Reduced PICU respiratory admissions during COVID-19

Pablo Vásquez-Hoyos 1,2,3 Franco Diaz-Rubio 3,4,5
Nicolas Monteverde-Fernandez 3,6 Juan Camilo Jaramillo-Bustamante 3,7,8
Cristobal Carvajal 3,9 Alberto Serra,3,10 Todd Karsies 11
Alexandre Tellechea Rotta,12 Sebastián González-Dambrauskas 3,10 LARed Network

ABSTRACT

Background The COVID-19 pandemic reached the Southern Hemisphere in the autumn of 2020, thus coinciding with its expected annual viral respiratory season. The potential impact of national strategies aimed at mitigating COVID-19 during the pandemic on the incidence of other critical viral lower respiratory tract infections (LRTIs) in children is unknown.

Methods We analysed admission data for LRTIs from 22 paediatric intensive care units (PICUs) in four countries, part of a large international Latin American registry of children with acute respiratory failure (Red Colaborativa Pediátrica de Latinoamérica [LARed Network]).

Results Between January and August, there were 83% fewer PICU admissions for LRTIs in 2020 compared to the 2018/2019 average over the same period. Similar decreases were noted for PICU admissions due to respiratory syncytial virus and influenza (92% and 78%, respectively).

Conclusion We observed a striking reduction in PICU admissions due to viral LRTIs over winter, during the COVID-19 pandemic in South America.

INTRODUCTION

Viral lower respiratory tract infections (LRTIs), particularly bronchiolitis and pneumonia due to respiratory syncytial virus (RSV) and influenza, are a frequent cause of hospitalisation, morbidity and mortality in children under 5 years of age.1 Viral LRTIs have a predictable seasonal pattern and result in a large number of paediatric intensive care unit (PICU) admissions worldwide, primarily during the winter months. The COVID-19 pandemic has changed the epidemiology of adult respiratory failure, resulting in a high demand for inpatient hospital services that have stressed healthcare systems to their capacity. Although children have been relatively spared from COVID-19 both in numbers of cases and disease severity, there is concern that an overlap between COVID-19 disease and the high burden of seasonal viral LRTIs could have disastrous consequences. This is of particular concern in the Southern Hemisphere, where the usual viral LRTI season (May–August) is occurring while the COVID-19 pandemic is at its peak in South America.2

What is already known?

► COVID-19 is the leading cause of severe acute respiratory failure in adults, yet children are relatively spared.
► Severe viral respiratory infections have a seasonal pattern and result in a large number of paediatric intensive care unit (PICU) admissions worldwide, primarily during the winter months.
► There is concern that an overlap between COVID-19 and seasonal viral respiratory infections could lead to an unprecedented healthcare burden with disastrous consequences.

What this study adds?

► We observed a striking reduction in PICU admissions for critical lower respiratory tract infections during the 2020 viral respiratory season in the Southern Hemisphere concurrently with the COVID-19 pandemic.
► Our findings could have implications for the upcoming paediatric winter viral respiratory season in the Northern Hemisphere.

A potential consequence of this pandemic could be that of a ‘perfect storm’, where SARS-CoV-2 converges with seasonal respiratory viruses during their annual winter outbreak.3 It is unknown, however, whether strategies implemented to mitigate COVID-19 could influence the epidemiology of concurrent seasonal viral LRTIs in children. To date, no studies have examined changes in the use of PICU due to seasonal viral LRTIs during the COVID-19 pandemic. To address this gap, we studied the epidemiology of paediatric acute respiratory failure (ARF) admissions in South American PICUs during the COVID-19 pandemic compared with two preceding viral respiratory seasons within the same region.

METHODS

We interrogated the Red Colaborativa Pediátrica de Latinoamérica (LARed) Network paediatric ARF registry, which includes prospectively acquired data.
from children up to 18 years of age admitted for ARF in 40 PICUs across eight Latin American countries. Data are continuously entered and managed using a secure web-based research electronic data capture platform. The registry collects epidemiological information on paediatric admissions due to ARF, defined here as children with a primary respiratory diagnosis who required admission to a PICU for advanced respiratory support (eg, high-flow oxygen via nasal cannula, continuous or bilevel-positive airway pressure and mechanical ventilation) or close monitoring, and is described in greater detail elsewhere.4

Viral testing for RSV and influenza is routinely performed on all children with ARF at participating centres. Testing for SARS-CoV-2 was performed with a dedicated PCR test and did not affect our ability to test for RSV or influenza.

For this report, we selected cases of LRTI from PICUs with continuous data submission between 1 January 2018 and 31 August 2020. Data from January to August of 2020 were compared with those of the preceding 2 years and were stratified by country, primary diagnosis, specific viral isolate and age. Data are presented descriptively, along with absolute percentage differences between the 2020 season and the arithmetic mean of the 2018/2019 seasons.

