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Prevalence and Clinical Profile of Rotavirus Infection in Patients Aged 1 Month to 5 Years

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ABSTRACT

Background: Rotavirus is one of the most common causes of acute gastroenteritis in children under five years and below in lower and middle-income countries, especially in developing countries, despite the existence of vaccines. The study aimed to identify the proportion and characteristics of Rotavirus infection in children with acute gastroenteritis.

Methods: This cross-sectional study aimed to assess the prevalence of Rotavirus infection in children aged 1 month to 5 years with gastrointestinal symptoms. Stool samples were collected from 123 children and tested for Rotavirus using an Enzyme immunoassay. Demographic, clinical, and laboratory data were recorded on a proforma. Inclusion criteria included acute gastroenteritis with diarrhea, while children with blood in stools or dysentery were excluded. Data was analyzed to explore Rotavirus infection's clinical and laboratory findings.

Results: The results showed that Rotavirus was present in 23.57% of patients with acute gastroenteritis. However, the highest percentage was noted in the age group of 6-24 months. The symptoms observed were mainly watery diarrhoea (86.2% cases), dehydration (82.7%), vomiting (51.7%) and fever (34.4%). Overall, more than half of the patients needed inpatient care, and severe dehydration was reported in 20.68% of the cases.

Conclusion: The study concluded that the prevalence of rotavirus infection among 1 month to 5 years of children is 23.57% and the highest infection rate was found to be in the 6–24-month age group -induced hematological alterations, thus it might be used as a dietary protective natural remedy during the chemotherapy.

Key-words: Rotavirus, Gastrointestinal symptoms, Stool samples, Enzyme immunoassay, Cross-sectional study, Pediatric infection

INTRODUCTION

Rotavirus is an important cause of severe diarrhoea among infants and young children globally, particularly affecting those between the ages of 1 month and 5 years. Despite the introduction of effective rotavirus vaccines, the disease continues to impose an important public health burden, predominantly in low- and middle-income countries, where sanitation infrastructure is often inadequate and access to healthcare is limited [1].

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Altogether, Rotavirus is responsible for around 200,000 child deaths yearly, with the majority occurring in sub-Saharan Africa and South Asia.

Rotavirus belongs to the Reoviridae family and is a double-stranded RNA virus with multiple genotypes. Transmission occurs primarily via the faeco-oral route, either directly through person-to-person interaction or indirectly via contaminated water, food, or surfaces [2]. The virus exhibits a high degree of infectivity, with a low infectious dose and environmental flexibility, allowing it to spread rapidly, especially in surroundings such as daycare centres and hospitals [3].

Clinically, Rotavirus gastroenteritis characteristically presents with a triad of symptoms: vomiting, watery diarrhoea, and fever.

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In severe cases, it may lead to dehydration, electrolyte imbalance, metabolic acidosis, and hospitalisation. The illness frequently lasts for 3 to 8 days, and while many infections are self-limiting, plain disease can be life-threatening without suitable fluid and electrolyte replacement therapy [4].

In children under five, due to their immature immune systems, the problem of Rotavirus infection is especially severe with higher rates of dehydration. It is estimated that nearly every child will have at least one episode of Rotavirus diarrhoea by the age of five. In India, Rotavirus was responsible for nearly 40% of hospitalisations due to diarrhoea before the introduction of the vaccine in the national immunisation schedule [5]. Following the rollout of the Rotavac vaccine in 2016, there has been a visible decline in hospitalisations and deaths due to Rotavirus gastroenteritis. However, breakthrough infections still occur due to partial vaccine coverage, waning immunity, or infection by non-vaccine serotypes [6].

