

Rotavirus Diarrhea in Children Presenting to an Urban Hospital in Western Uttar Pradesh, India

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Objective: To determine the proportion and clinical profile of rotavirus-associated diarrhea in children aged 6 months to 5 years.

Methods: Clinical details and stool samples were collected from 254 children aged between 6 months to 5 years presenting with acute diarrhea, irrespective of hydration status, to the outpatient department or emergency room of a hospital in Meerut, Uttar Pradesh, India.

Results: Rotavirus accounted for 26.3% (51 of 194) of diarrhea cases overall, and 41.2% (14 of 34) in hospitalized children. Rotavirus infection was associated with significantly longer duration [3.3 (1.4) d vs. 2.5 (1.1) d; $P=0.004$] of diarrhea, and more chances of dehydration (OR 1.85; 95% CI 1.19, 3.57) as compared to non-rotavirus diarrhea.

Conclusion: Rotavirus is a common cause of acute diarrhea in under-five children, and is associated with a longer duration and more chances of dehydration than non-rotavirus diarrhea.

Keywords: Acute diarrhea, Epidemiology, Etiology.

Rotavirus is a common cause of diarrhea in children below 5 years of age, and is estimated to cause 4.4% and 3.2% of deaths worldwide in children in age group below one year and 1-4 years, respectively [1]. India has estimated annual burden of 2.0-3.4 billion cases attributable to rotavirus [2]. A rising trend in proportion of rotavirus cases in hospitalized children has been reported; 26.1% before 2000 to 38.3% after 2005 [3]. A recent multi-centric surveillance study in India reported 39% prevalence of rotavirus in children below five years of age hospitalized for acute diarrhea [4]. World Health Organization (WHO) estimated that State of Uttar Pradesh (UP) in India accounts for 32% of diarrheal deaths due to rotavirus infection among Indian children younger than five years [5]. As UP was not included in rotavirus multi-centric surveillance study, it is pertinent to collect information related to rotavirus diarrhea from this region. The present study was designed to estimate the proportion of rotavirus diarrhea in children presenting with acute diarrhea, and to study its clinical profile.

METHODS

This descriptive study was conducted in the Department of Pediatrics, LLRM Medical College, Meerut, UP, India from July 2011 to June 2012. Children aged between 6 months to 5 years presenting with acute diarrhea (<7 days

duration), irrespective of hydration status, to the outpatient department (OPD) or emergency room of hospital were eligible for inclusion. Diarrhea was defined as passage of three or more loose stools in the last 24 hours [6]. Children with severe malnutrition (weight-for-height <-3 SD of WHO charts), dysentery and clinical evidence of coexisting acute or chronic systemic illnesses were excluded from the study. Written informed consent was obtained from parents of children enrolled in the study.

All children were managed according to their dehydration status, as per WHO guidelines [6]. Children were monitored for number of loose stools, consistency of stool and time since last loose stool every six hours in a day. Children admitted in emergency ward were monitored directly by doctor on duty. Those who were enrolled on outpatient basis were contacted telephonically till diarrhea resolved, or for a period of 7 days after enrolment, whichever was earlier.

Stool samples of enrolled children were collected in sterile screw-top container, and were stored at -20° C till testing. Rotavirus detection was done only in children who completed the 7-day follow-up. Samples were transported to Microbiology department of our hospital in vaccine carrier; rotavirus detection was done by ELISA using Rota IDEIA Kit (DAKO, Germany).

Data were entered in the Microsoft Excel worksheet and were analyzed using SPSS Version 17.0.

RESULTS

Over a 12-month period, 516 children (444 OPD and 72 Emergency services) with acute diarrhea presented to the hospital, out of which 254 eligible children were enrolled in the study. Among included patients, 170 patients were also part of another study to determine the effect of probiotics on acute childhood diarrhea [7]. Stool sample analysis for rotavirus could be done only for 194 patients; 165 (85.1%) were enrolled from OPD and 29 (14.9%) from the emergency (overnight hospital stay). The mean (SD) age was 19.1 (13.5) months, and children aged 6-23 months accounted for 79.5% of all included children. Some dehydration was seen in 40.7%, severe hydration in 5.1% and vomiting in 37.8% of participants. Thirty-six (14.6%) children required intravenous fluids for dehydration correction, and one child died 6 hours after admission in emergency services. None of the included children was vaccinated with rotavirus vaccine.

