

Coronavirus disease-19 deaths among children and adolescents in an area of Northeast, Brazil: why so many?

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Abstract

OBJECTIVE To describe COVID-19 deaths among children and adolescents in Sergipe, Brazil.

METHODS Ecological study of all COVID-19 reported cases and deaths occurring in children and adolescents < 19 years of age in Sergipe reported by the health surveillance and mortality information systems of Sergipe's Health Secretary and hospital records.

RESULTS Of 37 deaths of children < 19 years old were reported up to 30 September 2020, corresponding to 4.87 deaths for 100 000 population < 19 years old. Most deaths occurred among infants (44.1/100 000), and this age group had the highest case fatality rate (15.3 %). Most children had comorbidities such as chronic neurological diseases ($n = 7$; 19%) and prematurity ($n = 4$; 11%). Most children who died ($n = 18$; 49%) were not admitted to intensive care units (ICUs).

CONCLUSION COVID-19 mortality in children and adolescents in Sergipe was higher than in other Brazilian states and in high-income countries. A large proportion of the deaths occurred among children with comorbidities and a minority of children were admitted to ICU, reflecting the limited provision of such beds in the State. Newborns and infants are a high-risk group that must have priority in health public policy.

keywords covid-19, mortality, children, adolescents, deaths

Sustainable Development Goals (SDGs): 3.2.1 and 3.2.2

Introduction

Coronavirus disease 2019 (COVID-19) disproportionately affects adults, and older individuals have a high risk of severe disease and death [1]. Children and adolescents in turn account for a minority of cases and have more favourable disease outcomes, even those who have comorbidities [2–6]

By September 2020, Brazil had 4.3 million COVID-19 cases and 135 000 deaths, and 821 deaths of children and adolescents after the start of the pandemic [7] However, children's deaths are not evenly distributed. Sao Paulo, the most populous and developed Brazilian state, reported a rate of 0.81 deaths per 100 000 people under 19 years old [8], while Sergipe, the smallest Brazilian state, reported 4.87/100 000 [9] Such differences

motivate us to study and describe the burden of COVID-19 deaths in children and adolescents in Sergipe State, to identify possible reasons for the high proportion of deaths.

Methods

This was an ecological study of all reported COVID-19 cases and confirmed deaths of children and adolescents younger than 19 years in Sergipe. All deaths were confirmed by reverse transcription polymerase chain reaction (RT-PCR) assays for severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2). COVID-19 cases reported by the state are diagnosed based on clinical presentation, radiology, serology or RT-PCR, depending on the severity of clinical presentation and the place of consultation.

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Sergipe State has 2.2 million inhabitants of whom 36.6% are under 19 years old [10]. The state has 22 paediatric intensive care unit (ICU) beds, of which 20 (91%) belong to the Brazilian national health system (Sistema Único de Saúde, SUS) and 87 neonatal ICU beds, of which 64 belong to SUS [11].

Data on COVID-19 cases and deaths were obtained from the Sergipe Health Surveillance [9] and mortality information systems [12]. The characteristics of the children (sex, age, place of death, comorbidities, time from symptoms onset to hospitalisation and death) were obtained from the hospital records. Population data stratified by age were obtained from the Brazilian Institute of Geography and Statistics [10]. The characteristics of the children were summarised using descriptive statistics, and we calculated both the number of deaths per 100 000 population and the case fatality rates (CFRs) by age group. COVID-19 CFR was calculated by dividing the number of deaths by the number of COVID-19 cases. The study was approved by the Research Ethics Committee of the Federal University of Sergipe (approval number 36778320.0.0000.5546).

Results

Sergipe reported 6038 COVID-19 cases among children under 19 years of age until 30 September 2020, of whom 37 died, resulting in a CFR of 0.61%. Sergipe has a population of 759 907 children under 19, and thus, the state had 4.87 deaths per 100 000 paediatric population. The highest proportion of deaths was reported in infants ($n = 15$): 44.1 deaths per 100 000 infants < 12 months with a case fatality rate (CFR) of 15.3%. Of older children, fewer died, and their CFR was lower, as shown in Table 1.

