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INCIDENCE OF ROTAVIRUS DIARRHEA AMONG HOSPITALIZED CHILDREN UNDER FIVE YEARS OF AGE IN A TERTIARY CARE HOSPITAL

Microbiology

Dr.Nehal Mehta ESIC Model Hospital cum ODC, Andheri, Mumbai Senior resident Doctor LTMMC &GH, Sion, Mumbai

Dr.Sujata Baveja* MD Microbiology LTMMC & GH, Sion, Mumbai Professor & Head of Microbiology Department *Corresponding Author

ABSTRACT

Background: In India rotavirus is estimated to cause 34% of all diarrheal death in children. An incidence of rotavirus diarrhea appears to be associated with the season, general living conditions and socio-economic status of the patient. The present study was conducted to find out an incidence of rotavirus diarrhea among hospitalized children under five years of age in a tertiary care hospital.

Material and Methods: In this prospective study 200 stool samples from hospitalized children less than 5 years of age with symptoms of acute gastroenteritis were tested for rotavirus antigen by ELISA Kit (Premier™Rotaclone®). A detailed history including the demographic profile, presenting complaints, past history and risk factor was elicited for each patient and recorded.

Results: All 200 stool specimens were processed for rotavirus antigen by ELISA, out of which 26% were positive. Maximum cases of rotavirus diarrhea in present study belonged to age group 6 months to 2 years. There was marked seasonal variation in rotavirus cases. Maximum cases of rotavirus diarrhea were seen during winter season. Complications like sepsis, electrolyte imbalance, renal failure etc were seen in 20% of rotavirus diarrhea cases, While among non-rotavirus cases only 2% cases developed complications.

Discussion: Rotavirus diarrhea accounts for a large proportion of diarrheal disease in hospitalized children less than 5 years. It causes substantial mortality and morbidity in young children. Due importance should be given to the personal hygiene and handwashing practices of family members.

KEYWORDS

Rotavirus diarrhea, incidence, seasonal variation, complications

INTRODUCTION

Diarrhea, the third leading killer of children in India today, is responsible for 13% of all deaths in children <5 years of age and kills an estimated 300,000 children in India each year [1]. The study conducted in in Western Maharashtra in 2014 showed an incidence of diarrheal disease in children under five years as 0.6% episodes/child/year.

Diarrhea in children can be due to various causes like viruses, bacteria, protozoa and helminths. Among these rotavirus is the most common cause of severe diarrhea requiring hospitalization among infants and young children worldwide [2]. Rotavirus is estimated to be responsible for approximately 527,000 deaths each year worldwide in children under five years. Around 36% of hospitalization due to diarrhea in children under five years of age is because of rotavirus infection worldwide [3]. In India rotavirus is estimated to cause 34% of all diarrheal death in children [4]. Burden of rotavirus diarrhea in children having acute gastroenteritis was 21% in Amritsar in 2015, 25.2% in Kolkata in 2014, 35.9% in Kerala in 2013 and 35.77% in Pune in 2012 [5-8].

Rotavirus infections spread easily through multiple modes of transmission. It also spreads in settings where many children are together, such as day-care centers and nurseries. While some studies in India have found no association between rotavirus infection and time of year [5,9], most have observed an increase in rotavirus-associated diarrhea during the winter months, October to February, throughout the country [10-13]. An incidence of rotavirus diarrhea appears to be associated with the general living conditions and socio-economic status of the patient as unhygienic environment helps in spreading the infection. The present study was conducted to find out an incidence of rotavirus diarrhea among hospitalized children under five years of age in a tertiary care hospital.

MATERIAL AND METHODS

In this prospective study 200 stool samples from hospitalized children less than 5 years of age with symptoms of acute gastroenteritis were included after obtaining approval from the institutional ethics committee. The study was conducted over a period of one year from January 2014 to December 2014 in a Department of Microbiology at a tertiary care hospital.

Children above five years of age, outdoor patients and not giving consent were excluded from study. Consent was taken from the guardian of child for participation in the study after explaining the protocol to the guardian in the language that the guardian best understood. A detailed history including the demographic profile, presenting complaints, past history and risk factor was elicited for each patient and duly recorded in the case record forms.

