Original article

Rotavirus infection in under-five children in Yekatit 12 hospital

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Abstract: A prospective study was conducted to determine the prevalence of rotavirus infection and its seasonal pattern. A total of 358 infants and young children who had acute diarrhoea were studied at Yekatit 12 hospital, Addis Ababa, Ethiopia, between March 1992 and 1993. The virus was detected in 65(18%) specimens collected from patients with acute diarrhoea teste.d by ELISA. The rate of rotavirus detection was higher among infants and children less than two years of age (21 %) than among older ones. The virus had two peaks, during the months of June and July(27%), when it is wet and warm with high relative humidity, and in November and December(37%) when the weather is dry and cool with low relative humidity. Our study has shown that, rotavirus could be detected throughout the year with seasonal trend and climatological relationship. However, studies extending over a longer period of time are necessary to establish the influence of seasonal and climatological factors on rotavirus infection in our setting.[Ethiop. J. Health Dev.1995;9 (1):71-75]

Introduction

Rotavirus is recognized as a major cause of non-bacterial gastroenteritis especially in infants and young children, and has also been implicated as an etiological agent of diarrhoea in older children(1,2). The virus is believed to be a major etiological agent of acute enteritis in infants and young children with marked peak during the winter season in temperate zones and with seasonal fluctuation in the tropics(3-5).

Addis Ababa, the capital city of Ethiopia, is found in a tropical region with more than 2000m above sea level. The dry and warm season is from October to February while there are small rains from March to May followed by heavy rains from June to September . The significant role of rotavirus in acute childhood diarrhoea cases has been reported in Addis Ababa(5,6,7) with different findings in the seasonal pattern of the virus(5,7). The present study was conducted to determine the occurrence of rotavirus in acute childhood diarrhoea and its seasonal variation over a period of 13 months at Yekatit 12 hospital pacdiatrics clinic, Addis Ababa, Ethiopia.

Methods

Subjects: The study subjects were a total of 358 children (0-60 months of age) with acute diarrhoea of less than 10 days duration and visiting the out-patients clinic of the

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Table 1: **Number and percentage of rotavirus infection by age and sex among acute diarrhoeal cases at Yekatit 12 hospital.**

Age (months)	Male	Female	Total
0-6 No. studied	51	39	90
No. +ve	10	7	17
% +ve	20	19	19
7-12 No. studied	79	55	134
No. +ve	19	11	30
% +ve	24	20	22
13-24 No. studied	59	44	103
No. +ve	8	9	17
% +ve	14	21	17
25-60 No. studied	20	11	31
No. +ve	1	0	1
% +ve	6	0	3
Total No. studied	209(58%)	149(42%)	358
No. +ve	38	27	65
% +ve	18	180	18

Department of Paediatrics of Yekatit 12 hospital. The duration of the study was March 1992 to March 1993.

Acute diarrhoea in this study was defined as the passage of three or more loose or liquid stools in the previous 24 hrs(8). A questionnaire was designed to collect the necessary information and filled in for each
case by a trained laboratory technician. The questionnaire was designed to reveal age, sex, associated symptoms, frequency of diarrhoea, duration of diarrhoea, and stool appearance. Sampling and Laboratory Examination: After each patient was examined by a physician, stool specimens were collected from diapers,
rectal swab, or directly into sterile glass vials. Samples were then transported in phosphate buffer medium to the laboratory for the detection of rotavirus antigen by commercially available Enzyme Linked Immunosorbent Assay (ELISA) kit (Dakopatts, Copenhagen, Denmark). The test was performed as recommended by the manufacturer. All samples were stored at -20"<:: until tested. To each 1-2g faecal specimen, 1-2m1 of O.15M sodium chloride solution was added. The mixture was homogenized in a vortex and suspension clarified by low speed centrifugation. The supernatant was diluted 1:10 in phosphate buffer with bovine albumin and was used in the test (ELISA). Samples which show more intense staining colour than the negative controls of the kit by a photometric reading at 492 nm are considered positive for rotavirus antigen. Laboratory examination was not done for other etiological agents of diarrhoea due to various limitations.
Climatology: All climatological information was obtained from the National Meteorological

Service Agency, based on data collected at two stations in Addis Ababa: Bole and main campus of the Meteorological Service Agency . Data Analysis: Statistical analyses of results were performed by using EPI-INFO version 5 statistical package.

Results

Of the 358 patients sampled, 65(18%) were positive for rotavirus excretion. A total of 209(58%) male and 149(42%) female cases of acute diarrhoea were examined in this study. Among the positive, Rotavirus was most frequently found (22%) in the 7-12 months age group. The frequency was less

Table 2: **clinical variables of rotavirus positive and negative acute diarrhoea cases at Yekatit 12 hospital.**

Variables Rotavirus	Positive (n=65)	Negative (n=293)
Vomiting alone	29(45%)	102(35%)
Fever alone	25(39%)	96(33%)
Fever and vomiting	54(83%)	198(68%)
with out fever and vomiting	11(17%)	95(32%)
Temperature	∃37.5ºC	
Upper respiratory infection	39(60%)	182(62%)
Dehydration stool	42(65%)	186(64%)
Frequency of diarrhoea/day (mean)	3.8	3.6
Duration of diarrhoea (mean)	4 days	6 days
appearance		
Watery	40(62%)	178(61%)
mucoid	24(37%)	113(39%)
bloody	1(2%)	2(1%)

