

Do post-pandemic bronchiolitis require more ventilatory support? Perspective from a level II hospital

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Abstract

Introduction and Objectives: After the COVID-19 pandemic, the epidemiology and severity of bronchiolitis cases were affected. The aim of our study is to compare pre and postpandemic respiratory support and intensive care transfers in a level two hospital. **Methods:** A retrospective study of hospitalized patients with bronchiolitis in 2019 (prepandemic period) and 2022 (postpandemic period) in a level two hospital. **Results:** In 2019, 81 children were admitted for bronchiolitis compared to 101 in 2022. Of these, 56% were boys, with a median age of three months. In 2022, there was a higher need for CPAP (8.9% vs. 1.2%, $p = 0.02$), mechanical ventilation (2.0% vs. 1.2%, $p = 0.65$), supplemental oxygen (73.3% vs. 39.5%, $p < 0.01$) and admission to intensive care (8.9% vs. 2.5%). **Discussion:** In our postpandemic sample, there was a significantly higher need for oxygen and noninvasive ventilation in hospitalized patients. Our results are similar to those from previous studies in other European countries.

Keywords: Bronchiolitis. Intensive care unit. CPAP ventilation.

A bronquiólite pós-pandémica exige mais suporte ventilatório? Perspectiva de um hospital de nível II

Resumo

Introdução e Objetivos: A pandemia COVID-19 levou a uma modificação epidemiológica e da gravidade da bronquiólite. O objetivo do estudo é comparar o suporte respiratório e transferências para cuidados intensivos por bronquiólite aguda pré e pós-pandemia. **Métodos:** Estudo retrospectivo dos doentes internados com bronquiólite aguda em 2019 (pré-pandemia) e 2022 (pós-pandemia) num hospital nível II. **Resultados:** Em 2019 foram internadas 81 crianças com bronquiólite vs. 101 em 2022. 56,0% do sexo masculino com mediana de idade de três meses. Pós-pandemia houve maior necessidade de CPAP (8,9% vs 1,2%, $p = 0,02$), ventilação mecânica (2,0% vs 1,2%, $p = 0,65$), oxigenoterapia (73,3% vs 39,5%, $p < 0,01$) e admissão em cuidados intensivos (8,9% vs 2,5%). **Discussão:** Os doentes hospitalizados no período pós-pandémico apresentaram significativamente maior necessidade de oxigénio e de ventilação não invasiva. Os nossos resultados são semelhantes a estudos de outros países europeus.

Palavras-chave: Bronquiólite. Unidade de terapia intensiva. Ventilação CPAP.

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Received: 26-11-2023

Accepted: 07-11-2024

<https://pjp.spp.pt>

Available online: 25-06-2025

Port J Pediatr. 2025;56(3):132-136

DOI: [10.24875/PJP.23000053](https://doi.org/10.24875/PJP.23000053)

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Keypoints

What is known

- Postpandemic bronchiolitis cases have required more respiratory support.
- It reinforces the theory of immunity debt after the COVID-19 pandemic.

What is added

- It shows that there is an increase in intensive care admissions due to bronchiolitis, as reported in other European studies.

Introduction

Bronchiolitis is one of the most common viral lower respiratory tract infections in infants and is the main cause of hospitalization in children under two years of age¹⁻¹⁰. Bronchiolitis is a self-limited infection, with symptoms lasting, on average, five to seven days. However, preterm infants, children with preexisting conditions such as bronchopulmonary dysplasia, congenital heart disease or immunodeficiency have a higher risk of severe infection^{1,2}. Most viruses can cause acute bronchiolitis, however respiratory syncytial virus (RSV) is the most common etiology^{1,2,4,5,8-11}. These viruses are spread through droplets expelled via the airway, so close contact is needed to transmit this disease¹.

In March 2020, the World Health Organization (WHO) declared a worldwide pandemic due to the spread of SARS-CoV-2. Social distancing, hand hygiene and masks were adopted globally to reduce the spread of this disease, leading to a reduction in viral infections compared to previous seasons^{3,6,12}. Furthermore, the restrictions shifted the outbreak of infection from the winter months to spring^{3,4,6,7,12}. Despite the severity of COVID-19 in adults, children remained largely asymptomatic. Therefore, SARS-CoV-2 does not appear to trigger severe bronchiolitis and caused a shift in pathogens with the reduction of RSV infection^{3,4,11}.

The pandemic-associated restrictions led to a post-pandemic increase in co-infections, greater severity of disease, longer hospital stays and intensive care admissions, as well as ventilatory support^{2-4,6,7,12-15}. This leads to the hypothesis that the reduction in viral and bacterial diseases in children during the pandemic led to an immunity debt, resulting in a postpandemic increased severity of infection⁶.

