



# Frequency of rotavirus and adenovirus in pediatric patients with acute gastroenteritis

## Akut gastroenteritli çocuk hastalarda rotavirüs ve adenovirüs sıklığı

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### Abstract

**Introduction:** Early detection of viral gastroenteritis is important because it causes hospitalizations in children and administration of antibiotics unnecessarily. Rotavirus and adenovirus are the most common viral pathogens in childhood gastroenteritis. The aim of this study was to investigate the rate of rotavirus and adenovirus in stool samples sent from children with acute gastroenteritis.

**Methods:** The results of stool samples sent to the Tokat Gaziosmanpaşa University Medical Faculty Research and Practice Hospital Microbiology Laboratory for the investigation of rotavirus and adenovirus antigens from children diagnosed with gastroenteritis between January 2017 and January 2018 were evaluated retrospectively. Rotavirus and adenovirus 40/41 antigens were detected by immunochromatography.

**Results:** There were 1635 and 1608 patients' samples analyzed for rotavirus and adenovirus antigens, respectively. Rotavirus was detected in 133 (8.1%) patients, adenovirus in 30 (1.8%) and both agents in seven (0.4%) patients. Rotavirus antigen positivity was found to be significantly higher ( $p<0.05$ ) in the patients aged between 13–24 months compared to other age groups. There was no significant difference between age groups in terms of adenovirus positivity ( $p>0.05$ ). The majority of rotavirus gastroenteritis cases were seen in the winter (43.6%) and it was statistically significant ( $p<0.05$ ).

**Discussion and Conclusion:** Rapid antigen testing for viral gastroenteritis agents contributes to the planning of gastroenteritis treatment and decreases unnecessary antibiotic usage in children. It has been also concluded that it is important to consider the possibility of rotavirus gastroenteritis in children older than five years since 13.5% of patients were in this group.

**Keywords:** Acute gastroenteritis; adenovirus; rotavirus.

### Özet

**Amaç:** Çocuklarda hastanede yatışlara ve gereksiz antibiyotik kullanımına neden olmasından dolayı viral gastroenteritlerin erken tanımlanması önemlidir. Rotavirüs ve adenovirüs çocuklarda en sık rastlanan viral gastroenterit etkenleridir. Bu çalışmanın amacı akut gastroenteritli çocuk hastalardan alınan gaita örneklerinde rotavirüs ve adenovirüs sıklığının araştırılmasıdır.

**Gereç ve Yöntem:** Bu çalışmada Tokat Gaziosmanpaşa Üniversitesi Tıp Fakültesi Araştırma ve Uygulama Hastanesi Mikrobiyoloji Laboratuvarı'na Ocak 2017 – Ocak 2018 tarihleri arasında gastroenterit tanısı alan çocuklardan, rotavirüs ve adenovirüs antijenleri araştırılmak üzere gönderilmiş olan gaita örneklerinin test sonuçları retrospektif olarak değerlendirildi. Rotavirüs ve adenovirüs 40/41 antijenleri immüno-kromatografi yöntemi ile araştırıldı.

**Bulgular:** Çalışmada rotavirüs antijenleri araştırılmak üzere gönderilmiş olan 1635 hastanın gaita örneği ile adenovirüs antijenleri araştırılmak üzere gönderilmiş olan 1608 hastanın gaita örneği analiz sonuçları değerlendirildi. 133 hastada (%8.1) rotavirüs, 30 hastada (%1.8) adenovirüs ve yedi hastada (%0.4) rotavirüs ve adenovirüs birlikte pozitif olarak tespit edildi. Rotavirüs antijeni pozitifliği 13–24 aylık grupta diğer yaş gruplarına göre istatistiksel olarak anlamlı düzeyde yüksek ( $p<0.05$ ) saptandı. Adenovirüs pozitifliği açısından yaş grupları arasında istatistiksel olarak anlamlı fark görülmedi ( $p>0.05$ ). Rotavirüs gastroenterit vakalarının büyük kısmının (%43.6) kış mevsiminde olduğu ve bunun istatistiksel olarak anlamlı olduğu tespit edildi ( $p<0.05$ ).

**Sonuç:** Gastroenteritlerde viral etyolojiyi ortaya koymak için yapılan hızlı antijen testleri tedavi planının yapılması ve gereksiz antibiyotik kullanımının azaltılmasına katkı sağlayan testlerdir. Çalışmamızda rotavirüs antijen pozitifliği saptanan gruptaki hastaların % 13.5'inin beş yaş üstü olmasından dolayı, beş yaşından büyük çocuklarda da rotavirüs gastroenteritinin görülme ihtimalinin göz önünde bulundurulmasının önemli olduğu kanaatine varıldı.

