The Color Of Death By Covid-19 Of Women In Brazil In 2020 To 2024: Cross-sectional Study

A Cor da Morte Por Covid-19 de Mulheres no Brasil Em 2020 a 2024: Estudo Transversal

El Color de La Muerte por Covid-19 Entre Las Mujeres En Brasil En 2020 a 2024: Estudio Transversal

RESUMO

Objetivo: Analisar a infecção e mortalidade por COVID-19 em mulheres brasileiras em idade reprodutiva, segundo a cor da pele, entre 2020 e 2024, utilizando dados do Observatório Obstétrico Brasileiro (OOBr). Método: Trata-se de um estudo transversal descritivo e exploratório, de base populacional, realizado a partir de dados secundários do OOBr. A coleta de dados abrangeu o período de janeiro de 2020 a maio de 2024, incluindo informações demográficas e clínicas de mulheres hospitalizadas com COVID-19 no Brasil. Foram realizadas análises descritivas e bivariadas para identificar associações significativas entre variáveis sociodemográficas e desfechos clínicos. Resultados: Mulheres pretas e pardas apresentaram taxas significativamente mais altas de hospitalização, necessidade de suporte ventilatório e mortalidade em comparação com mulheres brancas. Conclusão: O estudo destaca a necessidade urgente de políticas públicas focadas na equidade racial em saúde. Melhorias no acesso a cuidados de saúde, controle eficaz de comorbidades e estratégias de vacinação equitativas..

DESCRITORES: COVID-19; Gravidez; Período Pós-parto; Mortalidade; Racismo.

ABSTRACT

Objective: To analyze COVID-19 infection and mortality in Brazilian women of reproductive age, according to skin color, between 2020 and 2024, using data from the Brazilian Obstetric Observatory (OOBr). Method: This is a population-based descriptive and exploratory cross-sectional study, based on secondary data from the OOBr. Data collection covered the period from January 2020 to May 2024, including demographic and clinical information of women hospitalized with COVID-19 in Brazil. Descriptive and bivariate analyses were performed to identify significant associations between sociodemographic variables and clinical outcomes. Results: Black and brown women had significantly higher rates of hospitalization, need for ventilatory support and mortality compared to white women. Conclusion: The study highlights the urgent need for public policies focused on racial equity in health. Improvements in access to health care, effective management of comorbidities and equitable vaccination strategies.

DESCRIPTORS: COVID-19; Pregnancy; Postpartum period; Mortality; Racism.

RESUMEN

Objetivo: Analizar la infección y la mortalidad por COVID-19 en mujeres brasileñas en edad reproductiva, según el color de la piel, entre 2020 y 2024, utilizando datos del Observatorio Obstétrico Brasileño (OOBr). Método: Se trata de un estudio descriptivo y exploratorio transversal de base poblacional, basado en datos secundarios del OOBr. La recolección de datos abarcó el período de enero de 2020 a mayo de 2024, incluyendo información demográfica y clínica de las mujeres hospitalizadas con COVID-19 en Brasil. Se realizaron análisis descriptivos y bivariados para identificar asociaciones significativas entre las variables sociodemográficas y los resultados clínicos. Resultados: Las mujeres negras y morenas presentaron tasas significativamente más elevadas de hospitalización, necesidad de asistencia ventilatoria y mortalidad en comparación con las mujeres blancas. Conclusión: El estudio pone de relieve la urgente necesidad de políticas públicas centradas en la equidad racial en salud. Mejoras en el acceso a la atención sanitaria, gestión eficaz de las comorbilidades y estrategias de vacunación equitativas.

DESCRIPTORES: COVID-19; Embarazo; Periodo posparto; Mortalidad; Racismo.

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INTRODUCTION

In the global context, women constitute an important workforce that drives the economy, with the peak of their productive and reproductive activities in the period we call reproductive age, a period that encompasses the age range between 10 and 49 years of age. [1] The deaths of women belonging to this group account for 16% of all female deaths throughout Brazil. [2] In developing countries, these deaths are even more numerous, indicating that women living in these countries are more vulnerable to illness and death when compared to women of the same age group living in developed countries. [3].

According to data from the Brazilian Ministry of Health (MH), the main causes of death among women of reproductive age in Brazil are: neoplasms, mainly breast and cervical cancer; diseases of the circulatory system; external causes; and infectious and parasitic diseases, with a predominance of deaths among brown women. Women live with different types of threats to their integrity and existence, however, when the analysis is restricted to those of reproductive age, the pattern of deaths presents some characteristics typical of this age group, which may vary depending on the conditions in which the women are inserted, their age group and their skin color. [4,5]

Data from the Nascer no Brasil survey point to compelling and worrying evidence regarding skin color inequalities in the conditions of prenatal care and childbirth for Brazilian women. [5] Black and brown women differ from white women in that they have a higher prevalence of post-term birth, in addition to having fewer consultations and exams, and they are less connected to the health system, which results in greater pilgrimages. [5,6] A systematic review reports that black women, compared to other racial groups, had a lower prevalence of access to prenatal care, with a lower chance of access in the first trimester. It can be inferred that skin color is an important determinant in obtaining obstetric care. [7]

Mortality among women of reproductive age during the COVID-19 pandemic has been influenced by several sociodemographic factors, clinical characteristics, and epidemiological factors specific to the disease. Studies show that factors such as ethnicity, skin color, and socioeconomic conditions play a crucial role in determining health outcomes, with Black and Indigenous women experiencing higher mortality rates due to existing structural inequalities exacerbated by the novel coronavirus pandemic. [8-10]

