

Epidemiological profile of COVID-19 in children in Acre from 2020 to 2022

Perfil epidemiológico da COVID-19 em crianças do Acre no período de 2020 a 2022

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ABSTRACT | OBJECTIVE: To describe the epidemiological profile of COVID-19 in children in the state of Acre from 2020 to 2022. **METHODS:** A retrospective, cross-sectional, population-based study was conducted. Data collection was performed through the Sistema de Informação de Agravos de Notificação – SINAN (Notifiable Diseases Information System) of the Acre State Health Department. **RESULTS:** During the study period, 9063 cases of COVID-19 were reported in children, with a predominance in the municipality of Rio Branco (3.880/43%). The majority occurred in the age group between 1 and 9 years (5.523/61%). The frequency was equal for both sexes, 50% each. The highest number of cases was reported in the brown race/ethnicity category (6.800/75%). In 2022, an increase in the disease was observed, totaling 4.857 cases. Regarding diagnostic tests, the antigen rapid test stood out (5.136/57%). The vast majority recovered (8.836/97%). Thirteen deaths occurred, predominantly in girls (8/62%), children under 1 year of age (6/46%), and of brown race/ethnicity (7/54%), with the majority in the year 2020 (6/46%). **CONCLUSION:** The results highlighted a significant number of COVID-19 cases in children in the state of Acre, although a small number of deaths occurred.

KEYWORDS: Child. COVID-19. Acute Respiratory Syndrome. Notifiable Disease.

RESUMO | OBJETIVO: Descrever o perfil epidemiológico da COVID-19 em crianças do Acre no período de 2020 a 2022. **MÉTODOS:** Estudo transversal, retrospectivo, de base populacional. A coleta de dados foi efetuada por meio do Sistema de Informação de Agravos de Notificação (SINAN) da Secretaria de Estado de Saúde do Acre. **RESULTADOS:** No período foram notificados 9.063 casos de COVID-19 em crianças, com predomínio no município de Rio Branco (3.880/43%). A maioria ocorreu na faixa etária entre 1 e 9 anos (5.523/61%). A frequência foi igual para ambos os sexos, 50% cada. O maior registro de casos foi na raça/cor parda (6.800/75%). Em 2022, observou-se aumento da doença, totalizando 4.857 casos. Quanto aos exames diagnósticos, o teste rápido de antígeno se destacou (5.136/57%). A grande maioria evoluiu para a cura (8.836; 97%). Ocorreram 13 mortes, predominantemente em meninas (8/62%), crianças com menos de 1 ano de idade (6/46%) e da raça/cor parda (7/54%), sendo a maioria no ano de 2020 (6/46%). **CONCLUSÃO:** Os resultados evidenciaram um número expressivo de casos de COVID-19 em crianças no estado do Acre, embora tenha ocorrido um número pequeno de óbitos.

PALAVRAS-CHAVE: Criança. COVID-19. Síndrome Respiratória Aguda. Doença de Notificação Compulsória.

1. Introduction

COVID-19 is an acute respiratory infection caused by the coronavirus SARS-CoV-2, which emerged in 2019 in China and spread rapidly around the world, resulting in a global pandemic.¹

Although newborns, children, and adolescents are generally less affected by COVID-19, Brazil stands out globally with high rates of pediatric mortality related to the disease. A 2020 systematic review revealed that the country recorded 23 deaths per 1,000,000 children, surpassing nations such as the United States.² Analysis up to May 2021 keeps Brazil in second place, with 32 deaths per 1,000,000 children, second only to Peru with 41 deaths per million.³

The literature has shown that SARS-CoV-2 is a betacoronavirus belonging to the *Sarbecovirus* subgenus of the *Coronaviridae* family—the seventh coronavirus known to infect humans—and transmission of the virus can occur by contact, droplets, and aerosols, with household exposure being one of the main forms of contraction in the pediatric population.^{4,5}

