

Prevalence of Rotavirus in Children with Acute Gastroenteritis, Seasonal Distribution, and Laboratory Findings in the Southeast of Turkey

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Abstract

Objective: Acute gastroenteritis is a major health problem associated with high morbidity and mortality in children. Group A rotavirus is the most common cause of acute gastroenteritis in childhood. The clinical signs are nonspecific; so, the analysis of viral antigen in the stool specimen is important for the diagnosis. In this study, we aimed to determine the frequency, seasonal distribution, and laboratory findings of rotavirus gastroenteritis in children 0-16 years old.

Material and Methods: A total of 3607 children who applied between March 2012 and February 2013, with complaints of acute gastroenteritis, were investigated retrospectively. Patients with chronic disease, immune deficiency, malnutrition, and chronic gastroenteritis were excluded from the study. Rotavirus antigens were detected in the stool of 597 (16.5%) patients by qualitative immunochromatographic assay. It has a sensitivity of 92.2% and a specificity of 96.5% for detection of Rotavirus antigen. Laboratory findings were recorded from the patients' charts. The frequency of rotavirus gastroenteritis was evaluated according to age and seasonal distribution. Statistical analysis was performed using Statistical Package of Social Science (SPSS), version 15.0.

Results: Viral antigens were determined in 597 (16.5%) of 3607 patients. Three hundred fifty-six (59.6%) children were male. The incidence of rotavirus-positive cases was higher during autumn and spring and higher (18.8%) in 0-24-month-old pediatric groups ($p<0.05$). The most common pathologic laboratory findings were leukocytosis (20%), thrombocytopenia (19.5%), and leukopenia (12.6%) in the blood count and hyponatremia (13.4%), hypochloremia (9.6%), and hypokalemia (7.8%) in the biochemical test. Additionally, 56 (14.2%) of the patients had metabolic acidosis.

Conclusion: The results of this study indicated that rotavirus was a frequent cause of acute gastroenteritis in infants, and it should be routinely, especially during autumn and spring. It is necessary to closely monitor fluid and electrolyte deficiency in patients with rotavirus infections. (*J Pediatr Inf 2014; 8: 7-11*)

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Introduction

Acute gastroenteritis is a major health problem associated with high morbidity and mortality in young children. It is crucially important to be aware of the factors and prevalence of acute gastroenteritis in terms of an efficient therapy. Viruses are detected as etiologic factors in 70% of the cases in whom acute gastroenteritis is

experienced in the first five years of a person's life (1). Rotaviruses (RV), Enteric Adenoviruses (Ead), Norwalk and Norwalk-like viruses, norovirus and caliciviruses are the most common and clinically important ones (2). Among these viruses, rotavirus group A is the most prevalent acute gastroenteritis factor in children under 5 year old and babies all over the world (3). Rotavirus infections progress with the symptoms of vomit-

ing, watery diarrhea and fever. The most prevalent complications of rotavirus gastroenteritis are; dehydration, electrolyte disorders, metabolic acidosis and malnutrition (4).

Many centers carried out studies to determine the prevalence of rotavirus in children with acute gastroenteritis and seasonal distribution in an attempt to identify epidemiologic characteristics of rotavirus infections in our country. However, it is clearly seen that the number of patients and laboratory findings were limited in most of those studies. This retrospective study in which the number of patients was high and the laboratory features in rotavirus diarrheas were examined aimed to make a contribution to epidemiologic data of rotavirus diarrheas in our country.

Material and Methods

597 patients, whose rotavirus antigens were positive out of the total of 3607 patients diagnosed as acute gastroenteritis between the dates of 1st of March, 2012 and 28th of February, 2013 were included in this retrospective study. The patients based on their ages were divided into four groups of 0-24 months, age 2-5, age 2-5 years, 5-12 years, above 12 years (5). Acute gastroenteritis was defined as a condition that lasted less than 14 days and as watery diarrhea in three or more times a day (6). The patients with chronic illnesses, immune deficiency, malnutrition or chronic gastroenteritis were excluded from the study. The diagnosis of acute gastroenteritis was made by the determination of rotavirus antigen in the stool. The presence of rotavirus in the stool was investigated in accordance with the procedure of the kit by using qualitative immunochromatographic method (Simple/Stick Rota Adeno Operon, Spain). It has a sensitivity of 92.2% and a specificity of 96.5% for detection of rotavirus antigen. Hemogram, routine biochemical and blood gases analyses of 395 (66.1%) patients whose rotavirus antigen was found positive and laboratory results were accessible were examined. Pediatric reference ranges based on age was used for the evaluation of laboratory test results (7).