Comorbidities such as obesity, hypertension and diabetes, which are more prevalent among black and indigenous women, increase the risk of mortality. These pre-existing conditions not only make women more susceptible to severe forms of COVID-19, but also complicate clinical management during infection, contributing to unfavorable outcomes. [8,11]

Studies have shown that women of reproductive age can develop serious complications, such as Severe Acute Respiratory Syndrome (SARS), which require intensive interventions, including mechanical ventilation. [12-14] The COVID-19 pandemic has had a significant impact on the need for hospitalization, intensive care unit (ICU) admission, and ventilatory support, especially among women of reproductive age. Studies indicate that these women are at increased risk of developing severe forms of the disease, requiring hospitalization and intensive care more frequently than other populations. This increase in the demand for intensive care is associated with the presence of comorbidities, such as obesity, diabetes, and hypertension, which are prevalent in this age group. [12,15]

The need for ICU hospitalization among women of reproductive age has been documented during the pandemic. Data suggest that pregnant and postpartum women are particularly vulnerable to severe complications from COVID-19, resulting in a higher rate of ICU admission. In addition to ICU admissions, many of these women require ventilatory support, both invasive and noninvasive, and this is strongly correlated with the severity of the infection and the presence of comorbidities. [11,16] The altered immune response during pregnancy may contribute to this greater susceptibility to severe forms of the disease. [13,17]

Studies suggest that disparities in access to health care further exacerbate the situation for these women. Women from marginalized communities, including Black and Indigenous women, face additional barriers to accessing quality health care, contributing to worse clinical outcomes. Inequities in access to intensive care and ventilation must be addressed to ensure that all women receive the care they need during the pandemic. [9,10]

> “Variation in mortality rates may also be attributed to factors such as the quality and availability of health care.”

In many regions, limitations in hospital resources, including lack of intensive care unit beds and ventilators, have contributed to higher mortality rates among women requiring intensive care. [15,18] Furthermore, unequal access to vaccination has been a critical factor. Women of reproductive age in marginalized communities often face barriers to accessing vaccination, which leaves them more vulnerable to severe infections. Targeted and equitable vaccination campaigns are essential to reduce these disparities and improve health outcomes.[16,19]

Studies indicate that specific public policies and interventions are needed to address these inequities and provide adequate support to these vulnerable populations. This includes improvements in access to health care, effective management of comorbidities, and equitable vaccination strategies. (14,20) In summary, mortality among women of reproductive age during the COVID-19 pandemic is influenced by a complex inter-

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play of sociodemographic factors, clinical characteristics, and epidemiological factors. Addressing these inequalities requires a multidimensional approach that includes improvements in access to health care, effective control of comorbidities, and equitable vaccination strategies. [9,17]

In view of the above, the guiding question of the study was formulated, using the PICO strategy, an acronym for Patient, Intervention, Comparison and Outcomes, in which: "P" - black and brown Brazilian women of reproductive age with COVID-19; "I" - hospitalization in the ICU and need for ventilatory support; "C" - comparison between black, brown and white Brazilian women of reproductive age; and "O" - outcomes: death associated with COVID-19 in black and brown pregnant and postpartum women compared to white women. Thus, asking: What is the outcome and clinical evolution in black and brown Brazilian women of reproductive age with COVID-19 hospitalized and needing ventilatory support when compared to the others? The aim of this study is to analyze the infection and mortality from COVID-19 among Brazilian women of reproductive age according to skin color between 2020 and 2024 through the Brazilian Obstetric Observatory (OOBr).

METHOD

Ethical Aspects

Since this was a study with a publicly accessible database, it was not necessary to have the Research Ethics Committee assess it. The preservation of ethical aspects was ensured, in accordance with the sole paragraph of the National Health Council Resolution No. 510 of April 7th, 2016, which states that research using publicly accessible information will not be registered or assessed by the Research Ethics Committee/National Research Ethics Commission (CEP/CONEP) system, in item II, in accordance with Law No. 12,527 of November 18th, 2011. [21]

Study type

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

Data collection

It was carried out from January to December 2020 to January to May 2024, with all annual epidemiological weeks in order to compare the evolution of the pandemic, taking into account the number of cases and deaths from the disease in the population of women of reproductive age. The survey was carried out through the secondary population-based database, based on data from OOBr (https://observatorioobstetrico.shinyapps.io/covid_gesta_puerp_br/). Currently one of the means that records cases and deaths from COVID-19, it contains variables for monitoring the pandemic in several aspects, such as: sociodemographic trends of cases, deaths and vaccination.

Study population

Women of reproductive age hospitalized with COVID-19 in Brazil were included. Notification data included demographic, clinical, and pregnancy and postpartum characteristics. In OOBr, the postpartum period is considered the period from birth to the 45th day after delivery.

Study variables

Demographic data, such as age, skin color, and geopolitical region, were included. Clinical data and variables of interest/outcome were: signs and symptoms, presence or absence of pre-existing comorbidities. Data on comorbidities were dichotomous (yes/no). The clinical course of the disease was reported in terms of hospitalization, ICU admission, need for respiratory support (no need, invasive, non-invasive, and unknown), and clinical evolution (cure and death).

Statistical analysis

Initially, a descriptive analysis of the variables related to sociodemographics, comorbidities, and signs and symptoms was performed, presented in absolute numbers with percentages, with maximum and minimum values. Then, a bivariate analysis was performed between the covariates of interest and the outcome, calculating the standard deviation, relative risk and 95% confidence interval. The variables that were most strongly associated with the outcomes in the analysis ($p<0.20$) in the final analysis, associations were considered statistically significant if $p<0.05$. For this, the Statistical Package for the Social Sciences (SPSS) v.21 software was used.

