Rotavirus Infection Among Hospitalized Children with Acute Watery Diarrhea In Basrah – Iraq

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Objective: To estimate the frequency and describe the clinical profile of rotavirus infection in children under five years admitted with acute watery diarrhea.

Methods: A prospective study done on 268 patients. All were investigated for the detection of rotavirus antigen in their stool by ELISA test. The report focuses on 116 (43.3%) patients in whom rotavirus was detected.

Results: The percentage of rotavirus infection among children with acute watery diarrhea was 43.3%. The percentage was higher in the first year of life and males were more affected than females. Malnourished children were at higher risk of having prolonged diarrhea and prolonged shedding of the virus from the intestine.

Conclusion: Rotavirus infection should be suspected in any patient with acute watery diarrhea, as there is no specific clinical pattern. Malnourished children are at a higher risk of developing prolonged diarrhea after rotavirus infection that may aggravate their nutritional status.

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Acute infectious diarrhea is still an important problem in children under 5 years in the developing countries, with an estimated 3–3.2 million deaths per year[1,2]. Viral agents recognized during the past decade have been shown to be responsible for a large proportion of diarrhea for which an etiological agent can be identified, including rotavirus, astrovirus, enteric adenovirus and calcivirus[3].

Rotavirus is the most common cause of severe diarrhea among children in developing countries. It accounts for an average one third of all hospitalizations for diarrhea worldwide. It causes approximately >873,000 death per year which is equivalent to 25% of all diarrheal deaths[4–6]. Rotavirus infection affects 95% of children under the age of 5 years especially in the first 2 years of life, regardless of the socio-economic or environmental conditions[6–8]. Prospective studies of diarrhea episode provides evidence that rotavirus associated diarrhea leads more frequently to dehydration and more attendance at the health facilities than all other diarrheas in the same age group[6].

Therefore the need for simple, effective and inexpensive intervention, not only to treat diarrhea but to prevent its occurrence is urgent. Many vaccines were tried and recent trials in the United States have demonstrated an efficacy of 49–73% against all rotavirus gastroenteritis. Thus the prevalence and severity of all rotavirus disease can be reduced by vaccination. Prevention of rotavirus disease by immunologic efforts may be an attainable goal[9].

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This study represents an effort to estimate the frequency of rotavirus infection in infants and children under 5 years of age hospitalized with acute watery diarrhea, to study some epidemiologic criteria and clinical profile of rotavirus infection and to look for the effect of nutritional status on the recovery from rotavirus infection.

METHODS

This study was carried out over a 5-month period (from October 1998 till the end of February 1999) and included all patients with acute watery diarrhea who were admitted to Basrah Maternity and Children Hospital. Two hundred and sixty eight patients were included in this study (145 females and 123 males). All patients were investigated for the detection of rotavirus antigen in their stool by using Rapid – Enzyme Linked Immunosorbent Assay (ELISA) test.

Rotavirus was detected in 116 patients, all of them were included in this study. Medical history, was recorded and physical examination was carried out for each patient. The following information was recorded: age, sex, residence, date of admission, type of feeding and clinical presentation. Measurements of body weight and height were taken and plotted on CDC/WHO weight for height or length to determine their nutritional status. Children whose weight for height were less than –2SD (or 2 Z scores) were considered to have faltering growth[10].

Patients with rotavirus gastroenteritis were followed by examination of rotavirus in their stools on day 3 of admission. If the test was still positive, it was repeated on day 7, 10 and 14 until negative results were obtained. Chi-square test was carried out to determine the relative importance of various variables, P value < 0.05 was considered as statistically significant and < 0.01 as highly significant.

RESULTS

Two hundred and sixty eight patients with acute watery diarrhea admitted to Basrah Maternity and Children Hospital during the 5 months study period were included in the study. Rotavirus was detected in 116 patients (43.3%). The frequency of rotavirus infection varied significantly with age, it was high during the first year of life reaching its peak between 7 – 12 months and then declined (Table 1), the frequency of rotavirus infection was also significantly higher in male patients compared to females while there was no significant difference in the frequency of infection among patients from urban and rural areas (Table 1).

