

Frequency of Rotavirus Infection in Children with Acute Gastroenteritis in Jahrom, South of Iran

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Abstract

Background: Rotavirus is a major cause of acute diarrhea in children worldwide. It is an important cause of death among young children in developing countries. The aim of this study was to evaluate the prevalence of rotavirus infection in children less than five years old hospitalized for gastroenteritis in Jahrom.

Methods: One hundred and two stool samples were collected from children less than 5 years old hospitalized for acute diarrhea during October 2006-February 2007 in Motahary hospital, Jahrom, south of Iran. All samples were tested for rotavirus antigen by commercial enzyme linked immunoassays (ELISA) and latex agglutination test.

Results: Sixty nine stool samples (67.6%) were positive for both ELISA and latex agglutination. The mean age of the patients was 14.38 months (range 2-60 months). There was no significant difference between the patients with positive and those with negative tests for rotavirus in duration of admission, fever, vomiting, gender, and stool examination. Thirty-three percent of the patients had abnormal increased blood urea nitrogen that was normalized after hydration.

Conclusion: Rotavirus was an important cause of acute gastroenteritis in young children less than 5 years old in our hospital. Dehydration, azotemia, and electrolyte disturbances were the major problems in those patients.

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Keywords • Gastroenteritis • children • rotavirus

Introduction

Rotavirus is a major cause of acute severe diarrhea in children worldwide. It is an important cause of death among young children in developing countries.¹⁻³ In industrialized countries, despite the low mortality rate due to rotavirus infection, the infection is widespread and most children experience an episode of diarrhea caused by rotavirus in the first 5 years of life.^{1,2,4, 5} In Iran, rotavirus is the leading pathogen that causes diarrhea in children. It is responsible for about 15.3% - 78% of diarrheal disease and 36.5% of diarrhea related hospitalization.⁶⁻⁸

The aim of the present study was to evaluate the frequency and clinical characteristics of rotavirus infections among children admitted to Motahary Hospital, Jahrom, south of Iran,

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during October 2006-February 2007 with the diagnosis of acute gastroenteritis.

Patients and Methods

In a cross sectional study, 102 stool samples obtained from patients admitted to Motahary Hospital during October 2006-February 2007. All consecutive children younger than 5 years with acute diarrhea were included in the study. More than 90% of the patients were younger than 2 years. Of them 51.6% were breast fed, 33.3% were bottle fed, and the remainder had combined feeding.

All children hospitalized in the previous 15 days were excluded to avoid possible nosocomial contamination. Other excluded children were those with chronic digestive disease including celiac disease based on their medical history. Clinical examination confirmed the diagnosis of acute diarrhea, which was defined as an increase in the number of loose stools to more than the normal number (i.e., an increase to ≥ 2 loose stools per day) for a period of < 15 days. Clinical evaluation included a search for signs of lower respiratory tract disease (e.g., bronchiolitis), dehydration, and other extra digestive conditions such as otitis media. Data on clinical manifestations, complications, administration of antibiotics, and length of admission were collected by means of questionnaires and chart records.

Stool samples

Stool sample from each child was obtained only once during the first 48 h of hospitalization. All samples were stored at 4°C until further analysis. Stool samples were tested for occult blood, pus cells, and fatty drops. Stool samples were also tested for rotavirus antigen by enzyme linked immunosorbent assay (ELISA), and latex agglutination test using commercially available kit (Rotastat, Biogen, England).

At the time of admission, blood samples of patients were tested for sodium, potassium, blood urea nitrogen (BUN), and creatinine.

Data were presented as percentage, mean, and 95% confidence interval. Chi-square and unpaired *t* tests were used to establish significant differences at $P < 0.05$.

Results

One hundred and two children [50 girls (49%) and 52 boys (51%)] were hospitalized in the pediatric ward of Motahary hospital during October 2006 and February 2007. All children had diarrhea 1-8 days before their hospitalization. Eighty-six percent, 61.8%, and 71.3% of them had vomiting, history of upper respiratory infection, and fever

(temperature more than 38.5 °C), respectively. Based on the growth chart references of the National Center for Health Statistics (NCHS), 23.2% of all patients had weight less than 3 percentile for their age and sex.⁹

Rotavirus in stool specimens was detected in 69 children (67.6%), including 33 girls (47.8%) and 36 boys (52.2%). Table 1 shows the comparison of clinical characteristics of the two groups (the children with positive and those with negative tests for rotavirus) in the present study.

Table 1: characteristics of patients with positive and negative tests for rotavirus

	Rotavirus tests		P value
	+	-	
Age (mean, months)	14.4	15.3	0.74
Duration of admission (days)	3.3	3.4	0.61
Sex (M/F)	36/33	16/17	0.44
Fever	66.7%	81.3%	0.10
Abnormal stool	47.8%	46.9%	0.55
Antibiotic administration	50.7%	69.7%	0.05*
Low weight	25	19.4	0.36
URI	58.7	41.3	0.010*

M/F = Male / female, URI = Upper respiratory infection, * = statistically significant

No significant difference was found between the two groups according to duration of admission, fever, vomiting, gender, and stool examination. There was a significant difference in upper respiratory symptoms in patients with rotavirus infection with those without the infection (53.6 v 46.4, $P = 0.012$).

