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Original Article

Prevalence of rotavirus infection in children below two years presenting with diarrhea

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ABSTRACT

Background: Rotavirus is a common cause of diarrhea in children. There is a need for data on prevalence of rotavirus diarrhea especially in our setting. This study was carried out to determine the prevalence of rotavirus infection in children upto two years presenting with diarrhea and to ascertain factors associated with rotavirus infection in them.

Methods: A cross sectional observational study was carried out to determine the prevalence of rotavirus infection amongst children less than 2 years presenting with diarrhea. The clinical profile of the children was analyzed along with detection of rotavirus antigen in stool.

Results: A total of 250 children with diarrhea were included in the study. The Male: Female ratio was 0.97:1. We found 24% children presenting with diarrhea to be positive for rotavirus antigen. 78.3% of children with rotaviral diarrhea were in the age group of 6–15 months. There was a significant association between type of feeding and rotavirus diarrhea with reduced prevalence while on exclusive breast-feeding. Though only 10.4% of children with rotavirus diarrhea had severe dehydration, 61.5% of children with severe dehydration were positive for rotavirus.

Conclusion: Rotavirus diarrhea caused substantial morbidity in our study population. The rotavirus positivity in these children was 24% and there was a significant association of rotavirus infection with type of feeding and severity of dehydration.

Introduction

Diarrheal disorders account for an estimated 1.5 million deaths globally every year making it the second leading cause of childhood mortality.[1] Amongst these, viral diarrheas form the most important cluster. Rotavirus is the most common identifiable viral cause of diarrhea in all children.[2,3] Rotavirus infection ranges from asymptomatic infection to severe life threatening diarrhea. 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.[4] Rotavirus infection affects 95% of children under the age of 5 years regardless of the socio-economic or

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environmental conditions and leads more frequently to dehydration than other etiologies.[5–7]

Advances in hygiene and sanitation have reduced the predominance of the other gut pathogens, while leaving rotavirus incidence almost unaffected.[8] Rotavirus vaccines are being projected as a solution to this problem. Availability of efficacious rotavirus vaccines has warranted extensive epidemiological studies on rotavirus diarrhea. It was with this background that this study was carried out to add to the existing knowledge on the magnitude of the problem in a tertiary care hospital setting.

Materials and methods

A cross sectional observational study was carried out in children presenting to either the outpatient department or admitted with diarrhea at a tertiary hospital between January 2011 and June 2012.

The inclusion criteria consisted of all children less than two years with acute diarrhea. Acute diarrhea was considered as passage of loose watery stools or an increased frequency of stools.

The exclusion criteria consisted of children with dysentery, diarrhea more than 14 days, or diarrhea developing after hospitalization due to any other cause. Clinical data was collected on a pre-designed pro forma. History regarding type of feeding was taken and classified as those taking exclusive breast feeds (BF), those on top feeds only (FF) and those on both breast feeds and top feeds (MF). Classification of dehydration and management was done based on WHO guidelines for diarrhea management. The children in the study were treated with oral rehydration therapy or intravenous fluids depending on severity of dehydration. Stool samples were collected from children on presentation to the hospital before starting therapy. Stool samples were collected in sterile containers and stored at −20 °C in the freezer for testing at a later date when adequate samples were collected. The stool samples were analyzed for rotavirus antigen by ELISA technique using Rotavirus Antigen Detection Microwell ELISA Kit by IVD Research Inc. Quality Diagnostic Products (Cat Code Rota-96). This ELISA based test was used for the qualitative determination of rotavirus antigen in stool.

The data was analyzed with appropriate statistical tests with the help of SPSS 17.0 software.

Results

In the study period from January 2011 to June 2012, a total of 250 samples were taken and clinical data regarding type of feeding, symptomatology, severity of dehydration and type of treatment given was recorded and analyzed.

Out of 250 children, 123 (49.2%) were male and 127 (50.8%) were female. Age wise distribution of patients showed maximum number of patients in the age group of 6 months to 15 months (74.8% for entire group and 78.3% for rotavirus group) (Fig. 1). 44 (17.6%) children were exclusively breastfed (BF), 90 (36%) were given top feeds only (FF) and 116 (46.4%) were being breastfed along with top feeds (MF). The feeding data showed that there were a large percentage of children who should have received supplementation beyond 6 months and those who should have continued breast-feeding beyond 6 months rather than giving only top feeds. However, further details on the same were not collected as this was not in the purview of the study.

Out of 250 children with diarrhea, 109 (43.6%) had vomiting along with diarrhea. 81 (32.4%) had cough or coryza and 83 (33.2%) had fever during diarrhea. The incidence of lethargy was 41.2%, irritability-39.2%, sunken eyes-21.2% and altered skin pinch-28%. 204 (81.6%) had passed urine in the last 6 h, 26 (10.4%) suffered from severe dehydration requiring intravenous fluids, 77 (30.8%) were diagnosed to have some dehydration. Majority of children 147 (58.8%) did not show any signs of dehydration. On presentation, 182 (72.8%) received oral rehydration therapy. 68 (27.2%) children required intravenous fluids on admission. Few children with some dehydration required IV fluids owing to persistent vomiting or inability to accept orally.

Rotavirus was detected in 60 (24%) samples. The proportion of rotavirus positive cases in in-patients was 45.2% as compared to those in out-patients which was 15.2%.

On comparison of rotavirus with non-rotavirus diarrhea, it was found that there was no statistically significant association between age (in months) and rotavirus ($p = 0.9$) or with gender and rotavirus ($p = 0.14$). There was a significant association between type of feeding, bottle feeding and severity of dehydration as shown in Table 1. Vomiting, coryza and fever were significantly more associated with rotavirus diarrhea. However, there was no statistically significant association between rotavirus and month of presentation ($p = 0.332$).

