

# Sociodemographic, Clinical and Vaccination Characteristics Associated with COVID-19 in Pregnant And Postpartum Women: Cross-sectional Study

Características Sociodemográficas, Clínicas e de Vacinação Associada à COVID-19 em Gestantes e Puérperas: Estudo Transversal

Características Sociodemográficas, Clínicas y de Vacunación Asociadas al COVID-19 en Mujeres Embarazadas y Puérperas: Estudio Transversal

## RESUMO

**Objetivo:** O estudo analisou as características sociodemográficas, clínicas e de vacinação associadas à COVID-19 em gestantes e puérperas no Brasil, utilizando dados do Observatório Obstétrico Brasileiro (OOBr). **Método:** Trata-se de um estudo transversal, descritivo e exploratório, baseado em dados secundários do OOBr. Foram incluídas gestantes e puérperas notificadas com COVID-19 entre 2020 e 2024. A análise contemplou variáveis sociodemográficas, clínicas e de vacinação, com apresentação gráfica das tendências ao longo do período. **Resultados:** Os dados mostraram maior incidência da doença em gestantes de 20 a 34 anos, com predominância de mulheres pardas e brancas. O pico de hospitalizações ocorreu em 2021, seguido por redução nos anos seguintes. A vacinação demonstrou baixa adesão inicial, mas aumentou progressivamente. A mortalidade materna relacionada à COVID-19 afetou principalmente mulheres com comorbidades. **Conclusão:** O estudo destaca a importância da vacinação e do acompanhamento pré-natal na redução da morbidade e mortalidade materna, evidenciando desigualdades regionais no acesso à saúde.

**DESCRITORES:** COVID-19; Características da População; Monitoramento Epidemiológico; Saúde da Mulher; Sistema de Informação em saúde

## ABSTRACT

**Objective:** This study analyzed the sociodemographic, clinical, and vaccination characteristics associated with COVID-19 in pregnant and postpartum women in Brazil, using data from the Brazilian Obstetric Observatory (OOBr).

**Method:** A cross-sectional, descriptive, and exploratory study was conducted using secondary data from the OOBr. Pregnant and postpartum women diagnosed with COVID-19 between 2020 and 2024 were included. The analysis considered sociodemographic, clinical, and vaccination variables, with graphical representation of trends over time.

**Results:** The data showed a higher incidence of the disease among pregnant women aged 20 to 34 years, with a predominance of mixed-race and white women. Hospitalizations peaked in 2021, followed by a decline in subsequent years. Vaccination adherence was initially low but increased over time. Maternal mortality related to COVID-19 primarily affected women with comorbidities. **Conclusion:** The study highlights the importance of vaccination and prenatal care in reducing maternal morbidity and mortality, revealing regional inequalities in healthcare access.

**DESCRIPTORS:** COVID-19; Population Characteristics; Epidemiological Monitoring; Women's Health; Health Information System

## RESUMEN

**Objetivo:** Este estudio analizó las características sociodemográficas, clínicas y de vacunación asociadas con la COVID-19 en mujeres embarazadas y puérperas en Brasil, utilizando datos del Observatorio Obstétrico Brasileño (OOBr). **Método:** Se realizó un estudio transversal, descriptivo y exploratorio basado en datos secundarios del OOBr. Se incluyeron mujeres embarazadas y puérperas diagnosticadas con COVID-19 entre 2020 y 2024. El análisis consideró variables sociodemográficas, clínicas y de vacunación, con representación gráfica de las tendencias a lo largo del tiempo. **Resultados:** Los datos mostraron una mayor incidencia de la enfermedad en mujeres embarazadas de entre 20 y 34 años, con predominio de mujeres mestizas y blancas. Las hospitalizaciones alcanzaron su punto máximo en 2021, seguidas de una disminución en los años posteriores. La adherencia a la vacunación fue inicialmente baja, pero aumentó con el tiempo. La mortalidad materna relacionada con la COVID-19 afectó principalmente a mujeres con comorbidades. **Conclusión:** El estudio resalta la importancia de la vacunación y del cuidado prenatal para reducir la morbilidad y mortalidad materna, evidenciando desigualdades regionales en el acceso a la salud.

**DESCRIPTORES:** COVID-19; Características de la Población; Vigilancia Epidemiológica; Salud de la Mujer; Sistema de Información Sanitaria

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**INTRODUCTION**

The COVID-19 pandemic has brought significant challenges to global public health, particularly affecting pregnant and postpartum women. Immunological and physiological changes inherent to pregnancy can increase susceptibility to serious respiratory infections, including that caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). Thus, it is important to recognize that pregnant women with COVID-19 are more likely to be hospitalized, require intensive care and mechanical ventilation compared to non-pregnant women<sup>(1)</sup>.

