

Original Research Article

Clinical profile of children (0-5 years) with rota virus diarrhea

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ABSTRACT

Background: Rotavirus is a common cause of acute watery diarrhea in under 5 years' children and it may cause severely dehydrating disease in an unvaccinated child.

Methods: A Cross sectional study including children aged 0-5 years presenting with complaints of acute watery diarrhea with or without fever at Department of Paediatrics, Eras Lucknow Medical College and Hospital, Lucknow (Uttar Pradesh).

Results: Among 399 patients of acute diarrhea, 385 were discharged and 14 took leave against medical advice. No mortality was reported in this study. Out of 399 patients enrolled 161 (40.4%) were rota virus positive on ELISA assay with mean age 18.65 months. ($p=0.028$). Rotavirus positivity rate was higher among those having decreased urine ($p < 0.001$), severe dehydration ($p < 0.001$), those with mix/formula feed (89.3%) as compared to those having exclusive breastfeeding (33.3%) in <6 month infants ($p < 0.001$). Only 17.5% of the patients had rotavirus immunization however, the positivity rate among those with rotavirus immunization was only slightly lower (40.0%) as compared to those having incomplete rotavirus immunization (40.4%) ($p=0.947$). Dehydration rate was significantly higher among cases with incomplete immunization ($p < 0.001$).

Conclusions: Severe malnutrition, mix/formula feed and improper hygiene makes the children prone for developing acute rotavirus diarrhea. Children with acute rotavirus diarrhea should be monitored for the development of severe dehydration, decreased urine output and electrolyte derangement especially hypokalemia.

Keywords: Dehydration, Hypokalemia, Rotavirus, Severe malnutrition

INTRODUCTION

Rotavirus is a major cause of acute gastroenteritis in infants and young children worldwide.¹ It has been estimated that about 39% of childhood diarrhea hospitalizations are caused by rotaviruses and nearly half a million children die from rotavirus infections each year.²

There are five species of this virus termed as A, B, C, D and E. Rotavirus A, the most common causes more than 90% of infections in humans. By the age five, nearly every child in the world has been infected with rotavirus at least once.³ Rotavirus infection results in a significant disease burden and economic effect of direct medical

costs, loss of work, quality of life and mortality. Vaccination is the only control measure likely to have a significant impact on the incidence of severely dehydrating rotavirus disease.⁴ Studies estimated that 90,00-153,000 children die from rotavirus infection in India each year.^{5,6}

Despite this high burden of mortality, there is limited literature on the prevalence of rotavirus diarrhea in India, especially in children. and hence there is very limited information available regarding the major risk factors and the epidemiological pattern of rotavirus in context of Indian population especially in children aged 0-5 years.⁷ The present study is being planned to fill this gap.

METHODS

This was a cross sectional observational study including Children aged 0-5 years presenting with complaints of acute diarrhea at Department of Pediatrics, Eras Lucknow Medical College and Hospital, Lucknow (U.P.). The Institute is a tertiary care referral centre to both urban and rural population from Lucknow and nearby areas belonging to different socioeconomic strata. Study was conducted for a period of 11 months from January 2014 to November 2014. Children with a previous history of immunosuppressive therapy e.g.- steroids, chemotherapy or documented significant background diseases such as immunodeficiency syndromes eg- HIV were excluded. After obtaining informed consent from the parents of each patient, demographic information was collected, anthropometric measurements (body weight, length, mid upper arm circumference, head circumference, chest circumference) were taken and the patients were subjected to a thorough clinical examination. Fresh stool samples were obtained within 24 to 72h of admission. The ELISA test was performed on stool sample to detect Rotavirus. Outcomes of the patients were determined at the time of discharge from hospital.

The present study is an epidemiological study which had variables both of quantitative as well as qualitative/categorical nature. For evaluation of quantitative variables against a particular outcome, Independent student t'-test was used for two groups whereas for categorical variables (which are represented as percentages or proportions) chi-square test was used. A two-sided ($\alpha=2$) P value less than 0.05 ($P<0.05$) was considered statistically significant. All analysis was performed on SPSS (PSAW, windows version 16.0) software.