The characteristics of all deaths in children and adolescents are shown in Table 2. Among the 15 (41%) deaths of infants, five were neonates. Thirty-five (95%) of the 37 deaths occurred in SUS hospitals. The median time

from symptom onset to admission to hospital was 3 days (interquartile range (IQR): 0–5). There was no difference between the time of symptom onset and admission to hospital between age groups ($P = 0.704$, from Kruskal–Wallis test). Four children admitted to hospital without COVID-19 (cardiac disease, neoplasia and chronic neurologic disease) became symptomatic after admission. Nine (24%) children died within 24 hours of admission; the median time to death was 6 days (IQR: 1–13) after admission. There was no difference between the time of admission to hospital and death between age groups ($P = 0.464$, from Kruskal–Wallis test). Twenty-five (68%) of the children had underlying comorbidities such as chronic neurological diseases ($n = 7$; 19%) and prematurity ($n = 4$; 11%). Fourteen (38%) of the children who died were admitted to ICU.

Discussion

We report an unusually high death rate and case fatality rate among children in Sergipe. Most of these children were infants and had a rapid progression to death after hospital admission. Most children had underlying comorbidities, and a small proportion of them were admitted to an ICU.

The COVID-19 mortality rate in children under 19 years old in Sergipe is 37 times higher than that reported from the United States and the UK (0.13 deaths per 100 000 population under 19 years old for both) and 3.7 times higher than in other areas of Brazil (1.3 deaths per 100 000 population under 19 years old) [8,13,14].

UNICEF reported scarce data on mortality among children and adolescents from low- and middle-income countries due to the later emergence of the COVID-19 pandemic in these settings and lack of resources to conduct epidemiological and clinical studies [15]. However, differences in fatality rates from COVID-19 by age between low-, middle- and high-income countries are predicted [16].

Table 1 COVID-19 mortality rate and case fatality ratio for age group in Sergipe, May–September 2020

Age group	Confirmed cases (n)*	Deaths (n)*	Population [†]	Deaths for 100 000 age group population	Case fatality rate
<1 year	98	15	34 016	44.10	15.31
1–4 years	935	4	136 606	2.93	0.43
5–14 years	2190	10	387 240	2.58	0.46
15–19 years	2815	8	202 045	3.96	0.29
All	6038	37	759 907	4.87	0.61

*Source: Secretary of State for Health, data recorded until 30 September 2020.

[†]Source: DATASUS – demographic indicators – Sergipe, data from 2018.

Table 2 Characteristics of children and adolescents' deaths by COVID-19, Sergipe

Variables	Age group				All (<i>n</i> = 37)
	< 1 year (<i>n</i> = 15)	1 to 4 years (<i>n</i> = 4)	5 to 14 years (<i>n</i> = 10)	15 to 19 years (<i>n</i> = 8)	
Sex, <i>n</i> (%)					
Male	7 (47)	3 (75)	7 (70)	6 (75)	23 (62)
Female	8 (53)	1 (25)	3 (30)	2 (25)	14 (38)
Days from symptom onset to hospitalisation; median (IQR)	3 (1–9)	2 (0–2)	1 (0–4)	3 (0–5)	3 (0–5)
Days from hospital admission to death; median (IQR)	3 (0–9)	9 (0–34)	7.5 (2.5–21.5)	11.5 (2–15.5)	6 (1–13)
Comorbidity, <i>n</i> (%)					
Yes	9 (60)	2 (50)	9 (90)	5 (62)	25 (68)
No	6 (40)	2 (50)	1 (10)	3 (38)	12 (32)
Type of comorbidity*, <i>n</i> (%)					
Chronic neurological disease	2 (13)	1 (25)	4 (40)	0 (0)	7 (19)
Prematurity	4 (26)	0 (0)	0 (0)	0 (0)	4 (11)
Chronic respiratory disease	2 (13)	0 (0)	2 (20)	0 (0)	4 (11)
Neoplasia	0 (0)	0 (0)	1 (10)	2 (25)	3 (8)
Chronic cardiac disease	0 (0)	1 (25)	1 (10)	0 (0)	2 (5)
Genetic disease	1 (6)	0 (0)	1 (10)	0 (0)	2 (5)
Diabetes	0 (0)	0 (0)	2 (20)	0 (0)	2 (5)
Kidney disease	0 (0)	0 (0)	1 (10)	1 (12.5)	2 (5)
Others [†]	1 (6)	0 (0)	0 (0)	2 (25)	3 (8)
Admitted to ICU, <i>n</i> (%)					
Yes	7 (47)	2 (50)	3 (30)	2 (25)	14 (38)
No	7 (47)	2 (50)	5 (50)	4 (50)	18 (49)
No registration	1 (6)	0 (0)	2 (20)	2 (25)	5 (13)
Attended SUS Hospital	15 (100)	2 (50)	10 (100)	8 (100)	35 (95)