Freshly passed (preferably on the day of presentation itself), 3 to 5 ml of stool samples were collected in a dry, sterile, wide mouth container from hospitalized children with acute gastroenteritis by the help of their guardian and transported to Microbiology laboratory immediately. Macroscopic examination of stool specimen was done and then it was divided in three parts. One part was processed for microscopic examination and culture. Second part was used for rapid test to detect rotavirus antigen from stool specimen. Third part was stored at -20ºC to perform rotavirus antigen Enzyme linked immunosorbent assay [ELISA] subsequently.

RESULTS

Out of 200 patients, 61.5% were male and 38.5% were female. Male: Female was 1.6:1. Maximum cases of acute gastroenteritis belonged to age group 6 months to 2 years (53.5%) followed by more than 1 month to six months of age (27.5%) (Table 1).

Table 1: Age and sex wise distribution of study population

Age group		Sex		Total
		Male	Female	
<1 month	No.	5	4	9
	%	55.56	44.44	100
1 month – 6 months	No.	33	22	55
	%	60	40	100
6 months – 2 years	No.	67	40	107
	%	62.62	37.38	100
2 years – 5 years	No.	18	11	29
	%	62.07	37.93	100
Total	No.	123	77	200
	%	61.5	38.5	100

Maximum cases of rotavirus cases were seen in November (35.7%) followed by December (21.4%), October (19.6%) and January (10.7%) respectively. Rotavirus cases were not seen in April, May and September. This difference in distribution of rotavirus cases in different months was found to statistically significant.

Table 2: Seasonal distribution among rotavirus cases (n=56)

Month	Number of cases	Percentage
January	6	10.7
February	1	1.8
March	1	1.8
April	0	-
May	0	-
June	2	3.6
July	2	3.6
August	1	1.8
September	0	-
October	11	19.6
November	20	35.7
December	12	21.4
Total	56	100

Chi square value: 98.7; P value: <0.01*

Table 3: Association between kuppuswamy socio economic status and rotavirus cases (n=200)

Kuppuswamy Socio Economic Status		Rotavirus cases (n=56)	Non rotavirus cases (n=144)	Total
Upper lower	No.	29	63	92
	%	31.5	68.5	100
Lower	No.	13	34	47
	%	27.7	72.3	100
Lower middle	No.	14	47	61
	%	23	77	100

Out of total rotavirus positive cases of diarrhea 31.5% were from upper lower class, 27.7% were from lower class and 23% were from lower middle class. All the patients in present study belonged either from upper lower, lower or lower middle socio economic class. None of the patients in present study were from upper middle or upper socio economic class. Hence, it is difficult to comment on association between socio economic status and positivity for rotavirus.

Mean duration of hospital stay was 3.59±1.67 days among rotavirus cases, which was significantly longer as compared to 2.67±1.10 days among non rotavirus cases. (Student t Test value: 4.55; P value <0.01). Out of total cases of Rotavirus, 20% cases encountered complications which was significantly more as compared to non rotavirus cases (2%).

DISCUSSION

Most of the children in present study were males (61.5%) and females were less, about 38.5% (Table 1). In one study done by Mohamed Khalil *et al* [14] in 2015 at Saudi Arabia, maximum patients of acute gastroenteritis were males (57%) while females were less about 43%. In another study conducted by Manohar Badur *et al* [15] in 2015 in Tirupati among the study subjects, a majority of them were male children around 57.2% and females were 42.8%. These findings correlated well with present study.

Maximum cases of acute gastroenteritis in present study belongs to age group 6 months to 2 years (53.5%) followed by age group 1 month to 6 months of age (27.5%). In all age groups of patients who presented with acute gastroenteritis, males were more than female. In one study done by Satarupa Mullick *et al* [6] in 2014 maximum cases of acute gastroenteritis belonged to 6 months to 2 years followed by 0–6 months of age. In another study done by Shaveta Dhiman *et al* [5] in 2015 at Amritsar maximum cases of acute gastroenteritis belonged to 6 months to 2 years of age (69%). Hence, there was no correlation between gender and positivity for rotavirus in present study. This can be because of higher tendency of parents to take male child for medical care than female child or may be attributed to more resistance to infections in female due to XX chromosome.