Table 1. **Distribution of patients with acute watery diarrhea according to their age, sex and residence**

Variable	Rotaviral-antigen positive cases		Rotaviral-antigen negative cases		Total No.	P-Value
	No.	%	No.	%		
Age (Months)						
0 – 6	32	46.34	37	53.65	69	< 0.05
7 – 12	55	49.1	57	50.9	112	
13 – 24	28	43.75	36	56.24	64	
25 – 36	1	4.34	22	95.66	23	
Sex						
Male	67	54.47	56	45.53	123	< 0.01
Female	49	33.7	96	66.2	145	

Residence						
Urban	81	41.75	113	58.25	194	> 0.05
Rural	35	47.29	39	52.7	74	

The clinical profile of rotavirus positive cases is presented in Table 2. It is clear that infants and children with rotavirus infection can present with any form of gastroenteritis whether diarrhea alone, with either fever or vomiting or with both. Respiratory symptoms were present in 29.3% of patients.

Table 2. **Clinical profile of rotavirus – antigen positive cases**

Clinical Features	Rotaviral antigen positive cases	
	No.	**%**
Abrupt onset	93	80
Diarrhea only	15	12.93
Vomiting preceding diarrhea	40	34.48
Diarrhea, vomiting, fever	48	41.37
Diarrhea and fever	13	11.2
Dehydration	110	94.9
Respiratory symptoms	34	29.31

The type of feeding had no significant role in the protection against rotavirus infection (Table 3). This table also shows that 25.85% of rotavirus positive cases were malnourished and although higher percentage of malnourished cases were on formula feeding or mixed feeding, the difference was statistically non-significant.

Table 3. **Distribution of rotavirus-antigen positive cases according to the nutritional status and type of feeding**

Type of feeding	**Well nourished**		**malnourished**		**Total**	
	No.	**%**	**No.**	**%**	**No.**	**%**
Breast feeding	36	81.9	8	18.1	44	37.93
Formula feeding	30	68.3	14	31.6	44	37.93
Mixed feeding	20	68.5	8	31.4	28	24.13
Total	86	74.14	30	25.85	116	100

P-Value > 0.05

The duration of excretion of rotavirus among well nourished and malnourished patients are compared in Table 4. Malnourished patients had statistically significant prolonged shedding of the virus in their stool in comparison with well nourished patients.

Table 4. **Duration of excretion of rotavirus in relation to the nutritional status**

Duration of virus excretion	Well **nourished**		**malnourished**		**Total**
	No.	**%**	**No.**	**%**	**No.**
≤ 3 days	75	87.2	6	20	81
≤ 7 days	9	10.5	19	63.33	28
≤ 10 days	2	2.3	4	13.33	6
≤ 14 days	-	-	1	3.33	1
Total	86	100	30	100	116

P-Value < 0.00001

DISCUSSION

Rotavirus was identified in 43.3% of patients who were admitted to Basrah Maternity and Children Hospital with acute watery diarrhea. Previous study in Basrah (community-based study) in 1991 had shown that the prevalence of rotavirus in children under the age of 5 years was (11.84%)[11]. Studies from developing countries found that the median rate of isolation of rotavirus in children with gastroenteritis was 35% (with a range of 16 – 71%)[6]. Infants and young children under the age of 2 years show highest frequency with peak age of infection between 7–12 months, this result is similar to the result of other studies done in Basrah and other countries[8,11,12].

The study shows that male infants and children have a significantly higher rate of rotavirus infection than females, similar results have been reported in previous studies[11,12]. Although a triad of diarrhea, vomiting and fever was noted in high percentage of cases, there was no single specific clinical pattern of rotavirus infection which could be used to differentiate it from other viral or non-viral gastroenteritis. Similar results have been observed in other studies[11, 12].

In addition, in 94% of these patients, the clinical improvement and resolution of symptoms was associated with disappearance of viral excretion in the stool, although a previous study done in 1996 reported that the excretion time of rotavirus antigen was independent of the clinical course[13]. In Bangladesh, a study concluded that exclusive breast feeding prevents rotavirus infection in children during the first year of life but the infection is only postponed and it may occur during the second year of life[14]. This result is not supported by our study which revealed that breast feeding has no protective effect against rotavirus infection with high prevalence of rotavirus infection among breast fed infants and children below 2 years of age. This may indicate that the infection was rarely associated with significant increase in anti-rotaviral IgA titer in breast milk. However, breast feeding is important in the prevention of malnutrition especially in the first 6 months of life. Malnourished children have defects in their cellular and humoral immunity[15], so they are more liable to have prolonged diarrhea and more liable to become chronically infected with rotavirus.

CONCLUSION

The frequency of rotavirus infection is high among children hospitalized with acute watery diarrhea. It should be suspected in any patient with acute watery diarrhea since there is no specific clinical pattern. Malnourished children are at risk of developing

prolonged diarrhea after rotavirus infection and this may aggravate the nutritional status of these children.

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