RESULTS
A total of 4135 cases from 22 hospitals in four countries (Bolivia, Chile, Colombia and Uruguay) fulfilled the inclusion criteria. Of these, 3041 cases occurred during the period of interest between January and August and were used for the multiyear comparisons. There were 234 cases from 2020, which were compared with 1340 cases and 1407 cases for the same period during 2018 and 2019, respectively (figure 1). There were 83% fewer PICU admissions for LRTIs in 2020 compared with the 2018/2019 average, and similar decreases were noted for admissions due to RSV and influenza (92% and 78%, respectively). These lower numbers admitted were consistent across diagnostic and age categories (table 1). There were only nine COVID-19 cases presenting with ARF in this cohort. Unlike the 2018 and 2019 seasons, when critical viral LRTIs exhibited a typical ramp-up period in May and June with a peak in July, the 2020 season had declining case numbers over those months, which were lower than the summer season baseline.

DISCUSSION
Our study shows a remarkable reduction in the incidence of paediatric LRTIs requiring PICU admission across South America during the COVID-19 pandemic. To our knowledge, this is the first report from hospitals in the Southern Hemisphere showing that, despite the intense circulation of SARS-CoV-2 during the 2020 winter season, the number PICU admissions did not peak, and the potential ‘perfect winter storm’ of RSV, influenza and SARS-CoV-2 among children did not occur.

RSV and influenza are two of the most common viral pathogens in children with LRTIs; they are responsible for high rates of paediatric hospital and PICU admissions, and constitute a substantial healthcare burden every winter.5 The winter season accounts for 81% of the annual RSV-associated hospitalisations and PICU admissions in the USA.6 In Latin America,

![Figure 1](image_url)  
**Figure 1** Monthly case numbers of paediatric intensive care unit admissions due to lower respiratory tract infections for 2018–2020 (left axis) and aggregate average daily temperature among all included sites (right axis).

<table>
<thead>
<tr>
<th>Case counts per study year</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>Relative reduction (%)*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Entire cohort</strong></td>
<td>1340</td>
<td>1467</td>
<td>234</td>
<td>83</td>
</tr>
<tr>
<td><strong>Country</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bolivia</td>
<td>53</td>
<td>23</td>
<td>19</td>
<td>50</td>
</tr>
<tr>
<td>Chile</td>
<td>315</td>
<td>376</td>
<td>24</td>
<td>93</td>
</tr>
<tr>
<td>Colombia</td>
<td>460</td>
<td>534</td>
<td>164</td>
<td>67</td>
</tr>
<tr>
<td>Uruguay</td>
<td>512</td>
<td>534</td>
<td>27</td>
<td>95</td>
</tr>
<tr>
<td><strong>Admission diagnosis</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bronchiolitis</td>
<td>733</td>
<td>771</td>
<td>126</td>
<td>83</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>308</td>
<td>378</td>
<td>45</td>
<td>87</td>
</tr>
<tr>
<td>Others</td>
<td>299</td>
<td>318</td>
<td>63</td>
<td>80</td>
</tr>
<tr>
<td><strong>Viral isolate</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RSV</td>
<td>474</td>
<td>596</td>
<td>45</td>
<td>92</td>
</tr>
<tr>
<td>Influenza</td>
<td>29</td>
<td>36</td>
<td>7</td>
<td>78</td>
</tr>
<tr>
<td><strong>Age group</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤2 years of age</td>
<td>1065</td>
<td>1156</td>
<td>165</td>
<td>85</td>
</tr>
<tr>
<td>&gt;2 years of age</td>
<td>275</td>
<td>311</td>
<td>69</td>
<td>76</td>
</tr>
</tbody>
</table>

*Relative percentage change between the 2020 case numbers and the average 2018/2019 case numbers.

RSV, respiratory syncytial virus.
We observed a striking reduction in PICU admissions due to ARF requiring mechanical ventilation outside of that region. We believe this is not a factor in our sample since we focused on the period of interest. Our network includes only a fraction of PICUs within South America and may not be representative of the entire region. Nonetheless, we believe the consistency in our results suggests that extrapolations from our findings to other countries in South America are probably valid. Finally, while we hypothesise that the reduction in LRTI admissions caused by other agents was likely due to measures enacted to limit the spread of COVID-19, it is possible that other unrecognised factors unique to South America were responsible for our findings, thus limiting generalisability outside of that region.

CONCLUSION

We observed a striking reduction in PICU admissions due to critical viral LRTIs during the COVID-19 pandemic in South America.

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Competing interests None declared.

Patient consent for publication Not required.

Ethics approval Each institution approved the LARed Network database, and this study was reviewed and approved by the institutional review board at Hospital de San José (IRB000011307, CEISH0364–2020), Bogota, Colombia.

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Data availability statement Data are available upon reasonable request.

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ORCID iDs

Pablo Vásquez-Hoyos http://orcid.org/0000-0002-4892-5032
Franco Díaz-Rubio http://orcid.org/0003-4763-074X
Nicolas Monteverde-Fernandez http://orcid.org/0002-4734-163X
Juan Camilo Jaramillo-Bustamante http://orcid.org/0001-6973-6612
Cristobal Carvajal http://orcid.org/0002-1712-7396
Todd Karsies http://orcid.org/0000-0001-6822-6952
Sebastián González-Dambrauskas http://orcid.org/0000-0003-4775-227X

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