

Rotavirus Diarrhea among Children under the Age of Five Years

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ABSTRACT

Objective: To determine the frequency of Rotavirus (RV) diarrhea among hospitalized children under the age of 5 years.

Study Design: A cross sectional / descriptive study.

Place and Duration of Study: This study was conducted at the Pediatrics departments of Services Hospital and Arif Memorial Teaching Hospital / Rashid Latif Medical College, Lahore from January 2019 to June 2019.

Materials and Methods: A total of 370 children (185 from each center), aged 1 month to 5 years of both genders, hospitalized with symptoms of AGE were enrolled for this study. All the patients were evaluated for the presence of diarrhea, vomiting along with severity of dehydration. Qualitative data like gender, age groups, symptoms, number of vomiting and presence of RV were represented as frequencies and percentages while age was represented as mean and standard deviation. Chi square test was applied to note any possible association of RV with study variables.

Results: Out of a total of 370 children, majority, 209 (56.5%) were male and 148 (40.0%) had age between the age of 1 to 12 months, followed by 91 (24.6%) from 13 to 24 months. Mean duration of diarrhea was noted to be 3.47+1.83 days whereas mean number of stools per day was 8.65+2.73. Fever was noted among 217 (58.6%) children. RV positive was noted in 214 (57.8%) children whereas remaining 156 (42.2%) were noted negative. Increasing age and presence of fever were found to have significant association with RV positive children (p value < 0.05).

Conclusion: Prevalence of RV was noted to be 58.7% among children aged less than 5 years. Increasing age and presence of fever were found to have significant association with RV positive children.

Key Words: Diarrhea, rotavirus, vomiting, stools per day, fever.

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INTRODUCTION

Viral agents like rotavirus (RV), enteric adenovirus, astrovirus, and human calciviruses are known to be cause diarrhea among children.¹ RV is the most significant etiological agent for acquired diarrhea among children and is documented as the commonest causative pathogen for severe diarrhea as well as dehydration among children aged below 5 years.² In developing countries, RV is the main reason for diarrhea related morbidity and mortality amongst young children. RV is responsible for severe acute gastroenteritis (AGE) that usually needs hospitalization, and if not treated timely, may go on to lead to mortality.³

As per WHO, RV is responsible for more than 5 million deaths among children aged less than 5 years. Out of these, around 50% of the deaths are reported from India, Nigeria, Congo, Ethiopia, China and Pakistan.⁴ Children of Eastern Mediterranean Region (EMR) accounts for approximately 65000 deaths per year and Pakistan lie in the same region.⁵ It is also known that by the age of 5 years, almost every child is noted to have at least one episode of RV gastroenteritis (RVGE), and 1 out of these 5 are known to visit a clinic, whereas 1 out of 65 is noted to have hospitalization, and around 1 in 293 is thought to die. It is also a well known fact that about 90% of RVGE related mortality is in low/middle income countries.³ In Pakistan, prevalence of RV is estimated around 20-60% among children under the age of 5 years.^{6,7}

RV is a double stranded Ribonucleic Acid (RNA) virus belonging to family of Reoviridae.⁸ Five categories of RV are A, B, C, D and E. RV A is responsible for around 90% RV infections amongst humans. Oro-fecal route is the commonest route for RV.⁹

RV illness usually starts with acute onset of diarrhea along with vomiting. Diarrhea is commonly watery. Fever is noted among most children.⁸ Better sanitation and hygiene can reduce burden of RV whereas the most important way of prevention is vaccination as RV is considered to be a vaccine preventable illness.¹⁰

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The present study was done at 2 main tertiary care centers of Lahore, Pakistan with an aim to determine the frequency of RV diarrhea among hospitalized children. The results of this study are thought to provide us estimation of RV in our settings while this will further aid us in designing strategies and resources to cope is common illness among children under the age of 5 years.

