Original Article / Özgün Araştırma

Investigation of the Enteric Adenovirus Antigen Frequency by Immunochromotographic Method in Children with Acute Gastroenteritis

Akut Gastroenteritli Çocuklarda Enterik Adenovirüs Antijen Sıklığının İmmünokromatografik Yöntemle Araştırılması

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Abstract

Objective: Gastroenteritis is the third common cause of death due to infections. After rotavirus, adenoviruses are also one of the reasons frequently seen in gastroenteritis in infants and children. This study is performed to determine the incidence of enteric virus serotype 40 and 41 in children with acute gastroenteritis in order to enable prompt and appropriate treatment.

Materials and Methods: Stool specimens of patients who attended our clinic with a diagnosis of acute gastroenteritis between January 2013 and December 2013 were examined for the presence of enteric adenovirus (Ad40 and Ad41) antigen using immunochromatographic methods.

Results: One hundred and two stool samples from 3206 were positive for adenovirus antigens. Adenovirus antigen positive-patients aged 0-5 years constituted 82.3% of patients. Adenovirus infections were observed in all seasons of the year.

Conclusion: In our country, the epidemiology of adenovirus infection is not known very well. According to the data we obtained from the results of this study, we assume that idntifying viral agent in patients with diarrhea in an accurate, prompt and reliable way can prevent unnecessary antibiotic use and can contribute seroepidemiologic data in childhood gastroenteritis in our region.

Öz

Amaç: Gastroenteritler enfeksiyonlara bağlı ölümler arasında ilk üç sırada yer almaktadır. Bebekler ve çocuklardaki gastroenteritlerin rotavirüslerden sonra diğer sık görülen nedenlerinden biri de adenovirüslerdir. Bu çalışma, akut gastroenterit nedeniyle başvuran çocuk hastalarda enterik adenovirüs serotip 40 ve 41 insidansını inceleyerek uygun tedaviye kısa sürede başlanabilmesi amacıyla yapılmıştır.

Gereç ve Yöntemler: Ocak 2013-Aralık 2013 tarihleri arasında, akut gastroenterit tanısıyla başvuran 0-14 yaş grubu hastaların dışkı örneğinde enterik adenovirüs (Ad40 ve Ad41) antijen varlığı immünokromatografik yöntem kullanılarak araştırıldı.

Bulgular: Üç bin ikiyüzaltı dışkı örneğinden 102'sinde (%3,2) adenovirüs antijenleri saptandı. Sıfır-beş yaş arası grup olguların %82,3'ünü oluşturmaktaydı. Adenovirüs enfeksiyonu yılın her mevsiminde görülmüştür.

Sonuç: Ülkemizde adenovirüs enfeksiyonu seroepidemiyolojisi çok iyi bilinmemektedir. Yaptığımız bu çalışma sonucu elde ettiğimiz verileri değerlendirdiğimizde ishal şikayeti ile

başvuran hastalarda viral etkenin doğru, hızlı ve güvenilir bir şekilde tanımlanarak bölgemizde görülen çocukluk çağı gastroenteritlerinde seroepidemiyolojik verilere katkıda bulunacağı ve gereksiz antibiyotik kullanımının önüne geçilebileceğini düşünmekteyiz.

Introduction

Diarrhea has emerged as a major health problem all over the world, especially in developing countries. Gastroenteritis is among the first three causes of deaths due to infections (1). Viruses are responsible for the vast majority of childhood diarrhea. Enteropathogenic viruses are the main factors blamed. Rotaviruses followed by adenoviruses are the major pathogens causing gastroenteritis in infants and children. Adenoviruses are double-stranded, non-enveloped DNA viruses. There are 51 different serotypes of adenoviruses and they can be classified into 6 subgenera (A-F). Certain serotypes show specific tissue tropism and lead to specific diseases. They can be found in the stool during and after upper respiratory tract infection but only subgenus F; serotype 40 and 41, more rarely serotype 31, cause gastroenteritis (2,3). Enteric adenoviruses (Ad40 and Ad41) that are acute gastroenteritis factors cause milder and self-limiting infection. However, they may become persistent and life-threatening in immunocompromised patients. Prolonged viral excretion of adenovirus even after infection symptoms disappeared can facilitate epidemics in pediatrics clinic (3). It may occur in a large part of the year; it is slightly more common in the summer. It affects mainly children under 4 years of age; those aged 6 months-2 years attending kindergartens are at higher risk for gastroenteritis. Reinfection can be seen. Incubation period is 3-10 days. Adenovirus enteritis often causes diarrhea lasting 10-14 days (3,4). Clinical symptoms of viral gastroenteritis is not specific to the infective agent, thus, laboratory support is required to determine the factors. Since it can cause death and effective treatments have not been developed yet, viral gastroenteritis must be followed by active surveillance and epidemiological studies. Many studies have been done to determine the agent of gastroenteritis. There are a limited number of epidemiological studies performed on patients admitted to hospital due to gastroenteritis. The epidemiology of adenovirus (Ad40 and Ad41) infection in childhood diarrhea in Turkey, and especially in the southwestern part of Turkey is not known very well.

