospitalization. It was observed that out of 166 cases, 110 (66.26%) children had fever (Table 1).

Analysis revealed that the mean duration of diarrhea in rotavirus positive cases was 4.97 ± 2.21 days and in non-RV diarrhea was 3.42 ± 1.42 days, and it was strongly significant ($p=0.000$). Diarrhea lasting >5 days in case of RV and non RV was observed in 36.14% (60) and 6.8% (20) cases, respectively ($p=0.000$). The mean duration of hospital stay in case of rotavirus was 3.71 ± 2.03 days as compared to non-RV 2.42 ± 1.21 days which were statistically significance ($p=0.0000$). Complications like electrolyte imbalance, convulsions were seen in few cases. Rectal prolapse was seen in two rotavirus positive cases. There was no mortality in the study population.

DISCUSSION

Diarrhea is one of the most common causes of death in children and rotavirus has been identified as the most common pathogen

associated with severe diarrhea. In this study, the incidence of rotavirus was found 36% in hospitalized children admitted with diarrhea. Previous studies from India as well as from different countries have revealed varying rates of prevalence of rotavirus infection that ranged from as low as 4 to 62.6% [6]. These wide ranges can be due to the difference in the age group studied, selection of cases from community or hospital, detection method employed, time of onset and the seasonal variation of rotavirus diarrhea in different regions of the country [6]. In recent report of Indian National Rotavirus Surveillance Network, they reported prevalence of rota virus disease was 39.6% [7]. Our incidence is also consistent with studied from neighboring states Assam and Manipur [8,9]. In this study, the maximum cases were observed below 1 year of age, but few cases were also seen above 4 years of age but frequency and severity were less in higher age group patients due to acquisition of antibody due to natural infection, less severe disease was also seen in young children due to persistence of maternal antibodies. Other studies have also shown that the incidence of RV diarrhea is the highest in infancy [10,11].

Male preponderance of infection was found in different studies like Ram *et al.* in Chandigarh [12], in another study done in Manipur by Sengupta *et al.*, they found higher positivity in male patients [13]. However, in our study, there was no significant association seen with sex of the children. The maximum cases were observed during December– March. It is in accordance with other studies in the same geographical location [8,13,14]. It had been observed that temperature influences the stability of rotavirus that contributes to the efficient transmission [15].

Analysis showed that children with rotavirus infection had fever and vomiting before the occurrence of loose motion. Due to the high frequency of loose stools, maximum cases (96%) were

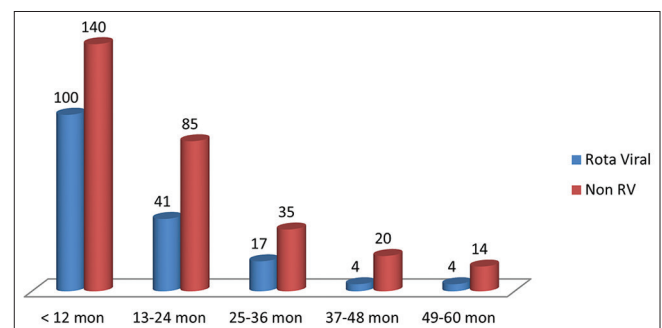


Figure 1: Age wise distribution of rotavirus (RV) and non-RV diarrhea

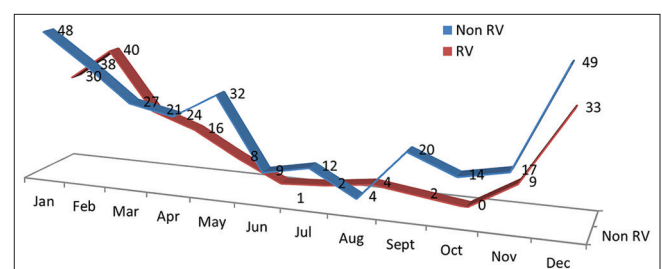


Figure 2: Month wise distribution of rotavirus (RV) and non-RV diarrhea

Table 1: Characteristics of study participants

Variables	Levels	Rotaviral N (%)	Non-rotaviral N (%)	p value
Gender	Male	102 (61.44)	186 (63.26)	0.763
Breastfeeding	Exclusive	73 (43.97)	137 (46.59)	0.626
Rotavirus vaccination		1 (0.6)	5 (1.7)	0.425
Vomiting		156 (93.97)	218 (74.14)	0.000
Fever		110 (66.26)	146 (49.65)	0.001
Dehydration	No dehydration	6 (3.61)	142 (48.29)	0.000
	Some dehydration	105 (63.25)	139 (48.27)	
	Severe dehydration	55 (33.13)	13 (4.42)	
Duration of diarrhea	Mean days >5 days	4.97±2.21 60	3.42±1.42 20	0.000
Duration of hospital stay	Mean days	3.71 (SD±2.03)	2.42 (SD±1.21)	0.000

SD: Standard deviation

admitted with some dehydration to severe dehydration. John *et al.* found that 10.4% of the children with rotavirus diarrhea had severe dehydration and 61.5% of the children with severe dehydration were positive for rotavirus [16]. In our study, a high percentage of dehydration might be late referral from peripheral hospitals which are far away and it is the only referral hospital of the state. In our study, 66.26% children had a fever and 94% rotavirus positive cases had vomiting at the time of hospitalization. It is in accordance with other study done in Indonesia by Salem *et al.* [17].

The mean duration of diarrhea and total hospital stay in RV diarrhea was significantly higher than in cases with non-rotavirus viral diarrhea. Other studies were done in Hong Kong, and Nigeria confirmed this trend [18,19]. This was a hospital based study, and hence, the results are unlikely to be a true reflection of the disease burden in the community. Isolated rotavirus positivity in a given case of diarrhea may not necessarily rule out an alternative infection or coinfection.

CONCLUSION

Rotavirus is an important cause of diarrhea in children and occurs more frequently in infants. There is a significant association between RV diarrhea and fever, vomiting, degree of dehydration, duration of diarrhea and total hospital stay. Improvement in the nutritional status and exclusive breastfeeding provides protection against RV and non-RV diarrhea.

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Funding: None; Conflict of Interest: None Stated.

How to cite this article: Barbhuiya NI, Majumder N, Majumder T, Chakraborty J. Incidence and clinical profile of rotaviral infection among children below 5 years of age admitted with acute diarrhea in a tertiary care hospital of Tripura. Indian J Child Health. 2018; 5(2):86-88.

Doi: 10.32677/IJCH.2018.v05.i02.004