Given this context of greater risk, the clinical manifestations of COVID-19 in pregnant women can range from asymptomatic to severe, common symptoms include: fever, cough and dyspnea. However, some

pregnant women may have fewer typical symptoms, which can delay proper diagnosis and treatment. Comorbidities such as diabetes mellitus, pulmonary and cardiovascular diseases are more common among pregnant women with COVID-19, contributing to the worsening of the clinical picture<sup>(2)</sup>.

Initially, it was identified that pregnant women had symptoms similar to those of the general population, such as fever, cough and dyspnea, but there was little evidence about the progression of COVID-19 in this group at the time<sup>(3)</sup>. In addition, concerns have arisen regarding the choice of type of delivery, since pregnant women infected with SARS-CoV-2 develop severe conditions associated with comorbidities, requiring emergency caesarean section or premature delivery, increasing the risk of maternal and neonatal death<sup>(4)</sup>.

A Brazilian study found that 28.2%

of pregnant women with COVID-19 required hospitalization in the Intensive Care Unit (ICU) and 9.5% died. Factors associated with a higher risk of hospitalization included region of residence, gestational trimester, number of comorbidities and presence of respiratory symptoms; the risk of death was higher in pregnant women aged over 34, presence of comorbidities, oxygen saturation lower than 95%, need for ventilatory support and ICU admission<sup>(5)</sup>.

Using data from the Mortality Information System (SIM) of DataSUS and the National Health Data Network Portal (RNDS), they carried out a descriptive and ecological study, the historical median of the Maternal Mortality Ratio (MMR) in Brazil, from 1996 to 2021, was 56.79 deaths per 100,000 live births. During the pandemic, this rate increased to 110.25 per 100,000 live births, with 40.5% of these deaths

related to COVID-19, about 70% of maternal deaths related to COVID-19 occurred in the puerperal period, the deaths predominantly affected single, brown women with complete high school education<sup>(6)</sup>.

During the COVID-19 pandemic, with the highest peak in 2021, it reached 113.1 maternal deaths per 100,000 live births, with an uneven distribution of maternal mortality<sup>(7)</sup>. A 39% increase in the number of maternal deaths in 2021 compared to the historical trend, totaling 3,030 deaths.

This rate exceeded the target set by the Sustainable Development Goals (SDGs), which aims to reduce maternal mortality to less than 70 deaths per 100,000 live births. In addition, the regional analysis highlighted significant inequalities, highlighting the need for targeted strategies to mitigate the impact of the pandemic on maternal health<sup>(8)</sup>.

Given this scenario, vaccination has emerged as a crucial strategy for protecting this group. The Brazilian Ministry of Health recommends the immunization of pregnant and postpartum women, such as Pfizer (Comirnaty®) and CoronaVac, in order to reduce maternal morbidity and mortality associated with COVID-19. Vaccination during pregnancy also offers the additional benefit of transferring maternal antibodies to the fetus, potentially conferring protection on the newborn<sup>(9)</sup>.

A study of 348 puerperal women in maternity hospitals between June and September 2022 revealed that only 17.2% of pregnant women had completed the recommended vaccination schedule<sup>(10)</sup>. Vaccination of pregnant and postpartum women has been widely recommended to prevent severe forms of COVID-19 and reduce maternal mortality<sup>(11)</sup>.

Pregnancy and the postpartum period are critical times in women's lives, and the pandemic exposes these popu-

lations to high risks due to immunological and physiological changes. In this context, the importance of vaccination stands out, as it plays a crucial role in preventing serious complications and death. Thus, this study aims to analyze the sociodemographic, clinical and vaccination characteristics associated with COVID-19 in pregnant and postpartum women by the Brazilian Obstetric Observatory (OOBr).

## METHOD

This is a cross-sectional, descriptive and exploratory population-based study, following the recommendations of the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist.

The study was conducted using data from OOBr, an interactive monitoring platform, scientifically based on the dissemination of relevant information in the area of maternal and child health<sup>(12)</sup>. In this study, the Brazilian Obstetric Observatory of Severe Acute Respiratory Syndrome (OOBr SARS) panel was used ([https://observatorioobstetrico.shinyapps.io/covid\\_gesta\\_puerp\\_br/](https://observatorioobstetrico.shinyapps.io/covid_gesta_puerp_br/)).

