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Short Communication

Impact of COVID-19 on immunization of Brazilian infants

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A B S T R A C T

Objective: To examine recent vaccination trends among Brazilian children during their first year of life, and the impact of the coronavirus disease 2019 (COVID-19) pandemic on these trends.

Methods: Monthly vaccination and birth data from the DATASUS (Department of Informatics of the Unified Health System) database of the Ministry of Health of Brazil were obtained from January 2017 to December 2020. Interrupted time series analysis was used to compare vaccination trends before and after March 2020, when isolation measures were first implemented in Brazil.

Results: There was no strong evidence of a significant change in trends during the study period, or before and during the pandemic at national level. However, the mean number of vaccinations per child was 10.6, which is lower than the 13 doses expected under the immunization schedule.

Conclusions: Although the pandemic did not appreciably impact on vaccinations, incomplete immunization among children aged <1 year in Brazil is cause for concern. A potential impact of the COVID-19 pandemic on specific antigens or regional and sociodemographic disparities in vaccinations cannot be ruled out without further research.

The first case of coronavirus disease 2019 (COVID-19) in Brazil, a country of 212 million inhabitants, was diagnosed on 26 February 2020. As of 2 March 2021, 10.65 million cases have been registered and 257,562 people have died (https://covid.saude.gov.br/). In addition to the profound economic impact of the social isolation measures adopted to face infection with severe acute respiratory syndrome coronavirus-2 infection, COVID-19 affected the entire healthcare network. Decreased vaccination coverage and the emergence of vaccine-preventable diseases (VPDs) have been reported, particularly in poor and developing countries (Adamu et al., 2020; McDonald et al., 2020; Zhong et al., 2021). The national immunization programme in Brazil, created in 1973, has significantly reduced VPD cases and deaths in the Brazilian population, and achieved other important results, such as the certification of Brazil as free of wild poliovirus circulation, and elimination of rubella virus circulation (Domingues et al., 2020). However, since 2016, a 10% decrease in vaccination coverage rates has been observed (Domingues et al., 2020). This reduction is thought to be associated with various factors such as parental perceptions about the need for or safety of certain vaccines, antivaccine movements, religious beliefs, adherence to 'natural' medicine, distrust towards medical technologies, resistance to government authority, persuasive approaches and operational problems in vaccine administration (Domingues et al., 2020). The fact that Brazil is the second most affected country by the COVID-19 pandemic, with a pre-existing economic and political crisis, exacerbated by measures of social restriction to control the pandemic, may be contributing to a dangerous decrease in children's vaccination coverage. However, the impact of the pandemic on immunization programmes and vaccine uptake among infants in Brazil is not known (Matos et al., 2020). A recent systematic review suggested that this subject has not been studied in Latin America (Lassi et al., 2021). As such, this study was undertaken to determine the impact of the COVID-19 pandemic on vaccination of children aged <1 year in Brazil.

Data were obtained from the DATASUS (Department of Informatics of the Unified Health System) database of the Ministry of Health of Brazil. By accessing the immunization link on the database's homepage (http://www2.datasus.gov.br/DATASUS/index.php?area=0202&id=11637), information was collected regarding the 13 doses expected to be administered to children aged <1

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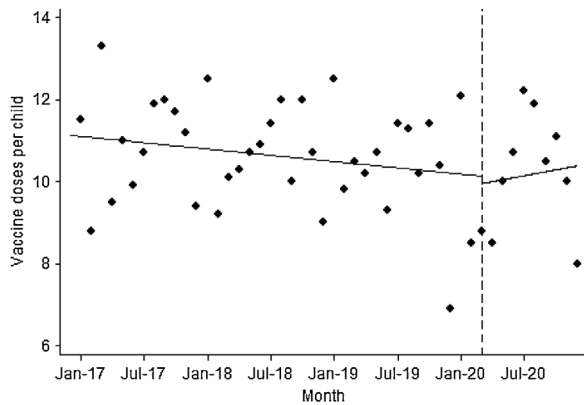E-mail address: marcelo.urquia@umanitoba.ca (M.L. Urquia).

Figure 1. Monthly number of vaccines per child between January 2017 and December 2020. Vertical line represents start of pandemic countermeasures in March 2020.

year (one dose of Bacillus Calmette-Guérin vaccine; two doses of hepatitis B vaccine; three doses of tetravalent diphtheria, tetanus, pertussis and haemophilus B vaccine; three doses of polio vaccine; two doses of rotavirus vaccine; one dose of 10-valent pneumococcal conjugate vaccine; and one dose of C meningococcal vaccine). The main outcome measure was the average number of vaccines per child, calculated using a period approach based on aggregate data as the monthly number of vaccine doses administered to children aged <1 year during 2017 to 2020 divided by the average number of children born in the previous calendar year.

Interrupted time series analysis (ITSA) was used to compare vaccination trends before and after March 2020 (vertical line in Figure 1), when isolation measures were first implemented in Brazil. Consistent with previous reports (Domingues et al., 2020), a slight decrease in the number of doses per child was observed between 2017 and 2020 (Figure 1), but the slope was not significant in the present study (pre-intervention slope -0.07, $P = 0.70$). However, and contrary to expectations, the ITSA model showed no evidence of a significant impact of COVID-19 isolation measures on the number of vaccines per child after March 2020. The slightly downward trend became positive during the COVID-19 pandemic, although the change in the slope was small and not significant (post-intervention slope 0.05, $P = 0.80$), rather suggesting a plateau. Interestingly, a seasonal decrease in vaccinations in December was observed across all years, coinciding with the end of the school term, the beginning of holidays and the Christmas season. Of note, the expected number of 13 doses was rarely achieved during the study period, indicating a longstanding problem of undervaccination. The average number of vaccines per child throughout the study period was 10.6, with a maximum of 13 doses per child in March 2017 and a minimum of seven doses per child in December 2019. On average, Brazilian infants were 2.4 doses short of the full immunization schedule during the study period.

Further research may clarify the mechanisms behind the observed trends. A main limitation of this study is the lack of information about antigen-specific vaccinations. It is possible that the pandemic may have affected the administration of certain vaccines, perceived as less essential or safe. In addition, this study used national-level aggregated data and could not assess the existence of disparities according to geography, socio-economic position or race. Finally, a possible decrease in immunizations due to the pandemic, particularly in the initial lockdown period, as observed in Pakistan (Chandir, 2021), could have been counterbalanced by governmental interventions. However, to the best of the authors' knowledge, the Brazilian Government has not deployed interventions to maintain or catch up coverage rates during the pandemic. On the contrary, the lenient approach to handle the pandemic at federal level has been strongly contested (Ortega and Orsini, 2020).

In conclusion, these analyses do not provide strong evidence that the COVID-19 pandemic may have appreciably impacted immunization of Brazilian children at national level. Under-vaccination observed before and during the pandemic is of concern. A more detailed understanding of incomplete immunization among children aged <1 year in Brazil is needed to inform action.

Conflict of interest

None declared.

Ethical approval

Not required. This study used publicly available data.

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