**Anahtar Sözcükler:** Adenovirüs; akut gastroenterit; rotavirüs.



Acute gastroenteritis is a major cause of hospitalisation, morbidity and mortality in children especially in developing countries.<sup>[1]</sup> Causative agents of acute gastroenteritis in children are various; some bacterial pathogens such as *Campylobacter* spp., *Salmonella* spp. and *Shigella* spp., parasites such as *Entamoeba histolytica* and *Giardia intestinalis*, as well as viruses.<sup>[2]</sup> It has been observed the frequency of gastroenteritis due to viruses is increasing steadily while a significant decrease in bacterial and parasitic gastroenteritis is achieved with the increasing protection measures. Incidence of viral gastroenteritis; distinct from others, are not affected by socioeconomic conditions and hygiene measures and have similar frequencies in developed and developing countries. However it is known to be associated with high mortality in developing countries whereas with high morbidity and financial burden in developed countries.<sup>[3-5]</sup>

Among the viral acute gastroenteritis agents, rotavirus<sup>[6]</sup> is the most common pathogen and the second is adenovirus.<sup>[4]</sup> Rotavirus is more common in children younger than five years especially under 24 months of age. Immune response against rotavirus antigens develops slowly with repeated infections and the incidence decreases with increasing age.<sup>[7]</sup>

Early identification of viral agent is important because gastroenteritis causes hospitalizations in children and unnecessary antibiotic use. The aim of this study was to investigate the frequency of rotavirus and adenovirus in children with acute gastroenteritis.

## Materials and Method

The study was approved by Tokat Gaziosmanpaşa University Faculty of Medicine Clinical Research Ethics Committee (Project number: 18-KAEK-010).

The results of analysis of stool samples sent to Gaziosmanpaşa University Medical Faculty Research and Practice Hospital Microbiology Laboratory for detection of rotavirus and adenovirus antigens from children aged between 0-18 ages with diarrhea between January 2017 and January 2018 were evaluated retrospectively. Rotavirus and adenovirus 40/41 antigens were investigated by immunochromatography method with

Ecotest Rotavirus and Adenovirus Combo Rapid Test (Assure Tech, Zhejiang, China) by manufacturer's recommendations in fresh stool samples. The sensitivity and specificity of the test were reported by the manufacturer as > 99.1% and > 99.9% for rotavirus, > 99.9% and > 99.4% for adenovirus, respectively.

Patients were grouped according to ages as; 0-12 months, 13-24 months, 25-60 months and 61 months and older. For statistical analysis Chi-square test was used for comparison between groups and a p value of 0.05 or less was considered to be significant.

## Results

There were 1.635 and 1.608 patients' samples analyzed for rotavirus and adenovirus antigens, respectively. Rotavirus was detected in 133 of 1635 (8.1%), adenovirus in 30 of 1608 (1.8%) and both agents in 7 of 1608 (0.4%) patients.

In the rotavirus positive group; 86 (64%) of the patients were male and median age of patients was 21 months (2-201 months). There wasn't any significant relation between rotavirus antigen positivity and gender ( $p > 0.05$ ). The majority (43%) of the patients in this group were between 13-24 months of age and rotavirus antigen positivity was found to be significantly higher in this age group compared to other age groups ( $p < 0.05$ ) (Table 1).

The majority of rotavirus gastroenteritis cases were occurred in the winter season (43.6%) and it was statistically significant ( $p < 0.05$ ) (Table 2).

In the adenovirus positive group; 17 (56%) of the patients were male and median age of patients was 32 months (3-192). There was no statistically significance between adenovirus positivity and gender or age groups ( $p > 0.05$ ) (Table 1). Likewise no seasonal difference were seen in the incidence of adenoviral gastroenteritis (Table 2).

## Discussion

The clinical signs and symptoms of rotavirus gastroenteritis were variously on a wide spectrum from mild symptoms which easily confines itself such as nausea, vomiting and low grade fever, to severe dehydration even leading to death. Diar-

**Table 1. Frequency of rotavirus and adenovirus antigen according to age groups of patients**

	Rotavirus				p	Adenovirus				p
	Negative		Positive			Negative		Positive		
	n	%	n	%		n	%	n	%	
Ages										
0-6 month	188	12.5	9	6.8		191	12.1	3	10.0	
7-12 month	163	10.9	19	14.3		170	10.8	3	10.0	
13-24 month	275	18.3	47	35.3	<b>&lt;0.001</b>	314	19.9	6	20.0	0.866
25-60 month	322	21.4	40	30.1		344	21.8	9	30.0	
60 ay-18 years	554	36.9	18	13.5		559	35.4	9	30.0	