Brazil is a country of continental dimensions, divided into five main geographical regions (North, Northeast, Midwest, Southeast and South). In addition to the regions, the analysis considered the area of residence of pregnant and postpartum women, classifying them as: urban, peri-urban and rural.

The study included data from pregnant and postpartum women notified of COVID-19 between February 2020 and December 2024, according to records available on OOBr. Inclusion criteria included women with a confirmed diagnosis of COVID-19 and available information on sociodemographic, clinical and vaccination variables. Cases with incomplete information on these variables were excluded.

The variables were categorized as sociodemographic: age, skin color, schooling, region of residence, area of residence; clinical: change of municipality, contact with swine, travel, hospitalization, ICU stay, maternal death); and vaccination: influenza and antiviral vaccination status.

Descriptive analysis was carried out by calculating absolute and relative frequencies for categorical variables and measures of central tendency and dispersion for numerical variables. In order to better interpret the evolution of cases, the absolute frequencies of each variable per year were calculated, as well as relative proportions within the total number of records.

The results were presented in descriptive graphs, highlighting the main associations found. The line graph was chosen as the best visual representation for this analysis, as it makes it easier to observe trends and variations over time. Each line represents a variable, and the points marked indicate the values corresponding to each year. The use of different line styles (continuous, dashed, dotted) helps to distinguish the categories.

The main software used includes: Python, which is widely used in data analysis due to its flexibility and computing power; the Pandas library, which is used to manipulate and organize the data, allowing time series to be structured; Matplotlib, which is used to create line graphs, customizing colors, line styles and legends; and Seaborn, which enhances visualization by adding styles and improving the presentation of the graphs. During this process, we imported the necessary libraries (Pandas, Matplotlib and Seaborn), organized the data in a DataFrame (the table structure used in Pandas), plotted the line graph, representing trends over the years and customized the graph, including title, legend and axes for better interpreta-

tion.

The study followed the ethical guidelines of Resolution 466/2012 of the National Health Council and did not need to be submitted to the Research Ethics Committee, as it used anonymized secondary data from OOB, guaranteeing the confidentiality and privacy of the participants.

## RESULTS

The analysis of the temporal evolution of sociodemographic characteristics between 2020 and 2024 shown in figure 1 reveals distinct patterns of variation in the different categories assessed. The 20-34 age group shows the highest absolute numbers over the period, with a peak in 2021 and a progressive drop in the following years. The 20-year-old category follows a similar trend, but with lower figures. The  $\geq 35$  age group shows more significant growth until 2021, followed by a sharp decline.

It can be seen that the white and brown population makes up the majority of registrations, with a significant increase in 2021, followed by stabilization and a drop in subsequent years. The indigenous group shows an irregular trajectory, with a significant drop after 2020, while the black and yellow population maintains more stable patterns, albeit on a smaller scale.

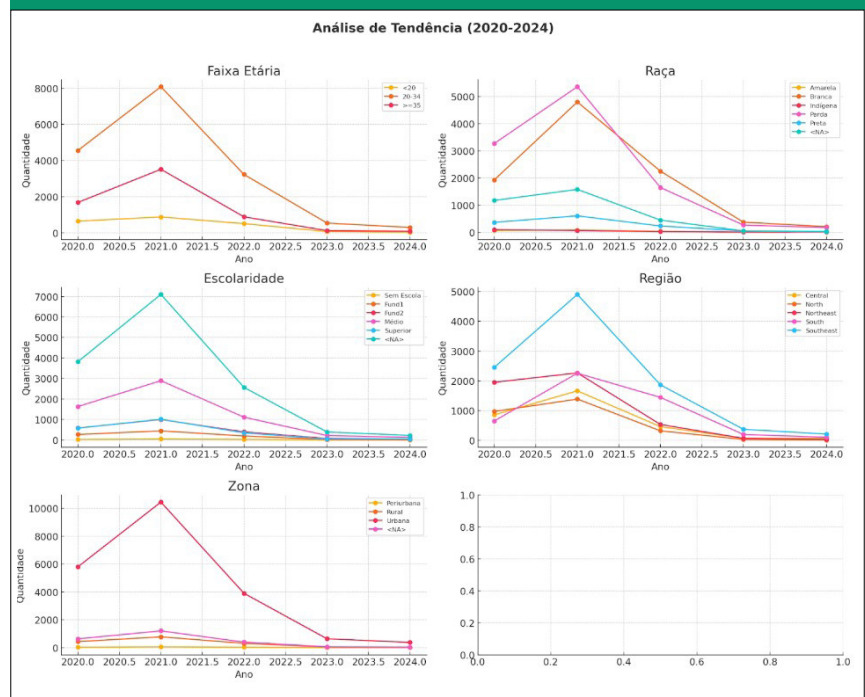
The majority of individuals have secondary or higher education, with a significant increase until 2021 and a subsequent decline. Primary education (initial and final years) follows a similar trend. Individuals with no schooling, on the other hand, maintain low figures over the years, suggesting a more restricted pattern of participation for this group.