MATERIALS AND METHODS

This was a cross sectional and descriptive study conducted at Pediatrics departments of Services Hospital and Arif Memorial Teaching Hospital / Rashid Latif Medical College, Lahore, from 1st January 2019 to 30th June 2019. A sample size of 369 children was calculated using: $n = z^2 * p * (1 - p) / e^2$

Z was taken as 1.96 for a confidence level (α) of 95%, p was taken as 60%⁷ while e was considered as 0.05. A total of 370 children (185 from each center), aged 1 month to 5 years of both genders, hospitalized with symptoms of AGE were enrolled for this study. Cases with bloody diarrhea or nosocomial gastroenteritis were excluded. Approvals from the ethical committees of the respective institutes were taken for this study. Informed written consent was also taken from parents or guardians of all the study participants.

Stool samples of all the study participants were taken within 24 hours of hospitalization. A single spoon of recent diarrheal stool was shifted in a stool container to the institutional central laboratory. Enzyme linked Immunoassay was done to identify the presence of RV. All the patients were evaluated for the presence of diarrhea, vomiting along with severity of dehydration. Diarrhea was labeled as acute occurrence of 3 or more loose or watery stools (symptoms < 7 days) in a span of 24 hours. Vomiting was labeled as 2 or more episodes of vomiting in a span of 24 hours. Dehydration was classified as no dehydration (no signs of some or severe dehydration), some dehydration (presence of 2 or more of: (i) restless or irritable, (ii) sunken eyes, (iii) showing eagerness while drinking, (iv) skin pinch going back slow) or severe dehydration (2 or more of: (i) lethargic or unconscious, (ii) sunken eyes, (iii) not drinking properly, (iv) skin pinch going back very slow).¹¹

All the study data was recorded on a predesigned proforma while SPSS version 20.0 was used for data analysis. Qualitative data like gender, age groups, symptoms, number of vomiting and presence of RV were represented as frequencies and percentages while age was represented as mean and standard deviation. Chi square test was applied to note any possible association of RV with study variables. P value less than or equal to 0.05 was considered as significant.

RESULTS

Out of a total of 370 children, there were 209 (56.5%) male and 161 (43.5%) female. Mean age was noted to

be 22.63 months with standard deviation of 12.52 months. There were 148 (40.0%) cases between the age of 1 to 12 months, 91 (24.6%) 13 to 24 months, 67 (18.1%) 25 to 36 months, 41 (11.1%) 37 to 48 months and remaining 23 (6.2%) were between the age of 49 to 60 months.

Table No.1: Characteristics of Study Participants (n=370)

Characteristics		Number (%)
Gender	Male	209 (56.5%)
	Female	161 (43.5%)
Age (months)	1 to 12	148 (40.0%)
	13 to 24	91 (24.6%)
	25 to 36	67 (18.1%)
	37 48	41 (11.1%)
	49 to 60	23 (6.2%)
Duration of Diarrhea (days)	1 to 3	226 (61.1%)
	4 to 6	144 (38.9%)
Number of Stools Per day	1 to 7	74 (20.0%)
	8 to 10	203 (54.9%)
	> 10	93 (25.1%)
Fever	Yes	217 (58.6%)
	No	153(41.4%)
Rotavirus	Positive	214 (57.8%)
	Negative	156 (42.2%)

Table No.2: Distribution of Characteristics of Study Participants With Regards to RV (n=300)

Characteristics		RV Positive (n=214)	RV Negative (n=156)	P value
Gender	Male	122 (57.0%)	87 (55.8%)	0.7159
	Female	97 (43.0%)	64 (44.2%)	
Age (months)	1 to 12	71 (33.2%)	77 (49.4%)	<0.0001
	13 to 24	41 (19.2%)	50 (32.1%)	
	25 to 36	45 (21.0%)	22 (14.1%)	
	37 48	36 (16.8%)	5 (3.2%)	
	49 to 60	21 (9.8%)	2 (1.3%)	
Vomiting	Yes	102 (47.7%)	124 (79.4%)	<0.0001
	No	112 (42.3%)	32 (20.6%)	
Fever	Yes	138 (64.5%)	79 (50.6%)	0.0075
	No	76 (35.5%)	77 (49.4%)	