Statistical analysis

The data were analyzed by using the Statistical Package of Social Science (SPSS), Version 15.0. For the evaluation of categorical variables (such as age and season), Chi-square Test was used. For statistical significance, the *p* value <0.05 was used. The results were given a frequency and percentage.

Result

Rotavirus antigen positivity was detected in 597 (16.5%) of the 3607 patients included in this study. Of the

cases in whom rotavirus antigen positivity was found, 241 (40.4%) of them were females and 356 (59.6) were males and the difference between the genders were not significant (*p*=0.27).

Given the age distribution of the patients who applied to the hospital because of acute gastroenteritis complaints, it was revealed that majority of them (64.5%) were under two years of age. Given the rates of rotavirus antigen positivity based on age groups, it was revealed that the highest rate of positivity was in the 0-24 months age group with 18.8% and the lowest rate of positivity in children above 12 years with 6.6% (Table 1). In respect of seasonal distribution of patients, it was revealed that the highest number of hospital visits due to acute gastroenteritis was in autumn and summer and the most prevalent rotavirus antigen positivity was in autumn and spring (Table 2). In respect of monthly rotavirus antigen positivity rates among the patients visiting the hospital because of acute gastroenteritis, it was revealed that the rate reached its peak with 29.3% in November; and within the period of one year, the rates were more intensive in the months of January, April, October and November; they became rare in June, July and August (Figure 1).

In 395 (66.1%) rotavirus antigen positive patients, in addition to stool analysis, hemogram, routine biochemistry and blood gases were also performed. In hemogram analyses, leukocytosis (20%), thrombocytopenia (19.5%) and leukopenia (12.6%) were the most frequent pathologic findings. In routine biochemical analyses, hyponatremia (13.4%), hypochloremia (9.6%) and hypopotassemia (7.8%) were the most frequent pathogenic findings. Besides, metabolic acidosis was found in 56 (14.2%) of the patients (Table 3).

Discussion

Acute gastroenteritis continues to be an important health problem and the fundamental reason for the mortality and morbidity in children. Rotaviruses are the most frequent factor for the viral gastroenteritis progressing with acute dehydration (8). The rates of rotavirus positivity in acute gastroenteritis cases differ from country to country, even from region to region within the same country. According to the World Health Organization (WHO), it is reported that the average rotavirus positivity is 20-40% in Europe, 5-25% in the United States, 30-50% in Asia and 10-65% in Africa (9). In the studies carried out between 2006 and 2010 in our country where rotavirus antigen was examined through immunochromatographic method, it was reported that rotavirus antigen was 18.7% (10, 11) in İstanbul, 27.8% (12) in Kayseri, 21% (13) in Konya and 16.7% (14) in Mardin. The rotavirus positivity in this study was 16.5%. Even though this prevalence is

Table 1. Age group distribution of rotavirus antigen positivity

Age groups	Rotavirus positive patient number n (%)	Rotavirus negative patient number n (%)	Acute gastroenteritis patient number n (%)	p
0-24 month	439 (18.8)	1888 (81.2)	2327 (100)	<0.001
2-5 years	106 (15.2)	591 (84.8)	697 (100)	
5-12 years	46 (9.3)	447 (90.7)	493 (100)	
>12 years	6 (6.6)	84 (93.4)	90 (100)	
Total	597 (16.5)	3010 (83.5)	3607 (100)	

Table 2. Seasonal distribution of acute gastroenteritis and rotavirus prevalence

Seasons	Rotavirus positive patient number n (%)	Rotavirus negative patient number n (%)	Acute gastroenteritis patient number n (%)	p
Spring	171 (20.8)	652 (79.2)	823 (100)	<0.001
Summer	62 (5.5)	1065 (94.5)	1127 (100)	
Autumn	325 (22.8)	1100 (77.2)	1425 (100)	
Winter	39 (16.8)	193 (83.2)	232 (6.5)	
Total	597 (16.5)	3010 (83.5)	3607 (100)	

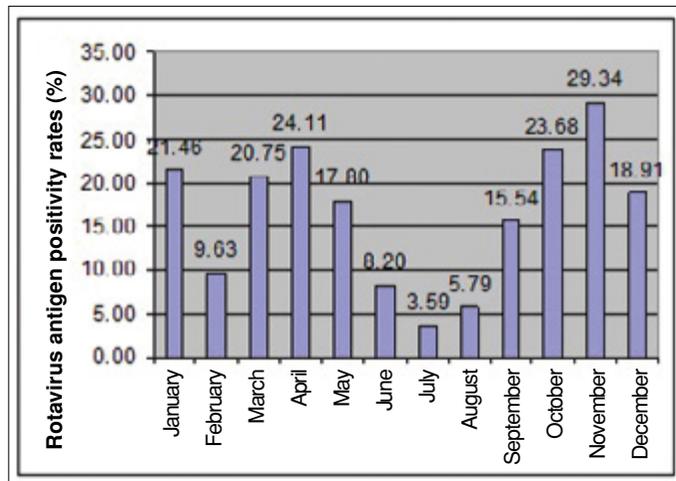


Figure 1. Monthly distribution of rotavirus antigen positivity rates

low in comparison to the previous studies in our country, it has some parallels with the recent studies.