This study was performed to determine the incidence of enteric virus serotype 40 and 41 in children with acute gastroenteritis by immunochromatographic method in order enable early appropriate treatment as soon as possible by studying the age and seasonal distribution.

Materials and Methods

Stool specimens of patients aged 0-14 years admitted to the Emergency Room and Pediatric Outpatient Clinic at Isparta Obstetrics and Pediatrics Hospital with a diagnosis of acute gastroenteritis between January 2013 and December 2013 were examined for the presence of enteric adenovirus (Ad40 and Ad41) antigen using immunoassay methods (Adenostrip C-1003 BioConcept Belgium). Patients who had chronic or persistent diarrhea were excluded. Fresh stool samples were checked with strips recognizing adenovirus 40 and 41 antigens via immunochromatography. After the suspension of fresh stool samples in buffer solution, contact was made with the strip, and the results were evaluated after 5 minutes. All procedures were performed according to the manufacturer's instructions. Adenovirus antigen test was done in the microbiology laboratories at our hospital. Test results and demographic data of the cases found positive and negative were obtained retrospectively from patient records in the hospital information processing unit, microbiology and pediatric emergency unit records. The distribution of antigen positivity in patients asked for adenovirus antigen test was made according to the relationship of demographic data and seasons. Statistic analysis of the data was performed using the Statistical Package for the Social Sciences (SPSS) statistical version 18 for Windows (SPSS Inc., Chicago, IL, USA). Data were presented as frequency and percentage. Chi-square test was used to compare genders for viral antigen positivity. A p value of less than 0.05 was considered statistically significant.

Results

Of 3206 stool samples, 102 (3.2%) were positive for adenovirus antigens. Fifty-three patients were

male and 49 were female. There was no statistically significant difference in viral antigen positivity between genders (p>0.05). Patients aged 0-5 years with adenovirus antigen positivity constituted 82.3% of patients. The infection was more prevalent in children under the age of 2 years (n=61; 59.8%) (Table 1). When examining the distribution by months, it showed peak in November and December. Seasonal distribution of adenovirus infections was as follows: summer: 34.3% (n=35), winter: 30.3% (n=31), spring 22.6% (n=23), and fall: 12.8% (n=13) (Graphic 1).