Duration of diarrhea as 1 to 3 days was noted among 226 (61.1%) children while 144 (38.9%) between 4 to 6 days. Mean duration of diarrhea was noted to be 3.47

days with standard deviation of 1.83 days. Stool frequency as less than or equal to 7 times a day was noted among 74 (20.0%) children, 8 to 10 stools among 203 (54.9%) whereas remaining 93 (25.1%) were having stool frequency of more than 10 stools a day. Mean number of stools per day was noted to be 8.65 with standard deviation of 2.73. Fever was noted among 217 (58.6%) children. RV positive was noted in 214 (57.8%) children whereas remaining 156 (42.2%) were noted negative.

When, RV positive children were compared with those RV negative, increasing age and presence of fever were found to have significant association with RV (p value < 0.05).

DISCUSSION

RV is known to be one of the commonest causes of non-bacterial gastroenteritis among children. Among low income countries like Afghanistan, Pakistan, Sudan and Yemen, RV has been found to induce higher mortality rates in comparison to high income countries like Saudi Arabia and Kuwait.³

Current research was done to determine the frequency of RV diarrhea in hospitalized children. Overall, we noted that majority of the children, 56.5% were male. Our findings in terms of gender distribution were pretty similar to what has been found previously in other local studies. Haq W et al⁷ noted 58.8% children to be male in similar study design while Badur and colleagues¹² also noted very similar numbers, 57.2% to be male children.

In terms of overall age mean age was noted to be 22.63 months with standard deviation of 12.52 months. This was very similar to what was found by Habib MI et al from Karachi¹¹ where mean age of the children hospitalized due to diarrhea was 20.6+15.14 months. We also noted that there were 148 (40.0%) cases between the age of 1 to 12 months, 91 (24.6%) 13 to 24 months, 67 (18.1%) 25 to 36 months, 41 (11.1%) 37 to 48 months and remaining 23 (6.2%) were between the age of 49 to 60 months. Our results were quite consistent with those of Haq W et al⁷ where they found a decreasing trend of diarrhea with increasing age. Badur M et al¹² also noted majority of their children (60.4%) to be less than or equal to 12 months of age while second most dominant age group was 13 to 24 months of age (28.9%).

Stool frequency as less than or equal to 7 times a day was noted among 74 (20.0%) children, 8 to 10 stools among 203 (54.9%) whereas remaining 93 (25.1%) were having stool frequency of more than 10 stools a day. Similar findings were noted by other local researchers⁷ where majority of the children (60%) had 8 to 10 stools per day. Habib MI¹¹ in 2014 also noted 60.3% of their children to be having 8 to 10 stools per day.

RV positive was noted in 214 (57.8%) children whereas remaining 156 (42.2%) were noted negative. Similar study results depicting more than half (60%) hospitalized children due to diarrhea having positive RV have been reported before.⁷ A study conducted by Salim H et al¹³ reported 50% of their children to be infected with RV. Habib MI et al¹¹ found this percentage to be 63%, which is again very similar to what was found in the present study. In Pakistan, prevalence of RV among cases of AGE was noted to be from 8 to 9% in between 1985 to 1996 but in recent years (2007 to 2014), it has been recorded between 24 to 66% which is alarming.³

We noted that increasing age was significantly associated with RV cases. Our results were correlated with those found earlier where local researchers⁷ have found age increasing above 24 months to be associated with RV infection. Salim and coworkers¹³ noted prevalence of RV very similar in different age groups among children except 49 to 60 months of age.

In the present study, most children without vomiting were seen to have positive RV. These findings are very consistent to studies done in Pakistan⁷ in Iran¹⁴ which seem to highlight that no vomiting is commonly found in RV positive cases.

Presence of fever was noted to have significant association with RV positive children as 64.5% of the children as RV positive had fever in comparison to 50.6% children among RV negative cases. This aspect of our study results are very similar to previous findings.^{7,11} RV positive cases seem to have significant association with presence of fever as depicted earlier. Ehsanipour F and colleagues from Iran¹⁴ also noted majority of RV positive cases had fever in them.