Mean BUN and creatinine were 15.5 ± 11 and 0.61 ± 0.2 mg/dl, respectively. 33.3% of the patients had abnormal BUN (more than 18 mg/dl) that became normal after hydration. 12.7% of the patients had hypokalemia (serum potassium less than 3.5 mEq/l). Stool examination showed abnormal finding including occult blood, pus cell, or both in 47.8%.

Of the patients, 50.7% received antibiotic during hospitalization. There was a significant difference in duration of admission between those who consumed antibiotic and those patients who did not receive antibiotic. The patients who used antibiotic had longer duration of hospitalization (3.5 days, $CI = 2.26-3.87$ v 3.1 days $CI = 2.93-3.29$ $P = 0.010$).

Discussion

The present study was the first that evaluated the epidemiologic characteristics of hospitalized children with acute viral gastroenteritis in this hospital. The results for 102 stool samples were analyzed. The number of stool samples that were positive for rotavirus was similar with the number reported in other

studies. These hospitalized children represent a small percentage of infected children. Acute viral gastroenteritis is generally treated by general practitioners or family pediatricians.

In 124 children aged 0-5 years with acute diarrheal diseases treated during 18 months at the pediatric clinic HMC "Kragujevac" city in Serbia, viruses were the causes in 27% of the patients.¹⁰ In Saudi Arabia a review of 22 published studies during 1982-2003 on rotavirus was carried out and the etiology of diarrhea was evaluated. The prevalence of rotavirus infection ranged from 10% to 46% with a median of 30%. Most patients were children less than 2 years old (particularly in the first year of life) that was similar to the results of our study.¹¹ In Jordan, the cumulative proportion of cases attributable to rotavirus gastroenteritis during 2002-2004 was 27.14%.¹²

During 1996-1999, acquired gastroenteritis was diagnosed in 757 children in Poland. Of them, 41% tested positive for rotavirus. Most of them were less than 24 months old.¹³ Six hundred thirty-eight stool samples were collected from children under 5 years of age seeking medical care for acute diarrhea during October 2003-September 2005 in hospitals in Eastern-Center Tunisia. The frequency of rotavirus infection was 20%.¹⁴ Some studies have been conducted in Iran for detection of rotavirus infection in children with acute gastroenteritis.¹⁵⁻¹⁷ In Ahvaz, during November 2001 to March 2002, rotavirus was isolated from 36 (26.3%) of the 137 stool samples of out-patients and from 23 (36.5%) of the 63 stool samples of in-patients.¹⁵ In Tehran, rotavirus was detected in 15.3% of children less than 5 years old suffering from diarrhea. Infants between 6 and 12 months of age were most frequently affected.⁷ In children younger than 5 years old with acute diarrhea in Shahrekord, the prevalence of rotavirus was 78%.⁸

During the winter to spring of 2002-2003 and 2003-2004, children younger than 36 months old presenting with acute gastroenteritis in the United States were enrolled in a study. One hundred and fifteen (40%) of tested specimens were positive for rotavirus with a range of 31%-50% across the 5 centers.¹⁶

In two studies on children younger than 5 years hospitalized for gastroenteritis in Quebec and Thailand, during autumn and winter, rotavirus tests were positive in 71.7% and 43.68%, respectively.^{17,18}

In comparison with some other studies, the prevalence of rotavirus infection in our study was higher. With regard to the above mentioned studies, it seems that the difference in the prevalence of rotavirus infection can be related to times of studies and in-patients

versus out-patients population. The prevalence was more than 40% in studies conducted in cold seasons and in patients admitted to hospitals. For example, the prevalence of rotavirus infection in report from Quebec, which was performed in winter and in hospitalized patients, was high (71.7%).

In most patients with gastroenteritis caused by rotavirus, dehydration was detected during a clinical examination and confirmed by laboratory evaluation. Approximately 33.3% of the patients in the present study had abnormal BUN (more than 18 mg/dl), which was normalized after hydration.

The mean age of the patients in our study was 14.38 months. This was similar to some studies reported from other countries, however, it was higher than some other reports. For example, in Guatemala, a major study reported that the mean age of children infected with rotavirus was 9 months.¹⁹ Some authors suggest that maternal antibodies against rotavirus offer better protection to infants, which could possibly explain the low incidence of rotavirus infection in infants aged 0-6 months.²⁰⁻²¹

In the present study the patients who received antibiotic had more prolonged course of hospitalization. There is good evidence that the complex microbial flora presenting in the gastrointestinal tract is effective in providing resistance to the disease. However, the composition of this protective flora can be altered by antibiotics.²² In contrast, restoration of the intestinal milieu by various agents such as probiotics have a definite positive effect on rotavirus diarrhea.^{23,24} Also, prior antimicrobial treatment should be recognized as an important risk factor for extended treatment among critically ill children.²⁵

According to the high frequency (67.6%) of rotavirus induced diarrhea found in this study, rotavirus might be considered as an important cause of acute gastroenteritis in young children less than 5 years old in our hospital. Dehydration, azotemia, and electrolyte disturbances were the major problems in these patients that need to be evaluated and treated.

Rapid diagnosis of rotavirus by a simple laboratory test in children with acute gastroenteritis can reduce unnecessary antibiotic administration.

Conflict of Interest: None declared

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