A descriptive hospital based study of rotavirus diarrhoea in children aged 6 months to 3 years

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Abstract

Objective: To study the prevalence, demographic characteristics, clinical characteristics, laboratory parameters and therapy of rotavirus diarrhoea in children aged 6 months to 3 years in a hospital setting

Method: A prospective hospital based cross-sectional study was carried out in Sri Guru Ramdas Institute of Medical Sciences and Research on 50 consecutive children aged 6 month to 3 years with diarrhoea from December 2011 to June 2013. Stool samples were collected and rotavirus antigen detection was done by the Enzyme Immunoassay method. Stool microscopy and culture were done to find out bacterial and other causes for diarrhoea. Data so obtained was statistically analysed.

Results: Out of 50 patients 22 tested positive for rotavirus by FAR diagnostic rotavirus card ELISA test. Prevalence of rotavirus diarrhoea in our study was 44%. Rotavirus diarrhoea was found most commonly in 6-12 months age group and in the months of October to December. Most of the patients presented with some dehydration.

Conclusions: Prevalence of rotavirus diarrhoea in our hospital based study was 44%. The consistency of stools was watery in a significant number of rotavirus diarrhoea patients compared to non-rotavirus patients (p<0.05). A significant number of cases with rotavirus diarrhoea had some dehydration compared to non-rotavirus patients (p<0.05).

(Key words: Rotavirus; prevalence; dehydration)

Introduction

There is a lack of nationally representative data on the incidence of severe rotavirus disease in India[1]. Previous studies in the Indian Rotavirus Strain Surveillance Network have confirmed that rotavirus accounts for 39% of acute diarrhoeal hospitalizations[2]. We aimed to study the prevalence, demographic characteristics, clinical characteristics, laboratory parameters and therapy of rotavirus diarrhoea in children between 6 months to 3 years.

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Method

This is a hospital based prospective, cross sectional descriptive study done in Sri Guru Ramdas Institute of Medical Sciences and Research from December 2011 to June 2013. All children aged 6 months to 3 years with chief complaints of loose stools and/or vomiting, after receiving informed consent from parent/guardian, were included in the study. Children over 3 years of age were excluded from the study.

A case of diarrhoea was defined as increased stool frequency compared with the usual pattern for which parents sought care for treatment of diarrhoea. The indications for hospitalization were (i) severe dehydration requiring intravenous hydration (ii) malnourished children with dehydration (iii) toxic appearance, changing mental status (iv) high output diarrhoea (>10 large volume stool/day) (vi) persistent vomiting or diminished or no oral intake (vii) suboptimal or no response to oral rehydration therapy (ORT) or further deterioration (viii) inability of the caregiver to administer oral rehydration salts (ORS)[3].

History of fever, loose stools, vomiting and the duration of presenting complaints was obtained from the parent/guardian according to proforma. Data about exclusive breast feeding and about current feeding pattern was also assessed. Anthropometry was done to find out grade of malnutrition. Temperature, pulse and blood pressure was checked. Children were assessed for signs of dehydration and classified as per WHO Integrated Management of Childhood Illness Model Handbook guidelines and was categorized into severe, some or no dehydration[3].

Stool samples of all the children presenting with diarrhoea were collected in sterile containers and tested in side laboratory in ward for presence or absence of rotavirus antigen. Other stool samples were sent to microbiology department of SGRDIMSR hospital for routine examination and

stool culture and sensitivity. ELISA testing (Rotavirus card, FAR diagnostics) was used to test for Rotaviral antigens in stool. The enzyme-linked immune-sorbent assay is highly sensitive (100%) and specific (97%) for rotavirus antigen[4.]

Venous blood samples, collected under aseptic precautions, were sent for haemoglobin estimation, total and differential blood counts and serum electrolytes. A clean catch midstream urine sample was collected and subjected to routine examination and culture sensitivity.

Data was collected and entered in Microsoft Excel 2010. For inferential analysis, Chi-square and independent t-test were calculated at the level of significance p=0.05 (Confidence interval=95%). Analysis was done using SPSS software, Version 11.5.

Results

Stools samples of 50 patients presenting with acute diarrhoea were subjected to rotavirus card test and prevalence of rotavirus diarrhoea was found to be 44% (n=22) (Figure 1).
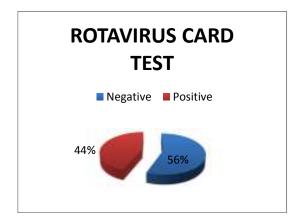

Figure 1: *Prevalence of rotavirus diarrhoea in study group*

The demographic characteristics and feeding pattern of the 50 patients are shown in Table 1.