In present study maximum cases of rotavirus diarrhea was found during winter season i.e. from October to January with peak in November (35.7%) (Table 2). According to one study done by Rajiv Bahl e*t al* [10] incidence of rotavirus diarrhea was maximum in winter months i.e. from November to February and peak was observed in November at New Delhi. In another study conducted by Borade A *et al* [8] in 2012 in Pune maximum cases of rotavirus diarrhea were seen during winter season and peak was seen in December and January. These findings were in concordance with present study. This winter peak can be due to additional droplet infection via respiratory tract in admission to feco-oral route and lower temperature in winter season which favors survival of rotavirus. According to study done by Rachita Sarangi *et al* [16] in 2015 at eastern part of India maximum cases of rotavirus was seen from March to August and peak was seen in June. In another study conducted in Kashmir in 2008 by Siraj Fayaz Ahmed *et al* [17] maximum cases were seen during summer season 16.5% and least cases of rotavirus was seen in winter 5.2%. These findings were not in concordance with present study. This might be due to different environmental condition in different geographical areas.

In present study, prevalence of rotavirus diarrheal cases was more or less similar in different socio economic class. In present study all the patients were either from upper lower, lower or lower middle socio economic class. None of the patients in present study were from upper middle or upper socio economic class according to Kuppuswamy socio economic status scale. Hence it is difficult to comment on association between socio economic status and positivity for rotavirus. However, in study conducted by Shaveta Dhiman *et al* [5] in 2015 at Amritsar it was seen that there is no statistically significant difference in the frequency of rotavirus infection among patients in different Kuppuswamy's classes.

In present study, duration of hospital stay was significantly longer (3.59 days) for rotavirus cases compared to non-rotavirus cases (2.67 days). In study done by Sivan Perl *et al* [18] in 2011 at Israel patients with rotavirus diarrhea required longer hospitalization (median 4 days) than those with rotavirus negative diarrhea (median 3 days). This finding is in concordance with present study. This is due to severe dehydration in rotavirus diarrhea and complications like renal failure, acidosis, electrolyte imbalance, sepsis etc. According to study done by Nokes *et al* [19] at Kenya in 2008, duration of hospital stay was significantly longer in rotavirus negative cases of acute gastroenteritis. This finding was not in concordance with present study.

In present study complications were seen more in rotavirus cases (20%) compared to non-rotavirus cases (2%). Various complications like electrolyte imbalance, acidosis, renal failure and sepsis were observed in present study. This finding was in very much in concordance with study conducted by Nokes *et al* [19]. Here also complications were more common in rotavirus cases compared to non-rotavirus cases. According to CDC, rotavirus infection in infants and young children can lead to severe diarrhea, dehydration, electrolyte imbalance, and metabolic acidosis. Children who are immunocompromised may experience severe or prolonged rotavirus gastroenteritis and may have evidence of abnormalities in multiple organ systems, particularly the kidney and liver. In present study 100% cases of non-rotavirus were discharged whereas among rotavirus positive cases only 92.85% cases were discharged and 5.35% cases died. Total three deaths had occurred out of 56 rotavirus positive cases. One died because of severe dehydration and metabolic acidosis. Second child died due to electrolyte imbalance and renal failure and third death occurred due to sepsis. In all three children no other preexisting factor was present which could lead to death. In India, rotavirus is estimated to cause 34% of all diarrheal death. In one study conducted by Sangaji MK *et al* [20] in 2012 at Democratic Republic of Congo death was occurred in 1% cases of rotavirus while no death was recorded in non-rotavirus cases which is in concordance with preset study. Increase in mortality in rotavirus diarrhea can be due to severe dehydration, metabolic acidosis, respiratory complication, electrolyte imbalance, renal failure, sepsis etc. In another study done by Nokes et al [19], it was observed that mortality in rotavirus positive cases (2%) was significantly less compared to rotavirus negative cases (9%). This finding was not similar to present study.

In conclusion, rotavirus diarrhea accounts for a large proportion of diarrheal disease in hospitalized children less than 5 years. It causes substantial mortality and morbidity in young children. Due importance should be given to the personal hygiene and handwashing practices of family members.

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REFERENCES

1. Bassani DG, Kumar R, Awasthi S, Morris SK, Paul VK, Shet A, et al. Causes of neonatal and child mortality in India: a nationally representative mortality survey. Lancet 2010;376:1853-60.
2. Diarrhoeal disease. WHO Factsheet. 2013;1–4 Available from http://www.who.int/