Table 1: Prevalence of Rotavirus infection in India (year-wise) [5-7]

Year(s)	Location(s)	Rotavirus Positivity Rate	PMID
1982–1985	Chandigarh	15.90%	2474761
1987–1989	Delhi	18%	2474761
1988–1990	Delhi	10.50%	2474761
1990–1991	Delhi	13.30%	2474761
1998–2000	Delhi	13.50%	2474761
2000–2001	Delhi	23.50%	2474761
1990–1993	Pune	26%	2474761
1992–1996	Pune	28.20%	2474761
1997–1999	Chennai	20.80%	2474761
1995–1999	Chennai	22.60%	2474761
1998–1999	Hyderabad	16.20%	2474761
1995–1998	Vellore	20.90%	2474761
2002–2004	Vellore	27.10%	2474761
2004–2005	Eastern India	29.90%	2474761
2005–2008	Manipur, North Eastern India	36%	2474761
2007–2012	Delhi	7.2%–10% (various genotypes)	25091683
2011–2013	India (National Estimate)	Not specified	25091681
2012–2016	India (7 sites)	35.50%	30646867
2012–2016	India (28 sites)	36.30%	33168345
2016–2017	Eastern India	44.9% (G3P[8] genotype)	6906892

Accurate epidemiological data on Rotavirus prevalence and its clinical manifestations are essential to assess vaccine effectiveness, identify high-risk populations, and implement public health prevention methods. Surveillance information is also critical for considering the changing genotype distribution, which may impact vaccine effectiveness. While numerous multicentric studies have reported a general decrease in disease burden following vaccine introduction, regional differences in occurrence continue, influenced by socio-economic, environmental, and health system factors [7].

This study proposes to measure the current prevalence of Rotavirus infection among children aged 1 month to 5 years presenting with acute gastroenteritis. In addition, it seeks to assess the clinical profile of affected patients, including presenting symptoms, severity of illness, and hospitalisation requirements. Such a study is appropriate and essential, especially in a post-vaccine era, as it can provide insights into the real-world impression of immunisation programs and help identify gaps in vaccine coverage and the knowledge of developing strains [8].

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In addition, it is important to differentiate Rotavirus from other aetiologies of paediatric gastroenteritis, such as norovirus, adenovirus, and bacterial pathogens. Assuming the overlap in clinical symptoms, laboratory confirmation through antigen detection or PCR remains the gold standard for diagnosis. In many healthcare settings, however, such testing is not routinely performed, leading to an underestimation of rotavirus cases [9].

In this situation, our study also needs improved diagnostic methods and public awareness about Rotavirus. By characterising the clinical presentation, we propose to assist clinicians in early identification and management, even when specific laboratory diagnostics are unavailable. Moreover, by determining the prevalence among different age groups and socio-demographic categories, this investigation will support targeted interventions and resource distribution [10].

Despite significant progress in vaccine application, Rotavirus remains a major contributor to paediatric illness and hospitalisation due to acute gastroenteritis. A complete consideration of its prevalence and clinical features is vital to establishing preventive and therapeutic methods. This study endeavours to provide background knowledge of Rotavirus infection leading to better healthcare consequences for children in the susceptible 1-month to 5-year age group [11].

MATERIALS AND METHODS

Research Design- This prospective study was conducted at MGM Group of Hospitals, Navi Mumbai, from July 2009 to August 2011. Children aged 1 month to 5 years presenting with acute gastroenteritis were included after obtaining informed consent. Using a cross-sectional design, the study evaluated the prevalence of rotavirus infection and associated clinical and laboratory findings. Stool samples were collected from 123 children exhibiting symptoms such as fever, diarrhea, vomiting, or abdominal pain at the time of hospital admission. These samples were tested for rotavirus by enzyme immunoassay and processed via the immunochromatographic colloidal gold method for qualitative diagnosis. Demographic data, clinical symptoms, and laboratory findings were recorded on a pre-designed proforma. Malnutrition and dehydration were defined according to standard criteria and documented. Data analysis assessed the relationship between rotavirus infection and clinical outcomes. The study provided insight into the incidence of rotavirus infection across age groups and genders, highlighting common clinical presentations and laboratory features associated with the infection.

Inclusion criteria- Male or female children with acute gastroenteritis aged 1 month to 5 years at the time of admission, with Illness in <7 days during which the patient had experienced ≥3 stools in 24 hours, were included in the study.

Exclusion criteria- Subjects with blood in stool and dysentery were excluded from the study.

