

## THE INCIDENCE OF ADENOVIRUS AND ROTAVIRUS IN PEDIATRIC PATIENTS WITH GASTROENTERITIS

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### Abstract

*Symptomatic or asymptomatic pediatric diarrhea is a worldwide public health problem, one of the important causes of morbidity and mortality in children 5 years and below. The main causes of viral acute gastroenteritis in the childhood are adenoviruses, rotaviruses, astroviruses and caliciviruses, especially between six months and two years of age.*

*The aim of this paper was to establish the incidence of gastroenteritis with adenovirus and rotavirus in pediatric patients in Curtea de Arges (Arges) in 17 months (between January 1<sup>st</sup>, 2021 and June 1<sup>st</sup>, 2022).*

*The immunochromatographic assay was used with OnSite Rota/Adeno Ag Rapid Test for viral antigens simultaneous detection in stool samples.*

*There were differences between number of infections with rotavirus or adenovirus, depend of children age and patients gender (the rotavirus infections were more frequent than those determined by adenoviruses, in male patients, between six and 18 months age), and the co-infections were occurred, too (10.75% from all cases).*

*Keywords: adenovirus, gastroenteritis, rotavirus*

### 1. INTRODUCTION

Discovery of adenoviruses was due to Wallace Rowe and his colleagues in 1953 from an adenoid tissue (and for this reason were termed adenoviruses<sup>TM</sup>). After twenty years, over 30 different types of such viruses were identified. It was demonstrated that these viruses determine clinical syndromes (like upper and lower respiratory tract infections, keratoconjunctivitis and pediatric gastroenteritis). The epidemiological studies between 1960 and 1970 showed the adenovirus infections are frequently and it cause 5 - 10% of all febrile illness in infants and small children (Bennett et al., 2019).

Adenoviruses are non-enveloped viruses, 70-90 nm in diameter and icosahedral capsid consist of 252 capsomers (240 hexons and 12 pentons). Each penton bears a slender fiber, different lengths depend of serotype (Chifiriuc et al., 2015). Human adenoviruses have a linear double stranded DNA genome in the middle of capsid, with a protein covalently attached to its 5' end.

Most respiratory infections with adenovirus occur in the late winter, spring and early summer in children (types 1, 2, 3, 5). The adults present serum antibodies against adenoviruses, because the

infections are frequently in childhood. The epidemics of pharyngoconjunctival fever are frequently in summer, but there are no seasonal distributions for adenoviral gastroenteritis.

Some of adenoviral types have been implicated in self-limited infections, but types 1-5, 7, 14, 21 have been associated with serious diseases, according to tissue tropism of virus (Bennett et al., 2019). Certain types of adenovirus replied in intestinal epithelial cells and are present in stool samples. Two serotypes (40 and 41) were associated with pediatric gastroenteritis, being abundant in diarrheal stool (Brooks et al., 2013).

Rotavirus genus is part of Family Reoviridae and it causes of severe, dehydrating gastroenteritis in children less than 5 years of age, mostly in winter and spring under temperate climate conditions (Gureser et al., 2017). The incidence of rotavirus infections is high because are shed in high concentration in the stool of infected person; it is very stable in the environment and may remain active for weeks or months.

Rotaviruses (called “rotavirus” because of its similarity in appearance to a wheel) are non-enveloped relatively large viruses, with an icosahedral capsid consist of three distinct concentric protein layers. They have three important antigenic features; group, subgroup, and serotypes. Rotaviruses are classified into seven serological distinct groups (A-G), based primarily on epitopes in VP6 protein (inner shell antigen). Inside the capsid, the double stranded RNA genome of rotavirus is composed of 11 segments. Human infections are caused by A, B, C groups of Rotavirus, but group A is the most important (Generalov, 2016).

The vaccine against rotavirus has demonstrated broad effectiveness across rotavirus serotypes (Angel et al., 2014; Bennett et al., 2018).

## 2. MATERIALS AND METHODS

The samples were collected from 484 patients aged 1 day to 16 years, between January 1<sup>st</sup>, 2021 and June 1<sup>st</sup>, 2022. These boys and girls were hospitalized with viral gastroenteritis in Curtea de Arges (in Table 1 is shown the age group distribution of cases).

The informations about patient were related to age, gender, symptoms (diarrhea, vomiting, fever, abdominal pain, dehydration), laboratory tests.

