COVID-19 and Pediatrics: a look into the past and the future

Globally, COVID-19 pandemic was devastating. Children were seemingly spared at the beginning of the pandemic, where by October 2021, according to the World Health Organization (WHO), those under the age of five accounted for 2% of the cases and 0.1% of global deaths.[1] However, the epidemiological scenario hás under gone major changes with an increase in cases among children and adolescents in 2022. Global data reveals that children under the age of five and between five and 14 years old currently account for 2.47% and 10.44% of the cases of COVID-19, respectively.[2]

The highest mortality of the disease in pediatrics occurred in low and middle income countries, especially those under one year of age[3] reflecting once again how the income markedly affects child health, and it was not different with COVID-19, where the worst Access to medical care also determined mortality indicators.[4]

Brazil accounted for about one in Five of these deaths in the pediatric age in the world and the vírus killed about two children under Five years of age per day, where as the Northeast region concentrated almost half of these deaths.[5]

Pediatric manifestations of Covid were found to appear at a frequency of 25.24%, with mood swings (16.50%), fatigue (9.66%), and sleep disturbances (8.42%) being the main ones.[6] However, the hidden side of the pandemic was even more dramatic for our children. There were important osses of caring parents and grandparents leading to psychological suffering that is difficult to measure. With the absence of regular classes in school, there was also the loss of nutritional support offered by school meals and reduced physical activities. In addition, the occurrence of mistreatment, sexual violence, and associated teenage pregnancy accentuated theal ready existing social inequalities.[7]

Vaccination has played an essential role in the fight against COVID-19, making it possible to reduces ever e illness and mortality rates, and contain the spread of the disease.[8] Children may play an important role in the transmission of this new respiratory disease by being a possible reservoir of the virus.[9,10]

Children and adolescents safely were excluded from the initial clinical trials, and vaccination was only introduced laterin this group.[11] In Brazil, the inactivated vírus vaccine from the pharmaceutical company, *Sinovac Biotech* (CoronaVac) received approval for immunization of the pediatric population over three years of age, and the messenger RNA (mRNA) vaccine BNT162b2, developed in collaboration by Pfizer and BioNTech laboratories, was authorized for adolescentes, 12 to 18 years old. Subsequently, children aged five to 11 years old with a special presentation containing one-third of the standard dose and in September 2022, another pediatric presentation, corresponding to one-tenth of the adult dose, was used in children aged six months to three years of age.[11-13]

The late introduction of vaccines in children combined with the emergence of new variants and sub-variants with greater transmission capacity have resulted in a proportional increase in infections in younger children.[13] Inequalities in vaccine distribution, vaccine hesitancy, misinformation, and political complexities meanth at vaccine coverageis still insufficient for pandemic containment.[9]

Prevention on SARS-CoV-2 infection in infants includes protection induced by maternal vaccination. Effectiveness studies in pregnant women have shown that this group benefited significantly from the vaccination.[14-16] Mothers Who were vaccinated before or during pregnancy also transfer specific antibodies to their babies transplacentally and through breastmilk to protect them.[17,18] It is noteworthy that infants are one of the pediatric populations most frequently hospitalized for SARS-CoV-2 infection,[19] and most of these children have no comorbidities.[18]

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The safety ofusing new vaccines and monitoring adverse events will always be a major concern. The rare cases of myocarditis and pericarditis that have been observed in adolescents and Young adults receive especially mRNA platform vaccines seem to bein dose and in dependent interval and were not yet been reported with lower dose pediatric vaccines in younger populations.[20-24]

Considering the overall benefits to the society and to the children, there is an urgent need to streng then measures to support COVID-19 vaccination in pediatrics and expand the protected groups.[25,26] The benefits of childhood vaccination with SARS-CoV-2 vaccines over come the risks of acquiring the infection than the unvaccinate dones, placing the vaccine among the most important for child health as other routine vaccines.[27]

Parental fears about safety are an important influencing factor in the decision to vaccinate children. Governments should have effective communication for reducing the various aspects surrounding vaccine hesitancy.[28,29]

Children have been a major weak link in this pandemic, being hit directly and indirectly with losses that Will have their consequences for years to come. Weneed a truly committed look at this cause.