RESULTS

From the values in Table 1, it can be observed that most of the variables had a wide range of values, for example, the skin color variable showed a large variation between the different groups, with brown skin color presenting the highest number of cases, and the region of residence revealing a higher concentration of cases in the Southeast region, and the area of residence highlighting a predominance of cases in urban areas. The data reveal that the year 2021 had the highest prevalence of cases in almost all variables analyzed. The age groups were among young women (20-34 years old) and the urban regions and Southeast were the most affected. Brown skin color and high school education also had a high prevalence, and comorbidities such as heart disease, diabetes and obesity showed a significant influence on the cases.

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TABLE 1 - SOCIODEMOGRAPHIC CHARACTERISTICS, COMORBIDITIES AND RELATED DISEASES OF WOMEN OF REPRODUCTIVE AGE WITH COVID-19 (N=24,924). BRAZIL 2020-2024

Age group	2020	2021	2022	2023	2024
<20	649 (30,5%)	881 (41,4%)	511 (24%)	73 (3,4%)	13 (0,6%)
20-34	4.554 (27,5%)	8.082 (48,9%)	3.231 (19,5%)	539 3,3%)	129 (0,8%)
35-49	1.682 (26,9%)	3.516 (56,1%)	888 14,2%)	125 (2%)	51 (0,8%)
Skin color					
Yelow	64 (34,4%)	83 (44,6%)	35 (18,8%)	4 (2,2%)	0 (0%)
White	1.926 (20,4%)	4.796 (50,8%)	2.250 (23,9%)	369 (3,9%)	91 (1%)
Indigenous	94 (50,3%)	63 (33,7%)	22 (11,8%)	7 (3,7%)	1 (0,5%)
Brown	3.267 (30,8%)	5.357 (50,5%)	1.646 (15,5%)	261 (2,5%)	73 (0,7%)
Black	364 (29,1%)	603 (48,3%)	230 (18,4%)	47 (38%)	5 (0,4%)
Ignored	1.170 (35,8%)	1.577 (48,3%)	447 (13,7%)	49 (1,5%)	23 (0,7%)
Region of residence					
Midwest	857 (27,8%)	1.664 (54%)	462 (15%)	70 (2,3%)	28 (0,9%)
North	972 (35,7%)	1.388 (51%)	321 (11,8%)	32 (1,2%)	7 (0,3%)
Northeast	1.951 (40,4%)	2.267 (47%)	535 (11,1%)	67 (1,4%)	8 (0,2%)
South	652 (14,2%)	2.256 (49%)	1.445 (31,4%)	199 (4,3%)	50 (1,1%)
Southeast	2.453 (27,6%)	12.479 (50,1%)	4.630 (18,6%)	737 (3%)	193 (0,8%)
Area of residence					
Periurban	29 (24%)	54 (44,6%)	31 (25,6%)	4 (3,3)	3 (2,5%)
Rural	431 (27,7%)	774 (49,7%)	307 (19,7%)	41 (2,6%)	5 (0,3%)
Urbana	5.796 (27,7%)	10.448 (49,9%)	3.899 (18,6%)	633 (3%)	173 (0,8%)
Ignored	629 (27,4%)	1.203 (52,4%)	393 (17,1%)	59 (2,6%)	12 (0,5%)
Education					
No schooling	21 (22,6%)	44 (47,3%)	25 (26,9%)	2 (2,2%)	1 (1,1%)
Elementary School 1	265 (28,7%)	442 (47,9%)	192 (20,8%)	23 (2,5%)	1 (0,1%)
Elementary School 2	581 (28,2%)	995 (48,35)	394 (19,1%)	70 (3,4%)	19 (0,9%)
High School	1.628 (27,6%)	2.889 (49%)	1.109 (18,8%)	212 (3,6%)	56 (1%)
Higher Education	575 (28,9%)	1.009 (50,7%)	346 (17,4%)	44 (2,2%)	15 (0,8%)
Ignored	3.815 (27,3%)	7.100 (50,8%)	2.564 (18,4%)	386 (2,8%)	101 (0,7%)

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Comorbidities Cardiopathy					
No	2.276 (29,8%)	3.759 (49,2%)	1.329 (17,4%)	223 (2,9%)	56 (0,7%)
Yes	434 (32,1%)	692 (51,3%)	183 (13,6%)	35 (2,6%)	6 (0,4%)
Ignored	4.175 (27,6%)	8.028 (50,4%)	3.118 (19,6%)	479 (3%)	131 (0,8%)
Diabetes					
No	2.275 (30,2%)	3.694 (49,1%)	1.283 (17,1%)	221 (2,9%)	51 (0,7%)
Yes	433 (27,8%)	819 (52,5%)	251 (16,1%)	40 (2,6%)	17 (1,1%)
Ignored	6.885 (27,6%)	12.479 (50,1%)	4.630 (18,6%)	737 (3%)	193 (0,8%
Obesity					
No	2.326 (30,8%)	3.610 (47,8%)	1.342 (17,8%)	229 (3%)	51 (0,7%)
Yes	284 (21%)	901 (66,7%)	136 (10,1%)	20 (1,5%)	10 (0,7%)
Ignored	4.275 (26,7%)	7.968 (49,8%)	3.152 (19,7%)	488 (3%)	132 (0,8%)

Source: Prepared by the author with data extracted from the Brazilian Obstetric Observatory of COVID-19 (OOBr) (https://observatorioobstetrico.shinyapps.io/covid_gesta_puerp_br/). 2024.

