

Burden of Rota Virus Gastroenteritis in Children Under 5 Years of Age

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ABSTRACT

Objective: To detect the burden of Rotavirus gastroenteritis in hospitalized and non-hospitalized children under 5 years of age.

Study Design: Retrospective observational study.

Place and Duration of Study: Department of Virology, Armed Forces Institute of Pathology, from Jan 2015 to Dec 2019.

Methodology: A total of 527 stool samples were analyzed using rapid immunochromatographic testing kit for Rotavirus. Samples were received from both outdoor and indoor children under 5 years of age presenting with diarrheal illness.

Results: 197 (37.4%) patients were positive for rotavirus antigen in stool while 330 (62.6%) were negative. Mean age of participants was 13.4 months \pm 16.6 (range: 1-60 months). Out of 197 (37.4%) stool samples which were positive for rotavirus antigen, 66 (33.5%) were female children and 131 (66.5%) were male children. Maximum positive rotavirus stool antigen was observed in 0-2 years age-group i.e., 173 (33%) while 24 (4.4%) were positive in 3-5 years age-group, 110 (20.9%) rotavirus positive samples were from Inpatient Department while 87 (16.5%) were received from Outpatient Department.

Conclusion: Rotavirus is a frequent cause of viral gastroenteritis in both hospitalized and non-hospitalized children. Maximum positivity is seen in children under 2 years of age.

Keywords: Gastroenteritis, Immunochromatographic testing, Rotavirus.

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INTRODUCTION

Acute viral gastroenteritis is one of the most common childhood illness that results in hospitalization.¹ Globally, it is the second leading cause of mortality in children under 5 years of age with majority of the deaths occurring in low resource countries.^{2,3} Most of these episodes are self-resolving requiring supportive therapy. However, complications are also reported in young children.^{4,5}

Viruses are the most common cause of non-bloody diarrhea in toddlers therefore, WHO also discourages use of antimicrobial therapy in children presenting with watery non-bloody diarrhea.⁶ Among diarrheal viruses Rota virus is most notorious and shares the greatest burden of illness in young children.^{7,8} Other common viruses causing diarrhea include norovirus, astrovirus, enteric adenovirus and sapovirus.⁸

Rota virus, a member of Reoviridae family has a segmented double stranded RNA genome. Most of the severe childhood infections are caused by Gp A rotaviruses.^{7,9} Pakistan is among the top five countries with highest degree of mortality and morbidity due to acute viral gastroenteritis in children. This is primarily due

to the lack of proper healthcare and diagnostic facilities, poor quality drinking water and unhygienic living conditions.¹⁰

Although, the burden of rotavirus gastroenteritis is well-recognized worldwide, but little information is available regarding rotavirus diarrhea in our country. We analyzed our records from 2015-2019 to find the burden of acute gastroenteritis caused by rotavirus in children under 5 years of age in our setup.

METHODOLOGY

This was a 4-year (2015-2019) retrospective study carried out at Department of Virology, Armed forces institute of Pathology, Rawalpindi which is a reference center for diagnosis of virological diseases in Northern Pakistan. Permission was granted by Institutional Review Board via letter FC-VIR15-4/READ-1RB/20/1002.

Inclusion Criteria: All the stool samples received from children under 5 years presenting with diarrheal illness (both indoor and outdoor) were included in the study.

Exclusion Criteria: Children above 5 years of age with gastroenteritis were excluded from the study.

Samples were received in sterile stool containers with properly filled patient complaint form. A total of 527 stool samples were received at Virology Departm-

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ent during the study period. All the patient details and stool sample results were obtained from LIMS (Laboratory information management system) and counter checking was done from the departmental record.

10% stool suspension was made by adding 100 ul of stool sample to phosphate buffer saline bottle provided with kit. The sample was then vortexed and centrifuged. Supernatant was used for detection of rotavirus antigen. 3-4 drops of supernatant was added to rapid diagnostic immunochromatographic kit for the detection of rotavirus. Result was read after 15 minutes.

Statistical Package for Social Sciences (SPSS) version 23.0 was used for the data analysis. Frequency and percentage were calculated for categorical variables like presence of rota virus in stool sample, age groups and gender. Mean and standard deviation were calculated for numerical variables like age. Chi square test was applied to find statistical significance. The *p*-value of ≤ 0.05 was considered statistically significant.

RESULTS

A total of 527 stool samples were received during study period, among those 197 (37.4%) are positive for rotavirus antigen in stool while 330 (62.6%) were negative. Mean age of participants was 13.4 months \pm 16.6 (range: 1-60 months). Out of 191 (36.2%) patients were females and 336 (63.8%) patients were males. About 197 (37.4%) stool samples which were positive for rotavirus antigen, 66 (33.5%) were female children and 131 (66.5%) were male children. The *p*-value was not significant which showed that there was no association of gender with positive stool sample (*p*-value 1.022) (Table-I).

Table-I: Gender Distribution of rotavirus positive cases.