RESULTS

A total of 399 patients falling in sampling frame were enrolled in the study. Among 399 patients, 385 were discharged and 14 took leave against medical advice. No mortality was reported in this study. Out of 399 patients enrolled in the study, a total of 161 (40.4%) were found to be rotavirus positive on ELISA assay shown in Table 1.

Table 1: Prevalence of ELISA proven rotavirus positivity.

ELISA	Frequency	Percent
Negative	238	59.6
Positive	161	40.4
Total	399	100.0

Rotavirus positive cases = 40.4%

Positivity rate was higher in females (46.4%) as compared to males (36.1%) with significant p value (0.038). In the present study mean age for rotavirus positive diarrhea was found to be 18.65 months.

($p=0.028$). Rotavirus positivity rate was higher among those having decreased urine (68.2%) as compared to those not having decreased urine (22.3%) ($p <0.001$). A total of 24/52 (46.2%) infants <6 month had exclusive breast feeding. Rate of positivity was higher among those with mix/formula feed (89.3%) as compared to those having exclusive breastfeeding (33.3%) in <6 month infants. The difference was also significant statistically ($p <0.001$) shown in Table 2.

Table 2: Association with feeding in <6 month children.

Feeding	Positive (n=33)		Negative (n=19)		Total (n=52)	
	No.	%	No.	%	No.	%
Mix/formula feed	25	89.3	3	10.7	28	100
Exclusive breast feeding	8	33.3	16	66.7	24	100

$\chi^2=17.448$; $p <0.001$ (S)

Among different hygiene factors Improper hand wash after toilet ($p <0.001$) and use of dry/open type of toilet ($p=0.009$) were found to be significantly associated with rotavirus diarrhea. Only 17.5% of the patients had rotavirus immunization. However, the positivity rate among those with rotavirus immunization was only slightly lower (40.0%) as compared to those having incomplete immunization (40.4%), ($p=0.947$). Rotavirus positivity rate was maximum among those with Mid upper arm circumference <11.5 cm (66.7%) and minimum among those with Mid upper arm circumference >13.5 cm (36.9%), ($p=0.023$). A total of 131/399 (32.8%) had some dehydration while 41/399 (10.3%) had severe dehydration. Positivity rate increased significantly with dehydration and its severity ($p <0.001$) shown in Table 3.

Table 3: Association with dehydration.

Dehydration	Positive (n=161)		Negative (n=238)		Total (n=399)	
	No.	%	No.	%	No.	%
No	35	15.4	192	84.6	227	100
Some	86	65.6	45	34.4	131	100
Severe	40	97.6	1	2.4	41	100

$\chi^2=149.213$; $p <0.001$ (S)

Among rotavirus positive cases all patients with severe dehydration (40/40) were un-immunized for rotavirus. Dehydration rate increased significantly among un-immunization cases whereas dehydration decreased significantly among those with rotavirus immunization ($p <0.001$).

Hypokalemia was observed in 57/399 (14.3%) cases. Positivity rate was higher in hypokalemia cases (57.9%) as compared to those not having hypokalemia (37.4%) ($p=0.004$).

DISCUSSION

We aimed to study the clinico-epidemiological profile of acute diarrhea in children aged 0-5 years with special consideration to rotavirus. For this purpose, a total of 399 patients falling in sampling frame were enrolled in the study admitted with acute diarrhea at pediatrics department ELMCH, Lucknow. 40.4% of the patients were found to be positive on ELISA assay. Literature also shows very varied positivity rates of rotavirus in children with diarrhea as shown in the Table 4.^{2,7-12}

Table 4: Positivity rate of Rota Virus diarrhea in various studies.