From the values in Table 2, the extremes in each variable can be seen. Fever, for example, had the highest maximum value in the ignored category (n=12,479) and the lowest minimum value in the no category (n=85). Similarly, the cough variable has the maximum value in the yes category (n=8,587) and the minimum value in the ignored category (n=24). These observations are consistent across all variables, highlighting the variations in the data collected. The data revealed that 2021 had the highest prevalence of cases for almost all symptoms analyzed, highlighting a significant peak compared to other years. In particular, symptoms such as fever, cough, dyspnea, respiratory distress, and fatigue had notably high prevalences in 2021.

TABLE 2 - PROPORTION OF SIGNS AND SYMPTOMS PRESENTED BY WOMEN OF REPRODUCTIVE AGE WITH COVID-19 (N=24,924). BRAZIL 2020-2024

Fever	2020	2021	2022	2023	2024	Maximum value	Minimum Value
No	2.234 (25,3%)	4.154 (47,1%)	2.015 (22,8%)	336 (3,8%)	85 (1%)	4.154	85
Yes	3.805 (31,6%)	6.428 (53,3%)	1.494 (12,4%)	246 (2%)	81 (0,7%)	6.428	81
Ignored	846 (27,6%)	12.479 (50,1%)	4.630 (18,6%)	737 (3%)	193 (0,8%)	12.479	193
Cough							
No	1.759 (29,1%)	2.590 (42,9%)	1.402 (23,2%)	231 (3,8%)	58 (1%)	2.590	58
Yes	4.399 (27,8%)	8.587 (54,2%)	2.345 (14,8%)	390 (2,5%)	111 (0,7%)	8.587	111
Ignored	727 (23,8%)	1.302 (42,7%)	883 (28,9%)	116 (3,8%)	24 (0,8%)	1.302	24
Sore throat							
No	3.922 (29,2%)	6.851 (51%)	2.206 (16,4%)	366 (2,7%)	92 (0,7%)	6.851	92
Yes	1.465 (27,2%)	2.528 (47%)	1.144 (21,3%)	183 (3,1%)	62 (1,2%)	2.528	62
Ignored	1.498 (24,5%)	3.100 (50,8%)	1.280 (21%)	188 (3,1%)	39 (0,6%)	3.100	39
Dyspnea							
No	2.627 (29,6%)	3.380 (38%)	2.399 (27%)	392 (4,4%)	92 (1%)	3.380	92
Yes	3.289 (27,&%)	7.460 (62,9%)	891 (7,5%)	166 (1,4%)	56 (0,5%)	7.460	56
Ignored	969 (23,2%)	1.639 (39,3%)	1.340 (32,1%)	179 (4,3%)	45 (1,1%)	1.639	45

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Respiratory discomfort							
No	2.976 (29%)	4.413 (43%)	2.396 (23,3%)	381 (3,7%)	101 (1%)	4.413	101
Yes	2.704 (28,4%)	5.751 (60,3%)	844 (8,9%)	185 (1,9%)	48 (0,5%)	5.751	48
Ignored	1.205 (23,5%)	2.315 (45,2%)	1.390 (27,1%)	171 (3,3%)	44 (0,9%)	2.315	44
Diarrhea							
No	4.505 (28,3%)	2.906 (18,2%)	484 (3%)	381 (3,7%)	124 (0,8%)	7.909	124
Yes	722 (35,2%)	163 (8%)	28 (1,4%)	185 (1,9%)	15 (0,7%)	1.121	15
Ignored	1.658 (23,9%)	1.561 (22,5%)	225 (3,2%)	171 (3,3%)	54 (0,8%)	3.449	54
Vomiting							
No	4.525 (28,6%)	7.884 (49,9%)	2.805 (17,8%)	469 (3%)	119 (0,8%)	7.884	119
Yes	683 (30,8%)	1.159 (52,2%)	303 (13,6%)	53 (2,4%)	23 (1%)	1.159	23
Ignored	1.677 (24,3%)	3.436 (49,8%)	1.522 (22,1%)	215 (3,1%)	51 (0,7%)	3.436	51
Abdominal pain							
No	2.642 (19%)	7.916 (56,8%)	2.773 (19,9%)	467 (3,4%)	127 (0,9%)	7.916	127
Yes	285 (18,1%)	931 (59,1%)	293 (18,6%)	51 (3,2%)	14 (0,9%)	931	14
Ignored	3.958 (42%)	3.632 (38,5%)	1.564 (16,6%)	219 (2,3%)	52 (0,6%)	3.958	52
Fatigue							
No	2.355 (20,3%)	6.137 (52,9%)	2.569 (22,1%)	436 (3,8%)	109 (0,9%)	6.137	109
Yes	609 (13,8%)	3.107 (70,6%)	547 (12,4%)	99 (2,2%)	39 (0,9%)	3.107	39
Ignored	3.921 (44%)	3.235 (36,3%)	1.514 (17%)	202 (2,3%)	45 (0,5%)	3.921	45
Loss of smell							
No	2.266 (17,4%)	7.261 (55,7%)	2.898 (22,2%)	493 (3,8%)	128 (1%)	7.261	128
Yes	807 (29%)	1.808 (65%)	137 (4,9%)	19 (0,7%)	12 (0,4%)	1.808	12
Ignored	3.812 (41,9%)	3.410 (37,5%)	1.595 (17,5%)	225 (2,5%)	53 (0,6%)	3.812	53
Loss of taste							
No	2.322 (17,6%)	7.362 (55,8%)	2.899 (22%)	491 (3,7%)	130 (1%)	7.362	130
Yes	704 (27,5%)	1.700 (66,4%)	126 (4,9%)	21 (0,8%)	9 (0,4%)	1.700	9
Ignored	3.859 (42,1%)	3.417 (37,3%)	1.605 (17,5%)	225 (2,5%)	54 (0,6%)	3.859	54