Although children and adolescents often present with mild forms of COVID-19, it is crucial to recognize their potential to develop serious clinical manifestations and contribute to the transmission of the virus. In this context, the availability of vaccination for children over 5 years of age appears as a fundamental strategy in Brazil, aiming to mitigate the risk of deaths in this age group.⁶

Infected children generally present common clinical manifestations, such as fever, cough, and gastrointestinal symptoms, but it is important to be aware of risk factors, such as age under two years, chronic lung diseases, heart disease, diabetes mellitus, renal failure, and immunosuppression, which can contribute to increasing the severity of the disease.⁷

Viruses are one of the main causes of respiratory tract infections in children, being considered a major factor in hospitalizations. Despite the initial belief that children and adolescents were only reservoirs of SARS-CoV-2 and would not develop severe forms of the disease, it is now understood that they can also present severe

manifestations, including Inflammatory Syndromes Associated with COVID-19. These syndromes, divided into Acute Febrile Syndrome, Kawasaki Disease, and Children's Inflammatory Multisystem Syndrome, demonstrate the complexity of the impact of the virus in this age group.⁸

In the area of nursing, professionals play a crucial role in the management of pediatric patients with COVID-19. This research seeks to provide an in-depth understanding of clinical cases, demographics, and strategies adopted, consolidating new knowledge. The relevance of this study lies in filling knowledge gaps to contribute to more efficient approaches to caring for affected children, aiming to improve health outcomes in this vulnerable population.

In this sense, this article aims to describe the epidemiological profile of COVID-19 in children in Acre from 2020 to 2022.

2. Method

This is a retrospective, descriptive, cross-sectional study. The data were extracted from the Sistema de Informação de Agravos de Notificação - SINAN (Notifiable Diseases Information System) of the Secretaria de Estado de Saúde do Acre - SESACRE (State Department of Health of Acre) regarding the number of cases of COVID-19 in children from 2020 to 2022 in the state.

Data were collected in February 2023. The sample was composed of all reported cases of COVID-19 in children aged 0 to 12 years in the state of Acre during the study period. Data that were incomplete in the information system (SINAN) were excluded.

After approval of the project by the ethics committee, the researchers sent the research approval opinion and requested the following secondary data from the epidemiological surveillance team responsible for SINAN of the Acre state health department: number of cases of the disease, municipality of origin, age group, race, sex, diagnostic methods, and outcome (cure or death).

The organization and analysis of data were carried out according to the type of data provided by the Department of Health, and the tabulation of results used statistical programs such as Microsoft Excel and Minitab, using a Microsoft Office Excel 2010 spreadsheet to compile them.

Considering that the collection took place in a secondary database and it was not possible to identify the participants, this study did not require signing an Informed Consent Form (ICF).

This research was based on the recommendations of Resolution No. 466 of December 12, 2012, and No. 510 of April 7, 2016, of the National Health Council—which govern the conduct of research with human beings—and was submitted to and approved by the ethics committee and local research with opinion No. 5.770.126 and CAAE: 65184022.7.0000.8028.

3. Results

In the period analyzed, 9,063 cases of COVID-19 were recorded in children, with the city of Rio Branco presenting the highest number of cases, totaling 3,880 cases (43%) (Table 1).

Table 1. Number of cases of COVID-19 among individuals aged 0 to 12 years by municipality of occurrence in the state of Acre in the period between January 2020 and December 2022 (n=9,063)

Variable	N	%
Acrelândia	233	3.0
Assis Brasil	222	2.0
Brasileia	166	2.0
Bujari	84	1.0
Capixaba	77	1.0
Cruzeiro do Sul	954	11.0
Epitaciolândia	87	1.0
Feijó	180	2.0
Jordao	86	1.0
Máncio Lima	361	4.0
Manoel Urbano	64	1.0
Marechal Thaumaturgo	141	2.0
Plácido de Castro	237	3.0
Porto Acre	132	1.0
Porto Walter	38	0.0
Rio Branco	3880	43.0
Rodrigues Alves	95	1.0
Santa Rosa do Purus	142	2.0
Sena Madureira	663	7.0
Senador Guiomard	221	2.0
Tarauacá	764	8.0
Xapuri	236	3.0
Total	9063	100.0

Source: SINAN/SESACRE (2023).