The aim of our study is to assess if there was a post-pandemic increase in the need for hospitalization, oxygen therapy or respiratory support in a level two hospital.

Methods

A retrospective observational study of hospitalized children in a level two hospital with bronchiolitis,

comparing a prepandemic (January to December 2019) and postpandemic period (January to December 2022).

The study sample was obtained through systematic sampling and selecting children under two years of age who were hospitalized with the diagnosis of acute bronchiolitis. We excluded older children, immunodeficiency and chronic heart, neurological or pulmonary disease. Demographic, clinical and microbiological data were collected by consulting each patient's electronic file. In our hospital, the etiological agent was obtained using a PCR test which tested for RSV, SARS-CoV-2 and influenza A and B.

Data collected from level three intensive care units consisted of the type of respiratory support used.

For statistical analysis, Microsoft Office Excel and IBM SPSS® were used.

Results

Out of a population of 427 children hospitalized in 2019, 90 were diagnosed with acute bronchiolitis (21.1%). Ten were excluded, giving us a final sample of 80 patients. In 2022, there were 377 children hospitalized, 112 with bronchiolitis (29.7%). Ten children were excluded, leaving a final sample of 102 patients (Fig. 1).

Our final sample of 182 children consisted of 56% boys, with a median age of three months (eight days to two years), which was similar in both periods. In both the prepandemic and postpandemic groups, bronchiolitis admissions comprised 0.3% of all emergency department visits.

The median length of stay was four days (one to 18 days) and RSV was the main agent involved in 2022 with 57 patients (N = 102, 55.9%), followed by SARS-CoV-2 in four (N = 102, 3.9%). In 2019, there was no systematic testing of respiratory pathogens for epidemiological purposes. In those tested, RSV accounted for 90% (27 out of 30) of the bronchiolitis cases (Table 1).

In 2022, 74 children (73.3%) admitted for acute bronchiolitis required supplemental oxygen compared to 32 patients in 2019 (39.5%), a statistically significant difference ($p < 0.001$). There was also a statistically significant increase in noninvasive ventilation

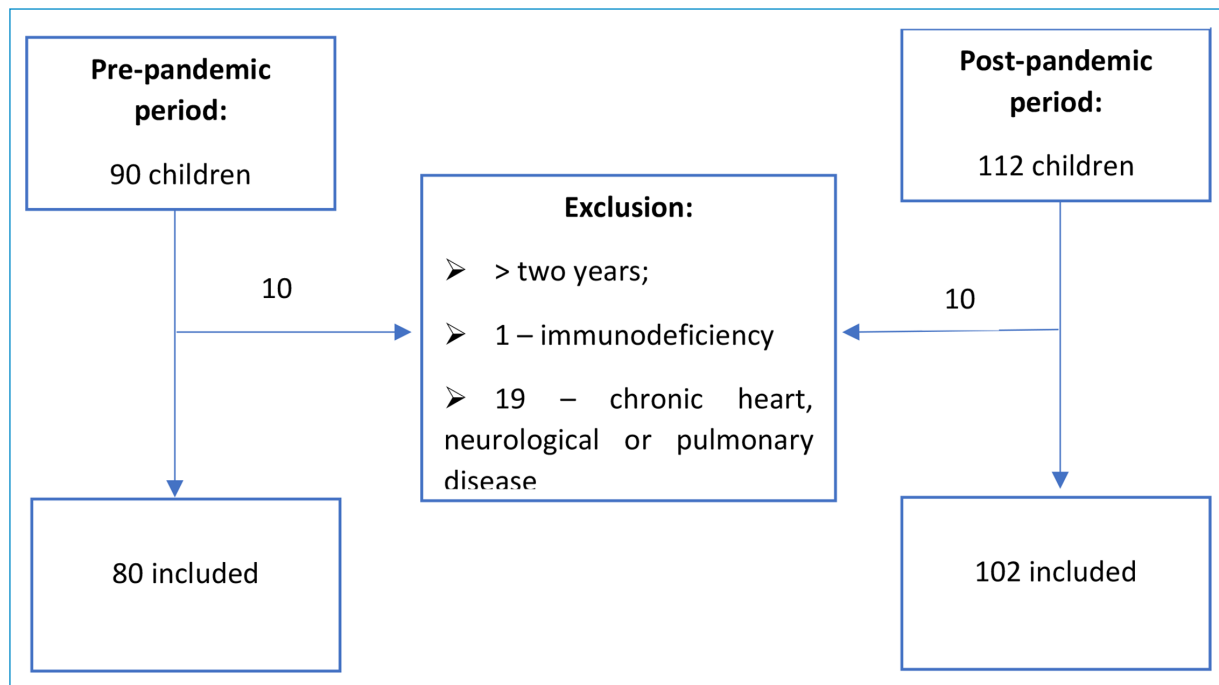


Figure 1. Exclusion criteria.