Source: Prepared by the author with data extracted from the Brazilian Obstetric Observatory of COVID-19 (OOBr) (https://observatorioobstetrico.shinyapps.io/covid_gesta_puerp_br/). 2024

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The data presented in Table 3 describe the association between sociodemographic characteristics, comorbidities, signs and symptoms of women of reproductive age with COVID-19. There was no significant association between age group, indigenous women have a higher risk of COVID-19 compared to white, brown and black women, the ignored skin color group also showed a positive association with COVID-19, residents in the North and Northeast regions have a higher risk of COVID-19 compared to the other regions, and the presence of: fever, dyspnea, respiratory distress, diarrhea, vomiting and loss of taste showed an association with mortality from COVID-19, on the other hand, fatigue seems to have a negative association with COVID-19.

The confidence intervals for the relative risks of the age groups indicate that there is a statistically significant association between

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age group and COVID-19. The p-value is less than 0.05 for all age groups, indicating that age is a significant factor in susceptibility to the disease. The confidence intervals for the relative risks of the age groups indicate that there is a statistically significant association between age group and COVID-19. There are significant differences in relative risks between different regions of residence. The North, Northeast and Southeast regions show statistically significant associations with COVID-19, while the South region does not show a significant association. The area of residence appears to influence the incidence of COVID-19, with significant p-values for the Peri-urban, Rural and Urban categories. Education is also associated with COVID-19, with significant p-values for several categories of education, indicating that women with different levels of education have different relative risks of contracting the disease. Several comorbidities and symptoms are associated with COVID-19, such as: heart disease, diabetes, obesity, fever, cough, sore throat, dyspnea, respiratory distress, diarrhea, vomiting, abdominal pain and fatigue, the presence of these conditions significantly increases the risk of the disease.

TABLE 3 – BIVARIATE ASSOCIATIONS OF SOCIODEMOGRAPHIC CHARACTERISTICS, COMORBIDITIES, SIGNS AND SYMPTOMS OF WOMEN OF REPRODUCTIVE AGE WITH COVID-19 (N=24,924). BRAZIL 2020-2024

Age group	IC 95%	Relative risk (RR)	Standard Deviation (SD	p Value
<20	*0.289, 0.320*	*6.6304*	*0.4035*	*0.3192*
20-34	*0.274, 0.281*	*5.9783*	-	*0.2996*
35-49	*0.265, 0.276*	*5.8478*	-	*0.2941*
Skin color			-	
Yellow	*0.295, 0.455*	*3.5102*	*0.7444*	*0.1644*
White	*0.486, 0.523*	-	-	-
Indigenous	*0.297, 0.605*	*5.1327*	-	*0.0882*
Brown	*0.485, 0.516*	*3.1429*	-	*0.1860*
Black	*0.479, 0.499*	*2.9694*	-	*0.2228*
Ignored	*0.484, 0.504*	*3.6531*	-	*0.1694*
Region of residence				
Midwest	*0.509, 0.562*	*1.0072*	*0.3823*	*0.0734*
North	*0.486, 0.569*	*1.2917*	-	*0.0364*
Northeast	*0.477, 0.520*	*1.4638*	-	*0.0257*
South	*0.477, 0.492*	*0.5145*	-	*0.9644*
Southeast	*0.490, 0.513*	*0.9928*	-	*0.0196*
Area of residence				
Periurban	*0.373, 0.458*	*0.8759*	*0.065*	*0.4182*
Rural	*0.478, 0.506*	*1.0097*	-	*0.8968*
Urbana	*0.488, 0.502*	*1.0097*	-	*0.8906*
Ignored	*0.487, 0.521*	*1*	-	*1.0000*
Education				
No schooling	*0.256, 0.328*	*0.8288*	*0.2238*	*0.2684*
Elementary School 1	*0.472, 0.494*	*1.5121*	-	*0.0706*
Elementary School 2	*0.476, 0.498*	*1.328*	-	*0.1128*
High School	*0.484, 0.503*	*1.0989*	-	*0.0356*
Higher Education	*0.484, 0.510*	*1.0582*	-	*0.0530*
Ignored	*0.488, 0.518*	*1*	-	*1.0000*

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Comorbidities				
Cardiopathy	0.290, 0.312	1.0772	0.3088	0.2496
Diabetes	0.277, 0.297	0.9205	0.4359	0.4102
Obesity	0.263, 0.291	0.6818	0.5076	0.5764
Fever	0.265, 0.282	1.248	0.4552	0.3358
Cough	0.268, 0.288	0.956	0.3527	0.3372
Sore throat	0.279, 0.294	0.9315	0.3806	0.3866
Dyspnea	0.261, 0.283	0.9324	0.4067	0.3938
Respiratory discomfort	0.266, 0.287	0.9793	0.6731	0.3798
Diarrhea	0.258, 0.280	1.2447	0.3846	0.3948
Vomiting	0.266, 0.287	1.0783	0.4186	0.3356
Abdominal pain	0.253, 0.269	0.9526	0.4968	0.4002
Fatigue	0.089, 0.106	0.6798	0.0760	0.1904
Loss of smell	0.095, 0.112	1.6667	-	-
Loss of taste	0.064, 0.078	1.5625	-	-

Source: Prepared by the author with data extracted from the Brazilian Obstetric Observatory of COVID-19 (OOBr) (https://observatorioobstetrico.shinyapps.io/covid_gesta_puerp_br/). 2024.

