

Prevalence of rotavirus and adenovirus in children with acute gastroenteritis

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Abstract

Background: Rotaviruses and adenoviruses are the commonly isolated viral agents from the patients with acute gastroenteritis and cause severe diarrhea in children younger than five years. Epidemiologic knowledge of the prevalence of these viruses is important for infection control policies and vaccination programs. Under this scope, we aimed to present the prevalence of rotaviruses and adenoviruses and their seasonal variations among pediatric age group patients with the diagnosis of acute gastroenteritis, which was determined by the immunochromatographic method in our region.

Material and Methods: We evaluated the stool samples of the pediatric age group patients with the diagnosis of acute gastroenteritis during one-year period of January 1st to December 31st in 2015 by using an immunochromatographic assay to determine the rotavirus and adenovirus antigens.

Results: During the one-year study period we examined the stool samples of 7994 pediatric patients. Rotavirus antigen was positive in 453 (5.7%) of the samples, whereas adenovirus antigen was positive in 176 (2.2%) of the samples. Acute gastroenteritis cases due to rotavirus dominated mainly in winter (9.5%) and spring (8.9%) and adenovirus affected patients more in spring (3.2%) and summer (2.6%).

Conclusion: We have determined the prevalence of rotavirus antigen positivity as 5.7% and adenovirus antigen positivity as 2.2%, which are both relatively low compared to the other studies from Turkey. Seasonal variations are only observed for rotaviruses. Prevalence rates from different studies conducted in different parts of the country together with the rates from this study, will contribute the baseline epidemiologic knowledge for implantation of vaccination programs and infection control policies in Turkey.

Key words: Rotavirus, adenovirus, acute gastroenteritis, immunochromatography

Introduction

Acute gastroenteritis is a large clinical definition. Diarrhea, nausea, vomiting, epigastric pain and fever are the most prevalent symptoms. The disease may cause excessive loss of body fluids, which in turn can result in life-threatening dehydration, especially in infants and small children (1).

Whatever the cause, whether infectious or non-infectious etiology, acute gastroenteritis is the second leading cause of death in children younger than five years of age after lower respiratory tract infections worldwide and is responsible up to 11% of the deaths in this age group (2-4).

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The causative agent of acute gastroenteritis is commonly acquired by fecal-oral route, contaminated surfaces and water sources, rarely by dissemination via droplets, and transmission by these ways are explanatory enough to explain the vigorous prevalence of the disease (5, 6). Underdeveloped countries, especially the ones in Africa and South-East Asia are under particular risk of infectious gastroenteritis due to limited socio-economical resources (7).

Bacterial agents were determined as the most common cause of acute gastroenteritis in the past, however, in the last one or two decades, viral etiology has become more frequently identified with the advances in the ability to detect viral agents from patients suffering diarrhea (1). Rotaviruses and adenoviruses are the commonly isolated viral agents from the patients with acute gastroenteritis and cause severe diarrhea in children younger than five years. Rotaviruses are the members of Reoviridae family and they are double-stranded RNA virus contained in a triple-layered capsid. Rotaviruses are examined under seven major groups defined as A to G according to the inner capsid protein VP6 (8). Rotaviruses (mainly the group A rotaviruses) cause up to 50% of the severe acute gastroenteritis cases (9). On the other hand, adenoviruses, which are also one of the common causes of diarrhea, are double stranded DNA viruses belonging to the Adenoviridae family. Adenoviruses have six species (A to F) and more than 50 serotypes that have the capability to infect many kinds of tissues, including intestines, respiratory tract and eyes (10, 11). Epidemiologic knowledge of the prevalence of these viruses is important for infection control policies and vaccination programs. Under this scope, we aimed to present the prevalence of rotaviruses and adenoviruses and their seasonal variations among pediatric age group patients with the diagnosis of acute gastroenteritis, which was determined by the immunochromatographic method in Turkey.

Material and methods

Patients and Samples We retrospectively evaluated the stool samples of the pediatric age group patients with the diagnosis of acute gastroenteritis during one-year period of Jan. 1st to Dec. 31st in 2015, in the clinical microbiology laboratory of a university hospital. The stool samples were tested as soon as they were delivered to the laboratory.

Immunochromatography testing

True Line Rota/adeno Cassette Test® (Biocare Diagnostic, Zhunzai, China) was used to determine the qualitative interpretation of the presences of the rotavirus and adenovirus in the stool samples. This test briefly uses a homogenous immunochromatographic system with gold particles and results in approximately 5 to 15 minutes. The testing procedure was carried out as the instructions of the manufacturer.

Statistical analysis

Commercial statistical software SPSS version 22.0 (SPSS Inc., Chicago, IL, USA) was used to perform descriptive analysis and frequency tables.

Results

During the one-year study period, we have evaluated the stool samples of 7994 pediatric patients. Rotavirus antigen was positive in 453 (5.7%) of the samples, whereas adenovirus antigen was positive in 176 (2.2%) of the samples. When seasonal variations of rates of the antigen positivity were evaluated, the highest rates of rotavirus were determined in the months Jan. 98(13.1%) and Feb. (13.4%). For the adenovirus, highest rates were detected in July 34(4.6%), Feb. 15(3.9%) and June 18(3.6%). Rotavirus and adenovirus antigen positivity rates, according to months in 2015 were listed in the Table 1.

Table 1. Rotavirus and adenovirus antigen positivity according to months.

