

# Features of respiratory syncytial virus infection in children in the post-COVID-19 era

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## ABSTRACT

Respiratory syncytial virus (RSV) infection in children is a major public health problem, especially in the 0-1 year age group where clinical forms of the disease can evolve severely with life-threatening complications.

In the period 2020 – 2022, as a result of epidemiological measures specific to the COVID-19 pandemic (protective mask, online teaching activity, social distancing) we have witnessed a considerable decrease in the number of cases of RSV infection in children. With the lifting of prophylactic measures and the onset of the cold season, we have seen an increase in the number of admissions with a diagnosis of respiratory virus in pediatric wards.

In this article, we aim to analyze the clinical, evolutionary and epidemiological features of respiratory syncytial virus infection in children in the 2022 - 2023 season. We conducted a retrospective clinical study of RSV infection cases admitted to the Pediatric Infectious Diseases Clinical Departments of the National Institute of Infectious Diseases “Prof. Dr. Matei Bals” in the period October 2022 - March 2023.

During this period, we registered 195 cases of RSV infection in children, which represents 6.47% of the total number of hospitalized virological illnesses in children (195/3012). All pediatric RSV infection cases admitted to our wards have progressed favorably; we have not recorded any deaths. From an epidemiological point of view, the peak incidence of RSV infection in children occurred in December (98 cases). The most frequent clinical form of the disease was the medium form, but severe forms represented 31.8%.

Among the complications, the most common were respiratory (acute respiratory failure, pneumonia/bronchopneumonia), hematological (intra-infectious and deficiency anemia, leukopenia, thrombocytopenia), digestive (diarrhoeal disease, hepatic cytolysis syndrome) and acute dehydration syndrome associated with hydroelectrolytic and acid-base disturbances. Severe complications were more frequent than in previous seasons, being associated with a risk of an unfavorable outcome: acute respiratory failure and neurological complications (convulsions, encephalitis).

We also observed that acute RSV infection in the 2022 - 2023 season is characterized by the association of co-infections (viral, bacterial and fungal) more frequent than in previous years (22.5%). The most frequent co-infections were bacterial (superinfections - pneumonia/bronchopneumonia) probably due to the immunosuppression of the hosts as a result of repeated recent episodes of viral infections. Of note, RSV infection associated with other co-infections evolved more severely, with prolonged hospitalization and more complications.

In conclusion we can say that RSV infection in the 2022 - 2023 season evolved more severely in children compared to previous seasons because in the last 3 years during the COVID-19 pandemic there were very few cases of respiratory viruses, thus the population was not naturally immunized, especially the age group 0 - 4 years. In addition, the abandonment of specific protective measures for respiratory diseases has “exploded” the number of respiratory illnesses in the pediatric population, especially in children.

**Keywords:** RSV infection, child, season 2022-2023

## INTRODUCTION

With the abandonment of specific prophylactic measures against COVID-19, we are witnessing in autumn 2022 the emergence of waves of viral infections (RSV, influenza, SARSCoV-2 infection, adenovirus infection, rhinovirus, parainfluenza viruses, metapneumovirus, etc.).

Respiratory viruses are an important cause of morbidity in the pediatric population due to their increased incidence, especially in the cold season, both because of the high degree of infectiousness and because of the severe clinical forms of the disease, which can lead to complications and even death. Severe forms of the disease are more common in children with co-morbidities (heart disease, lung disease, diabetes, systemic diseases, congenital or acquired immunodeficiencies, malignancies).

Among the respiratory virological diseases, RSV infection is one of the most important pediatric diseases in the 0-1 year age group due to the severe clinical forms of the disease with the potential for adverse outcome. It is of note that clinical forms of disease and co-infections predominantly affect younger age groups, a risk factor for severity and frequent complications.

The introduction of prophylactic measures for COVID-19 has led to a significant decrease in the number of influenza cases over the last two years, resulting in a lack of natural immunity in the majority of the population. Children, especially young children (0 - 4 years), are most vulnerable to illness as they have not had contact with RSV and maternal immunity is not present in this situation. In this age group, there is practically no natural immunity, so they are prone to more severe forms of the disease.

## OBJECTIVES

In this paper, we aim to analyze the clinical and epidemiological features of RSV infection in children in the post-pandemic COVID-19 season. We will

also identify the clinical forms of the disease, complications and course of bronchiolitis in children in the 2022-2023 season (October 2022 – March 2023).