mediacentre/ factsheets/fs330/en/ (Last accessed on 20/10/2015)
3. Rotavirus, New and Under utilized Vaccines Implementation (NUVI) Rotavirus. World Heal Organ. 2011;1–2. Available from: http://apps.who.int/nuvi/rotavirus/en/ (Last accessed on 25/10/2015).
4. Morris SK, Awasthi S, Khera A, Bassani DG, Kang G, Parashar UD, et al. Rotavirus mortality in India: estimates based on a nationally representative survey of diarrhoeal deaths. Bull World Health Organ. 2012;90:720–7.
5. Dhiman S, Bimla Devi, Singh K and Pushpa Devi. Comparison of Enzyme- Linked Immunosorbent Assay and Immunochromatography for Rotavirus Detection in Children Below Five Years with Acute Gastroenteritis. J Clin Diagnostic Res 2015;9(9):1–6.
6. Mullick S, Mukherjee A, Ghosh S, Pazhani GP, Sur D, Manna B, et al. Community Based Case-Control Study of Rotavirus Gastroenteritis among Young Children during 2008-2010 Reveals Vast Genetic Diversity and Increased Prevalence of G9 Strains in Kolkata. PLoS One 2014;9(11):e112970.
7. MA Mathew, Abraham Paulose, S Chitralekha, MKC Nair, Gagandeep Kang and Paul Kilgore. Prevalence of Rotavirus Diarrhea among Hospitalized Under-five Children. Indian Pediatr 2014;51:27–31.
8. Borade A, Bais AS, Bapat V, Dhongade R. Characteristics of rotavirus gastroenteritis in hospitalized children in Pune. Indian J Med Sci 2010;64(25):210–8.
9. Van Damme P, Giaquinto C, Huet F, Gothefors L, Maxwell M and Van der Wielen M. Multicenter Prospective Study of the Burden of Rotavirus Acute Gastroenteritis in Europe, 2004–2005: The REVEAL Study. J Infect Dis 2007;195:S4–16.
10. Bahl R, Ray P, Subodh S, Shambharkar P, Saxena M, Parashar U, et al. Incidence of severe rotavirus diarrhea in New Delhi, India, and G and P types of the infecting rotavirus strains. J Infect Dis 2005;192:S114-9.
11. Kelkar SD, Purohit SG, Simha KV. Prevalence of rotavirus diarrhoea among hospitalized children in Pune, India. Indian J Med Res 1999;109:131-5.
12. Saravanan P, Ananthan S, Ananthasubramanian M. Rotavirus infection among infants and young children in Chennai, South India. Indian J Med Microbiol 2004;22:212-21.
13. Phukan AC, Patgiri DK, Mahanta J. Rotavirus associated acute diarrhoea in hospitalized children in Dibrugarh, north-east India. Indian J Pathol Microbiol 2003;46:274-8.
14. Khalil M, Azhar E, Kao M, Al Kaiedi N, Alhani H, Al Olayan I, et al. Gastroenteritis attributable to rotavirus in hospitalized Saudi Arabian children in the period. Clin Epidemiol 2015;(7):129–37.
15. Badur M, Latha NM, Ravi Kumar P, Dudala SR, Shaikh AS, Kang G, et al. Prevalence of Rotavirus diarrhea among under 5 hospitalized children in a Government tertiary hospital, Tirupati. J NTR Univ Heal Sci 2015;4(2):112–6.
16. Sarangi R, Rath S, Dash M, Rath B, Lenka RK and Padhy RN. Prevalence of rotaviral diarrhoea in under-five hospitalized children in a tertiary care hospital of Eastern India. Egypt Pediatr Assoc Gaz 2015;63:46–51.
17. Ahmed SF, Farheen A, Muzaffar A and Mattoo GM. Prevalence of Diarrhoeal Disease, its Seasonal and Age Variation in under- fives in Kashmir, India. Int J Health Sci (Qassim) 2008;2:126–33.
18. Perl S, Goldman M, Berkovitch M, Kozer E. Characteristics of rotavirus gastroenteritis in hospitalized children in Israel. Isr Med Assoc J 2011;13:274–7.
19. Nokes DJ, Abwao J, Pamba A, Peenze I, Dewar J, Maghenda JK, et al. Incidence and clinical characteristics of group A rotavirus infections among children admitted to hospital in Kilifi, Kenya. PLoS Med 2008;5(7):e153.
20. Sangaji MK, Mukuku O, Mutombo AM, Mawaw PM, Kawawa ES, Kasungo BK, et al. Epidemiological and clinical study of rotavirus acute diarrhea in infants in hospital Jason Sendwe Lubumbashi , Democratic Republic of Congo. Pan Afr Med J 2015;113:1–8.