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Original Article

Burden of Rotavirus Diarrhea in Children Under 5 Years of Age in A Tertiary Care Center

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Abstract

Background: Acute diarrheal illness is a major cause of pediatric mortality and morbidity. Rotavirus is the major infectious pathogen causing diarrhea in children under 5 years of age.

Aims and Objectives: To assess the burden of rotavirus diarrhea and analyse the common genotypes among children admitted with acute diarrhea in our setup.

Materials and Methods: A cross-sectional observational study was conducted at Institute of Child Health & Research Centre (ICH&RC), Government Rajaji Hospital, in children under 5 years of age admitted with acute diarrhea. History, clinical examination, stool analysis was done. A surveillance study of children under 2 years of age admitted with intussusceptions was also done.

Results: Out of 180 cases admitted with acute diarrhea, the mean age was 12 months, with 76% under 1 year of age. Out of the 180 children, 42% had received rotavirus vaccination (partial & complete) while 58% had not received vaccine. Out of this only 24% had received complete vaccination. Stool testing by ELISA for VP6 antigen was done for 180 cases. It revealed a positivity of 32.2%. The common G-P genotypes found were G3P8 43% G3+G12P8 15.7%, G1P8 14%, G12P8 8.7%, G3+G10P8 5%, G9P4, G3P4, G3+G9P8, G3P6+P8, untypable 1.7% each.

Conclusion: Rotavirus is the major infectious pathogen causing acute diarrhea in our community with a prevalence of 32.2%.

Key words: Diarrhea, Rotavirus, Types

INTRODUCTION

Diarrheal disorders in children cause mortality and morbidity.[1] Rotavirus is considered to be one of the leading culprits in causing severe dehydrating gastroenteritis in the under 5 children.

Rotavirus infection has a very broad spectrum ranging from asymptomatic infection to severe dehydrating life-threatening diarrhea.[2] The WHO estimates suggest that about 34% of diarrheal deaths are due to rotavirus in India. About 95% of under 5 children are affected by rotavirus irrespective of socioeconomic status. This is due to the fact that improvement in hygiene and sanitation may help in reducing the burden of other gut pathogens but plays no role in reducing rota viral burden.

There has been a decline in global deaths due to diarrhea over the past two decades as per recent studies. However, it has also been revealed that diarrheal hospitalizations, due to rotavirus, have been increasing.[3] Knowledge about the local circulating serotypes would help in assessing the adequacy of the current vaccines and need for new ones.

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MATERIALS AND METHODS

This study was a prospective analytical hospital-based study conducted in children aged <5 years admitted with

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gastroenteritis to the Institute of Child Health and Research Centre, Government Rajaji Hospital, Madurai. The study was conducted over a period of 1 year (September 2017–August 2018).

Inclusion Criteria and Case Definition

- A case of acute gastroenteritis is defined as the passage of more than or equal to three loose or watery stools over a period of 24 h.
- Children < 5 years of age.

Exclusion Criteria

- Children >5 years of age.
- Children with chronic or persistent diarrhea (lasting >14 days).
- Children with acute dysentery.

The institutional ethical committee was obtained. After getting informed parental consent, all children under 5 years of age admitted to the hospital were enrolled in the study. Basic information regarding the demographics were obtained. History regarding the onset and duration of symptoms such as onset, frequency, duration of loose stools, vomiting, fever, and urine output was obtained meticulously from the caregivers. A thorough examination was done; the level of dehydration was assessed based on IMCI guidelines and documented. Anthropometry of the children was documented.

Sample Collection

The caregivers were given a container with a spatula to collect stool sample and asked to collect about 5–10 ml of stool in it. The following instructions were given to the caregivers. The patient was placed on a plastic sheet. Stool was scooped from the plastic sheet with a wooden spatula and poured into the stool container until the mark was reached.

Storage and Transport

Ensuring universal precautions, the container was labeled with the patient details and ID then stored in the freezer compartment of the refrigerator (at –20°C). Later, the stored sample containers were transported to a reference laboratory in vaccine carrier with frozen ice packs ensuring maintenance of cold chain.

Sample Analysis

In the reference laboratory, the stool samples were analyzed as follows: The first step in analysis was enzyme-linked immunosorbent assay (ELISA). Initially, the sample containing rotavirus was added to well-containing anti-rotavirus antibodies. Now, the rotavirus antigens were captured by the antibody. Then, the sample was washed thrice to discard unbound antigen. Then, an enzyme-conjugated rotavirus antibody was added to the well. The sample was again washed thrice to discard excess unbound antigen. Now, the specific anti-rotavirus enzyme conjugate binds to captured rotavirus antigens. Then, the sample was incubated at 39°C. A colored product if formed indicating the presence of rota viral antigens.