*Table 1. The distribution of studied cases*

Age groups	Boys	Girls	Total
0-30 days	4	5	<b>9</b>
1-3 months	22	13	<b>35</b>
4-11 months	70	42	<b>112</b>
12-23 months	78	33	<b>111</b>
24-35 months	30	26	<b>56</b>
36-47 months	18	14	<b>32</b>
48-59 months	21	16	<b>37</b>
60-71 months	12	11	<b>23</b>
>72 months	29	40	<b>69</b>
<b>Total</b>	<b>284</b>	<b>200</b>	<b>484</b>

The stool samples were used to gain information about the cause of gastroenterological disease. They were tested in the laboratory by rapid tests. The immunochromatographic assays were used

with OnSite Rota/Adeno Ag Rapid Test for viral antigens simultaneous detection in stool samples (Figure 1). The fast detection of adenovirus and rotavirus antigens were done in the acute period of illness. The rapid tests use antibodies against specific viral antigens and had high sensitivity. The results were correlated with biochemical and haematological parameters (white blood cells count, neutrophils number, hemoglobin and hematocrit, C-reactive protein).



Figure 1. OnSite Rota/Adeno Ag Rapid Test positive for rotavirus (original)

### 3. RESULTS AND DISCUSSIONS

Among 484 studied cases, 186 (38.42%) presented viral gastroenteritis with adenovirus and/or rotavirus (Figure 2). The rotaviruses were more frequent than adenoviruses and co-infections were just 20 cases. These results showed the well known higher incidence of rotavirus gastroenterological infections.

Among all patients, 30.2% were breast-fed infants, and 1.9% was vaccinated with rotavirus vaccine. Both methods protect infants and small children against adenovirus and rotavirus gastroenteritis.

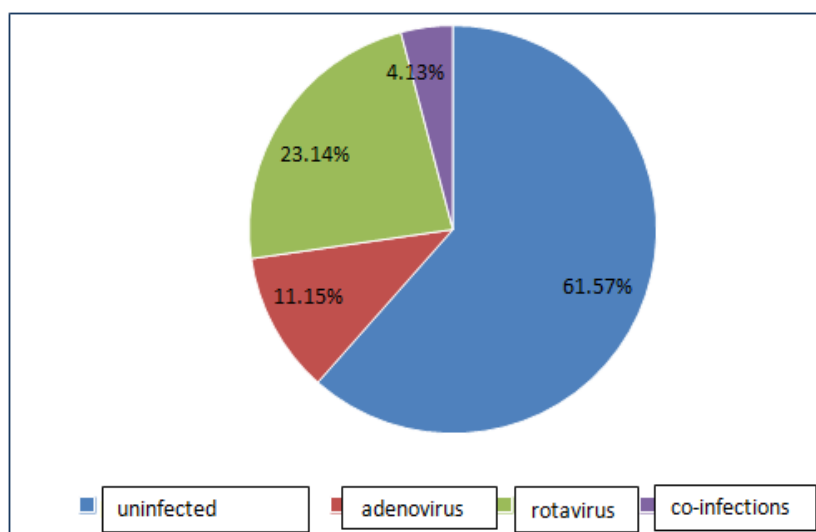


Figure 2. The incidence of viral gastroenteritis in pediatric patients

All categories of infections were prevalent in male than female patients (Figure 3) because in the studied group the boys were more than girls. The most affected age group was 12-23 months for rotavirus (16.66%) and 4-11 months for adenovirus (7.52%). Just a few patients with more than 5 years were infected with adenoviruses, rotaviruses or both (Figure 4).

These results match with data from other countries, that adenovirus and rotavirus gastroenteritis occur in children younger than age 5 years and the distribution can differ by geographic area.

