

# Involvement of Respiratory Viruses in Community-Acquired Alveolar Pneumonia (CAAP) in Children <5 Years in Southern Israel, Before and During the COVID-19 Pandemic

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## Introduction

Respiratory syncytial virus (RSV) and human metapneumovirus (hMPV) and to a lesser extent, parainfluenza and influenza viruses have been associated with pneumonia in young children. In contrast, adenovirus (AdV) and rhinovirus (RhV) are usually not associated with pneumonia.

## Objectives

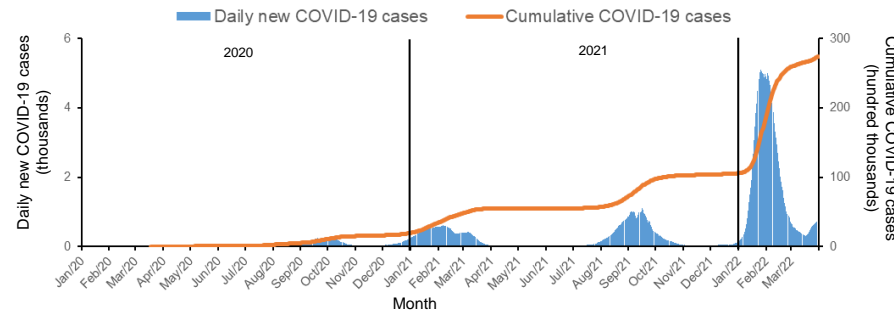
To evaluate the involvement of the four pneumonia associated viruses (grouped as PAV) in pediatric CAAP, before and during the COVID-19 pandemic

## Materials and Methods

- Soroka University Medical Center is the only hospital in southern Israel, providing health care services to ~85,900 and ~99,400 children <5y in 2016 and 2021, respectively
- We reviewed the period of January 2016 - March 2022
- Data was collected using ongoing, prospective surveillance programs including all children <5y in the region;
  - Incidence dynamics of hospital visits for CAAP (consolidated pneumonia), since 2002.
  - All positive detection in the region since 2008 of the following respiratory viruses: RSV, hMPV, parainfluenza and influenza viruses
- A nasal wash for virus PCR detection obtained within 48hr of admission or emergency room visit for CAAP was included in the analysis of virus rates in CAAP
- The first SARS-CoV-2 cases were detected in Israel in February 2020, resulting in a full lockdown, followed by several partial restrictions. The SARS-CoV-2 vaccination campaign started at the end of December 2020. Most cases of COVID-19 in children <5y occurred during Dec 2021 - Mar 2022 (**Figure 1**); Over 95% of children admitted for respiratory disease were tested for COVID-19 (PCR).
- Since AdV and RhV activity was previously not associated with CAAP and tended to be equally involved in mixed and single infections, the current analysis was done for the four PAV only.

## Materials and Methods

**Figure 1: Monthly number of new nationally reported COVID-19 cases in children <5 years**



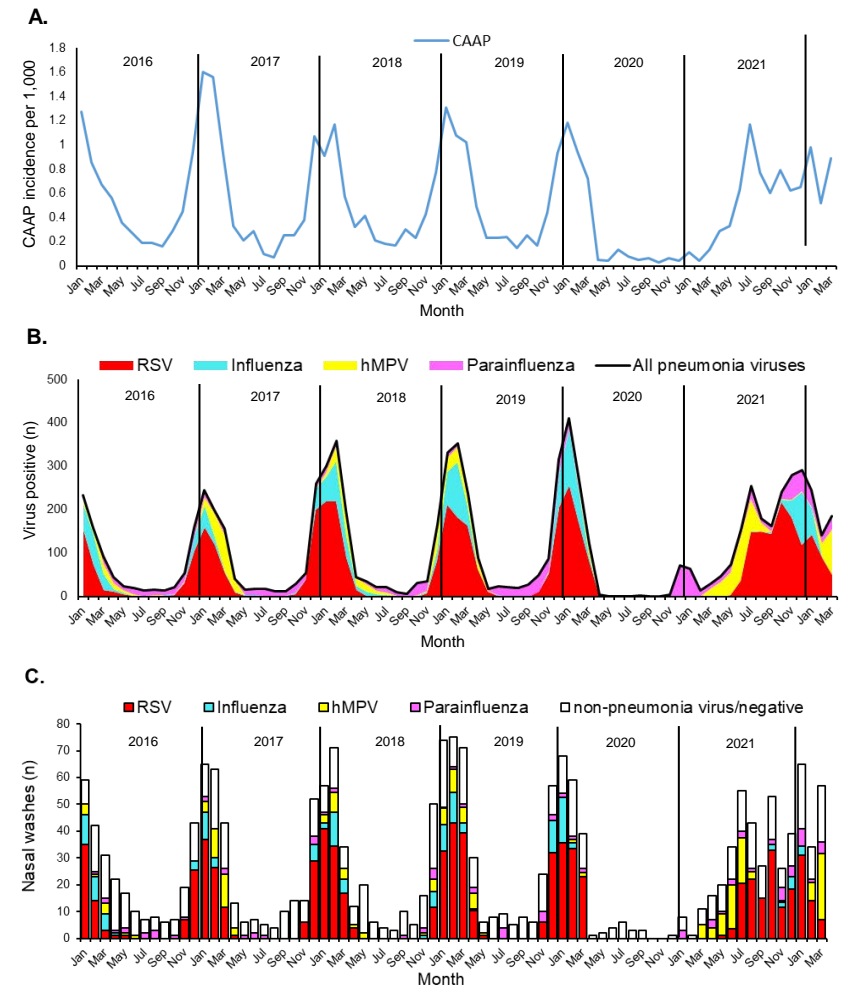
## Results

- CAAP incidence dynamics closely resembled the four PAV (grouped) activity dynamics (**Figure 2A, 2B**) with very low activity during the expected peak in winter 2020-2021, but with an off-season resurgence from spring 2021.
- Even though most CAAP episodes during the pandemic coincided with peak COVID-19 rates, only 9 CAAP episodes were COVID-19 positive (7 in 2022, of which 5 were RSV positive).
- Out of 3,430 CAAP episodes 55% were tested for PAV, of which 61% were positive, with similar rates before and during the pandemic.
- RSV was the most common involved virus, followed by hMPV.
- The virus distribution in CAAP during the entire period reflected their activity in the community (**Figure 2C**).
- Unlike pre-pandemic years where all four PAV appeared almost simultaneously, in 2021 PAV resurged sequentially, resulting in successive involvement in CAAP episodes, suggesting a causative association.

## Conclusions

1. SARS-CoV-2 was only rarely involved in CAAP in young children.
2. PAV were involved in 61% of CAAP episodes in children <5y with predominance of RSV and hMPV.
3. The atypical dynamics imposed by the COVID-19 pandemic suggests a causative association between PAV and CAAP.

**Figure 2: Dynamics of; A. Monthly CAAP incidence B. Pneumonia viruses activity C. Virus detection in CAAP, January 2016 through March 2022, in children <5 years of age.**



- Samples obtained within 48 hours of admission  
- Samples were examined from 1,886/3,430 children with CAAP