Table 1: Demographic characteristics and feeding pattern

		Rotavirus present (n=22)	Rotavirus absent (n=28)	P value
Age group (Months)	6 – 12	08 (36%)	09 (32%)	0.828
	13 – 18	05 (22%)	07 (25%)	
	19 – 24	06 (27%)	09 (32%)	
	25 – 30	02 (09%)	03 (11%)	
	31 – 36	01 (04%)	-	
Gender	Male	09 (40%)	17 (60%)	0.626
	Female	13 (60%)	11 (40%)	
Seasonality	January-March	05 (22%)	05 (17%)	
	April-June	01 (07%)	04 (14%)	
	July-September	07 (31%)	15(53%)	
	October-December	09 (40%)	04 (14%)	
Exclusive breast feeding for 6 months		15 (68%)	20 (71%)	0.630
Current feeding pattern	Only breast feed	02 (09%)	05 (17%)	0.634
	Breast + bottle feed	15 (68%)	17 (66%)	
	Bottle feed	05 (22%)	05 (17%)	
Nutritional status	No malnutrition	11 (50%)	12 (42%)	0.55
	Grade 1	08 (36%)	07 (25%)	
	Grade 2	02 (09%)	06 (21%)	
	Grade 3	01 (05%)	03 (12%)	

The clinical characteristics of the 50 patients are shown in Table 2.

Table 2: Clinical characteristics

Characteristic			Rotavirus positive *(n=22)*	Rotavirus negative *(n=28)*	P value
Fever			13 (59%)	15 (53%)	0.696
Stool consistency	Semi-formed		03 (14%)	10 (36%)	0.047
	Watery		19 (86%)	18 (64%)	
Stool frequency	6-10 Times		02 (09%)	08 (28%)	
	11-15 Times		10 (45%)	08 (28%)	0.33
	16-20 Times		08 (36%)	09 (32%)	
	>20 Times		02 (09%)	03 (12%)	
Mucus	Present		10 (45%)	14 (50%)	0.749
Stool colour	Watery		14 (63%)	15 (53%)	
	Green		02 (09%)	04 (15%)	0.745
	Yellow		06 (27%)	09 (32%)	
Duration of diarrhoea	1-2 days		05 (22%)	05 (19%)	
	3-4 days		10 (45%)	12 (42%)	0.581
	5-6 days		06 (27%)	11 (39%)	
	>6 days		01 (04%)	-	
Degree of dehydration	No		04 (18%)	12 (42%)	0.039
	Some		15 (68%)	09 (32%)	
	Severe		03 (13%)	07 (25%)	
Signs of dehydration	Anterior fontanelle	Depressed	15 (68%)	13 (46%)	0.048
	Thirst	Present	03 (13%)	12 (42%)	
		Increased	16 (74%)	15 (53%)	0.011
		Absent	03 (13%)	01 (03%)	
	Eyes	Sunken	18 (81%)	15 (53%)	0.012
	Mucosa	Dry	18 (81%)	15 (53%)	0.014
	Skin turgor	Slow	15 (68%)	09 (32%)	0.039
		Slow > 2s	03 (13%)	07 (25%)	

The consistency of stools was watery in a significant number of rotavirus diarrhoea patients (X^2=3.121, p value=0.047, df=1) compared to non-rotavirus patients. A significant number of cases with rotavirus diarrhoea had some dehydration. (X^2=6473, p=0.039, df=2) compared to non-rotavirus patients. Signs of dehydration significantly associated with rotaviral diarrhoea were depressed anterior fontanelle (X^2=4.026, p=0.048,df=2), increased thirst (X^2=8.981,p=0.011,df=2), dry mucosa (X^2=6.088,p=0.014,df=1) and diminished skin turgor (X^2=6.473, p=0.039,df=2) (Table 2).

The laboratory parameters of the 50 patients are shown in Table 3. Treatment of the patients in study group was done as per WHO guidelines according to degree of dehydration (Table 4).

Table 3: Laboratory parameters

		Rotavirus positive (n=22)	Rotavirus negative (n=28)	P value
Anaemia	Moderate - Severe (5-8 g/dl)	03 (13%)	05 (17%)	0.194
Total leukocyte count	3000-6000/cu mm	07 (31%)	08 (28%)	0.240
	6100-9000/cu mm	11 (50%)	09 (32%)	
	>9000/cu mm	04 (19%)	11 (39%)	
Urine R/E	>5 leucocytes/hpf	10 (45%)	08 (28%)	0.120
Stool R/E	Many pus cells	02 (09%)	10 (35%)	0.110
	Reducing substance	01(4.5%)	01(3.5%)	
	Cyst/Trophozoite (Giardia)	01(4.5%)	01(3.5%)	
	Vibrio Cholerae	-	01(3.5%)	
Electrolyte abnormalities	Hyponatraemia	03 (13%)	06 (21%)	0.687
	Hypernatraemia	04 (18%)	05 (17%)	
	Hypokalaemia	01(4.5%)	02 (07%)	
	Hyperkalaemia	-	-	

