Rotavirus Diarrhoea among Children under Five Years in a Tertiary Level Government of Rajasthan

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Abstract

Introduction: Rotavirus is the leading cause of severe, dehydrating diarrhoea in young children globally.Studies indicate that rotavirus causes approximately40 percent of childhood diarrhoea hospitalization worldwideand around 39 percent in India in lessthan 5 years of age.This study aimed to estimate the prevalence of rotavirus diarrhea among hospitalized children aged under five years.**Materials and Method:** Stool samples were collected from children who fall within the age range of 0-5 years with acute diarrhea and samples are tested for rotavirus by the enzyme linked immunosorbent assay (ELISA). **Result:** Out of 349 samples, 104(29.8%) cases were positive for rotavirus by ELISA. Therefore the prevalence of rotavirus infection among hospitalized patient under this study was 29.8%.**Conclusion:** Rotavirus is an important cause of diarrhea in hospitalized children.

Key words: Diarrhea, enzyme-linked immunosorbent assay (ELISA), rotavirus, Rajasthan

Introduction

Rotaviruses are the most common cause of severe infant and childhood gastroenteritis worldwide, responsible for an estimated 23 million outpatient visits, 2.3 million hospitalizations, and over half a million deaths annually among children under five years of age[1,2].Each year an estimated 527,000 children die from rotavirus diarrhoea[3,4,5]. It's account for approximately one in six deaths among children younger than five years[3,4,5].The majority of these deaths occur in developing countries[2,6]. Rotavirus causes about 30-50% of diarrheal diseases in young children and the prevalence of severe rotavirus disease has remained high[7,8].Very few studies on the prevalence of rotavirus among children have been conducted in Rajasthan.This study aimed to identify the proportion of children with acute gastroenteritis infected with rotavirus through systematic sampling over a one year period in a tertiary care Government hospital in Rajasthan.

Materials and Methods

This study was conducted at a Government tertiary care hospital in Jaipur, Rajasthan, India from October 2011 to September 2012.

This study included all hospitalized children of aged under 5 years who had presented with acute watery diarrhea. Informed consent was obtained for each child from the respective parent/guardian after explaining the purpose of the study. A case of diarrhea was defined as increased stool frequency, compared with the usual pattern occurring in a child aged under five years for whom the parents sought care for treatment of diarrhea[9]. Clinical details including age, sex, duration of illness, number of stools, associated vomiting and fever, degree of dehydration, and concomitant illness we rerecorded on a standardized reporting form. Detailed examination was done, dehydration was classified and treated as per WHO protocol and severity of illness was classified as per Vesikari scoring system for diarrheal illness[10].Stool specimens from all hospitalized children aged under five years who had presented with acute watery diarrhea were collected and stored in the refrigerator at 4°C and later transported to the laboratory of our hospital at 4°C. Samples were tested for the presence of rotavirus using a commercially available antigen detection apparatus, the enzyme-linked immunosorbent assay (ELISA) (Premier™ Rotaclone®, Meridian Biosciences,Cincinnati, Ohio, USA), as per kit protocol. Samples showing an optical density value of ≥0.150 were reported as positive.Enzyme immunoassay has a sensitivity of 96%, 99% specificity, 98% of positive predictive value and 98% of negative predictive value[11]. Statistical analysis were performed using SPSS (Statistical Package for Social Sciences) software (SPSS version 20; SPSS Inc, Chicago, IL). Chi square test was applied. $p<0.05$ was considered statistically significant.

Result

For the one year period, a total of 349 children were included in the study group. Among the study subjects, a majority of them were male children [247 (70.7%)], and 102 (29.2%) were female children. The stool samples of 104 (29.8%) children were positive for rotavirus by ELISA [Table 1].

Among 349 cases, a majority [246 (70.4%)] were in the age group of <15 months. Similarly, out of 104 ELISA-positive cases, 83 (79.8%) were found to be in the same age group.There were 5 rotavirus-infected cases among neonates and in the initial 2 months of age [Table 2].Applying chi-square analysis, it was found that there was strong statistical significant difference (p- 0.007**)** in ELISA reactivity between different age groups of cases.

Rotaviral diarrhea was more common during winter months i.e. November to February. 61.5%, with highest prevalence in the month of February (22.1%).Lower prevalence 28.8% during summer and monsoon months i.e. March- September (Figure 1).

Severity of rotavirus diarrhoea was shown in Table 3as per Vesikari scoring. It was seen that severity of illness is more (p=0.003) in rotavirus positive diarrhoeal cases.