References

1. Centers for Diseases Control and Prevention (CDC). COVID Data Tracker: Demographic Trends of COVID-19 cases and deaths in the US reported to CDC. [access in 2022 out 20]. Available from: https://Covid.cdc.gov/Covid-data-tracker/#demographics.
2. World Health Organization (WHO). Interim statement on COVID-19 vaccination for children. 11 August 2022. [access in 2022 out 20]. Available from: https://www.who.int/news/item/11-08-2022-interim-statement-on-covid-19-vaccination-for-children
3. Kitano T, Kitano M, Krueger C, Jamal H, Al 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 Jan; 16 (1): e0246326.
4. Levin AT, Owusu-Boaitey N, Pugh S, Fosdick BK, Zwi AB, Malani A, et al. Assessing the burden of COVID-19 in developing countries: systematic review, meta-analysis and public policy implications. BMJ Glob Health. 2022; 7: e008477.
5. Levy B. Covid-19 mata dois menores de 5 anos por dia no Brasil. Agência Fiocruz de Noticías. 28 de junho de 2022 [Internet]. [access in 2022 out 20]. Available from: https://portal.fiocruz.br/noticia/covid-19-mata-dois-menores-de-5-anos-por-dia-no-brasil
6. Lopez-Leon S, Wegman-Ostrosky T, Ayuzodel Valle NC, Perelman C, Sepulveda R, Rebolledo P, et al. Long-COVID in children and adolescents: a systematic review and meta-analyses. Sci Rep. 2022 Jun; 12(1): 9950.
7. United Nations Children's Fund (UNICEF). Where are we on education recovery. [access in 2022 out 20]. Available from: https://www.unicef.org/lac/media/32546/file/Where-are-we-in-education-recovery.pdf
8. De Paris K, Permar SR. Routine SARS-CoV-2 vaccination for all children. Immunol Rev. 2022 Aug; 309 (1): 90-6.
9. Zimmermann P, Pittet LF, Finn A, Pollard AJ, Curtis N. Should children be vaccinated against COVID-19? Arch Dis Child. 2022 Mar; 107 (3): e1.

10. Jing QL, Liu MJ, Zhang ZB, Fang LQ, Yuan J, Zhang AR, et al. Household secondary attack rate of COVID-19 and associated determinants in Guangzhou, China: a retrospective cohort study. Lancet Infect Dis. 2020; 20: 1141–50.

11. Tian F, Yang R, Chen Z. Safety and efficacy of COVID-19 vaccines in children and adolescents: a systematic review of randomized controlled trials. J Med Virol. 2022 Oct; 94 (10): 4644-53.

12. Ministério da Saúde (BR). Agência Nacional de Vigilância Sanitária (ANVISA). Covid-19: Anvisa aprova vacina da Pfizer para crianças entre 6 meses e 4 anos. Brasília (DF): ANVISA; 2022. [access in 2022 out 20]. Available from: https://www.gov.br/anvisa/pt-br/assuntos/noticias-anvisa/2022/covid-19-anvisa-aprova-vacina-da-pfizer-para-criancas-entre-6-meses-e-4-anos.

13. Ministério da Saúde (BR). Secretaria de Vigilância em Saúde. Departamento de Imunização e Doenças Transmissíveis. Coordenação-Geral do Programa Nacional de Imunizações. Nota técnica Nº 213/2022-CGPNI/DEIDT/SVS/MS. Brasília (DF): Ministério da Saúde; 2022. [access in 2022 out 20]. Available from: https://www.gov.br/saude/pt-br/coronavirus/vacinas/plano-nacional-de-operacionalizacao-da-vacina-contra-a-covid-19/notas-tecnicas/2022/nota-tecnica-213-

14. Giles ML, Gunatilaka A, Palmer K, Sharma K, Roach V. Alignment of national COVID-19 vaccine recommendations for pregnant and lactating women. Bull World Health Organ. 2021; 99: 739-46.