Identification of Serotypes

Once a sample was found to be positive for the presence of rota viral antigens on ELISA, a polymerase chain reaction (PCR) test is done. This helped in detecting the structural proteins on the surface of the virus, namely G and P serotypes, thereby helping in identifying the strain of the infecting serotypes

Statistical Analysis

Collected data were entered into Microsoft Excel sheet. Statistical analysis was done using SPSS software (IBM, USA). Mean and standard deviation were used to report data. Comparison of results between vaccinated and unvaccinated group was done using Chi-square test. $P < 0.05$ was considered to be statistically significant.

DISCUSSION

Acute diarrheal disease is still considered a major killer illness in the pediatric population. It is found to be the second major cause of mortality in under 5 children.[4] A total of 180 cases of diarrheal children were included in the study (n = 180). Of which males constituted 58% while females contributed 42%. The mean age of presentation was 12 months with a standard deviation of 9 months. Nearly 76% of children were under 1 year of age while 17% were between 1 and 2 years of age. Majority of the cases presented with no signs of dehydration 59% followed by some dehydration 34% and severe dehydration 7%. Only 5% of cases had received ORT before hospitalization. Stool testing by ELISA for VP6 antigen was done for 180 cases. It revealed a positivity of 32.2%. The positive samples were then subjected to PCR for genotyping. It was done for 57 out of the ELISA positive 58 cases. The common G-P genotypes found were G3P8 43% G3+G12P8 15.7%, G1P8 14%, G12P8 8.7%, G3+G10P8 5%, G9P4, G3P4, G3+G9P8, G3P6+P8, and untypable 1.7% each.

Stool ELISA for rotavirus	Number of cases (%)
Positive	58 (32.2)
Negative	122 (67.8)
Total	180 (100)

Genotypes	Number of cases (%)
G1 P8	8 (14.04)
G1 P6	2 (3.51)
G12 P8	5 (8.77)
G3 P8	25 (43.86)
G3 P4	1 (1.75)
G3+G10 P8	3 (5.26)
G3+G12 P8	9 (15.79)
G3+G9 p8	1 (1.75)
G9 P4	1 (1.75)
G3P6+P8	1 (1.75)
UT	1 (1.75)
Total	57 (100.00)

Saravanan *et al.,* in 2003, studied the epidemiology of rotavirus in South Indian population. The prevalence of infection was found to be 22% which is much similar to our study. The common genotypes isolated were G2P4P8, G1G2P4P8, G1P4, G2P8, G4P4, G10P11, G9P11, and G9P6 which are much different from the prevalent genotypes in our study population. This reiterates the fact that genomic diversity is seen with different geographical location and with different seasons.[5] A systematic review of about 54 studies on the epidemiology of rotavirus diarrhea in India done by Kumar *et al.* published in the Indian Journal of Pediatrics showed a stool positivity rate that varied from 4.6% in Kolkata to 89.8% in Manipur among hospitalized children. The major causes were due to G1, G2, and untypable strains with regional variations. The infection rate varied from 4% in Delhi to 33.7% in Manipur in the community. The most common cause of nosocomial diarrhea was found to be rotavirus with prevalence ranging from 5.2% to 80.5%. Similar to studies conducted previously in varied geographical areas, our study has shown a prevalence rate of rota viral diarrhea of 32%. Furthermore, the comparison of infection rates between vaccinated and unvaccinated children showed $P = 0.035$ which is statistically significant. These points to the fact that the 116E vaccine is effective in preventing rota viral diarrhea. The common genotypes found were G3P8, G3+G12 P8, and G1P8. These are the prevailing strains in our community in the current season.

Limitations

The sample size is small when compared to the burden of acute diarrhea in the community burden of the illness in the community could not be studied.

CONCLUSION

Rotavirus is the major infectious pathogen causing acute diarrhea in our hospital setting. The common age group involved was children <1 year of age. There is no gender predilection. Mild illness with no dehydration and some dehydration formed the vast majority of the affected children. The burden of rotavirus diarrhea was found to be 32% in our hospital setting. The common infecting genotype is G3 P8 followed by G1P8 and G3+G12P8 in our geographical location.

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