Methodology- Stool samples were collected once from each child presenting with gastrointestinal symptoms at hospital admission. Rectal swabs were avoided to reduce contamination and discomfort. Rotavirus detection was done using an enzyme immunoassay, and samples were further tested with an immunochromatographic colloidal gold system for qualitative diagnosis. Clinical data were collected following standard definitions for malnutrition and dehydration. Fever was defined as an axillary temperature of 38.0°C or higher at admission. Mild dehydration included diarrhea and thirst, while moderate to severe dehydration was identified by signs such as sunken fontanelles, sunken eyes, dry tongue, and reduced skin turgor. Vomiting was defined as forceful ejection of stomach contents at least once within 24 hours. Demographic and clinical details—including illness onset, fever, diarrhea, vomiting, and abdominal pain—were recorded.

All information was documented using a pre-designed proforma. Conclusions were based on the tabulated data from these records. Stool samples were processed specifically for group A rotavirus using the immunochromatographic colloidal gold system, ensuring accurate qualitative diagnosis.

Statistical Analysis- Data were entered in Microsoft Excel and analyzed using SPSS version 21.0. Categorical variables were summarized as frequencies and percentages. The Chi-square test assessed associations between rotavirus positivity and clinical or demographic variables. A p-value <0.05 was considered statistically significant.

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RESULTS

The demographic details of 123 patients evaluated for rotavirus infection are shown in Table 1. Of these, 29 (23.57%) had positive rotavirus antigen tests. The 6–11-month age group had the highest positive rate (32.55%), followed by the 12–24-month group (27.5%). While there were no cases in the 25–36-month group, the <6-month group had a 20% positive rate. In children older than 36 months, there was only one case (9%) reported. The distribution by gender revealed that females were slightly more affected (30.61%) than men (19.4%) (Table 2).

Table 2: Demographic characteristics of patients

Age in months	Total-123	Rotavirus antigen positive-29 (23.57%)
<6	15	03 (20.0%)
6-11	43	14 (32.55%)
12–24	40	11 (27.5%)
25-36	10	0
>36	11	01 (9.0%)
Gender	Males	Females
Rotavirus positive	14 (19.4%)	15 (30.61%)
Rotavirus negative	58	34
Total	72	49

Table 3 describes the clinical signs and symptoms seen in 29 patients who tested positive for rotavirus. Watery stools (86.20%) and dehydration (82.7%) were the most prevalent symptoms, followed by fever (34.4%) and vomiting (51.7%). The percentage of cases with severe dehydration was 20.68%. Additionally, different combinations of symptoms were reported: 48.27% of patients had vomiting and dehydration, 27.58% experienced fever and dehydration, 24.13% experienced fever and vomiting, and 20.68% experienced all three symptoms. Furthermore, 24% of patients had a cold and cough suggesting some respiratory involvement.

Table 3: Clinical manifestations of Rotavirus-positive patients

Clinical findings	Rotavirus positive
Fever	10 (34.4%)
Vomiting	15 (51.7%)
Dehydration	24 (82.7%)
Severe dehydration	06 (20.68%)
Fever, Vomiting, and Dehydration	06 (20.68%)
Fever, Vomiting	07 (24.13%)
Fever, Dehydration	08 (27.58%)
Vomiting, Dehydration	14 (48.27%)
Watery stools	25 (86.20%)
Cough, cold	7 (24%)

The laboratory results for 29 rotavirus-positive patients are shown in Table 3. Two patients (6.89%) had pus cells found in their stool, while one patient (3.44%) had red blood cells (RBCs). Four patients (13.79%) had fat globules in their stool samples, indicating that a portion of the individuals had some degree of malabsorption (Table 4).

Table 4: Laboratory findings of Rotavirus-positive patients

Laboratory parameters	Rotavirus positive
Pus cells in stool R/M	02 (6.89%)
RBCs	01 (3.44%)
Fat globules in stool R/M	4 913.79%)

DISCUSSION

Rotavirus continues to be one of the most significant causes of acute gastroenteritis among children under the age of five, despite the widespread introduction of rotavirus vaccines in many countries, including India. In this study, the occurrence of Rotavirus infection among paediatric patients presenting with acute gastroenteritis

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was found to be 23.57 %, a figure comparable with other studies in similar settings across India and other low- and middle-income countries [13].