*Some cases with more than one comorbidity

[†]Post-operative, pregnancy.

Although Sergipe State has an adequate number of adult ICU beds and deployed a further 88 adults' ICU beds since the start of the pandemic, Sergipe has a 41% deficit in paediatric ICU beds [11,17], with only seven in its neonatal ICU, and no additional paediatric ICU beds deployed during the epidemic [9]. Moreover, none of the paediatric ICU beds are ring-fenced for COVID-19 and children often experience long waiting times before ICU admission. Another Brazilian study during the pandemic also described similar difficulties accessing ICU beds for pregnant women [18].

Seven of the deaths occurred in neonates and infants with neonatal-related problems. The large proportion of deaths among children with comorbidities has been reported elsewhere; especially, neonates are at greater risk of severe illness and death than older children [19,20]. Neonates are more susceptible to infectious diseases and are more likely to present health complications such as prematurity, perinatal asphyxia and maternal infections, which lead to high fatality rates.

One study has described the direct and indirect effects of the pandemic in the health services available for neonates in low- and middle-income countries [21]. Sergipe has historically had high mortality rates among its neonates [12]. COVID-19-related deaths in Sergipe may have highlighted these discrepancies in the Brazilian SUS, especially for services such as maternal and neonatal care that have a history of inadequate supplies and services [22,23].

The role of comorbidities in severe COVID-19 has been reported less frequently in children than in adults. In Europe, COVID-19 deaths occur less frequently in children, even among those who are immunocompromised [24]. Other studies have reported a large number of previously healthy children with severe COVID-19 [4–6]. In Sergipe, almost 70% of children's deaths were associated with comorbidities, some of which require lengthy hospitalisation that may have facilitated nosocomial transmission. Nine children died within 24 h of hospital admission, reflecting delays on health seeking and severe presentation at the time of admission to hospital.

This study has several limitations. The data were not collected prospectively and based on epidemiological surveillance and hospital records. Overall, there is significant under-reporting of COVID-19 cases in Sergipe State and Brazil, and therefore, our information is likely to represent merely the most severe forms of the disease. Sergipe and Brazil have the same availability of tests, as most of them are provided by the Ministry of Health, with a smaller proportion of tests being purchased by the State Government. This would increase the CFR, but this occurs for most states, Sergipe included. However, it would not change the number of deaths/ age-specific population that we found. The death rate by population is unbiased, as the denominator comes from the last official census.

Conclusion

COVID-19 deaths by population and the case fatality ratio in children and adolescents in Sergipe are higher than in other Brazilian states and elsewhere, especially among infants. Although most of the children had underlying health conditions, the proportion of children admitted to ICU was small and reflects insufficient paediatric ICU capacity in Sergipe State. Neonates and infants are a risk group that should have priority in public health policy and ICU services.

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