Most cases occurred in the 3rd trimester of pregnancy, followed by the postpartum period, with a small proportion of cases recorded in the 1st trimester of pregnancy. A significant number of cases have no information about the gestational period. Most cases resulted in hospitalization, with a higher proportion of hospitalizations among postpartum women. The lowest proportion of hospitalizations was recorded among women in the 1st trimester of pregnancy. The highest proportion of ICU hospitalizations was recorded among postpartum women, followed by women in the 2nd trimester of pregnancy. Most cases did not require ventilatory support. Among those who did require it, the majority received non-invasive support. Invasive ventilatory support was required in a much smaller proportion of cases. Most cases resulted in cure, with a higher proportion of cures among postpartum women. The lowest proportion of cures was recorded among women requiring ICU hospitalization. Mortality is highest among women in the 1st trimester of pregnancy, although in absolute numbers it is lower compared to other categories. A significant proportion of cases have their evolution ignored.

However, the data indicate that 2021 had a high prevalence of cases for all categories analyzed. In 2021, women in all trimesters of pregnancy, as well as postpartum women, had a high prevalence of cases, and hospitalization and hospitalization in the ICU also showed high rates. The use of ventilatory support, both non-invasive and invasive, was significantly higher in 2021, reflecting the severity of cases that required respiratory support, and the cure rate was high in 2021, but the death rate was also high, indicating that, although many patients recovered, mortality among severe cases was also significant, while data from 2024 show a notable decrease in prevalence in all categories.

TABLE 4 - CLINICAL CHARACTERISTICS OF WOMEN OF REPRODUCTIVE AGE WITH COVID-19 (N=24,924). BRAZIL 2020-2024

Gestational period	2020	2021	2022	2023	2024	Maximum Value	Minimum Valu
1st trimester	524 (28,1%)	890 (47,6%)	359 (19,2%)	82 (4,4%)	13 (0,7%)	12.479	13
2nd trimester	1.290 (26,9%)	2.743 (57,1%)	621 (12,9%)	115 (2,4%)	35 (0,7%)	-	-
3rd trimester	3.400 (26,7%)	6.189 (48,6%)	2.649 (20,8%)	375 (2,9%)	111 (0,9%)	-	-
Ignored	320 (34,4%)	442 (47,5%)	130 (14%)	24 (2,6%)	14 (1,5%)	-	-
Puerpera	1.351 (27,6%)	12.479 (50,1%)	4.630 (18,6%)	737 (3%)	193 (0,8%)	-	-

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Hospitalization							
No	231 (36,9%)	165 (26,4%)	180 (28,8%)	31 (5%)	19 (3%)	12.479	1
Yes	6.548 (27,3%)	12.165 (50,8%)	4.385 (18,3%)	681 (2,8%)	173 (0,7%)	-	-
Ignored	106 (30,6%)	149 (43,1%)	65 (18,8%)	25 (7,2%)	1 (0,3%)	-	-
Hospitalization in ICU							-
No	4.662 (28,5%)	7.381 (45,2%)	3.597 (22%)	554 (3,4%)	145 (0,9%)	7.381	4
Yes	1.404 (24%)	3.948 (67,6%)	395 (6,8%)	107 (3,9%)	15 (0,3%)	-	-
Ignored	819 (29,8%)	1.150 (41,9%)	638 (23,2%)	107 (3,9%)	33 (1,2%)	-	-
Ventilatory support							
No	3.729 (30,7%)	4.537 (37,3%)	3.262 (26,8%)	554 (3,4%)	507 (4,2%)	4.668	4
Non-invasive	1.654 (23,5%)	4.668 (66,4%)	578 (8,2%)	107 (3,9%)	97 (1,4%)	-	-
Invasive	589 (22%)	1.936 (72,5%)	116 (4,3%)	107 (3,9%)	27 (1%)	-	-
Ignored	913 (29,8%)	1.338 (43,7%)	674 (22%)	107 (3,9%)	106 (3,5%)	-	-
Evolution							
Healing	5.939 (28,3%)	9.974 (47,5%)	4.264 (20,3%)	672 (3,2%)	161 (0,77%)	9.974	1
Death	461 (22,4%)	1.502 (73%)	74 (3,6%)	20 (1%)	1 (0,05%)	-	-
Ignored	485 (26,1%)	1.003 (54%)	292 (15,7%)	45 (2,4%)	31 (1,67%)	-	-

Source: Prepared by the author with data extracted from the Brazilian Obstetric Observatory of COVID-19 (OOBr) (https://observatorioobstetrico.shinyapps.io/covid_gesta_puerp_br/). 2024.

In Table 5, the relative risk of mortality during the 3rd trimester is significantly higher compared to the 1st and 2nd trimesters. The relative risk of mortality for hospitalized patients is significantly higher than for those who were not hospitalized. The relative risk of mortality for patients hospitalized in the ICU is significantly lower than for those who were not hospitalized in the ICU. The relative risk of mortality for patients on no-ninvasive ventilatory support is significantly higher than for those who did not receive such support. The relative risk of mortality for patients on invasive ventilatory support was not significantly different from those who did not receive ventilatory support. The relative risk of mortality for patients who died is significantly lower than for those who were cured. In summary, the data provided suggest significant associations between different variables and mortality, for example, mortality appears to be associated with the gestational period, hospitalization, ICU hospitalization, type of ventilatory support, and patient outcome.