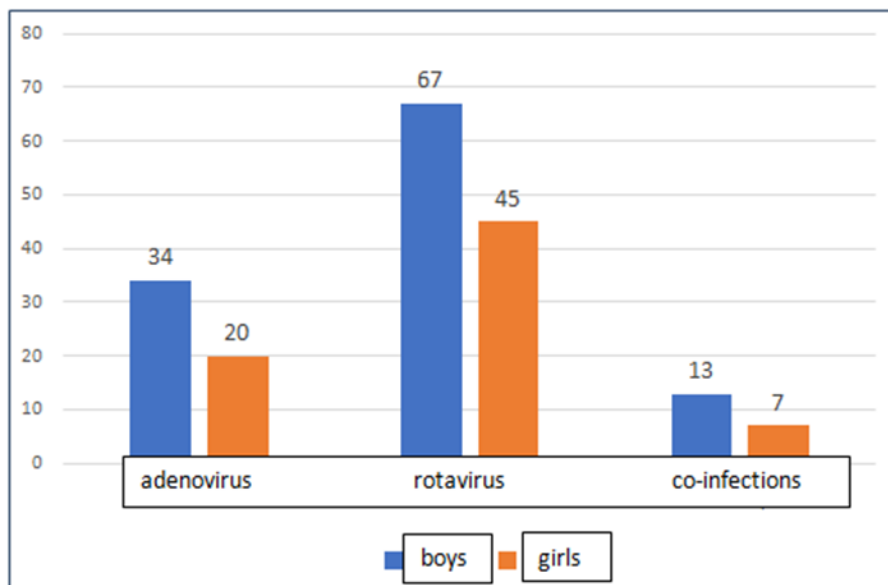


Figure 3. Gender distribution of viral infections

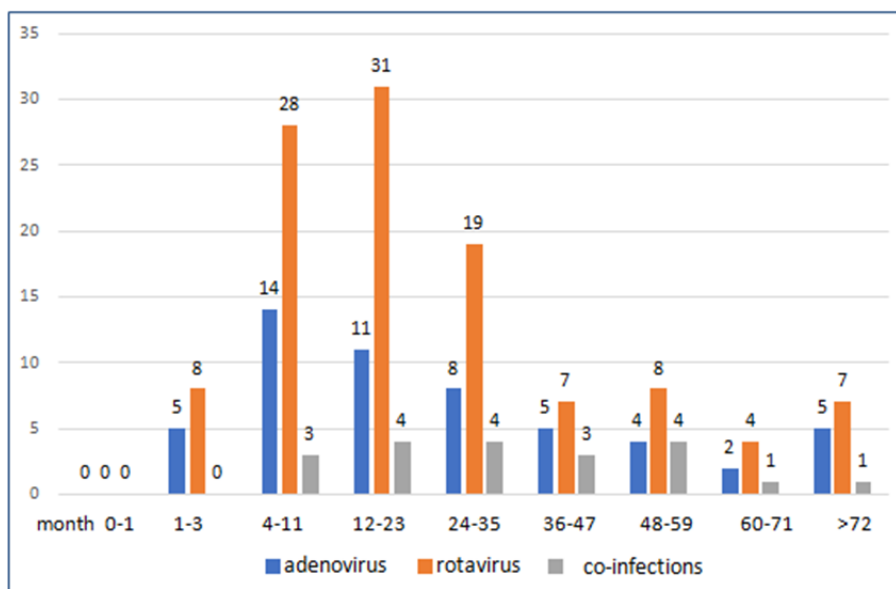


Figure 4. The distribution of viral gastroenteritis according to patient age

The viral infections were different in spring season (mostly rotavirus was implicated, in April) than early summer season (adenovirus infections mostly occur especially in August) - Figure 5.

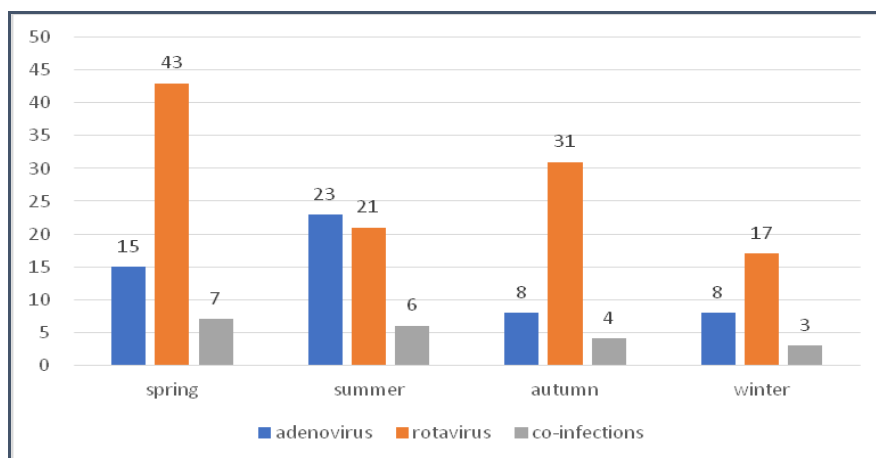


Figure 5. The seasonality of adenovirus and rotavirus infections

These results suggest the existence of seasonality of viral infections, especially or rotavirus gastroenteritis, in correlation with temperate climates. The adenovirus infections do not respect a certain distribution according to period.

Regarding the blood tests, in co-infections the white blood cells count, neutrophils number and C-reactive protein had higher average than separate infections with adenovirus and rotavirus.

#### 4. CONCLUSIONS

The incidence of rotavirus and adenovirus infections in studied group was 38.42% and 4.13% of cases were co-infections. Rotavirus was more frequent than adenovirus in pediatric gastroenteritis.

For both type of viral infections, the most cases were determined in male patients and the most affected age groups were 12-23 months for rotavirus and 4-11 months for adenovirus.

Rotavirus gastroenteritis had a higher incidence in spring season and the adenovirus infections had a higher incidence in summer.

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