According to data in Table 2, the majority of cases occurred in children between 1 and 9 years of age, representing 61% of the total. The distribution of cases was similar for both sexes, corresponding to 50% each. Regarding race/color, most cases were registered in children classified as brown, totaling 6,800 cases (75%).

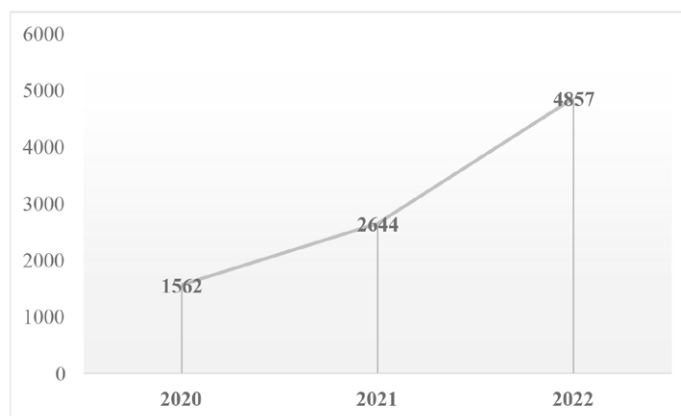
Table 2. Socio-demographic profile of individuals aged 0 to 12 years affected by COVID-19 in the state of Acre in the period between January 2020 and December 2022 (n=9,063)

Variable	N	%
Age range		
Under 1 year old	924	10.0
1 to 9	5523	61.0
10 to 12	2616	29.0
Sex		
Female	4557	50.0
Male	4506	50.0
Race/Skin color		
Yellow	246	2.7
White	729	8.0
Ignored	1045	11.5
Indigenous	171	1.9
Brown	6800	75.0
Black	72	0.8

Source: SINAN/SESACRE (2023).

In 2022, there was a significant increase in the number of cases, with a total of 4,857 records (Figure 1).

Figure 1. Number of cases of COVID-19 in individuals aged 0 to 12 years old per year of occurrence in the state of Acre in the period between January 2020 and December 2022 (n=9,063)



Source: SINAN/SESACRE (2023).

According to the data in Table 3, regarding the tests carried out for diagnosis, the Rapid Antigen Test was the most used, representing 57% of the cases identified. Most cases progressed to cure, totaling 8,836 cases (97%).

Table 3. Clinical and epidemiological profile of cases of individuals aged 0 to 12 years affected by COVID-19 in the state of Acre in the period between January 2020 and December 2022 (n=9,063)

Variable	n	%
Type of exam		
Epidemiological Clinic	1	0.0
PCR	1338	15.0
Serology	20	0.0
Rapid Antigen Test	5136	57.0
Serological Rapid Test	2568	28.0
Outcome		
Cure	8836	97.5
Death	13	0.1
No information	214	2.4

Source: SINAN/SESACRE (2023).

There were 13 deaths recorded, most of which were girls (62%), children under 1 year of age (46%), and those belonging to brown race/color (54%), with the majority occurring in the year 2020 (46%) (Table 4).

Table 4. Profile of deaths of individuals aged 0 to 12 years affected by COVID-19 in the state of Acre in the period between January 2020 and December 2022 (n=13)

Variable	n	%
Sex		
Female	8	62.0
Male	5	38.0
Age range		
Under 1 year old	6	4.0
1 to 9 years	5	38.0
10 to 12 years	2	15.0
Race/Skin color		
Ignored	4	31.0
Indigenous	2	15.0
Brown	7	54.0
Year of occurrence		
2020	6	46.0
2021	5	38.0
2022	2	15.0

Source: SINAN/SESACRE (2023).