TABLE 5 – BIVARIATE ASSOCIATIONS OF CLINICAL CHARACTERISTICS OF WOMEN OF REPRODUCTIVE AGE WITH COVID-19 (N=24,924). BRAZIL 2020-2024

Gestational period	CI 95%	Relative risk (RR)	Standard Deviation (SD)	p Value
1st trimester	0.0420± 1.96	-	0.4035	0.3192
2nd trimester	0.1033± 1.96	-	-	0.2996
3rd trimester	0.2726± 1.96	-	-	0.2941
Ignored	0.0256± 1.96	28.34-	-	0.2996
Puerpera	0.1083± 1.96	0.1083± 1.96	-	0.2941

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Hospitalization				
No	0.5249±1.96	-	4971.60	0.0001056
Yes	0.0185±1.96	-	81.09	-
Ignored	0.0085±1.96	0.30	52.13	-
Hospitalization in ICU				
No	0.3737±1.96	-	2848.59	-
Yes	0.1126±1.96	-	1452.84	0.0000776
Ignored	0.0656±1.96	-	419.27	-
Ventilatory support				
No	0.2987±1.96	-	1850.61	-
Non-invasive	0.1327±1.96	0.44	1911.02	0.0002086
Invasive	0.0472±1.96	0.16	758.80	-
Ignored	0.0732±1.96	0.25	483.39	-
Evolution				
Healing	0.4757±1.96	12.91	3965.91	-
Death	0.0369±1.96	0.95	618.43	0.0014799
Ignored	0.0389±1.96	-	354.52	-

Source: Prepared by the author with data extracted from the Brazilian Obstetric Observatory of COVID-19 (OOBr) (https://observatorioobstetrico.shinyapps.io/covid_gesta_puerp_br/). 2024.

In all variables analyzed, hospitalization, ICU hospitalization, ventilatory support and evolution, brown people have the highest prevalence of cases, indigenous people generally have the lowest prevalence in almost all variables, except for ignored for hospitalization. All p-values are less than 0.05, indicating that the results are statistically significant, meaning that there is a significant association between skin color and the clinical outcomes analyzed. The results in Table 6 suggest that skin color has a significant influence on clinical outcomes related to hospitalization, ICU hospitalization, ventilatory support and patient evolution. In particular, brown people have a higher prevalence in almost all categories.

TABLE 6 - CLINICAL CHARACTERISTICS OF WOMEN OF REPRODUCTIVE AGE WITH COVID-19 ACCORDING TO SKIN COLOR (N=24,924). BRAZIL 2020-2024

Hospitalization	Yellow	White	Indigenous	Brown	Black	Ignored	CI 95%	Relative risk (RR	Standard deviation (SD)	p Value
No	10 (1,6%)	240 (38,3%)	3 (0,5%)	269 (43%)	35 (5,6%)	69 (11%)	0.43±1.96	0.025	0.0196	0.0196
Yes	173 (0,7%)	9.111 (38%)	181 (0,8%)	10.151 (42,4%)	1.196 (5%)	3.140 (13,1%)	0.424±1.96	0.971	0.0031	0.0031
Ignored	3 (0,9%)	81 (23,4%)	3 (0,9%)	184 (53,2%)	18 (5,2%)	57 (16,5%)	0.132±1.96	0.014	0.0185	0.0185
ICU hospitalization										
No	106 (0,6%)	6.379 (39%)	114 (0,7%)	6.912 (42,3%)	769 (4,7%)	2.059 (12,6%)	0.423±1.96	0.681	0.0038	0.0038
Yes	45 (0,8%)	2.185 (37,4%)	24 (0,4%)	2.456 (42,1%)	328 (5,6%)	800 (13,7%)	0.421±1.96	0.243	0.0064	0.0064
Ignored	35 (1,3%)	868 (31,6%)	49 (1,8%)	1.236 (45%)	152 (5,5%)	407 (14,8%)	0.136±1.96	0.116	0.0066	0.0066

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Ventilatory support										
No	84 (0,7%)	4.759 (39,1%)	97 (0,8%)	5.249 (43,2%)	575 (4,7%)	1.400 (11,5%)	0.432±1.96	0.282	0.0044	0.0044
Non-invasive	43 (0,6%)	2.830 (40,4%)	23 (0,3%)	2.739 (39%)	369 (5,3%)	1.023 (14,6%)	0.39±1.96	0.481	0.0059	0.0059
Invasive	24 (0,9%)	909 (34%)	17 (0,6%)	1.243 (46,5%)	155 (5,8%)	324 (12,1%)	0.465±1.96	0.107	0.0096	0.0096
Ignored	35 (1,1%)	934 (30,5%)	50 (1,6%)	1.373 (44,8%)	151 (4,9%)	519 (16,9%)	0.448±1.96	0.123	0.0088	0.0088
Evolution										
Healing	157 (0,7%)	8.200 (39%)	155 (0,7%)	8.642 (41,1%)	1.026 (4,9%)	2.830 (13,5%)	0.411±1.96	0.043	0.0034	0.0034
Death	17 (0,8%)	683 (33,2%)	16 (0,8%)	988 (48%)	147 (7,1%)	207 (10,1%)	0.481±1.96	0.418	0.0110	0.0110
Ignored	12 (0,6%)	9.432 (37,8%)	187 (0,8%)	10.604 (42,5%)	1.249 (5%)	3.266 (13,1%)	0.425±1.96	0.517	0.0031	0.0031

Source: Prepared by the author with data extracted from the Brazilian Obstetric Observatory of COVID-19(OOBr) (https://observatorioobstetrico.shinyapps.io/covid_gesta_puerp_br/). 2024.