The regional distribution shows that the Southeast concentrates most of the registrations, followed by the Northeast. Both regions showed sharp

growth until 2021, followed by a decline. The South stands out for its more expressive increase between 2020 and 2021, remaining at high levels. The North and Central regions were less representative, with a downward trend after 2021. The urban popula-

tion has dominated the records over the years, with a strong concentration in 2021 and a slight decline thereafter. The rural and peri-urban areas have significantly lower numbers, but follow a relatively stable trajectory.

**Figure 1 - Temporal evolution of the sociodemographic characteristics of pregnant and postpartum women with COVID-19. Brazil (2020-2024)**



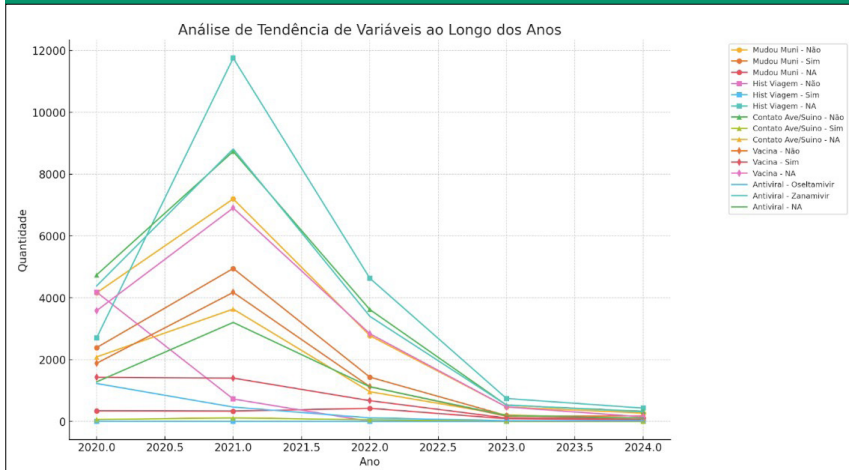
Source: Prepared by the authors with data extracted from the Brazilian Obstetrics of Severe Acute Respiratory Syndrome. Brazil, 2025.

The data illustrated in figure 2 analyzes the evolution of different variables over the years 2020 to 2024, highlighting changes in the patterns observed. It can be seen that the majority of individuals did not change municipality, with a peak in 2021 (48.4%), followed by a reduction in the following years. Those who did move also reached their highest value in 2021 (54.6%) before decreasing. This suggests an increase in mobility in 2021. The majority of registrations in 2020 did not involve travel histo-

ry (85.2%), while in 2021 there was a significant rise in the <NA> category (58.0%).

The trend follows a similar pattern, with an increase in registrations in 2021 (48.7%) and a decline in the following years. The percentage of positive cases ("yes") for this variable has remained low over the years. The highest percentage of records for vaccinated people occurs in 2020 (38.5%), but in 2021 there is a significant increase in the "unvaccinated" category (55.5%). The use of Oseltamivir was more concentrated in 2020 (66.6%), while Zanamivir was more widely used in 2021 (50.6%).

**Figure 2 - Time trend by change of place of residence, travel, contact with pigs, vaccination and antivirals. Brazil (2020-2024)**