4. Discussion

The study analyzed significant data on the incidence of COVID-19 in children in Acre, highlighting clinical, epidemiological, and socioeconomic aspects. Although it was observed that 97% of cases were cured, the considerable number of infections in the region reinforces the urgency of preventive measures. Educational strategies—emphasizing hygiene, hydration, and adequate nutrition—stand out as crucial to ensuring children's immunity, in addition to highlighting the fundamental importance of childhood vaccination against the disease.

In comparison, a study carried out in the state of Ceará analyzed 48,002 suspected cases of COVID-19 in children and adolescents, confirming 18,180 cases. The median age for confirmed cases was 12 years. The death rate was 0.3%, with 15% of these cases having comorbidities.⁹ Comparing these results with those of the present study, there is a divergence in relation to the age group; while in Acre, most cases occurred in children, in Ceará, the largest number occurred in adolescents, highlighting regional particularities.

A study carried out on hospital mortality from COVID-19 in children and adolescents in Brazil, covering the years 2020 and 2021, identified 18.2% of confirmed cases among 144,041 patients and offered a national view of the disease in the country.¹⁰ The results highlighted the predominance of cases in infants and preschoolers and are in line with the considerable increase in cases in children aged 1 to 9 years that occurred in Acre, as identified in this study, especially in 2020.

Similarly, a retrospective cohort study involving children and adolescents hospitalized for COVID-19 in Brazil highlighted significant aspects. The analysis of 4,930 cases revealed a predominance of 51.8% of male patients, while the self-declared brown race/color was the most common (47.4%). Among the deaths, 323 (64.6%) were children (zero to 11 years of age). Notably, the federative unit of Roraima presented a significant in-hospital mortality rate of 68.8%.¹¹ When comparing these findings with those of the present study, the prevalence of the brown race in both scenarios stands out, indicating demographic similarity.

However, divergences arise regarding deaths by age, with the present study showing the majority in female children under 1 year old and belonging to the brown race/color, while the national study revealed that the age group from zero to 11 years old concentrated the majority of deaths. These discrepancies highlight the need to consider regional specificities for a more comprehensive understanding of the dynamics of the disease in children.

Also noteworthy is another research carried out in Franco da Rocha/SP in 2021, showing that children aged 5 to 9 years, of white race/color, had a higher incidence of COVID-19, with mild cases predominating in girls and severe cases in boys. Symptoms such as cough, fever, and respiratory discomfort were common, and the presence of pre-existing conditions was associated with 60% of serious cases, culminating in death in some cases, especially in the age group of 1 to 4 years.¹²

Comparing the results of the study mentioned above with those of the present research, it is noted that the age range of affected children differs, with the 5- to 9-year-old group being more prevalent in Franco da Rocha, while in Acre, the majority of cases were concentrated between 1 and 9 years. Both studies indicate race/color as a relevant factor, with a higher incidence in white children in Franco da Rocha and a predominance of brown children in Acre. These discrepancies highlight the variability in the manifestation of COVID-19 in children, influenced by different regional and demographic contexts.

Also noteworthy is a study carried out in the state of Minas Gerais, which analyzed 2,606 children admitted to a pediatric hospital and identified 164 (6.3%) confirmed cases of SARS-CoV-2 infection among them. The majority of affected children (70%) were under five years old, 54.9% were male. Viral detection in nasopharyngeal swabs by RT-PCR occurred in 101 children (3.9%). Diagnosis by serological test occurred in 44 children (1.7%), and the rapid antigen test, which began to be used at the hospital only in 2021, was positive in 26 patients. Four children died (2.4%).¹³

These findings differ from the results of the present research regarding the predominance of cases in children under five years of age and the predominance of males. On the other hand, both used RT-PCR as the main diagnostic method, although the Rapid Antigen Test was more used in Acre. Regarding outcomes, the death rate in Minas Gerais was 2.4%, while in Acre, it was 0.1%, suggesting possible variations in the severity of cases and the availability of medical resources.