Table 1: Distribution of Rotavirus cases according to sex

Sex	Rotavirus status (n=349)		
	Positive	Negative	Total
Male	75(72.1%)	172(70.2%)	247
Female	29(27.9%)	73(29.8%)	102

Table 2: Distribution of Rotavirus cases according to age group

Age group of children (months)	Rotavirus status of children		Total
	Positive	Negative	
0-2	5(4.8%)	23(9.3%)	28
3-5	14(13.4%)	44(17.9%)	58
6-8	17(16.3%)	45(18.3%)	62
9-11	30(28.8%)	26(10.6%)	56
12-14	17(16.3%)	25(10.2%)	42
15-17	4(3.8%)	8(3.2%)	12
18-23	7(6.7%)	16(6.5%)	23
24-35	5(4.8%)	22(8.9%)	27
36-48	4(3.8%)	19(7.7%)	23
49-59	1(0.9%)	17(6.9%)	18

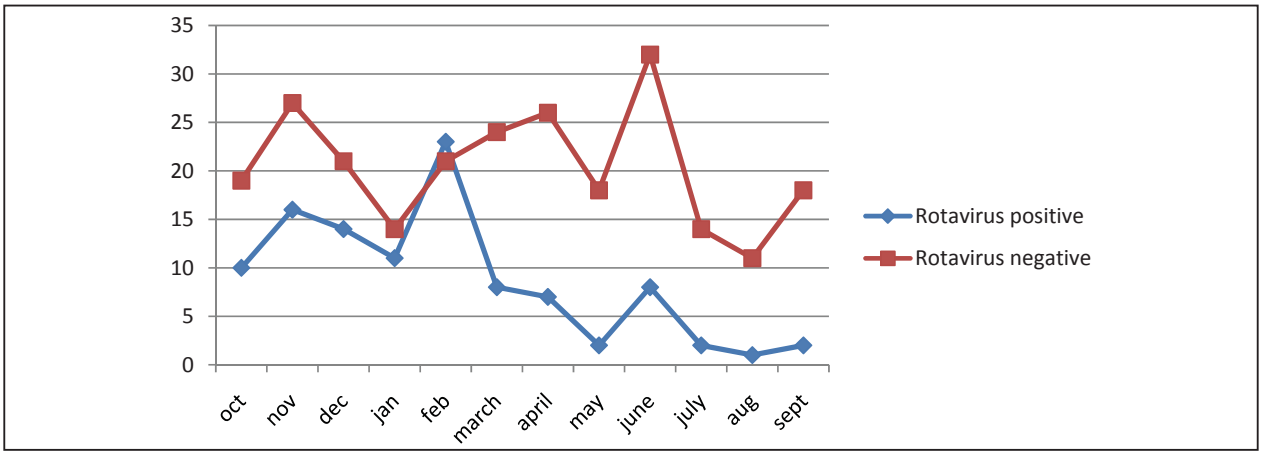

Fig 1: Seasonal distribution of rotavirus cases

Discussion

In the present study, it was found that 29.8% of the children aged less than five years, hospitalized with the complaint of diarrhea are due to rotavirus which correlates very well studies conducted in India.Bahl *et al*[12] reported 23.5% positivity, Banerjee *et al*[13] reported 27.4% positivity, and Ramani and Kang[14] reported 20-35% positivity. Comparatively, lower prevalence rates of rotavirus diarrhea had been reported in India from Bangalore (16.3%)[15], Calcutta (14.6%)[16], and Chandigarh (15.9%)[17]; because they useddifferent method of detection (latex slideagglutination test which is less sensitive to ELISA) ofrotavirus antigen from stool, as well as because ofdifference in climate and socio demographic status.

In this study, maximum Rotavirus positivity was found in the age group of 9-11 months (28.8% *p*-value<0.05) (Table 2), which correlates well withnumerous studies conducted in India. Dutta et al[18] revealed that rotavirus was most frequently detectedin the age group of 6-11 months (26.6%), and wasnot detected at all above 24 months of age. Nath et al[19] demonstrated that the overall prevalence of rotavirus diarrhea was significantly higher in childrenbelow 2 year as compared to those between 2-5 yearsof age. Phukan et al[20] showed rotavirus diarrhea was significantly high in children between 11 to 20months (37.75%).

As per Vesikari clinical scoring system, severity of diarrhoea was classified as mild, moderate, severe and very severe. As per this system, severity of rotavirus diarrhoea was more in positive cases and it is statistically significant (p<0.005). Similar findings are also observed in other studies[13,26].

Regarding seasonality, some studies in India have found no association between rotavirus infection and the time of year[13,21].Other studies have observed an increase in rotavirus-associated diarrhea during the winter months, October-February, throughout the country[12,22,23]. Rotavirus was markedly seasonal in northern India but was less seasonal in southern locations with a more tropical climate[20,24,25].Our study also shows prevalence of rotavirus diarrhoea is maximum during winter months.

Conclusion

This study has made it clear that one-fourth of the diarrheal disorders among children aged less than five years are due to rotavirus, which calls for stringent preventive measures in terms of vaccination against rotavirus and it is more prevalent during winter months of the year.

The strengths of this study include use of the WHO protocol for diagnosis and management of diarrhea, laboratory confirmation of Rotavirus and severity is classified as per Vesikari scoring system. There were a few limitations of present study. As this study is hospital-based, the prevalence of rotavirus might have been different from the actual prevalence in the community. The incidence of the disease could not be calculated in this study.

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