## MATERIAL AND METHOD

To achieve the proposed objectives, we conducted a retrospective clinical study of pediatric cases of RSV infection admitted to the Pediatric Infectious Diseases Clinical Departments of the National Institute of Infectious Diseases “Prof. Dr. Matei Bals”, in the period October 2022 - March 2023. In these cases, we analyzed the distribution of cases over the mentioned period, the clinical forms of disease as well as associated co-infections and their impact on the clinical forms of disease. The diagnosis of RSV infection was based on epidemiological, clinical and laboratory criteria (PCR – Biofire test that identifies from nasal secretions several types of viruses: *respiratory syncytial virus*, *SARS-Cov-2*, *human community coronaviruses*, *influenza A and B viruses*, *parainfluenza*, *adenoviruses*, *rhinovirus*, *bocavirus* and *metapneumovirus*).

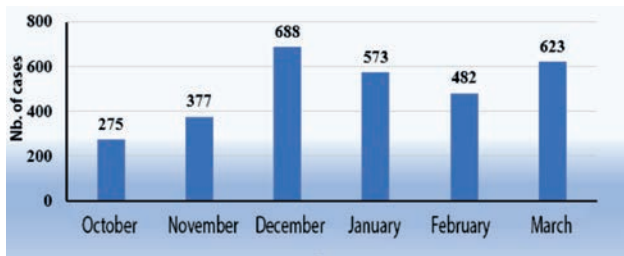
## RESULTS AND DISCUSSION

Between October 2022 and March 2023, 3,012 cases of respiratory viroids in children were admitted to the pediatric wards of the National Institute of Infectious Diseases, representing 72.9% of all pediatric admissions during the period. There were no deaths; all cases evolved favorably.

The number of respiratory virological cases peaked in December 2022, but there are epidemiological peculiarities of each individual virus. *Respiratory syncytial virus*, *influenza viruses*, *parainfluenza viruses*, *rhinoviruses*, *adenoviruses* and *bocaviruses* follow the usual seasonality, whereas coronaviruses (*SARS CoV-2* and *human coronaviruses*) and *metapneumoviruses* show an upward trend in incidence during the period analyzed (Table 1).

TABLE 1. Number of cases of respiratory viroids in children

Virus type/month	October	November	December	January	February	March	Total
<i>SARS CoV2</i>	140	125	206	214	202	354	<b>1.241</b>
<i>Influenza A</i>	2	6	183	223	130	73	<b>617</b>
<i>Influenza B</i>	2	4	8	8	19	35	<b>76</b>
<i>Respiratory syncytial virus</i>	7	69	98	14	5	2	<b>195</b>
<i>Rhinovirus</i>	15	24	36	11	15	19	<b>120</b>
<i>Adenovirus</i>	10	21	32	27	31	20	<b>141</b>
<i>Coronavirus</i>	0	4	7	2	8	11	<b>33</b>
<i>Bocavirus</i>	0	2	4	5	0	2	<b>13</b>
<i>Meta-pneumovirus</i>	1	2	8	6	14	9	<b>40</b>
<i>Parabial virus</i>	5	10	6	1	0	0	<b>21</b>
<i>Unspecified</i>	93	110	97	60	58	97	<b>515</b>
<b>Total</b>	<b>275</b>	<b>377</b>	<b>685</b>	<b>571</b>	<b>482</b>	<b>622</b>	<b>3.012</b>

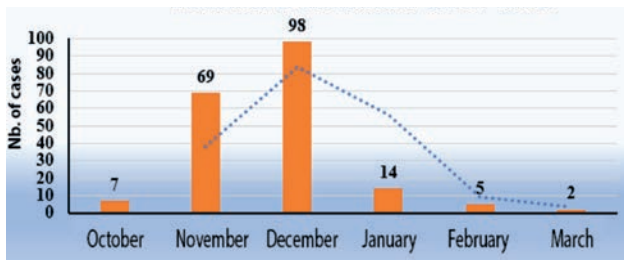


**FIGURE 1.** Evolution of the number of cases of viral infections in children

Figure 1 shows that the 2022-2023 season of respiratory virus infections in children evolved biphasically, with a peak in incidence in December but also with an increasing trend in March due mainly to a high number of cases of COVID-19. This proves that SARS-CoV-2 infection is not seasonal and occurs in epidemic “waves”. The results obtained confirm the scientific data presented by other authors on the epidemiology of SARS-CoV-2 in children [2].