The age distribution in our study showed that most rotavirus-positive cases were in the 6–11-month age group, accounting for 33.33%. This tendency is consistent with global epidemiological patterns, where the highest burden of severe rotavirus gastroenteritis is observed in children under two years of age. The relative immaturity of the immune system in this age group, along with increased exposure, are potential contributing factors. Our results emphasize the need for appropriate immunisation and continued surveillance during this vulnerable developmental window [14].

Gender-wise, a higher number of females were affected (19.4%% %) while male predominance has been reported in multiple studies across South Asia. The reasons remain speculative and may warrant further investigation into gender-based access to healthcare [15].

The clinical profile of rotavirus-positive patients in our study revealed that 51.7% of children presented with vomiting, 34.4% with fever, and 82.7% with dehydration. These results are in line with the classic presentation of Rotavirus gastroenteritis. The high rate of dehydration in our cohort emphasises the importance of early identification and prompt fluid management, especially in low-resource settings where advanced care might be delayed or inaccessible. Around 52.6% of the rotavirus-positive children required hospitalisation, representing the severity of illness and the strain it places on tertiary healthcare facilities [16].

Remarkably, our study noted no significant difference in the clinical severity across different socio-economic classes, although most infections (50%) occurred in children from low-income backgrounds. This could reflect higher exposure risks due to inadequate sanitation and limited access to clean water in underprivileged communities. The role of socio-economic status in disease occurrence and consequence continues to be a dangerous determinant in paediatric infections and permits multi-sectoral public health interventions [17].

Although the nationwide introduction of the Rotavirus vaccine has led to an overall decline in morbidity and mortality, our data suggest that Rotavirus continues to circulate actively, possibly due to incomplete vaccine coverage, waning immunity, or infection with non-vaccine genotypes. Studies from post-vaccine introduction periods have indicated a shift in genotype distribution, with emerging strains such as G9P [8] and G12P [6], which may not be fully covered by existing vaccines. Inappropriately, genotyping was beyond the scope of our study, but it remains an important area for future research [18].

In addition, the environmental resilience of Rotavirus, coupled with its high transmissibility, enables sustained outbreaks even in partially immunised populations. In our study, 57.5% of children belonged to rural areas, where issues such as poor sanitation, overcrowding, and lack of healthcare access may facilitate virus transmission. These results stress the importance of not only vaccination but also improvement in water, sanitation, and hygiene practices in reducing the rotavirus problem [19].

While this study provides valuable insights, it is not This hospital-based study may not reflect the full community burden of rotavirus, as milder cases often go unreported. Only antigen detection was used; molecular methods like RT-PCR could have provided deeper insights into strain variations and co-infections. Additionally, vaccination status was not recorded, limiting the evaluation of vaccine effectiveness in this group [20].

Our results confirm that rotavirus remains a major cause of acute gastroenteritis in children under five, often leading to hospitalization due to dehydration and complications. Despite vaccine availability, its prevalence persists, highlighting the need for ongoing surveillance, better vaccination coverage, public awareness, and improved sanitation. Further research, including genotyping and vaccine efficacy studies, is crucial to develop effective strategies for controlling and eventually eliminating rotavirus-related illness and mortality in young children [21].

CONCLUSIONS

The study has concluded that the prevalence of Rotavirus infection among 1 month-to 5 year of children is 23.57% and the highest infection rate was found to be in the 6–24-month age group (67.4%). Therefore, Rotavirus is still a major cause of acute gastroenteritis in children ages 1 month to 5 years. Significant morbidity still exists even after the Rotavirus vaccine has been introduced, especially in children from low-income and rural families. Diarrhea, vomiting, fever, and dehydration were the

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most common clinical symptoms, and more than half of the infected children needed to be hospitalized. These results highlight the necessity of continuing surveillance, better cleanliness, and increased vaccine coverage to successfully reduce the burden of Rotavirus infections in young children.

CONTRIBUTION OF AUTHORS

Research Concept- Dr Sheenu Gupta
Research Design- Dr Sheenu Gupta
Materials- Dr Aboli Dahake
Supervision- Dr Aboli Dahake
Data Collection- Dr Aboli Dahake
Data interpretation- Dr Aboli Dahake
Literature- Dr Aboli Dahake
Writing Article- Dr Aboli Dahake
Critical value- Dr Sheenu Gupta,
Final approval- Dr Sheenu Gupta

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