Therefore, the analysis of disparities in deaths from COVID-19 in children and adolescents, considering socioeconomic factors, is an area that has been little explored. Studies suggest that lethality in this group is associated with race and medium- and low-income areas. The North and Northeast regions of Brazil had more deaths initially, but these analyses focused mainly on the first year of the pandemic. Gaps persist in understanding inequalities in Brazilian municipalities in 2020 and 2021, especially given the different waves of COVID-19.¹⁴⁻¹⁶

Another point to highlight is the fact that children generally present less severe cases of COVID-19 than adults and the elderly. This may be attributed to the developing immune system, which may not trigger intense inflammatory responses common in severe cases. The BCG vaccine or previous respiratory syncytial virus infections may provide some protection, and the ACE2 receptors, used by the virus to enter cells, are immature in childhood, making invasion by SARS-CoV-2 difficult.¹⁷ However, more research is needed to fully understand these mechanisms.

The lower incidence of COVID-19 cases in children can be explained by the fact that they spend more time at home, reducing exposure to the virus. Furthermore, the mild symptoms they often present may result in fewer tests to detect SARS-CoV-2 compared to adults. This combination of factors contributes to underreporting and, consequently, a lower reported incidence of the disease in this age group.¹⁸⁻²⁰

On the other hand, some risk factors may contribute to the worsening of COVID-19 and severe acute respiratory syndrome in childhood, such as: being younger than two years of age, who more frequently present general, respiratory and gastrointestinal symptoms, in addition to chronic lung diseases; heart disease; diabetes mellitus; renal failure and immunosuppression, which can contribute to worsening and in many cases death.¹⁷⁻²¹

It is noteworthy that based on the scenario found in the present study, vaccination played a crucial role in combating the disease, resulting in the reduction of serious cases and mortality, in addition to containing the spread of the virus. However, children, possible reservoirs of the virus, experienced a proportional increase in infections due to the late introduction of vaccination and the emergence of more transmissible variants at the beginning of the pandemic period. It is urgent to strengthen measures to support COVID-19 vaccination in pediatrics, considering the general benefits for society and emphasizing that the benefits of childhood vaccination outweigh the risks of contracting the infection when not vaccinated.²²⁻²⁴

In terms of limitations, the study was based on data available in the SINAN, which may have resulted in underreporting or lack of detailed information about cases. Additionally, information on risk factors, comorbidities, and specific clinical characteristics of cases was not provided, limiting a full understanding of the impact of COVID-19 on these children.

5. Conclusions

The data presented reveals the situation of COVID-19 in children in the state of Acre, with the capital, Rio Branco, being the most affected municipality. The predominant age range for cases was 1 to 9 years old, with an equal distribution between the sexes and a predominance in the brown race/color population.

The year 2022 stood out for a significant increase in cases, and the rapid antigen test was the most used diagnostic method. The majority of cases had a positive outcome, with a significant cure rate, indicating the remarkable resilience of most children in the face of the disease. However, it is crucial to observe the occurrence of deaths, especially in girls, children under 1 year of age, and in the brown race/color population, with most of these events recorded in 2020.

These results highlight the continued importance of preventive strategies and specific interventions for more vulnerable groups, highlighting the need for constant vigilance to protect children's health against the effects of the disease.

Authors' contributions

Costa RSL participated in the conception, design, submission of the project to the Ethics and Research Committee, interpretation of data, search and analysis of research data, interpretation of results, and writing of the scientific article. Costa PR, Andrade TF, and Souza VC participated in the conception, design, collection of research data, interpretation, search and analysis of data, and writing of the scientific article.

Conflicts of interest

No financial, legal, or political conflicts involving third parties (government, private corporations, and foundations, etc.) have been declared for any aspect of the submitted work (including, but not limited to, grants and financing, advisory board participation, study design, preparation manuscript, statistical analysis, etc.).