Study	Rota virus positivity rate
Ananthan and Saravanan	26%
Parashar et al.	39%
Gagandeep Kang et al.	16.2%-35.4% (median, 23.4%)
De et al.	10%
Bonkougou et al.	33.8%
Nakawesi et al.	45.4%
Rerksuppaphol and Rerksuppaphol	37 %

The reason for this difference in positivity rates is not very clear. However, majority of the studies including the present study showed positivity rates between 30%-40%. In the present study mean age for rotavirus diarrhea was 18.65 months, which is in consonance with other studies conducted by Bonkougou et al, Rerksuppaphol and Rerksuppaphol, Kajbaf et al., Chavan et al.^{10,12-14} Studies done in other parts of the world also depicted the burden of rotavirus disease being predominantly borne by children less than 2 years of age.¹⁵ This can be explained by the protective effect of maternal antibodies in <6 months old, and the development of natural immunity after repeated infections in children over 2 years of age.^{16,17}

Mean duration for rotavirus positive diarrhea illness was 5.68 days and for rotavirus negative diarrhea 5.52 days ($p=0.220$). Similarly, in a study done by Rerksuppaphol and Rerksuppaphol duration of diarrhea observed was almost equal in both rotavirus positive and rotavirus negative groups (≈ 60 hours) likewise Ogilvie et al. also found the duration of hospital stay ranging between 2.5 days to 5.0 days.^{12,18} In the present study 52.6% of patients had <10 stools/day, rotavirus positivity rate was found lower among those having >10 stools (39.7%) as compared to those having <10 stools/day (41%) with insignificant p value. Among rotavirus positive cases 46.58% had >10 stools/day. Rerksuppaphol and Rerksuppaphol found frequency of stools was higher in rotavirus group of children (8 stools/day) as compared to non-rotavirus group (5 stools/day).¹² In the present study rotavirus positivity rate was found higher among those with decreased urine output (68.2%) as compared to ones with normal urine output (22.3%) with significant p value

($p<0.001$). This could probably be explained by correlation of rotavirus diarrhea with severe dehydration leading to decreased urine output. In a study conducted by Rerksuppaphol and Rerksuppaphol rotavirus positive children had moderate to severe dehydration (p value = 0.01).¹² In the present study 46.2% infants of <6 months age had exclusive breast feeding. Rate of positivity was found higher among those with mix/formula feed (89.3%) as compared to those having exclusive breastfeeding (33.3%) in <6 months aged infants with significant p value (<0.001). Bonkougou et al. observed that during the first year of life breastfeeding is associated with a lower incidence of rotavirus diarrheal episodes.¹⁰ In the present study hand wash after toilet with water only ($p<0.001$) and use of dry/open type of toilet ($p=0.009$) were found to be significantly associated with higher positivity rates for rotavirus. In the present study 17.5% patients had taken rotavirus immunization. However, the positivity rate among those with rotavirus immunization was found slightly lower (40.0%) as compared to those who were unimmunized (40.4%) with insignificant p value. The present study also found significant association between severe dehydration and lack of immunization for rotavirus with significant p value (<0.001). However, in the present study, currently available two types of rotavirus vaccines (RV1, RV5) have not been analyzed separately. Dennehy found that vaccination is the only control measure likely to have a significant impact on the incidence of severely dehydrating rotavirus disease.⁴ In the present study the positivity rate was found maximum among those with mid upper arm circumference <11.5 cm (66.7%) and minimum among those with mid upper arm circumference >13.5 cm (36.9%) with significant p value (0.023). However, Nakawesi et al. found no significant association between rotavirus infection and nutritional status.¹¹ Rotavirus positivity rate was found increased significantly with dehydration and its severity ($p<0.001$). The present study is in consonance with other studies conducted by Nakawesi et al. and Rerksuppaphol and Rerksuppaphol.^{11,12} In the present study hypokalemia was observed in 14.3% cases. Rotavirus positivity rate was found higher in hypokalemia cases (57.9%) as compared to ones without hypokalemia (37.4%) with significant p value (0.004). Metabolic acidosis and low/high serum sodium level were not significantly associated with rotavirus diarrhea. Rerksuppaphol and Rerksuppaphol also found rotavirus positive children being more prone to develop hypokalemia (p value= 0.04), acidosis (p -value < 0.001) and loss of bicarbonate (p -value <0.001) than non-rotavirus group.¹²

CONCLUSION

Rotavirus is a common cause of acute watery diarrhea in under 5 years' children and it may cause severely dehydrating disease in an unvaccinated child. Severe malnutrition, mix/formula feed and improper hygiene makes the children prone for developing acute rotavirus diarrhea. Children with acute rotavirus diarrhea should be

monitored for the development of severe dehydration, decreased urine output and electrolyte derangement especially hypokalemia.

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