(19%) at 0-6 months and 13-24 months (17%). Only one rotavirus positive sample was seen in the age group 25-60 months (Table 1). Statistical difference was not noticed in the distribution of rotavirus excreters in different age groups($X2 = 6.49$, $P = 0.09$). Patients who excreted rotavirus were more (21%) among less than 13 months of age than among the age groups greater than 12 months (13%). Their difference is not statistically significant($X2 = 2.73$, $P = 0.09$). Rotavirus excretion was higher in male cases 29/130(22%), than in females 18/94(19%) up to the age of 12 months, but the reverse is true among those $\geq$ 12 months of age, male cases 9/79(11%), and female cases 9/55(16%). The ratio of the infection of male to female children was 1: 1 and, there is no statistical difference in the distribution of rotavirus by sex ($X2 = 0.02$, $P = 0.90$). A comparison of clinical variables between patients with and without rotavirus diarrhoea is shown in Table 2. High

percentage of vomiting alone and fever alone were observed in both groups. The only significant differences between patients with and without rotavirus diarrhoea were the presence of vomiting and fever which were noted more frequently among rotavirus positive patients($X2 = 5.41$, $p = 0.02$).

Rotavirus was present throughout the study period except in May. Two peak incidences of the virus were found during the wet (June and July, 27%) and dry months (November and December, 37%) of the year. The relationship between the monthly average climatological variables ranges and the monthly prevalence of rotavirus were examined by using chi-square test and statistically significant relationships were observed (Table 3).

Discussion

In this study, rotavirus was detected in 18 % of acute diarrhoea cases. According to other studies rotavirus is believed to be responsible for about 6% of all diarrhoea episodes and 20% of all diarrhoea deaths in children under 5 years of age(9). The percentage detection of the virus in our study was lower than that of similar hospital-based studies(5,7) done in Addis Ababa, but is higher than other tropical studies(10,11,12). Since this is a hospital- based study, all study samples comprised only cases of acute diarrhoea that were brought to
the hospital for treatment. Therefore, the observed finding in this study may not reflect the true situation in the community which is not yet well studied. However, the percentage of rotavirus detection in our study is higher

Table 3: **Relationship between rotavirus prevalence and climatological factors**

Climatological Factors	Values (range)	Rotavirus prevalence		Negative	%
		Positive	%		
Monthly total	1-25	21	24.4	65	75.6
rain fall in	25-59	4	5.4	70	94.6
mm.	60-100	14	13.1	93	86.9
	101-260	26*	18.4	115	18.6
Monthly	14-16	47	18.5	207	81.5
min. and max.	16-18	12	22.2	42	77.8
temperature in ^{o}C	18+	6**	6	94	94
Monthly	34-49	9	10.1	80	89.9
relative	50-56	21	14.1	128	85.9
humidity in%	60-83	35***	20.6	135	79.4

mm = millimetre ^{o}C = degree centigrade % = percent *x^2 = 12.06
P = 0.007 **x^2 = 10.22 P = 0.006 x^2 = 5.38 P =0.068

than that of community-based longitudinal surveys(8-10%) in developing countries(9). The higher percentage detection of rotavirus among children less than two years of age is consistent with a number of similar studies carried out in Addis Abeba(5,7) and other temperate and tropical countries(12-14) .This is in accordance with the assumption in under- developed areas that the early peak of rotavirus diarrhoea may result from early exposure to contaminated sources as well as to over- crowded homes(15).

Detection of rotavirus with higher number in male cases than in females upto the age of 12 months and the revers findings for the more than 12 months of age was also noticed in our study. Whether this difference is due to sex susceptibility or by chance (to appear more in number in the hospital between the different sex and age groups) is, however, questionable and needs further investigation. The ratio of the infection of male to female children (1 : 1) was in contrast to the reported ratios of 1.5: 1 by Samir, et.al (13) from Bahrain, and 1:2.4 by Puri, et.al(16) from India. The reason(s) for these findings with different geographical location are not well understood.

Vomiting followed by fever appears to be more common with rotavirus diarrhoea. Although these symptoms appear to be more common in acute rotavirus infection (7, 13,17), no clinical features could be found to distinguish rotavirus diarrhoea from that caused by other etiological agents, as described before(7,18).

Rotavirus was detected throughout the study period with peak ocurrence in dry and wet seasons. The findings of this seasonal variation are different from the study carried out in Addis Ababa during 1983-1984(7) which
showed a uniform distribution of the. virus throughout the year .But, similar seasonal peaks in rotavirus diarrhoea have been observed in Addis Ababa, 1977-1978(5) and some other tropical areas(19-21). Eventhough it is only a thirteen months study, factors including environmental, geographical, and viral changes may contribute to the observed seasonal pattern.

The relationships observed between rotavimc; prevalence and two climatological factors have indicated agreement with the findings of temperate and tropical studies. That is, (i) total monthly rainfall for which it has been shown that, an increase in rotavirus prevalence with low rainfall(22), and (ii) monthly mean minimum and maximum temperature where an increase in rotavirus infectivity with lower temperature (14,23,24). However, rotavirus infection becomes more prevalent with increasing monthly mean relative humidity unlike in other reports (22,25,26). These observations demonstrate that climatological factors may play an important role to influence the infectivity and activity of human rotavirus in different geographical locations.

In conclusion, hospital-based studies have limitations in that they do not show the real picture of diarrhoeal infections in the community .However, those limitations don't invalidate the overall findings of this study which show rotavirus as one of the major etiological agents of diarrhoea seen in infants and younger children, with seasonal pattern. To understand the reasons for the observed different findings, conducting studies covering a longer period of time is essential.

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