RSV infection in children has shown a similar epidemiological evolution to previous years, peaking in December 2022 (Figure 2). The total number of cases was low compared to SARS-CoV-2 or influenza infection, accounting for only 6.47% of all pediatric RSVs in the 2022-2023 season [5,7].

Epidemiologically, RSV infection in children peaks in incidence approximately one month later compared to the results of similar studies abroad [1,4,5].



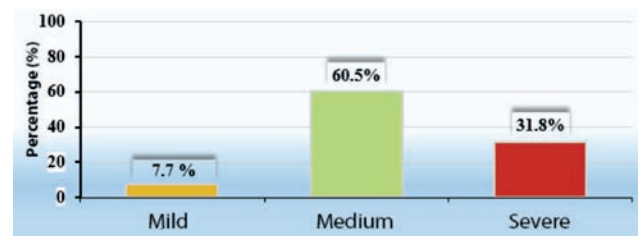
**FIGURE 2.** Evolution of the number of cases of RSV infection in children

An analysis of the disease forms of the RSV cases admitted to the hospital in children shows that the majority are moderate (60.5%), and severe forms account for 31.8% of the cases, a high percentage compared to previous seasons (Table 2). The association with other viral infections is a factor favoring the occurrence of more prolonged and severe clinical forms of the disease. The data on clinical forms of RSV infection in children are similar to those reported by other authors in studies, concluding that in the 2022-2023 season, we are witnessing more severe and prolonged clinical forms of disease compared to previous seasons [3].

**TABLE 2.** Distribution of clinical forms of RSV infection in children

Disease form	Number of cases	Percentage (%)
Mild	15	7.7
Medium	118	60.5
Severe	62	31.8
<b>Total</b>	<b>195</b>	<b>100</b>

The most severe clinical forms of RSV infection we recorded in children presenting as a complication with respiratory failure, but also in cases associating viral co-infections (influenza, COVID-19, rhinovirus) and bacterial superinfections (sepsis, pneumonia/bronchopneumonia, suppurative otitis).



**FIGURE 3.** Distribution of respiratory virus cases in children by clinical form of disease

From the analysis of cases of RSV infection in children in the 2022-2023 season, we see that after the COVID-19 pandemic, the number of severe cases increased due to the abandonment of protective measures and due to the lack of acquired immunity of the population during this period and the association with other pathogens. The clinical forms of RSV infection in children have been more prolonged and severe due to an increase in viral or bacterial coinfections. The results obtained in our study are consistent with those reported in the literature both in the country and abroad [3,6].

**CONCLUSIONS**

During the period under review, we note the re-emergence of seasonal viral respiratory diseases with certain particularities caused by the post-pandemic COVID-19 conditions (abandonment of specific protective measures, naturally unimmunized and unimmunized host terrain, considerable reduction in the number of cases of viral respiratory infections in the last two seasons).

RSV infection in children accounts for 6.47% of the hospitalized virological illnesses admitted between October 2022 and March 2023 (195/3012). One of the most important features of the 2022 - 2023 season from an epidemiological point of view is that RSV infection in children has maintained its known seasonality, with a peak in incidence in December 2022.

Another feature of childhood RSV infection in the 2022-2023 season is the higher number of severe

cases (31.8%) due to COVID-19 induced immunosuppression in a population not naturally immunized with respiratory viruses in the last two years.

The increased number of co-infections associated with respiratory viruses is another feature of the 2022-2023 season. The most common were bacterial superinfections (12.3%) often leading to severe forms of disease (sepsis, pneumonia/bronchopneumonia) and viral coinfections (4.1%) led to respiratory complications, with acute respiratory failure being the most severe. Thus, bacterial and viral co-

infections resulted in more prolonged and severe clinical forms of disease with risk of adverse outcome and after-effects.

In these circumstances, the application of non-specific prophylactic methods (avoidance of crowding, frequent ventilation of rooms, wearing a mask, secretion hygiene, isolation of symptomatic persons) together with specific methods (vaccination) in the case of influenza and SARS-CoV-2 infection are effective methods of preventing respiratory illness.

*Conflict of interest:* none declared

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