Discussion

Diarrheal disease is one of the commonest causes of death in children in developing countries and rotavirus has been consistently identified as the commonest pathogen associated with severe diarrhea. In our study of 250 children presenting with diarrhea, 24% were found to be positive for rotavirus antigen in their stool samples. A large number of studies

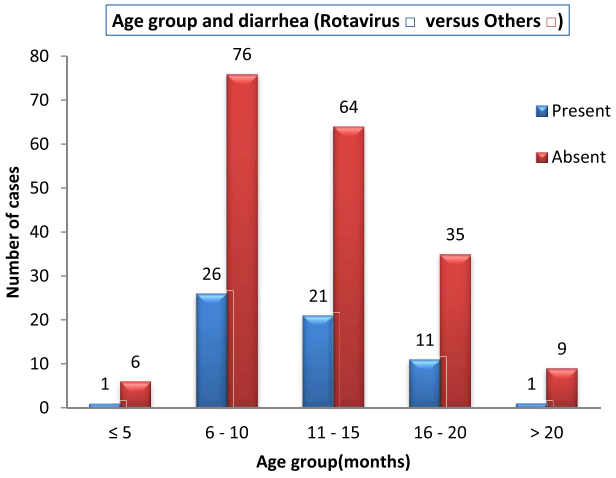

Fig. 1 – Age distribution of children with diarrhea.

Table 1 – Association of rotavirus diarrhea with feeding and dehydration.

Parameter	Rotavirus		Total	P-value
	Present	Absent		
Feeding				
BF	2	42	44	0.001
FF	23	67	90	
MF	35	81	116	
Bottle feeding				
Yes	34	76	110	0.023
No	26	114	140	
Dehydration				
Severe	16	10	26	0.0001
No/Some	44	180	224	

conducted in India regarding rotavirus diarrhea have been hospital based and have shown positivity of upto 34%.[8–10] Cases of diarrhea attributable to rotavirus in outpatient studies and community setting is much lower. In one study, rotavirus positivity rates varied greatly between different settings - diarrhea hospitalizations (20%), neonatal infections (35%), symptomatic and asymptomatic infections in the community (15.1% and 6.3% respectively) and nosocomial enteric infections (22.5%).[10] In another study on prevalence of rotavirus diarrhea in two settings in the same geographical region, the occurrence of rotavirus diarrhea was more among hospitalized children as opposed to the out-patients.[11] Our study also showed a higher proportion of rotavirus positive cases in in-patients (45.2%) as opposed to out-patients (15.25%). This increased prevalence amongst hospitalized children may be because of the higher admission rate with rotavirus diarrhea.

In our study, we sampled children less than 2 years, with maximum number of cases in the age group of 6–10 months. However, percentage positivity in all age groups were comparable for rotavirus and other diarrheas and statistically insignificant. The rotavirus positivity was 14.28% in less than 6 months age group, 25.4% in 6–10 months; 24.7% between 11 and 15 months; 23.9% between 16 and 20 months. This fact has been corroborated in other hospital based studies where rotavirus diarrhea has been found to be 13% (inter study variation of 10–25%) in children less than 6 months.[6,7] This variation has been attributed to less severe disease in young children due to persistence of maternal antibodies.[12,13] In a multicentric study conducted by Kang et al, rotavirus detection rates were greatest among children aged 6–23 months.[14]

The association between seasonality and rotavirus diarrhea has not been clear with evidence both for and against it.[15,16] In our study, there was no statistically significant association of infection and time of the year, but the maximum percentage of rotavirus positive cases were recorded in the period from October to December (32.5%). Exclusive breast-feeding appeared to protect infants against severe rotavirus diarrhea in studies, but this per se conferred no overall protection during the first 2 years of life, suggesting that breast-feeding temporarily postponed rather than prevented this outcome.[17–19] In our study, we found statistically significant association between feeding and rotavirus positivity, with children on exclusive breast feeds (some of them more than 6 months of age) having a reduced prevalence of rotavirus diarrhea. Bottle feeding was independently associated with rotavirus diarrhea. Rotavirus was also significantly associated with vomiting, coryza, fever and severe dehydration which is similar to data from other studies.[20]

Our study had a few limitations. 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 co-infection. However, a rotavirus prevalence of 24% makes it an important public health issue particularly in view of its significant association with the severe forms of diarrhea. Rotavirus diarrhea does not have any specific treatment and repeat infections are common. It has been seen that with good hygiene and sanitation, bacterial and parasitic diarrhea have declined considerably but there has been less of an impact on rotavirus disease. The predominance of vomiting along with the diarrhea makes treatment with oral rehydration more difficult. Thus, immunization is possibly an important preventive strategy towards control of rotavirus infection. However, in view of the reduced efficacy of the vaccine in developing countries, difference in type of native rotavirus strains compared to the vaccine strains and the possibility of co-infection with other enteric pathogens adding to the rotavirus morbidity or mortality, one may have to do a study of effectiveness of the rotavirus vaccine in our population before introduction of the vaccine.[14,20–24] At the same time, there are those who feel that the vaccine strategy may fail because of the lack of true estimate of disease burden, paucity of Indian studies with the currently available vaccines and a questionable capability of the health system to deliver the intervention against the backdrop of poor complete immunization rates.[25] Hence large population based studies on rotavirus and other possible co-pathogens in diarrhea may be required before these controversies can be laid to rest.

Conflicts of interest

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