Annals of "Dunarea de Jos" University of Galati
Fascicle I. Economics and Applied Informatics
Years XXVIII – nº2/2022
ISSN-L 1584-0409 ISSN-Online 2344-441X
www.eia.feaa.ugal.ro

DOI https://doi.org/10.35219/eai15840409280

The Management of Adenovirus Infection in the Children's Hospital from Galati

Elena-Roxana MATACHE★, Daniela ONISOR★★, Lucian PEPTINE★★★, Larisa GOROFTEI★★★★, Diana-Andreea CIORTEA★★★★★

ARTICLE INFO

Article history:
Accepted September 2022
Available online September 2022
JEL Classification
A39, I19

Keywords:
adenovirus, children, health management, immunochromatographic method, gastroenteritis

ABSTRACT

Adenoviruses represents one of the primary pathogens responsible for children hospitalization. The aim of this study was to analize the incidence, clinical and laboratory characteristics in pediatric patients infected with adenovirus. It was conducted a retrospective study on a number of 117 patients, ages between 0-16 years, having clinical signs of gastroenteritis, admitted to the Emergency Clinical Hospital for Children "Sf. Ioan" from Galati, between January and November 2022. The clinical history, socio-demographic characteristics, physical examination findings and laboratory investigations were recorded. Stool samples were collected from children on presentation to the hospital before starting therapy. From the total of 1602 patients investigated for adenovirus infection, 117 were positive (7%). The season with the most cases recorded was autumn (11.13%). The most affected age group was 1-3 years (45,29%). Admission symptoms were diverse, vomiting (34%) and diarrheal stools (26%) being the most commonly seen in positive patients. Laboratory tests revealed an elevated CRP (46,15%), leukocytosis (17,09 %) and hydroelectrolytic imbalances: low sodium (36,75%) and an elevated potassium (6,83%). In 35% of cases, coinfections were found. Adenoviruses detection rate is correlated to season and age, in our study being risen mostly in autumn and in pediatric patients between 1 to 3 years. The predominant symptoms at admission were digestive. Our study reveales that adenoviruses can be one of the main causes for viral gastrointestinal infections in children. The management of adenovirus infection focuses on the treatment of dehydration, diet, probiotics and symptomatic drugs, although the use of anti-emetics can be indicated in some cases.

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1. Introduction

Lower respiratory tract infections (LRTIs) are one of the leading causes of hospitalization and mortality among young children worldwide (1). In the pediatric patient, most LRTIs are the result of viruses such as: adenovirus, respiratory syncytial virus (RSV), severe acute respiratory syndrome (SARS), coronavirus, (RSV), human metapneumovirus, influenza A and B and bocavirus (2).

Human adenoviruses (HAdVs) are doubled-stranded DNA viruses that spread by close personal contact, respiratory droplets, direct conjunctival inoculation, fecal oral route, or contact with infected tissues or surfaces and are responsible for a wide range of clinical syndromes including upper respiratory tract infection, pneumonia, nephritis, hemorrhagic cystitis, hepatitis, and enteritis. (3). Also, in Europe and the United States, have been associated with adenovirus infection recent cases of hepatitis outbreaks, including severe liver failure in children. In most of these cases, adenovirus infection causes mild disease, but in some cases, infection is severe enough to cause death. Because adenovirus infection does not fully explain the more severe cases, investigations are still ongoing given (4).

HAdV were first isolated in 1953 as respiratory pathogens [5] and to date, over 60 types of HAdV have been identified and classified into seven species (A to G) [6]. Cases of severe infection, outbreaks in closed populations, and even epidemic outbreaks have been associated with the newly emerging or re-emergent types or variants [7]. Very interestingly, different types of HAdV display various tissue tropisms that correlate with different clinical manifestations of infection and HAdV infections of the respiratory tract are predominantly caused by HAdV-B (including subspecies B1 and B2), HAdV-C, or HAdV-E. Also, the predominant types vary among different countries and regions, and they change over time because transmission of novel strains between countries or across continents may occur [8].

★, ★★★★, ★★★★★Dunarea de Jos University of Galati, Romania, Emergency Clinical Hospital for Children, "St. Ioan", Galati, Romania, ★★Dunarea de Jos University of Galati, Romania, ★★★Emergency Clinical Hospital for Children, "St. Ioan", Galati, Romania. E-mail address: danielaghimpu76@yahoo.com (D. Onisor – Corresponding author).

Khanal *et al.* (2018) reported that most adenoviral infection (AdVI) are self-limited and rarely cause serious infection in adults and healthy children. However, they can be life threatening to immunocompromised hosts, neonates and infants. For this reason, most of the recommendations for treatment for these infections focus on immunocompromised patients, particularly allogenic transplant patients, who carry the greatest risk of life-threatening infections (9).

The aim of this study was to analize the incidence, clinical and laboratory characteristics in pediatric patients infected with adenovirus.

