Original Article

Pregnancies and births in times of COVID-19

Gestações e nascimentos em tempos de COVID-19

Embarazos y nacimientos en tiempos de COVID-19

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Abstract

Objective: Identify the profile of births of pregnancies of women with internet access who were infected with SARS-CoV-2 and their outcomes.

Methods: Cross-sectional study integrated into a prospective cohort, with collection between August 2021 and February 2022, based on the responses of 304 women who had pregnancies and/or deliveries during the pandemic period.

Results: Of the total, 25.7% of the interviewees had COVID-19, with a predominance of diagnoses in the third quarter. Complaints of anosmia, fatigue and headache prevailed as related to the infection. The variables: using the Unified Health System for care (p = 0.084); gestational diabetes (p = 0.141); low birth weight (p = 0.117); need for admission to a neonatal unit (p = 0.120) were included in the regression model because they had p values lower than 0.20. The variable referring to the type of delivery (p=1.000) was inserted in the model because it is a variable of interest and with a description of relevance in the literature. Prematurity was the only variable that was statistically associated with SARS-CoV-2 infection during pregnancy (p = 0.008) in the bivariate analysis, explaining the outcome of infection during pregnancy (<0.001), confirmed in the Poisson Robust Regression model.

Conclusion: There was a high prevalence of COVID-19 in the sample, with varying symptoms and a predominance of operative deliveries. However, SARS-CoV-2 infection only explained the higher occurrence of premature births.

Resumo

Objetivo: Identificar o perfil de nascimentos das gestações de mulheres com acesso à internet que cursaram com a infecção pelo SARS-CoV-2 e seus desfechos.

Métodos: Estudo transversal integrado a uma coorte prospectiva, com coleta entre agosto de 2021 e fevereiro de 2022, baseado nas respostas de 304 mulheres que tiveram gestações e/ou partos durante o período pandêmico.

Resultados: Do total, 25,7% das entrevistadas tiveram COVID-19, com predomínio de diagnósticos no terceiro trimestre. Queixas de anosmia, fadiga e cefaleia prevaleceram como relacionados à infecção. As variáveis: utilizar o Sistema Único de Saúde para atendimento (p = 0,084); diabetes gestacional (p = 0,141); baixo peso de nascimento (p = 0,117); necessidade de internação em unidade neonatal (p = 0,120) foram inseridas no modelo de regressão por terem valores de p inferiores a 0,20. A variável referente ao tipo de parto (p=1,000) foi inserida no modelo por se tratar de uma variável de interesse e com descrição de relevância na literatura. A prematuridade foi a única variável que apresentou associação estatística com a infecção pelo SARS-CoV-2

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durante a gestação (p = 0,008) na análise bivariada, explicando o desfecho da infecção na gestação (<0,001), comprovado no modelo de Regressão Robusta de Poisson.

Conclusão: Observou-se alta prevalência de COVID-19 na amostra, com variação de sintomas e predomínio de partos operatórios. No entanto, a infecção pelo SARS-CoV-2 explicou apenas a maior ocorrência de nascimentos prematuros.

Resumen

Objetivo: Identificar el perfil de nacimientos de los embarazos de mujeres con acceso a internet que lo cursaron con la infección por SARS-CoV-2 y sus desenlaces.

Métodos: Estudio transversal integrado a una cohorte prospectiva, con recopilación entre agosto de 2021 y febrero de 2022, basado en las respuestas de 304 mujeres que tuvieron embarazos o partos durante el período pandémico.

Resultados: Del total, el 25,7 % de las entrevistadas tuvieron COVID-19, con predominio de diagnósticos en el tercer trimestre. Prevalecieron quejas de anosmia, fatiga y cefalea como relacionadas a la infección. Las variables utilización del Sistema Único de Salud para atención (p = 0,084), diabetes gestacional (p = 0,141), bajo peso de nacimiento (p = 0,117), necesidad de internación en unidad neonatal (p = 0,120) se introdujeron en el modelo de regresión por tener valores de p inferiores a 0,20. Se introdujo la variable relacionada al tipo de parto (p = 1,000) en el modelo por tratarse de una variable de interés y con descripción de relevancia en la literatura. La prematuridad fue la única variable que presentó asociación estadística con la infección por SARS-CoV-2 durante el embarazo (p = 0,008) en el análisis bivariado, lo que explica el desenlace de la infección en el embarazo (>0,001), comprobado en el modelo de regresión robusta de Poisson.