Table 4: *Treatment plan and duration of hospital stay*

		Rotavirus positive (n=22)	Rotavirus negative (n=28)	P value
Intravenous fluid requirement		18 (81%)	18 (64%)	0.171
Duration of Oral rehydration therapy	0-2 days	06 (27%)	08 (28%)	
	3-4 days	10 (46%)	13 (46%)	0.357
	5-6 days	06 (27%)	07 (25%)	
Use of antibiotics		03 (13%)	08 (28%)	0.261
Duration of hospital stay	No	04 (18%)	13 (46%)	
	1-3 days	14 (63%)	09 (32%)	0.153
	4-6 days	04 (18%)	02 (07%)	
	>7 days	-	04 (14%)	

Oral rehydration solution (ORS) was given to all 50 patients. Oral zinc was given for 14 days in all patients.

Discussion

In our hospital-based study we found a prevalence of rotavirus diarrhoea of 44%. Mathew et al in Ernakulam district, Kerala also detected rotavirus in 36% of diarrhoea-related hospital admissions among children less than 5 years of age[5]. In our study 36% of rotavirus positive cases were in the 6-12 month age group and 27% cases in the 19-24 month age group. Similar results were reported in a study by Mathew et al who reported high prevalence in children aged 6 -11 months and 12-23 months (32% and 42%, respectively)[5]. A study by Grimwood et al in New Zealand also showed rotavirus detection rate to be 27% in infants aged 0–5 months, 43% in infants aged 6–11 months, and 52% in the 12–35 month age group (p < 0.001)[6].

Of the 22 patients with rotavirus diarrhoea in our study 40% were male. Proportion of male and female patients were 53% and 47% respectively in a study done by Azemi M et al in Kosovo[7]. In our study we found that 40% of cases with rotavirus diarrhoea were seen from October-December and 31% from July-September. Most studies have observed an increase in rotavirus-associated diarrhoea during the winter months, October to February, throughout the country ranging from 59% to 72%, with a median of 64%. The northern, more temperate regions may exhibit stronger seasonality[8]. However Dey SK, Hayakawa Y. et al observed that 50% children from Bangladesh were afflicted by rotavirus during the summer[9].

In our study, exclusive breast feeding for 6 months did not have any impact on distribution of rotavirus diarrhoea. Similar results were observed by Wobudeya E et al in a case controlled study in Uganda[10] and by Golding J et al in infants aged 4 - 6 months[11]. In our study the nutritional status was not significantly associated with rotavirus diarrhoea. Bern C et al observed no significant difference in prevalence of rotavirus diarrhoea and severity of dehydration in children with or without malnutrition in Bangladesh[12].

We found that fever was present in 59% patients, vomiting in 50% patients and diarrhoea in 100% patients with rotavirus gastroenteritis. Duration of diarrhoea was 3-6 days in 45% cases. Similar results were seen in a study conducted by Azemi M, et al where the most dominant symptom was diarrhoea (98.6%) followed by vomiting (88%). The average duration of diarrhoea was 5 days[7]. In our study the consistency of stools was watery in 86% cases. Azemi M, et al observed that the stools were watery in the majority of cases[7].

In our study 68% of rotavirus cases had moderate dehydration and 13% severe dehydration. Mathew et al found moderate dehydration in 49% of cases and severe dehydration in 14% of cases[5]. Sherchand JB et al. in Nepal in 2010 observed that the degree of dehydration among rotavirus cases was more likely to be moderate to severe rather than mild[13]. In our study, increased thirst, depressed anterior fontanelle and dry mucosa were significantly associated with rotavirus diarrhoea as compared to non-rotavirus diarrhoea. In our study no electrolyte abnormalities were present in 64.5% of cases with rotavirus diarrhoea and hypernatraemia was present in 18% cases. Azemi M et al in 2012 also observed no electrolyte abnormality in 64.1% patients. Only 9.85% of patients suffered hypernatremia[7].

In our study ORS and oral zinc were given to all 50 patients. Intravenous fluids were needed in 81% patients with rotavirus diarrhoea and 64% patients with non-rotaviral diarrhoea. Nalin DR et al observed that oral therapy is safe and effective for rehydration in most infants with 5-10% dehydration due to viral or bacterial diarrhoea[14]. In our study we found that the mean hospital stay in rotavirus diarrhoea was 3±2 days as compared to 4±1 days in non rotaviral group. Kurugol Z et al on the other hand observed that the mean hospital stay for rotavirus gastroenteritis was significantly longer 5.5±5.1 days compared to 3±3.1 days for non-rotavirus gastroenteritis[15].

Conclusions

- In the 6 month-3 year age group the prevalence of rotavirus diarrhoea was 44% in our hospital-based study.
- The consistency of stools was watery in a significant number of rotavirus diarrhoea patients compared to non-rotavirus patients ($p < 0.05$).
- A significant number of cases with rotavirus diarrhoea had some dehydration compared to non-rotavirus patients ($p < 0.05$).

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