2. Material and method

A retrospective study was conducted, in which 117 patients were analised, 60 girls (51%) and 57 boys (49%), aged between 0-16 years, having clinical signs of gastroenteritis and admitted to Emergency Clinical Hospital for Children "Sf Ioan" Galaţi, during January to November of 2022.

The biological samples were collected according to the instructions provided by the laboratories.

The method used to identify adenovirus was immunochromatographic test, which detects the specific antigens present in the stool samples. The patients were also tested for other pathogens such as: norovirus, rotavirus, *Campylobacter*, *Clostridium*.

qRT-PCR tests were performed to detect ARN SARS-Cov-2 from nasopharyngeal swabs and blood samples were collected in order to run the following tests: CBC (complete blood count), CRP (C-Reactive Protein), Sodium, Potassium, AST (Aspartate transaminase), ALT (alanine aminotransferase), alkaline reserve.

The results were collected from the databases of the Emergency Clinical Hospital for Children "St. Ion" Galati and were statistically processed by Microsoft EXCEL software.

3. Results and discussions

The incidence of adenovirus infections was 7% (117/1602 cases). Detection rate peaked during autumn with a percentage of 11,13 % (44/395), being significantly different from the rates registered in spring 5,72% (27/472), summer 6,36% (30/471) and winter 4.98% (13/261). The month in which the most positive cases were registered was October. (Figure 1).

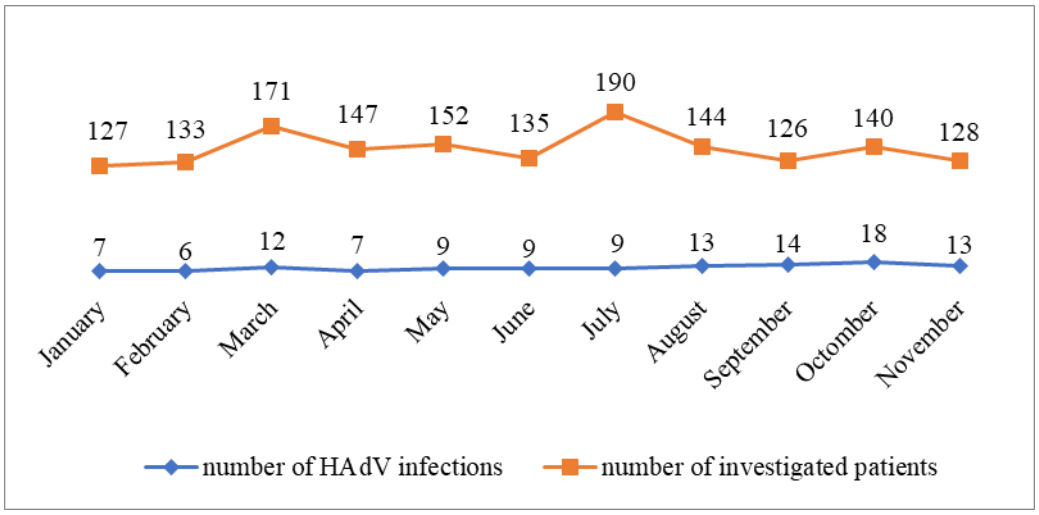

Figure 1. Monthly distribution of HAdV infections in 2022

Source: authors' contribution

The age group distribution of adenovirus positive cases was: <1 year – 10,25% (12 cases), 1-3 years – 45,29% (53 cases), 3-5 years – 26,49% (31 cases), ≥ 5years -17,94% (21 cases) (Figure 2).

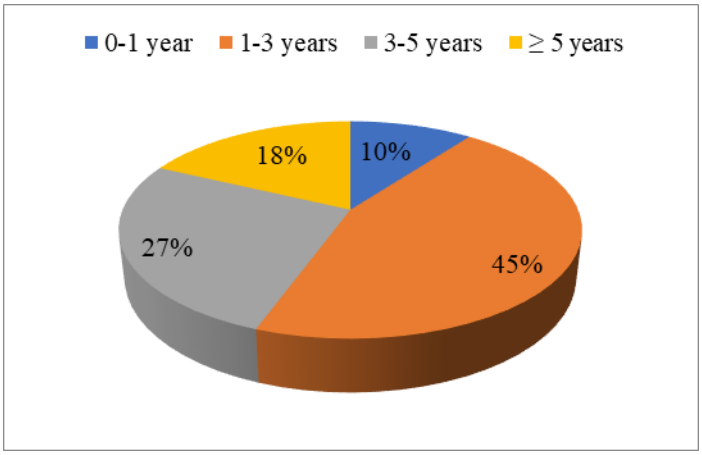

Figure 2. Distribution of HAdV infections by age group

Source: authors' contribution

Out of the group of 117 patients, 96 presented digestive symptoms at admission (82,05%) and 21 presented respiratory symptoms (17,94%). Vomiting (34%, 85 cases) and diarrhea (26%, 76 cases,) were the most frequent symptoms in positive patints while the other clinical manifestations were fever (15%, 37 cases), cough (9%, 24 cases), loss of appetite (5%, 13 cases), rhinorrhea (4%, 9 cases), abdominal pain (3%, 8 cases), drowsiness (2%, 5 cases), convulsions (1%, 3 cases), and headache (1%, 2 cases). (Figure 3). The duration of hospitalization varied from 1 to 11 days, with an average duration of 3 days.