Conclusión: Se observó alta prevalencia de COVID-19 en la muestra, con variación de síntomas y predominio de partos operatorios. Sin embargo, la infección por SARS-CoV-2 explicó solamente la mayor incidencia de nacimientos prematuros.

Introduction

More than two years after the declaration of a COVID-19 pandemic, the World Health Organization (WHO) reported, in July 2022, about 550 million people infected with SARS-CoV-2 (the causative agent of COVID-19) and more than six million deaths.[1] In this context, the physiological changes of pregnancy predispose pregnant women to severe forms of COVID-19,[2] in order to be considered a risk group for infection and priority for care and testing,[2,3] since the first guiding documents.

The gestational period is a unique immunological state, in which the pregnant woman acquires tolerance to the allogeneic embryo/fetus and, simultaneously, protects herself and the conceptus from pathogens.[4] The first and third trimesters of pregnancy are considered critical in terms of the risk of infections,[4] including respiratory viruses.[5] Thus, the physiological alterations of pregnancy make it difficult to assess infectious conditions, especially of the respiratory tract, since pregnant women tend to have a costal breathing pattern, tachypnea, tachycardia, increased circulating volume and hemodilution with hypotension.[6] These signs can act by masking the conditions of COVID-19 during pregnancy, especially in those who develop with severity. Even in pregnancies that progress with SARS-CoV-2 infection, the predominance was of cesarean deliveries,[7-9] justified by maternal respiratory decompensation or fetal distress, a reflection of poor oxygenation and maternal pneumonia.[7-10]

The severity of the maternal COVID-19 condition substantially increased the number of premature births, between 10 and 60%, despite low rates of neonatal infection, or good evolution among infected newborns (NB).[7-11] Neonatal deaths in the period were related to prematurity, not infection.[7,8,10,12]

Brazil has high rates of maternal deaths due to COVID-19, reaching rates of 10.2%,[13] considered high when compared to international indices (1.8%).[8] As determinants of the increase in maternal mortality in the COVID-19 pandemic, the pregnant woman's hesitation in seeking assistance, either for fear of the disease, or for financial problems and/or transportation and access to health services, as well as low adherence to prenatal consultations.[14] Furthermore, maternal mortality secondary to COVID-19 demonstrates minority disparities and population vulnerability.[14]

Advances and deepening of knowledge related to COVID-19 in the puerperal pregnancy cycle are urgent. Brazil experienced and still experiences many maternal deaths. Pregnant women and postpartum women are physiologically vulnerable after COVID-19 infection, including its severe form.

Although we have a satisfactory production of published studies on the profile of pregnant women, postpartum women and newborns, there are still few national studies that point out the outcomes of pregnancies among Brazilian women in this period, demonstrating the social and scientific relevance of the theme. Considering the above, this study aimed to identify the birth profile of pregnancies of women with internet access who were infected with SARS-CoV-2 and their outcomes.

Methods

This is a cross-sectional study, integrated into a prospective cohort, with an online survey of women who had pregnancies and/or deliveries during the COVID-19 pandemic. Data collection took place from August 2021 to February 2022.

The virtual environment of social networks of an extensionist project constituted the scenario of this study. In mid-July 2020, a group of partner researchers from the Federal Universities of Triangle Mineiro (UFTM) and São Carlos (UFSCar) carried out studies around the theme of COVID-19 during pregnancy, childbirth and the postpartum period, in addition to producing content to translate and disseminate knowledge on social networks created for this purpose. Through an extension project, the profile "@nascer.e.covid"/"Nascer e Covid" was created on Instagram® and Facebook®. More than 200 posts were made. On Instagram®, the profile had, in July 2022, more than 2,900 followers and, on Facebook®, 225 followers.