DISCUSSION

The age group under 20 years old showed a significant variation, with a maximum value of 881 and a minimum of 13. It is observed that, in 2021, there was a considerable increase in cases (41.4%), brown women were the most affected (50.5%), followed by white (50.8%) and black (48.3%). The Southeast region had the highest number of cases, with a maximum value of 12,479 and a minimum of 193, brown and white women are also the most prevalent groups in this region, with 50.5% and 50.8% respectively. Most cases were registered in urban areas, with a maximum value of 10,448 and a minimum of 173 and again, brown and white women were the most affected, with 49.9% and 50.8% respectively. Most cases are concentrated among those with secondary education, with a maximum value of 2,889 and a minimum of 56, the brown and white groups are predominant, with 50.5% and 50.8% respectively.

According to a study carried out in Italy, the fatality rate among patients aged 70 and over was significantly higher compared to those under 40. 22 Similarly, in the United States of America (USA), the Centers for Disease Control and Prevention (CDC) reported that the majority of COVID-19 deaths occurred in individuals aged 65 years and older [23], regional disparities are evident, with densely populated urban areas experiencing higher case burden and mortality compared to rural regions. [24] In India, unequal distribution of health resources has contributed to higher mortality in less developed states. [25]

> “These disparities are often attributed to social determinants of health, including lower access to quality health care, poor living conditions, and higher prevalence of chronic comorbidities.”

Studies, including in the US and UK, have shown that minority groups, such as African Americans and Hispanics, face higher rates of infection and mortality. [9]

In Brazil, the impact of COVID-19 on different racial groups has also been significant, with brown and black individuals experiencing higher rates of hospitalization and mortality. [6,8,9,10]

It is known that heart disease is a condition that affects cardiovascular health and, when compared with skin color, reveals significant inequalities. Data show that brown and white people are the most affected by heart disease, with 50.5% and 50.8% of cases, respectively. Heart disease has been identified as a significant risk factor for maternal mortality in patients with COVID-19. [16,17,19]

PFor those who had a fever, the prevalence was also higher among brown (50.5%) and white (50.8%) individuals, with a maximum value of 6,428 and a minimum of 81. These data indicate that fever, a common symptom of COVID-19, mainly affects these two groups. Among those who had a cough, brown (50.5%) and white (50.8%) individuals were again the most affected, with a maximum value of 8,587 and a minimum of 111. This reinforces that cough, another significant symptom, is more common among

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these groups. Among those who had a sore throat, brown (50.5%) and white (50.8%) individuals maintained the highest prevalence, with a maximum value of 2,528 and a minimum of 62. These data suggest a consistent racial distribution of symptoms. Those with dyspnea showed an even higher prevalence among brown (50.5%) and white (50.8%) individuals, with a maximum value of 7,460 and a minimum of 56. Dyspnea is a serious symptom, often associated with worse outcomes. Individuals with respiratory distress also showed a higher prevalence among brown (50.5%) and white (50.8%) individuals, indicating that respiratory distress is a significant concern for these groups.

Analysis of the data shows that fever is a common symptom across all age groups and skin colors. Similar to fever, cough is reported consistently across racial groups, with fever and cough being the most frequently reported symptoms among pregnant women. [13,14,15,16,17] The presence of diarrhea was observed in pregnant women with COVID-19. [19,20]

The data reveal that women with brown skin (43%) and black skin (5.6%) have higher hospitalization rates compared to those with white skin (38.3%) and yellow skin (1.6%). Hospitalization in the ICU is more frequent among black skin (5.6%) and brown skin (42.1%) compared to those with white skin (37.4%) and yellow skin (0.8%). An international study, such as that carried out by Knight et al., (2020) [13] n the United Kingdom, reports that approximately 10% of pregnant women hospitalized with COVID-19 required intensive care.

The need for invasive ventilatory support is greater among black (5.8%) and brown (46.5%) women compared to white (34%) and yellow (0.9%) women. Knight et al., (2020) [13] reported that approximately 4% of pregnant women with COVID-19 admitted to the ICU require invasive ventilation.

The cure rate is lower among women with black skin color (4.9%) and brown skin color (41.1%), while the death rate is higher among those with black skin color (7.1%) and brown skin color (48%) compared to white (33.2%) and yellow (0.8%) women. Data indicate mortality among pregnant women with COVID-19. [8,9,10] Maternal mortality was reported to be significantly higher, highlighting disparities in health outcomes between different regions. [8,9,10,13,14]

The study highlights significant disparities in COVID-19 outcomes across racial groups, providing critical evidence for public health policies focused on racial equity. This study highlights the need for better practices in the collection and recording of racial and ethnic data, which can lead to a more accurate understanding of the health needs of these populations.

The findings can inform efforts to strengthen public health infrastructure in areas of greatest vulnerability, including training health professionals on the importance of cultural sensitivity. Sharing our results can raise awareness of the need for social justice in health, encouraging actions that reduce inequities and promote universal health.

> “The results of this research can be used to develop health education programs that address specific risk factors and promote preventive behaviors in disadvantaged communities.”

CONCLUSION

The study reveals significant disparities in COVID-19 outcomes across racial and ethnic groups, with Black and Brown women in particular experiencing higher rates of hospitalization, need for ventilator support, and mortality compared to White women. Finally, the study highlights the importance of collecting detailed and accurate racial and ethnic data to better understand health disparities. Granular data can help identify specific patterns and develop more effective intervention strategies. The findings indicate the need for continued research to monitor trends in health outcomes over time and assess the effectiveness of interventions implemented to reduce mortality and racial health inequities.

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