

Original Article

Clinico-Epidemiological Profile of Rotavirus Infection in Children with Acute Gastroenteritis in New Delhi

Ajay Kumar¹, Vyom Aggarwal², Jyoti Aggarwal²

¹Senior Resident, Department of Pediatrics, MaharshiValmiki Hospital, Delhi, India. ²Senior Consultant, Department of Pediatrics, Tirath Ram Shah Hospital, Delhi, India.

Corresponding Author: Dr Ajay Kumar
Email: ajaychauhan669@gmail.com

ABSTRACT

Objective: To determine the epidemiological and clinical profile of rotavirus-associated diarrhea in children under five years of age.

Methods: Clinical characteristics were recorded and stool samples collected from 180 consecutive children aged between one month to 5 years presenting with acute diarrhea, irrespective of hydration status, to the outpatient department or emergency room of a pediatric postgraduate teaching institute catering to middle or higher socioeconomic status groups.

Results: Rotavirus accounted for 27.8% (50 of 180) of all diarrhea cases, and 41.2% (14 of 34) in hospitalized children. Vomiting was present in 90% of children infected with rotavirus, fever in 66%, and abdominal pain in 54%. Hospitalization was required in 68.2% of children who had received the full course of rotavirus vaccine, and 96.4% among those who had not received any dose.

Conclusion: Rotavirus is a significant cause of acute diarrhea in children from higher-income groups. Rotavirus vaccine appears to reduce the frequency and severity of diarrheal episodes and, thus hospital admission rates.

KEYWORDS: Acute diarrhea; Epidemiology; Rotavirus.

Introduction

Acute diarrhea is defined as passage of liquid or watery stools at least three times per day or more frequently than normal for an individual that begins acutely and resolves within 14 days.¹

Rotavirus is considered the single most common cause of gastroenteritis in children, accounting for about 25-50% of all cases in developing countries. Globally,

more than 25 million outpatient visits, and more than 2.5 million hospitalizations are attributable to rotavirus infections each year.² Severe rotavirus gastroenteritis is largely limited to children aged 6-24 months with fatal outcomes reported in approximately 420,000-494,000 children in the year 2008 alone.³ India has estimated annual burden of 2.0-3.4 billion cases attributable to rotavirus.⁴

In a study conducted in Pune, 88 cases out of 246 (35.7%) hospitalized children with acute gastroenteritis were attributable to rotavirus infection.⁵ The infection was most common in the age group of 11-20 months (38.6%), followed by the age group of 0-10 months (23.8%). In rotavirus-positive patients, associated features were fever in 48.8%, vomiting in 29.5%, and pain in abdomen in 53.4% of cases. In another study from Kerala,⁶ 648 amongst 1827 (35.9%) hospitalized children of less than five years age were positive for rotavirus while in a study from Jammu,⁷ out of 210 fecal samples collected from children below five years suffering from diarrhea, 41.9% of samples were found positive for rotavirus.

Various Indian studies on the role of rotavirus in the causation of acute diarrhea in children, available to date, have been conducted at Government hospitals, mainly catering to the children from lower socioeconomic strata. Therefore, the present prospective study was planned to fill up this lacuna in our knowledge by assessing the importance of rotavirus in the causation of acute diarrhea and its clinical features in children from middle and higher-income groups.

Materials and Methods

This hospital-based prospective observational study was carried out at the Tirath Ram shah hospital, a pediatric postgraduate teaching institute at Delhi, catering to middle and high-income groups. The study population consisted of children between the age group 1 month to 5 years, admitted in the pediatric ward, or attending pediatric OPD with acute diarrhea, in the period May 2015 to May 2016. Children with persistent or chronic diarrhea, those who developed diarrhea after admission, and those with systemic illnesses were excluded from the study. Considering the prevalence of rotavirus gastroenteritis to be 36%,⁵ the minimum required sample size with a 20% allowable error was calculated to be 180.

Ethical considerations

Ethical clearance was obtained from the Institutional Ethical Committee prior to the study. No pressure/coercion was exerted on the subjects for participation in the study. The confidentiality of information was assured to all the participants.