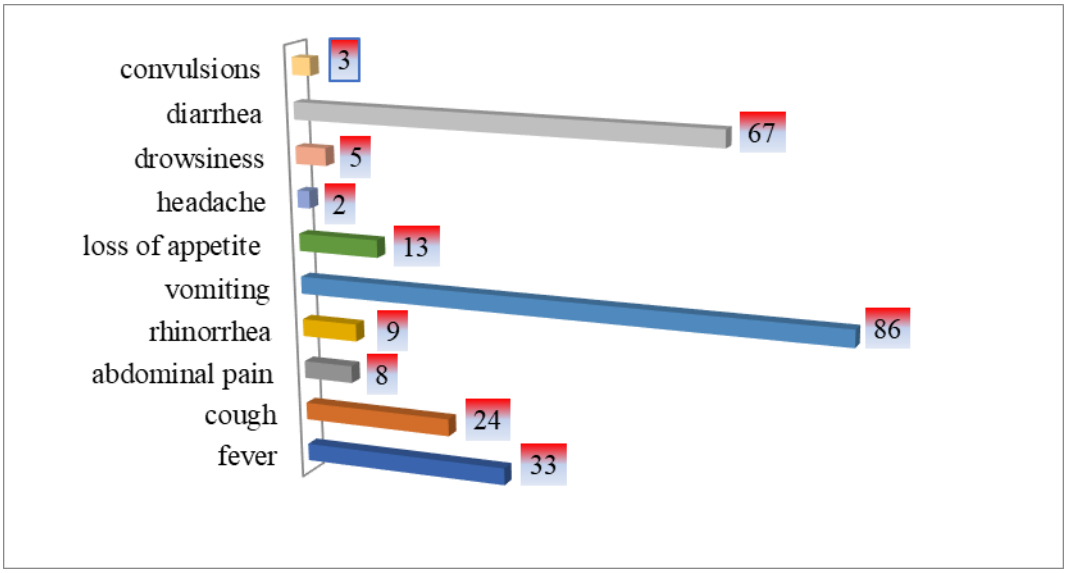

Figure 3. Distribution of HAdV infections according to admission symptoms

Source: authors' contribution

Laboratory tests revealed an increased level of CRP in 46,15% of cases (54), leukocytosis in 17,09% of cases (20), hydroelectrolytic changes: low sodium 36,75% (43) and increased potassium 6,83% (8) (Table 1) .

In 35% of cases, coinfections with different pathogens were detected: rotavirus, norovirus, SARS-CoV-2, toxin A and toxin B synthesized by *Clostridium difficile*.

The management of the patients admitted with acute gastroenteritis due to adenovirus focused on treatment and prevention of dehydration. In most situations, the clinician will not know at the start of treatment whether gastroenteritis is caused by adenovirus or another pathogen. For this reason, the initial assessment focuses on determining the degree of dehydration, as this will be used to guide and monitor treatment.No specific drug treatment is available for AdVI, but oral rehydration solutions have been shown to be highly effective and at low cost.(10).

In the literature, preventive measures are reported that have demonstrated variable efficiency in different conditions. But to be effective, these measures must be combined and rigorously applied by everyone in the hospital wards (health care workers, patients, visitors). There are many barriers to the implementation of such prevention policies and may explain their overall relative utility (11)

Our study also had limitations. The type of adenovirus was not identified in the investigated patients, as this is related to the severity of the disease. The need for identification is important so that clinicians can administer adequate and early treatment in severe cases.

Table 1 Analytical data of patients positive for adenovirus infection

	Number of positive patients for adenovirus infection	N, %
High WBC count	20	17.09
High CRP	54	46.15
High AST	59	50.42
High ALT	14	11.96
Decreased alkaline reserve	97	82.90
Decreased Sodium	43	36.75
Increased Potassium	8	6.83
Coinfection with norovirus	7	5.98
Coinfection with rotavirus	32	27.35
Coinfection with toxin A and B synthesized by *Clostridium difficile*	1	0.85
Coinfection with SARS-CoV-2	1	0.85

Source: authors' contribution

4. Conclusions

The detection rate of adenoviruses is related to the season and age, in our study being particularly increased in autumn and in pediatric patients between 1 to 3 years. The predominant symptomatology at admission was the digestive one. The majority of cases were mild or moderate, and the management of the infection involved hydroelectrolytic balancing, diet. administration of probiotics and symptomatic treatment. This study provides evidence that adenoviruses can be one of the main causes of gastrointestinal viral infections in children and it is necessary to identify the type of adenovirus so that clinicians can administer adequate and early treatment in severe cases.

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