Rotavirus was detected in 51 out of 194 (26.3%) children with acute diarrhea. **Fig. 1** depicts the month-wise detection of rotavirus antigen in study children. Among hospitalized children, rotavirus was detected in 14 out of 34 (41.2%). Most (82.3%) rotavirus-positive cases occurred in the age group of 6–23 months. Rotavirus positivity rate did not differ significantly by sex (34.7% among boys *vs.* 24.3% among girls). **Table I** compares clinical profile of diarrhea in children with rotavirus positive and rotavirus negative status. Children with rotavirus diarrhea had a longer duration of diarrhea and were more likely to be dehydrated than those with rotavirus-negative disease [dehydrated (56.8%) *vs.* non-dehydrated (43.2%); OR 1.85; 95% CI 1.19, 3.57; *P*=0.021]. Fever was observed in 72.5% (37 of 51) children with rotavirus diarrhea and 48.9% (70 of 143) without rotavirus diarrhea.

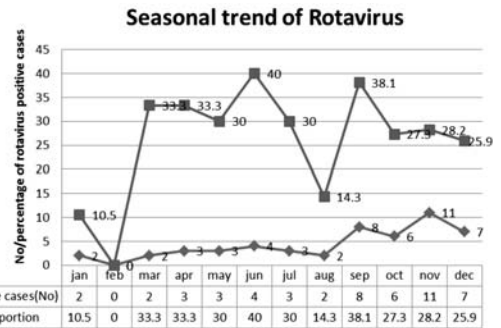


FIG. 1 Month-wise rotavirus positivity in study children.

DISCUSSION

Rotavirus infection is the most common cause of severe gastroenteritis in children below five years of age in most regions of India [8-10]. The present study demonstrated that rotavirus accounts for approximately one-fourth of acute diarrhea among children presenting to hospital below 5 years of age. The proportion was higher (41.2%) in hospitalized children, and those with rotavirus diarrhea had a longer duration of diarrhea and were more likely to be dehydrated.

Kang, *et al.* [2] detected rotavirus in 39% cases in Indian multi-centric surveillance whereas Bahl, *et al.* [8] reported 23.5% positivity rate in children below 5 years, hospitalized for acute diarrhea. A review of 46 epidemiological studies reported rotavirus in 20% of children hospitalized for acute diarrhea [10]. The difference observed between our study and previous studies may be attributed to variation in enrolment criteria among the studies, and inclusion of outpatient children in our study. Like previous studies [2,11], we also found more dehydration and longer duration of diarrhea in rotavirus-positive children.

Main limitations of our study were hospital-based enrolment and absence of asymptomatic control group.

TABLE I CLINICAL PROFILE OF CHILDREN WITH ROTAVIRUS DIARRHEA

| Variable | Rotavirus positive | Rotavirus negative | P value | OR (95% CI) |
|--|--------------------|--------------------|---------|------------------------|
| Age < 2 y | 42 (82.3) | 94 (65.7) | 0.02 | 2.41 (1.10, 5.26) |
| Winter season (Nov-Feb) | 26 (50.9) | 69 (48.3) | 0.89 | 1.11 (0.48, 2.20) |
| Fever | 37 (72.5) | 70 (48.9) | 0.004 | 2.75 (1.37, 5.53) |
| Dehydrated | 29 (56.9) | 56 (42.0) | 0.02 | 1.85 (1.19, 3.57) |
| #Loose stools per day | 9.8 (2.1) | 9.6 (2.2) | 0.83 | 0.33 (-0.44, 0.93)* |
| #Duration of hospital stay (h) | 76.1(27.7) | 76.5 (17.7) | 0.97 | -0.36 (-16.19, 15.48)* |
| #Duration of diarrhea at time of enrolment (d) | 3.3 (1.4) | 2.5 (1.1) | 0.004 | 1.25 (0.90-1.64) |
| #Total duration of diarrhea (d) | 6.3 (1.6) | 5.3 (1.4) | 0.02 | 1.55 (1.09, 2.00)* |

Data in No. (%) or #Mean (SD); *Mean difference (95% CI).

Rotavirus detection was done only in children completing the follow-up, which might have affected the calculation of the correct positivity rate. Also, we did not look for other etiological agents causing diarrhea. A recent study from Kolkata reported that 57.8% cases positive for rotavirus were co-infected with other pathogens.

We conclude that rotavirus is responsible for about one-fourth of childhood diarrhea under age of five years, and is associated with significant risk of dehydration and prolonged diarrhea.

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