Data Collection Technique & Tools

180 children were recruited after obtaining informed written consent from the parents. The children were assessed by a detailed history and physical examination using a pre-designed proforma. The children were managed as per the WHO protocol for acute diarrhea. The time to recovery and other details were noted during the hospital stay or treatment on an outpatient basis.

Sample collection and transport

Stool samples were collected directly in sterile containers, while the child passed stools. The stool collected was transported to the microbiology lab within two hours of collection, during which the stool sample was stored at room temperature in winters and in the fridge in summers. The stool samples were examined for color, consistency, presence of blood, mucus, and worms. Gram-stained and Lugol Iodine preparation were examined to identify pus cells and organisms, and acid-fast staining was done to identify the oocysts of *Cryptosporidium* and *Isospora*.

Stool samples were inoculated on several media for maximum yield. The organisms were identified on the basis of colony characteristics and biochemical methods according to standard procedures. Rotavirus antigen in the stool samples was detected by ELISA using commercially available kits. The procedure was carried out as per the manufacturer's instruction manual.

Analysis and statistical tools

Data was entered in an Excel sheet and analyzed using SPSS version 22 (Chicago, IL, USA). Means and Standard Deviations (SD) were calculated for continuous variables, while proportions and frequencies were calculated for categorical variables.

Results

Out of the 180 children (62% males) included in the study, rotavirus infection was detected in 50 (27.8%) children. Bacteria were identified as the most common cause of diarrhea in 115 (63.8%) children. Mixed organisms were found in 5 (2.8%), and in 20 (11.1%) cases, no causative organism could be identified. Among the mixed organisms, 2 out of 5 were rotavirus with *E. coli*, and 3 out of 5 were *Klebsiella* with *E. coli*.

Rotavirus infection was most common in children in the age group of 13 to 24 months (44%) followed by 32% in the age group of 7 to 12 months and 24% in the age group of 1 to 6 months of age. The Rota virus antigen positive children belonged predominantly to grade 4 (68%) and grade 5 (32%) as per the Kupuswamy socioeconomic status classification. Out of 50, 22 had received the full course of rotavirus vaccine. [Table 1]

Table 2 shows the clinical profile of children presenting with rotavirus diarrhea. Vomiting was present in 90% of children infected with rotavirus, fever in 66%, and abdominal pain in 54%. Most children (68%) presented within 12-24 hours of onset of diarrhea, followed by 32% in less than 12 hours. Rotavirus infection was associated with severe dehydration in 52% and some dehydration in 48% of children.

Table 3 shows the distribution of children based on rotavirus ELISA positivity in vaccinated versus unvaccinated children. Out of the 22 subjects with rotavirus antigen in stools, who had received the full course of rotavirus vaccine, 15 required admission, while 7 were managed on an outpatient basis. In 28 subjects who had not received the vaccine and had rotavirus antigen in stools, 27 had to be admitted, and only one could be managed as an outpatient. The difference was statistically significant (P < 0.05).

Discussion

In our study, bacteria were responsible for most cases of diarrhea followed by rotavirus in one-fourth cases.

Rotavirus prevalence in our study is comparable to study conducted by Borade *et al.* in Pune⁵, Chen *et al.* in Taiwan⁸ and Mathew *et al.* in Kerala,⁶ in which rotavirus was present in 35.7%, 35.4%, and 35.9% cases respectively. The male to female ratio in our study was

1.6:1 and male predominance was also seen in Brazil⁹ with male to female ratio 1.5:1.

Similar to the other previous reports from Taiwan⁸ and Brazil⁹, vomiting was a prominent symptom (90%) in rotavirus associated diarrhea in our population. However, the studies from Pune⁴ and Wardha¹⁰, reported a lower frequency of vomiting (29.5% and 56%, respectively).

Fever was present in patients with rotavirus diarrhea in 66% of cases, as seen with other populations.^{5,9,10} Thus, it may be concluded that rotavirus infection in addition to causing diarrhea also causes significant vomiting and fever.

Table 1: Socio-demographic profile of children presenting with rotavirus diarrhea.