Majority of the previous studies revealed that there was no gender-based difference in the frequency of viral gastroenteritis (15). However, in a study done in Turkey reported that rotavirus was significantly more frequent in male children and adenovirus in male children (16). In this study, even though males outnumbered, there was no statistical difference.

In countries with mild climate, rotavirus infections are more common especially in cold seasons (end of autumn, winter, beginning of spring). While rotavirus is common in all seasons of a year in tropical countries, it is more frequent in some countries in dry seasons. In the relevant literature, there are studies reporting more intense rotavirus infections in autumn and winter seasons (11, 14); there

Table 3. Laboratory findings of rotavirus antigen positive patients

Laboratory findings	Patient numbers*	%
Leukocytosis	79	20.0
Thrombocytopenia	77	19.5
Leukopenia	50	12.6
Metabolic acidosis	56	14.2
Hyponatremia	53	13.4
Hypochloremia	38	9.6
Hippopotami	31	7.8
Hyperpotassemia	7	1.7
Hyperchloremia	7	1.7
High level of urea	7	1.7
Hypernatremia	5	1.2
High level of creatinine	5	1.2

*Laboratory results; registered patient number was less than the total number of patients

also exist some studies reporting increase in winter and spring seasons (12). Even though rotavirus infections are more common in winter seasons, recent studies have reported some changes in the epidemiology of the virus after the rotavirus vaccines have come into use (17, 18). In this study, while rotavirus frequency was high in autumn and spring seasons as compatible with the relevant literature, it was found relatively lower than those studies in the literature in winter. Although rotavirus positivity is common as a factor of acute gastroenteritis, different studies have reported real values in different seasons (19-21). In this study, rotavirus frequency reached its peak in November (29.3%). In the studies done in Turkey, it was reported that the most common reason of viral gastroenteritis especially

in children aged 0-5 was rotavirus and adenovirus serotype 40-41 (2, 19, 20, 22). While rotavirus infection is common in all age groups, symptomatic infection is more common in children under two years (23). In this study, it was revealed in line with the literature that majority of the patients were children under two years and that the highest rotavirus positivity rates were again in the same age group.

Since loss of water and salt was a variable in childhood diarrheas, laboratory findings vary as well. When many rotavirus studies carried out nationally as well as internationally are examined, it is clearly seen that information about laboratory features is very limited. In a study in which childhood gastroenteritis were assessed, it was reported that the most common laboratory findings were metabolic acidosis (47.17%), hyponatremia (9.89%) and high level of urea (31.07%) (24). In a study done in Turkey, on the other hand, metabolic acidosis (3.5%) and pre-renal failure (4.5%) were reported to be the most common laboratory findings (25). Similarly, in another study in which 40 patients were assessed, high level of urea (72.5%) and metabolic acidosis (85%) were reported to be the most common laboratory findings (26). In this study, it was revealed that leukocytosis (20%), thrombocytopenia (19.5%), metabolic acidosis 14.2 (%), hyponatremia (13.4%) and hypochloremia (9.6%) were the most common pathologic laboratory findings.

In rotavirus gastroenteritis, it is possible to encounter complications such as neurologic (encephalitis, convulsion, intracerebral hemorrhage), gastrointestinal (invagination, hepatitis) or seconder bacteremia. Even though the fact that high number of cases was available, its potential to provide information about rotavirus epidemiology in our region and that its laboratory features were debated strengthened our study, the limitations of our study are that our study is retrospective one and that the complications mentioned above were not explicated due to lack of sufficient data in the files.

Conclusion

Rotavirus is an important gastroenteritis factor in children under two years of age. The rotavirus in gastroenteritis prevalent in autumn and spring seasons should be especially investigated and it should be closely scrutinized in respect of loss of liquid and electrolytes.

Ethics Committe Approval: Ethics committee approval was not received due to the retrospective nature of this study.

Informed Consent: Written informed consent was not obtained due to the retrospective nature of this study.

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