Rotavirus Antigen in stool sample			
Gender	Positive	Negative	<i>p</i> -value
Female	66 (12.5%)	125 (23.7%)	1.022
Male	131 (24.8%)	205 (39.0%)	

Children included in study were divided into two age groups: 0-2 years and 3-5 years. Maximum positive rotavirus stool antigen was observed in 0-2years age-group i.e. 173 (33%) while 24 (4.4%) were positive in 3-5 years age-group (Figure).

Among the 197 Rotavirus positive samples 110 (20.9%) were from inpatient department while 87 (16.5%) were received from outpatient department (Table-II).

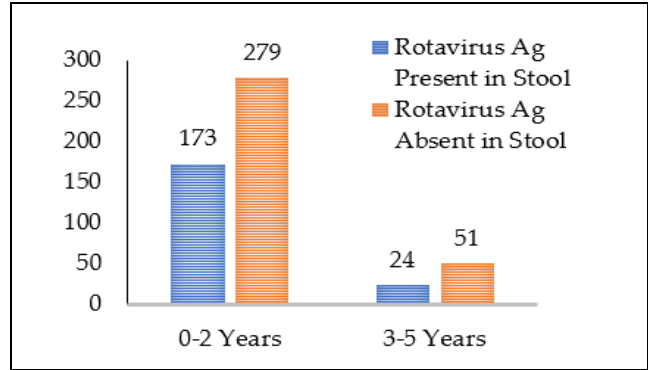


Figure: Age Distribution of rotavirus positive cases.

Table-II: Distribution of hospitalized and non-hospitalize rotavirus positive cases.

Rotavirus	Hospitalized	Non-hospitalized
Positive	176 (33.4%)	154 (29.2%)
Negative	110 (20.9%)	87 (16.5%)

DISCUSSION

Globally, Rotavirus is notorious for causing severe dehydrating diarrhea in children less than 5 years of age.^{11,12} There are seven sero-groups (A-G) of rotavirus. Among these groups, the group A rotaviruses are the leading cause of diarrheal disease. Rotavirus infections have seasonal variation with peak occurring in winter months but this is less marked in tropical and developing countries where infections are reported all around the year. The virus is transmitted via faeco-oral route resulting in symptoms of loose watery stools, pain abdomen, vomiting and fever in children. It may lead to death due to severe dehydration. Out of 95% of children under 5 years of age are infected by rotavirus at least once in their lifetime.¹³

In this study we assessed the frequency of gastroenteritis in children under 5 years of age caused by rotavirus. The results of our study showed that 37.4% of children were infected by rotavirus majority being less than 2 years of age (33%). The results of our study were comparable with study carried in neighboring country Iran which showed that predominant virus causing diarrhea was rotavirus (24.3%) and also most of positive children were under 2 years of age (75.9%).¹⁴ Gupta *et al*, carried out a study in Lucknow, North India which showed that Rotavirus was the leading viral agent causing gastroenteritis in both hospitalized and non-hospitalized children and majority of the positive children in that study were also less than 2 years of age. They detected Rotavirus antigen in stool samples using ELISA (enzyme linked immunosorbent assay) format.¹⁵

A study was carried out at National Institute of Child Health, Karachi, Pakistan on hospitalized children with watery non-bloody diarrhea and their results illustrated that most leading cause of diarrhea was due to Rotavirus infection. 80% of infected children were under 3 years of age.¹⁶ Another study was carried out in Islamabad, Pakistan from January 2009 to December 2010 on children presenting with loose watery stools to a tertiary care hospital showed that 66% of children had rotavirus infection.⁹

Rotavirus is the leading causing of childhood mortality in low resource countries. Worldwide, it causes approximately 611,000 childhood deaths and 2 million hospitalizations annually.^{17,18} 2008 Global Health Survey reported that among Asian countries Pakistan bears the highest number of deaths in children under five years.⁹ Rotavirus gastroenteritis is only vaccine preventable gastroenteritis as two oral vaccines are available and are recommended by WHO for routine immunization of infants.^{12,19} Introduction of rotavirus vaccination into childhood immunization program has reduced morbidity and mortality in developed countries.²⁰

Rotavirus vaccine has not been yet incorporated into nation Expanded Program for Immunization (EPI). Introduction of this vaccine will help to improve childhood survival rates in low income countries with poor sanitation and fragile health system.⁹

Rotavirus is the most frequent cause of viral gastroenteritis in both hospitalized and non-hospitalized children. Maximum positivity is seen in children less than two years of age. Routine screening of stool samples for viral agents will limit the use of antimicrobials and help reduce hospital stay. In addition, inclusion of rotavirus vaccine in EPI will reduce childhood morbidity and mortality.

CONCLUSION

Rotavirus is a frequent cause of viral gastroenteritis in both hospitalized and non-hospitalized children. Maximum positivity is seen in children under 2 years of age.

Conflict of Interest: None.

Authors' Contribution

MN: Conception of idea, design of work, data collection & analysis drafting, EG: Revision and correction of manuscript, SKN: Revision and correction of manuscript, MJ: Data collection, analysis & drafting, SK: Drafting and revision, NS: Data collection & analysis.

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