**Table 2. Distribution of rotavirus and adenovirus gastroenteritis cases by seasons**

Seasons	Rotavirus					Adenovirus				
	Negative		Positive		p	Negative		Positive		p
	n	%	n	%		n	%	n	%	
Winter	309	20.6	58	<b>43.6</b>	<0.001	345	21.9	11	36.7	0.103
Spring	265	17.6	36	27.1		283	17.9	3	10.0	
Summer	539	35.9	16	12.0		534	33.8	6	20.0	
Autumn	389	25.9	23	17.3		416	26.4	10	33.3	

rhea, vomiting and fever are the most common symptoms.<sup>[8]</sup> Adenovirus causes similar symptoms with rotavirus but less vomiting and dehydration.<sup>[9]</sup>

Oyinloye et al. reported that different frequencies for rotavirus infection in two different regions of Nigeria was detected, as 4% and 9.3% and this was attributed to the differences of toilet type and toys used by children.<sup>[10]</sup> In Turkey, rates of rotavirus infections among gastroenteritis cases were reported differently in various studies. It was found to be 16% in Duzce,<sup>[11]</sup> 9.8% in Konya<sup>[12]</sup> 17.5% in Corum<sup>[13]</sup> and 11.7% in Samsun.<sup>[14]</sup> In our study, it was found 8.1%. Different results in the studies may be due to both regional climatic differences and the selection of cases for ordering fecal analysis for detecting rotavirus antigens.

According to the European Centre for Disease Prevention and Control (ECDC) report 2017 based on 46 studies in 17 European countries; 300–600 of every 100.000 children under the age of five years were hospitalized due to rotavirus infection) and among rotavirus gastroenteritis cases hospitalisation ratio was reported to be 26% to 69%. This wide range is thought to arise from utilization of different diagnostic methods, such as polymerase chain reaction or antigen identification and seasonal fluctuations.<sup>[15]</sup>

In our study, in accordance with the literature, the rate of rotavirus gastroenteritis was more common in children under five years of age.<sup>[12,13,16,17]</sup> Regarding this issue, it is important to consider the possibility of rotavirus gastroenteritis in children older than five years since 13.5% of our patients were older than five years. In some other studies from Turkey similar age distribution was found. For instance, Turk Dagi et al. reported that rotavirus gastroenteritis was more frequent in children aged 0–2 years.<sup>[12]</sup> Gureser et al. found that rotavirus gastroenteritis was seen more frequently in the age group of 7–24 months and 25 months–4 years.<sup>[13]</sup> Calgın et al. reported that rotavirus gastroenteritis was seen more frequently in the 13-month–4 age group.<sup>[17]</sup>

For rotavirus gastroenteritis it is known that vaccination decreases incidence and severe dehydration, hospitalisation, morbidity and mortality.<sup>[18]</sup> Kayıran et al. were shown that the incidence of rotavirus gastroenteritis was 3.6% in children with rotavirus vaccination, all of whom were determined to have a

high socio-economic status in a private hospital in Istanbul.<sup>[19]</sup> It is noteworthy that the incidence of rotavirus infections in children with vaccination was lower than those children without vaccination.

Seasonality of rotavirus infections may variable according to the climatic conditions. In countries with temperate climates like Turkey, rotavirus epidemics occur during colder months of the year, especially during winter as it was in our study, while endemic or sporadic cases occur in other months. In some other studies from Turkey; the majority of the cases were reported to occur in winter and autumn in Duzce,<sup>[11]</sup> winter and spring in Samsun,<sup>[14]</sup> spring and winter in Istanbul,<sup>[19]</sup> spring in Karabuk.<sup>[20]</sup> In tropical countries, the seasonal variation is less pronounced and rotavirus infections may occur endemically throughout the year.<sup>[21]</sup> For adenovirus, we did not find any significant relation with seasons and this was in accordance with the other studies in Turkey.<sup>[14,16,21]</sup>

In our study the rate of adenovirus antigen positivity was 1.8% and this was reported as 6% in Duzce,<sup>[11]</sup> 1.3% in Konya,<sup>[12]</sup> 3.3% in Corum,<sup>[13]</sup> 3.3% in Samsun<sup>[14]</sup> and 3.2% in Isparta.<sup>[22]</sup> Adenovirus gastroenteritis was not related with age groups, similar to that reported in Duzce<sup>[11]</sup> and Konya.<sup>[12]</sup> In our study, the proportion of patients co-infected with adenovirus and rotavirus was 0.4%. This was reported as 1% by Turk Dagi et al.<sup>[12]</sup> and 1.3% by Gureser et al.<sup>[13]</sup>

In conclusion, rapid antigen testing for viral gastroenteritis agents contributes to the planning of gastroenteritis treatment and decreases unnecessary antibiotic usage in children. It has been also concluded that it is important to consider the possibility of rotavirus gastroenteritis in children older than 5 years, since 13.5% of patients were in that age group in our region.

**Conflict of interest:** There are no relevant conflicts of interest to disclose.

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