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References

1. Ministério da Saúde (Brasil). Definição de caso e notificação. 2020. Available from: https://coronavirus.saude.mg.gov.br/images/2022/01/SEI_GOVMG_-_40841579_-_Nota_T%C3%A9cnica_-_Atualiza%C3%A7%C3%A3o_Protocolo.pdf
2. Kitano T, Kitano M, Krueger C, Jamal H, Rawahi H, Lee-Krueger R, et al. The differential impact of pediatric COVID-19 between high-income countries and low- and middle-income countries: A systematic review of fatality and ICU admission in children worldwide. PLoS One. 2021;16(1):e0246326. <https://doi.org/10.1371/journal.pone.0246326>
3. Sousa BLA, Silva CA, Ferraro AA. An update on the epidemiology of pediatric covid-19 in Brazil. Rev Paul Pediatr. 2022;40:e2021367. <https://doi.org/10.1590/1984-0462/2022/40/2021367>
4. Ministério da Saúde (Brasil), Secretaria de Vigilância em Saúde. Boletim Epidemiológico Especial: Doença pelo Novo Coronavírus – COVID-19 [Internet]. 2022. Available from: <https://www.gov.br/saude/pt-br/centrais-de-conteudo/publicacoes/boletins/epidemiologicos/covid-19/2022/boletim-epidemiologico-no-95-boletim-coe-coronavirus.pdf>
5. Mostardeiro LR, Antonioli ECA, Xavier JW. Coronavirus in pediatrics: report of two cases and review of the literature. J Bras Patol Med Lab. 2020;56:e3552020. <https://doi.org/10.5935/1676-2444.20200058>
6. Safadi MAP, Silva CAA. The challenging and unpredictable spectrum of covid-19 in children and adolescents. Rev Paul Pediatr. 2021;39:e2020192. <https://doi.org/10.1590/1984-0462/2020/38/2020192>
7. Nunes MDR, Pacheco STA, Costa CIA, Silva JA, Xavier WS, Victória JZ, et al. Diagnostic tests and clinical characteristics of COVID-19 in children: an integrative review. Texto Contexto Enferm. 2020;29:e20200156. <https://doi.org/10.1590/1980-265X-TCE-2020-0156>
8. Fundação Osvaldo Cruz, Instituto Nacional de Saúde da Mulher, da Criança e do Adolescente Fernandes Figueira. COVID-19 e Saúde da Criança e do Adolescente [Internet]. Rio de Janeiro: Fiocruz; 2021. Available from: https://portaldeboaspraticas.iff.fiocruz.br/wp-content/uploads/2021/09/Covid_edu_v2.pdf
9. Cavalcante ANM, Tavares LVS, Bastos MLA, Almeida RLF. Clinical-epidemiological profile of children and adolescents with COVID-19 in Ceará. Rev Bras Saude Mater Infant. 2021;21(suppl 2):S429-35. <https://doi.org/10.1590/1806-9304202100S200006>
10. Silva ACCAC, Luiz RR, Moraes JR, Rocha PHV, Zeitoune RCG, Barbosa AP, et al. Hospital mortality from COVID-19 in children and adolescents in Brazil in 2020–2021. Rev Saúde Pública. 2023;57:56. <https://doi.org/10.11606/s1518-8787.2023057005172>
11. Gomes NTN, Haslett MIC, Alves AJS, Percio J, Duarte MMS, Malta JMAS, et al. Retrospective cohort of children and adolescents hospitalized by COVID-19 in Brazil from the beginning of the pandemic to August 1st, 2020. Rev Bras Epidemiol. 2021;24. <https://doi.org/10.1590/1980-549720200026>
12. Tafarello EC. Efeitos diretos e indiretos da pandemia de covid-19 na saúde das crianças de Franco da Rocha/SP [monografia] [Internet]. São Paulo: Instituto de Saúde; 2021. Available from: <https://pesquisa.bvsalud.org/portal/resource/pt/biblio-1151769>
13. Bentes AA, Silva DRL, Ramos LA, Silva MAO, Cunha ALG, Soares PAA, et al. Perfil clínico-epidemiológico de crianças e adolescentes com infecção confirmada por SARS-COV-2 em hospital de referência pediátrica de Minas Gerais. Braz J Infect Dis. 2022;26(S1):102049. <https://doi.org/10.1016/j.bjid.2021.102049>
14. Martins-Filho PR, Quintans-Júnior LJ, de Souza Araújo AA, Sposato KB, Souza Tavares CS, Gurgel RQ, et al. Socio-economic inequalities and COVID-19 incidence and mortality in Brazilian children: a nationwide register-based study. Public Health 2021; 190. [Doi.10.1016/j.puhe.2020.11.005](https://doi.org/10.1016/j.puhe.2020.11.005)