Table 1. Clinical data of the study population

	2019 (prepandemic period) n = 102	2022 (postpandemic period) n = 102
Demographic data		
Age	Three months	Three months
Median (min-max)	(Eight days-19 months)	(16 days-two years)
Gender	46 boys (56.8%)	56 boys (55.4%)
Hospitalization (days)	4	4
Median (min-max)	(1-13)	(1-18)
Etiological agent (PCR)		
RSV, n (%)	27/30 (90%)	57/102 (55.9%)
SARS-CoV-2, n (%)	-	4/102 (3.9%)
Influenza A, n (%)	-	2/102 (2.0%)

in 2022 (nine vs. one, $p = 0.023$) but not in high-flow oxygen therapy (one vs. one, $p = 0.150$). In 2022, most infants requiring non-invasive ventilation were three months old or younger (88.9%). Two patients needed mechanical ventilation in 2022 (2.0%) and one in 2019 (1.2%, $p = 0.645$). Accordingly, there was an increased admission to intensive care in 2022, with nine patients compared to two in 2019 (8.9% vs. 2.5%, $p = 0.070$). Most of the patients who required intensive care were one month old or younger (63.6%) (Table 2).

There were no cases of SARS-CoV-2 bronchiolitis requiring ventilatory support or intensive care admission.

Discussion

This study revealed that there was a postpandemic increased need for respiratory support, particularly noninvasive ventilation. In 2022, there were more children admitted for bronchiolitis and there was an increased need for oxygen therapy, noninvasive

Table 2. Ventilatory support and oxygen therapy in pre- and post- pandemic bronchiolitis

	2019 (prepandemic period)	2022 (postpandemic period)	p
Oxygen therapy	32 (39.5%)	74 (73.3%)	< 0.001
Noninvasive ventilation	1 (1.2%)	9 (8.9%)	0.023
High-flow oxygen	1 (1.2%)	1 (1.0%)	0.150
Mechanical ventilation	1 (1.2%)	2 (2.0%)	0.645
Intensive care admission	2 (2.5%)	9 (8.9%)	0.070

ventilation and intensive care admission, which suggests more severe disease. Caballero et al. also reported a postpandemic increased severity of infection with more children needing ventilation and intensive care unit admission, with 34.3% of infections requiring intensive care admission after the pandemic compared to 22.4% prior to the pandemic. Ghirardo S et al. also reported more children needing ventilation (23% vs 12%), intensive care unit admission (29% vs 16%) and oxygen therapy (77% vs 55%)¹⁴. The lack of a significant increase in mechanical ventilation could be due to the small sample size, but it is also reported by Cardenas, J. et al.⁶.

Our low rates of high-flow oxygen therapy are probably explained by the lack of experience at our center, as most literature reports a higher use, especially after the pandemic.

Children requiring ventilation support or intensive care were primarily small infants, as already well documented by several studies, such as Zurita-Cruz, J. N. et al. and Nguyen, S. et al.².

As reported by several studies, such as Caballero et al. and Guitart, C. et al., SARS-CoV-2 infection does not appear to be a major factor for respiratory support in bronchiolitis³.

In line with previous studies, our study suggests that the pandemic led to an immunity debt, resulting in an increased need for ventilatory support. However, ventilatory support was an individualized decision based on clinical and gasometrical parameters, not a standardized approach.

The study results and analysis are limited due to its retrospective design, small sample size and lack of systematic testing of etiological agents in the prepandemic period. It also lacks data from intensive care admissions, especially regarding respiratory and infectious complications.

Acknowledgements

The Pediatric Department of Centro Hospitalar do Oeste.

Author contributions

All authors: Conception and design of the study, report, review or other type of work or paper; Acquisition of data either from patients, research studies, or literature; Analysis or interpretation of data either from patients, research studies, or literature; Drafting the article; Critical review of the article for important intellectual content; Final approval of the version to be published; Agreement to be accountable for the accuracy or integrity of the work.

Funding

There were no external funding sources for the drafting of this paper.

Conflicts of interest

The authors declare that there were no conflicts of interest in conducting this research.

Ethical considerations

Protection of humans and animals. The authors declare that no experiments involving humans or animals were conducted for this research.

Confidentiality, informed consent, and ethical approval. The study does not involve patient personal data nor requires ethical approval. The SAGER guidelines do not apply.

Declaration on the use of artificial intelligence. The authors declare that no generative artificial intelligence was used in the writing of this manuscript.

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