Months	Rotavirus		Adenovirus	
	Positive n (%)	Total	Positive n (%)	Total
Jan.	98(13,1)	748	3(2,0)	150
Feb.	80(13,4)	597	15(3,9)	382
Mar.	55(8,4)	651	24(3,4)	702
Apr.	47(10,8)	436	17(3,5)	485
May	21(7,0)	299	9(2,5)	361
Jun.	13(2,8)	459	18(3,6)	504
July.	24(3,5)	685	34(4,6)	744
Aug.	18(1,9)	942	11(1,0)	1139
Sept.	16(2,0)	805	14(1,8)	799
Oct.	20(2,5)	809	10(1,1)	887
Nov.	29(4,1)	705	6(0,7)	843
Dec.	32(3,7)	858	15(1,5)	998
Total	453(5,7)	7994	176(2,2)	7994

Rate of rotavirus and adenovirus antigen positivity vary according to seasons (Figure 1). Acute gastroenteritis cases due to rotavirus dominated mainly in winter (9.5%) and spring (8.9%) and adenovirus affected patients more in spring (3.2%) and summer (2.6%).

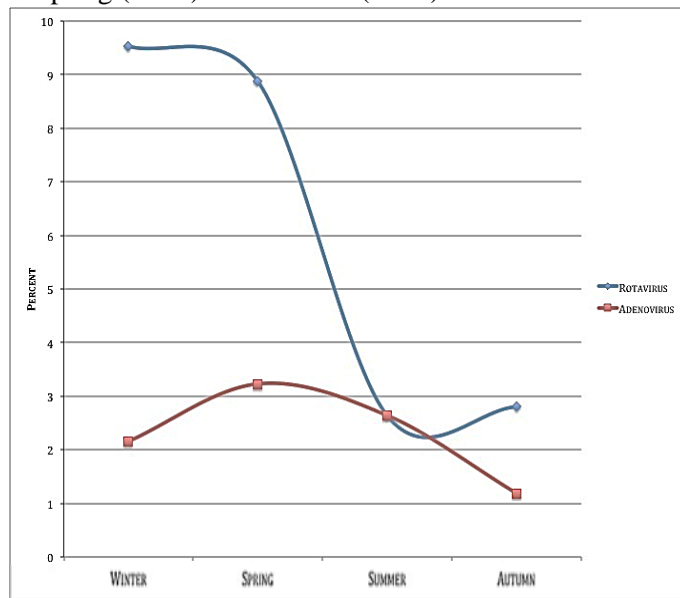


Figure 1. Seasonal variations in rates of rotavirus and adenovirus antigen positivity.

Discussion

More than 2 billion cases of diarrheal disease are reported worldwide every year. Dramatically, 1.9 million of children younger than 5 years of age die from diarrhea each year according to the data from WHO and UNICEF, most of the losses occur in developing countries (2, 12). Most commonly identified infectious agents from the stool samples of the acute gastroenteritis pediatric patients are the viruses and rotaviruses are being the most prevalent (1, 8). Also adenoviruses are responsible for approximately 5-15% of the infectious diarrheal diseases in preschool children (13, 14).

We have determined the prevalence of rotavirus as 5.7%, which is relatively low compared to the other studies from our country. Rotavirus positivity in pediatric patients is ranged 13.5% to 43.6 in various papers from different regions (13, 15-19). This may result from the wide heterogeneity of the socioeconomic status of the regions, which can be easily and directly connected to rates the fecal-oral transmitted diseases. Another point is that the rotavirus vaccination program is not fully implemented in Turkey but its use in pediatric ages is advised. The vaccine is available on market and its use

will contribute further decrease in the rates of rotavirus. Adenovirus prevalence is relatively lower than that of rotaviruses and we determined the adenovirus antigen positivity as 2.2%. According to the data from different studies conducted in Turkey, adenovirus positivity is determined between the ranges 1.4% to 10% (18, 19, 20). We have clearly observed the seasonal characteristics and periodic fluctuations of rotavirus gastroenteritis in this study (Figure). The rates were higher in winter and spring (9.5% and 8.9%) when compared to the rates in summer and autumn (2.6% and 2.8%). In many observational studies, peaking of acute gastroenteritis cases in dry and cold seasons, typical characteristics of winter and early spring, is demonstrated (21, 22). Also in some studies, it is stated that adenovirus gastroenteritis is seen more often in winter, but there is not enough evidence about the seasonal changes related to adenoviral diseases (13, 23). We have determined a slight increase in adenovirus positivity in spring and summer but this is not significant enough to set clear comment on the seasonal fluctuations of the disease.

Immunochromatographic assay is easy-to-use and easy-to-interpret diagnostic tool and largely implanted in many laboratories (24). Unnecessary use of antibiotics can be eliminated with the results of such assays. However, when compared to the molecular methods due to vulnerability to false positive and false negative results together with cross-reactivity, the choice of the commercial immunochromatographic assay becomes important in the era of high-tech laboratory methods (24). According to the data from Turkish Rotavirus Surveillance Network, rotavirus RNA was detected by reverse transcription polymerase chain reaction in 78.2% of the samples, which were previously reported as rotavirus antigen positive (8). It is clear that the use of the molecular methods helps us not only to understand the structure of the viruses but also aids developing vaccines against these viruses.

Conclusion

We have presented the prevalence of rotavirus antigen positivity regarding our region with that of adenoviruses, before the introduction of rotavirus vaccination program in Turkey. Seasonal variations are only observed for rotaviruses. Prevalence rates from different studies conducted in different parts of the country together with

the rates from this study, will contribute the baseline epidemiologic knowledge for implantation of vaccination programs and infection control policies in Turkey.

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