15. Martins-Filho PR, Araújo AAS, Quintans-Júnior LJ, Santos VSS. COVID-19 fatality rates related to social inequality in Northeast Brazil: a neighbourhood-level analysis. *J Travel Med.* 2020;27(7):taaa128. <https://doi.org/10.1093/jtm/taaa128>
16. Lima EEC, Gayawan E, Baptista EA, Queiroz BL. Spatial pattern of COVID-19 deaths and infections in small areas of Brazil. *PLoS One.* 2021;16(2):e0246808. <https://doi.org/10.1371/journal.pone.0246808>
17. Sociedade Brasileira de Pediatria, Departamento de Pneumologia. COVID-19 em crianças: envolvimento respiratório [Internet]. Rio de Janeiro: SBP; 2020. Available from: <https://www.sbp.com.br/imprensa/detalhe/nid/covid-19-em-criancas-envolvimento-respiratorio/>
18. Lee P-I, Hu Y-L, Chen P-Y, Huang Y-C, Hsueh P-R. Are children less susceptible to COVID-19?. *J Microbiol Immunol Infect.* 2020;53(3):371-2. <https://doi.org/10.1016/j.jmii.2020.02.011>
19. Kaushik S, Aydin SI, Derespina KR, Bansal PB, Kowalsky S, Trachtman R, et al. Multisystem inflammatory syndrome in children associated with severe acute respiratory syndrome coronavirus 2 infection (MIS-C): A multi-institutional study from New York City. *J Pediatr.* 2020;224:24-9. <https://doi.org/10.1016/j.jpeds.2020.06.045>
20. Chiu JS, Lahoud-Rahme M, Schaffer D, Cohen A, Samuels-Kalow M. Kawasaki disease features and myocarditis in a patient with COVID-19. *Pediatr Cardiol.* 2020;41(7):1526-8. <https://doi.org/10.1007/s00246-020-02393-0>
21. Ramos C, Castro ME, Daboit LG, Nogueira LB, Goes IS, Ribeiro KM, et al. Fatores de Risco para o agravamento de Crianças com síndrome inflamatória multissistêmica após Infecção Por Covid-19: Revisão Sistemática. *Brazilian Journal of Health Review.* 2022;5(3):10636-48. <https://doi.org/10.34119/bjhry5n3-223>
22. Lima EJF. COVID-19 and Pediatrics: A look into the past and the future. *Rev Bras Saude Mater Infant.* 2022;22(4):731-4. <https://doi.org/10.1590/1806-9304202200040001>
23. Paris K, Permar SR. Routine SARS-CoV-2 vaccination for all children. *Immunol Rev.* 2022;309(1):90-6. <https://doi.org/10.1111/imr.13108>
24. Ministério da Saúde (Brasil), Secretaria de Vigilância em Saúde, Departamento de Imunização e Doenças Transmissíveis. Nota técnica N° 213/2022-CGPNI/DEIDT/SVS/MS [Internet]. Brasília: Ministério da Saúde; 2022. Available from: <https://www.gov.br/saude/pt-br/assuntos/covid-19/notas-tecnicas/2022/nota-tecnica-no-213-2022-cgpn-deidt-svs-ms-1/view>