Our study had few limitations as well. We did not record management strategies among studied cases which would have further given us insight about the effectiveness of current strategies. We also did not note any kind of short term outcome like mortality or number of days required for recovery in our cases.

CONCLUSION

Prevalence of RV was noted to be 58.7% among children aged less than 5 years. Increasing age and presence of fever were found to have significant association with RV positive children.

Author's Contribution:

Concept & Design of Study:	Sanaullah Khan
Drafting:	Muhammad Anwar, Zeeshan Mehmood
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Revisiting Critically:	Sanaullah Khan, Muhammad Anwar
Final Approval of version:	Sanaullah Khan

Conflict of Interest: The study has no conflict of interest to declare by any author.

REFERENCES

1. Kawai K, O'Brien MA, Gouveia MG, Mast TC, El Khoury AC. Burden of rotavirus gastroenteritis and distribution of rotavirus strains in Asia: a systematic review. *Vaccine* 2012;30:1244–54.
2. Tate JE, Burton AH, Boschi-Pinto C, Parashar UD. World Health Organization-Coordinated Global Rotavirus Surveillance Network. Global, regional, and national estimates of rotavirus mortality in children <5 years of age, 2000-2013. *Clin Infect Dis* 2016;62(Suppl 2):S96–S105.
3. Badur S, Ozturk S, Pereira P, Ghany MA, Kalaf M, Lagoubi Y, et al. Systematic review of the rotavirus infection burden in the WHO-EMRO region. *Human Vaccines & Immuno therapeutics* 2019;15(11):2754-68.
4. WHO. Immunization, vaccines and biologicals Rota virus [Internet]. [updated 2010 Apr 12; cited 2011 January 11]; Available from: <http://www.who.int/immunization/topics/rotavirus/en/index.html>
5. Malek MA, Teleb N, Abu-Elyazeed R, Riddle MS, Sherif ME, Steele AD, et al. The epidemiology of Rota virus diarrhea in countries in the Eastern Mediterranean Region. *J Infect Dis* 2010; 202: S12-22.
6. Afzal A, Tariq PA, Choudhry S. Rotavirus gastroenteritis in children upto 5 years of age. *J Rawal Med Coll* 2010;14(1): 33-35.
7. Haq W, Khan MA, Hussain I. Frequency of Rotavirus Diarrhea in Hospitalized Children. *PJMHS* 2018;12(1):561-3.
8. Kumar A, Basu S, Vashishtha V, Choudhury P. Burden of rotavirus diarrhea in under-five Indian children. *Ind Pediatr* 2016;53:607-17.
9. Bhatnagar S, Srivastava G. Clinical profile of children (0-5 years) with rota virus diarrhea. *Int J Contemp Pediatr* 2017;4:947-50.
10. Kadim M, Soenarto Y, Hegar B, Firmansyah A. Epidemiology of Rotavirus diarrhea in children under five: a hospital-based surveillance in Jakarta. *Paediatr Indones* 2011;51(3):139-43.
11. Habib MI, Kazi SG, Ahmed KM, Zia N. Rota virus Diarrhea in Hospitalized Children. *J Coll Physicians Surgeons Pak* 2014;24 (2):114-7.
12. Badur M, Latha NM, Kumar PR, Dudala SR, Shaik SA, Kang G, et al. Prevalence of rotavirus diarrhea among under-5 hospitalized children in a Government Tertiary Hospital, Tirupati. *J NTR Univ Health Sci* 2015;4:112-6.
13. Salim H, Karyana IPG, Sanjaya-Putra IG, Budiarsa S, Soenarto Y. Risk factors of rotavirus diarrhea in hospitalized children in Sanglah Hospital, Denpasar: a prospective cohort study. *BMC Gastroenterol* 2014;14:54.
14. Ehsanipour F, Noorbakhsh S, Taj FE, Movahedi Z. The study of incidence, clinical presentation and progression of rota virus infection in hospitalized children with acute nonbacterial diarrhea: a cross sectional study in Tehran, Iran. *J Pediatr Child Health Care* 2017;2(2):1017.