		Number	Percentage
Age	0-6	12	24
	7-12	16	32
	13-24	22	44
	25-60	0	0
Sex	male	31	62
	female	19	38
SE Status	Grade 4	34	68
	Grade 5	16	32
Rotavirus vaccine received		22	44
	Not received	28	56

Table 2: Clinical profile of children presenting with rotavirus diarrhea.

Clinical Feature	Number	Percentage
Fever	33	66
Vomiting	45	90
Abdominal Pain	27	54
Dehydration	none	0
	Some	24
	Severe	26

Table 3: Distribution of children based on Rotavirus ELISA positive in vaccinated child versus unvaccinated child.

	ROTAVIRUS ELISA POSITIVE		Total	P value
	VACCINATED	UNVACCINATED		
OPD	7 (31.8%)	1 (3.6%)	8 (16%)	0.007
ADMISSION	15 (68.2%)	27 (96.4%)	42 (84%)	
TOTAL	22 (100 %)	28 (100 %)	50 (100%)	

Out of the 22 subjects with rotavirus antigen in stools, who had received full course of rotavirus vaccine, 15 (68.2%) had dehydration or frequency of vomiting or purge rate severe enough to necessitate admission while 7 (31.8%) could be managed on an outpatient basis. While in 28 subjects who had not received the vaccine and had rotavirus antigen in stools, 27 (96.4%) had to be admitted, and only 1(3.6%) could be managed as an outpatient.

Conclusion

Rotavirus is an important causative organism for acute diarrhea in children from middle and higher socioeconomic strata, from Delhi. In this small study group, the Rotavirus vaccine reduced both the frequency and severity of diarrheal episodes and the hospital admission rate.

References

1. World Health Organization. Diarrheal disease. [last accessed on 10 March 2019]. Available from <http://www.who.int/mediacentre/factsheets/fs330/en/>.
2. Tate JE, Burton AH, Boschi-Pinto C, Steele AD, Duque J, Parashar UD. 2008 estimate of worldwide rotavirus associated mortality in children younger than 5 years before the introduction of universal rotavirus vaccination programmes: A systematic review and meta-analysis. *Lancet Infect Dis.* 2012;12:136-41.
3. UNICEF. Pneumonia and diarrhoea: tackling the deadliest diseases for the world's poorest children. 2012. UNICEF: New York. 2014:2-8.
4. Tate JE, Chitambar S, Esposito DH, Sarkar R, Gladstone B, Ramani S, *et al.* Disease and economic burden of rotavirus diarrhoea in India. *Vaccine.* 2009;27:18-24.
5. Borade A, Bais A, Bapat V, Dhongade R. Characteristics of rotavirus gastroenteritis in hospitalized children in Pune. *Indian J Med Sci.* 2010;64(5):210-8.
6. Mathew MA, Paulose A, Chitralekha S, Nair MKC, Kang G, Kilgore P. Prevalence of Rotavirus Diarrhea among Hospitalized Underfive Children. *Indian Pediatr* 2014;51: 27-31.
7. Gazal S, Taku A, Bhat MA, Badroo G. Group A rotavirus and bacterial agents associated with diarrhoea induced hospitalisations in children below 5 years of age in Jammu. *Indian J Med Microbiol.* 2014;32:57-9.
8. Chen SM, Ni YH, Chen HL, Chang MH. Microbial etiology of acute gastroenteritis in hospitalized children in Taiwan. *J Formos Med Assoc.* 2006;105(12):964-70.
9. Carneiro NB, Santos DR, Fagundes SQ, Neves LL, Reges MB, Lima KP, *et al.* Clinical and epidemiological aspects of children hospitalized with severe rotavirus associated gastroenteritis in Salvador, BA, Brazil. *Braz J Infect Dis.* 2005;9:525-8.
10. Chavan NS, Tankhiwale N. Detection of human Rotavirus and Bacterial Enteropathogen in Acute Gastroenteritis in children below 5 years of age in Wardha. *Int J Curr Microbiol App Sci.* 2014;3(6):288-91.