Discussion

Infectious diarrhea is still one of the major health problems in the world. Viral gastroenteritis has an important place among infectious diarrheas especially in childhood. Adenoviruses are the most common cause of acute viral gastroenteritis after rotavirus infection (1,2). Detecting the virus responsible from gastroenteritis is important for treatment and to predict prognosis. Subgenus F; serotypes 40 and 41 are the most common cause of diarrhea due to adenovirus (3,4). Determining the antigen in the stool is possible with a rapid immunochromatographic assay. This method is preferred due to its consistency with the results obtained by antigen ELISA, resulting in a short time such as 10 minutes, with high sensitivity and can be easily studied in a small amount of stool samples (93-100%). Rotavirus followed by adenovirus is considered the most common cause of viral gastroenteritis in the literature (2,3). Only in one study performed in Guatemala, it was reported that enteric adenovirus was seen 3 times more frequently than rotavirus and this has been linked to climate variations (5). Ahluwalia et al. (6) stated that the prevalence of childhood gastroenteritis caused by adenovirus was 4.1%. In their studies done in our country by Gül et al. (7), and Biçer et al. (8), the incidence of gastroenteritis caused by adenovirus was found to be 4.7% and 16.2%, respectively. In our study, adenovirus was found in 102 stool samples from 3206 (3.2%) which falls slightly below the national and world average. It has been reported that although it is slightly more common in the summer, gastroenteritis caused by adenovirus may occur in a large part of the year (2,5,9). In studies performed in our country, Akıncı et al. (10) found that the adenovirus-related gastroenteristis was seen equally throughout the year, a little more often in the summer. In their study, Gül et al. (7) found that the incidence of rotarivirus-positive cases among children aged 1-2 years was higher in January and February. In our study, gastroenteritis caused by adenovirus was seen more often during the summer and winter, mostly in August, November and December. Adenovirus-related gastroenteritis can occur in all age groups (5,11). It has been shown that adenovirus was the most common cause of gastroenteritis in children under 2 years of age (7,12). Bates et al. (9) found that 50% of children with adenovirus-detected gastroenteritis were under 2 years of age, Hazar et al. (12) reported that 35% of children infected with adenovirus were aged 6-11 months and 35% were 1-2 years of age. Gül et al. (7) found that 57.1% of children were 1-2 years and 28.6% were 0-1 years of age. Consistent with those of the previous studies, our results show that most of the children who were diagnosed with gastroenteritis due to adenovirus (59.8%) were under 2 years of age.

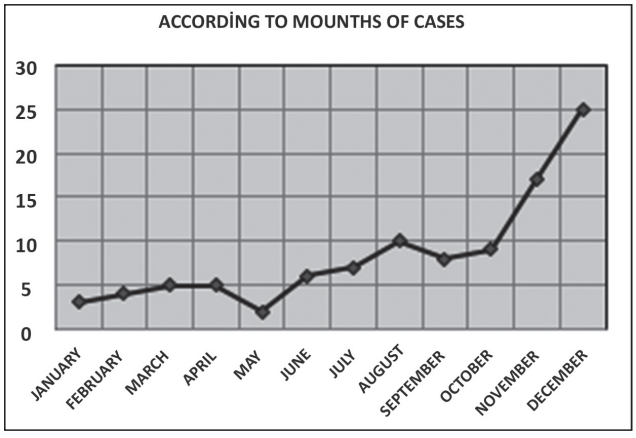
There have been very few studies showing significant gender difference in viral gastroenteritis.

Cruz et al. (5) detected significantly higher incidence of the enteric adenovirus in men.

Akıncı et al. (10) also reported that gastroenteritis caused by adenovirus was more common in males.

Table 1. The distribution of cases by ages groups

According to the age groups of cases		
Groups of ages (year)	Number (n)	Percentage (%)
0-2	61	59.8
2-5	23	22.5
6-11	14	13.7
12->	4	4.0
Total	102	100



Graphic 1. The distribution of cases by month

In our study, 53.9% of children with adenovirus were male and 46.1% were female and, there was no significant difference between genders (p>0.05).

Due to limited laboratory conditions in developing countries, diagnosis and surveillance of bacterial pathogens of diarrhea and most of the viral infection cannot be made precisely. Factors causing gastroenteritis vary among geographic regions. Knowing the probable regional gastroenteritis factors may contribute to the accurate diagnosis and effective treatment and also may be a guide for selection of an appropriate antibiotic for conditions requiring antimicrobial therapy.

Conclusion

While microbiological agents have been investigated in general, viral agents that are responsible for the significant portion of gastroenteritis have not been investigated because of insufficient infrastructure and the technical requirements in most of our hospitals. Antimicrobial resistance due to unnecessary use of antibiotics is still a major health problem which should be solved. We assume that to be able to make a diagnosis of gastroenteritis due to enteric adenovirus quickly by detection methods such as stool antigen immunochromatographic assay is important. Identifying viral agent in patients with diarrhea in an accurate, fast and reliable way can prevent unnecessary antibiotic use and can contribute to seroepidemiologic data on childhood gastroenteritis in our region.

Ethics

Ethics Committee Approval: Retrospective study.

Informed Consent: Retrospective study.

Peer-review: Internally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: O.A., Concept: O.A., Design: O.A., Data Collection or Processing: O.A., H.A., Analysis or Interpretation: O.A., Literature Search: H.A., Writing: O.A.

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