15. Shook LL, Fallah PN, Silberman JN, Edlow AG. COVID-19 vaccination in pregnancy and lactation: current research and gaps in understanding. Front Cell Infect Microbiol. 2021 Sep; 11: 735394.

16. Butt AA, Chemaitelly H, Al Khal A, Coyle PV, Saleh H, Kaleeckal AH, et al. SARS-CoV-2 vaccine effectiveness in preventing confirmed infection in pregnant women. J Clin Invest. 2021; 131 (23): e153662.

17. Collier AY, McMahan K, Yu J, et al. Immunogenicity of COVID-19 mRNA vaccines in pregnant and lactating women. JAMA. 2021 Jun; 325 (23): 2370-80.

18. Beharier O, Plitman Mayo R, Raz T, Sacks KN, Schreiber L, Suissa-Cohen Y, et al. Efficient maternal to neonatal transfer of antibodies against SARS-CoV-2 and BNT162b2 mRNA COVID-19 vaccine. J Clin Invest. 2021 Jul; 131 (13): e150319.

19. Marks KJ, Whitaker M, Agathis NT, et al. Hospitalization of infants and children aged 0–4 years with laboratory-confirmed COVID-19 - COVID-NET, 14 states, March 2020–February 2022. MMWR Morb Mortal Wkly Rep. 2022; 71: 429-36.

20. Wu CT, Chin SC, Chu PH. Acute fulminant myocarditis after ChAdOx1 nCoV-19 vaccine: a case report and literature review. Front Cardiovasc Med. 2022; 9: 856991.

21. Asaduzzaman M, Purkayastha B, Alam MMJ, Chakraborty SR, Roy S, Ahmed N. COVID-19 mRNA vaccine-associated encephalopathy, myocarditis, and thrombocytopenia with excellent response to methylprednisolone: a case report. J Neuroimmunol. 2022 Jul; 368: 577883.

22. Ahmed SK. Myocarditis after BNT162b2 and mRNA-1273 COVID-19 vaccination: A report of 7 cases. Ann Med Surg (Lond). 2022; 77: 103657.

23. Hadley SM, Prakash A, Baker AL, Ferranti SD, Newburger JW, Friedman KG, et al. Follow-up cardiac magnetic resonance in children with vaccine-associated myocarditis. Eur J Pediatr. 2022 Jul; 181 (7): 2879-83.

24. Patel T, Kelleman M, West Z, Peter A, Dove M, Butto A, et al. Comparison of multisystem inflammatory syndrome in children-related myocarditis, classic viral myocarditis, and COVID-19 vaccine-related myocarditis in children. J Am Heart Assoc. 2022 May; 11 (9): e024393.

25. Lima EJF, Faria SM, Kfouri RA. Reflections on the use of COVID-19 vaccines in children and adolescents. Epidemiol Serv Saúde. 2021 Dec 15; 30 (4): e2021957.

26. Tran Kiem C, Massonnaud CR, Levy-Bruhl D, Poletto C, Colizza V, Bosetti P, et al. A modelling study investigating short and medium-term challenges for COVID-19 vaccination: From prioritisation to the relaxation of measures. EClin Med. 2021 Aug; 38: 101001.

27. Souza TH, Nadal JA, Nogueira RJN, Pereira RM, Brandão MB. Clinical manifestations of children with COVID-19: a systematic review. Pediatr Pulmonol. 2020 Aug; 55 (8): 1892-9.

28. Cerda AA, García LY. Hesitation and refusal factors in individuals' decision-making processes regarding a coronavirus disease 2019 vaccination. Front Public Health. 2021 Apr; 9: 626852.

29. Cauchemez S, Bosetti P, Kiem CT, Mouro V, Consoli A, Fontanet A. Education and mental health: good reasons to vaccinate children. Lancet. 2021 Jul; 398 (10298): 387.

Eduardo Jorge da Fonseca Lima [1]
https://orcid.org/0000-0002-2277-2840

[1] Instituto de Medicina Integral Prof. Fernando Figueira. Rua dos Coelhos, 300. Boa Vista. Recife, PE, Brazil. CEP: 50.070-902.