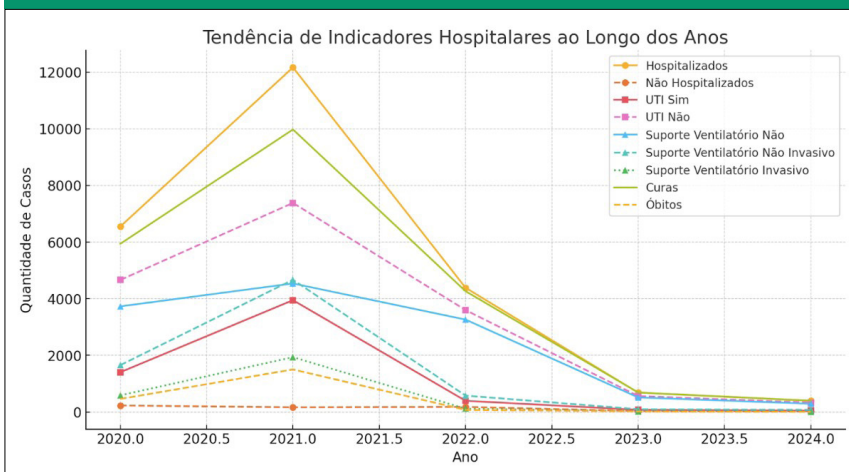


Source: Prepared by the authors with data extracted from the Brazilian Severe Acute Respiratory Syndrome Obstetrics. Brazil, 2025.

Analysis of the trend in hospital indicators over the years, as shown in figure 3, reveals a significant pattern in the evolution of cases. There is a sharp peak in 2021, followed by a progressive drop in subsequent years. In 2020, the figures already indicated a considerable volume of hospitaliza-

tions and the need for ventilatory support, but it was in 2021 that the cases reached their peak. The hospitalized category shows a significant increase from 2020 to 2021, with a subsequent reduction in 2022 and stabilization at lower numbers in 2023 and 2024. The same behavior is observed in those hospitalized for UTIs and in patients who required ventilatory support, both invasive and non-invasive.

**Figure 3 - Trends in admissions, UTI hospitalizations and clinical outcomes. Brazil (2020-2024)**



Source: Prepared by the authors with data extracted from the Brazilian Obstetrics of Severe Acute Respiratory Syndrome. Brazil, 2025.

## DISCUSSION

The COVID-19 pandemic has had a significant impact on maternal health, especially among pregnant and postpartum women, due to the physiological and immunological changes inherent to this group. The analysis of sociodemographic, clinical, vaccination and mortality data allows us to better understand the risk factors and strategies to mitigate the effects of SARS-CoV-2 infection in this group.

The data analyzed shows that the majority of pregnant women affected by COVID-19 were aged between 20 and 34, with a predominance of brown and white women, reflecting Brazil's population composition. High school was the most common level of education, and there was a significant increase in the number of cases between 2020 and 2021, followed by stabilization in subsequent years<sup>(13,14)</sup>.

The regional distribution revealed that the Southeast concentrated the majority of records, followed by the Northeast, while the North and Midwest regions were less representative. These data indicate a reflection of disparities in access to health services and population distribution, factors that can influence both the prevention and outcome of the disease<sup>(15,16)</sup>.

Most pregnant women with COVID-19 did not move to another municipality and had no recent travel history, although there was an increase in mobility in 2021. In addition, the presence of comorbidities such as diabetes mellitus and cardiovascular disease was associated with a worsening clinical condition and a higher risk of hospitalization<sup>(17,18)</sup>. The data also indicate an increase in the rate of hospitalization and UTI admissions at the peak of the pandemic in 2021, followed by a reduction in subsequent years<sup>(19)</sup>.

Vaccination against COVID-19

was a determining factor, however, adherence to the full vaccination schedule was low, with only 17.2% of pregnant women receiving all the recommended doses<sup>(20,21)</sup>. Factors such as access to information, perception of vaccine safety and family support directly influenced adherence to immunization<sup>(22,23)</sup>. Ministry of Health guidelines recommend vaccination with immunizers without a viral vector, such as Pfizer and CoronaVac, considering their benefits in reducing maternal morbidity and mortality and in transferring antibodies to the newborn<sup>(23,24)</sup>.

Maternal mortality increased significantly during the pandemic,

reaching a peak of 113.1 deaths per 100,000 live births in 2021, which exceeded the target set by the Sustainable Development Goals (SDGs)<sup>(7)</sup>. Approximately 40.5% of maternal deaths were related to COVID-19, with 70% occurring in the puerperal period<sup>(6)</sup>. An unequal distribution of mortality was also observed, with the North and Northeast regions showing the highest rates, reflecting socioeconomic inequalities and access to health services<sup>(25)</sup>.

## CONCLUSION

The data analyzed shows the vulnerability of pregnant and postpartum

women during the COVID-19 pandemic, especially in relation to the morbidity and mortality associated with the disease. Low adherence to vaccination was a major challenge, highlighting the need for awareness campaigns aimed at this audience. In addition, regional disparities point to the urgency of public policies that guarantee equitable access to prenatal and hospital care. Preventive and educational measures remain essential to protect maternal and child health in the face of possible new pandemic waves.

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