All female followers of "@nascer.e.covid"/"Nascer e Covid" with experience of pregnancy during the COVID-19 pandemic were invited to participate in the study. The inclusion criteria were: having access to the internet, being over 18 years old and having been pregnant and/or giving birth during the COVID-19 pandemic. The invitation to the study was posted on the aforementioned networks, with the availability of a link that, when accessed, contained the Free and Informed Consent Form. Upon consenting to participate in the study, the women were directed to a more general questionnaire with sociodemographic data and, later, when the respondents checked the option of pregnant or puerperal women, they were directed to a specific questionnaire, which they filled out with information on clinical and obstetric data, as well as on the occurrence of COVID-19. If they responded affirmatively to the disease, they were also directed to a form about it. In addition, for postpartum women, information about the birth and the child was questioned.

The dependent variable was COVID-19 in the pregnancy-puerperal cycle, and the independent variables were sociodemographic, clinical and obstetric variables. It is noteworthy that, following ethical regulations for remotely collecting data, none of the questions were flagged as mandatory, so women had the option of keeping the fields for answers blank. Forms that did not contain complete information about the dependent variable and the outcome (delivery) were not included in the analysis.

To determine the sample size, the PASS (Power Analysis and Sample Size) application, version 15, was used. The calculation considered the prevalence of cesarean deliveries of 60.0% (average percentage of operative deliveries during the COVID-19 pandemic), an average obtained in previous review studies,[8,9] a precision of 5% and a confidence interval of 95% for a finite population of 1,985 women (total number of social network followers at the time of calculation), reaching 312 participants. In all, 304 pregnant or puerperal women consented to participate in the study, comprising the final sample. The sample is non-probabilistic of convenience. The cesarean section rate was chosen as the outcome variable because it showed a significant increase among infected pregnant women, according to the literature.

The data collected through Google Forms® were imported into a Microsoft Excel® spreadsheet and then into the Statistical Package for the Social Sciences application, version 23.0. Descriptive analysis of data related to sociodemographic and obstetric variables (absolute numbers and percentages, mean, standard deviation, minimum and maximum values) was carried out. The Chi-Square and Fisher's

Exact Tests were applied, considering a significance level of 5%. Calculations of prevalence ratios and respective confidence intervals were 95%. Multiple analysis was applied using Poisson regression, with robust variance, including in the model variables with p value <0.20 in the bivariate.

The project to which this study is articulated was approved by the Research Ethics Committee and is registered under the Certificate of Presentation for Appreciation (CAEE) 45485921.0.0000.5154. The "Guidelines for research in a virtual environment" determined by CONEP in 2021 were followed. This study refers to the specific objective of the aforementioned project, entitled "*Inquérito Nascer e COVID-19*". It is noteworthy that all Equator Network Health Research Quality and Transparency Recommendations were followed in this study.

Results

Sociodemographic, clinical and obstetric characterization

The characterization of the sociodemographic profile showed that most of the participants were postpartum women (72.4% - 220), with ages ranging from 18 to 45 years, with a mean of 31.8 ± 5.4 years. 69.1% (210) declared themselves white and 84.6% (257) lived with a partner. A high level of education was observed among the respondents, with 66.1% (201) having completed higher education or postgraduate studies, and 29.3% (89) reported having completed a *stricto or lato sensu* postgraduate course (master's/specialization). There was a predominance of women who performed paid work (79.9% - 243). The participants lived in different locations, covering all regions of the country, namely: Midwest: 13 (4.3%); North: 02 (0.6%); Northeast: 35 (11.5%); South: 25 (8.2%); and Southeast 207 (68%). The states with the highest number of participants in the survey were: São Paulo (33.9% - 103), followed by Minas Gerais (28.3% - 86) and Bahia (3.9% - 12), and 74% of Brazilian states were represented in this study. Acre, Amapá, Amazonas, Rondônia, Roraima, Sergipe and Tocantins had no respondents. Most respondents had health insurance (77.3% - 235), however 50.3% (153) reported using the Unified Health System (SUS) for care. With regard to obstetric data, 49.3% (150) were primiparous, 71.7% (218) had no previous chronic diseases, and did not develop any pregnancy-related illness (74.3% - 226). The most cited chronic diseases were obesity (n = 31; 10.2%), asthma (16; 5.3%) and chronic arterial hypertension (10; 3.3%). The most cited gestational diseases were diabetes (n = 32; 10.5%) and hypertensive syndromes (18; 5.9%).

COVID-19 data in the sample

When asked about the transmission of COVID-19 during pregnancy/postpartum period, 25.7% (n = 78) answered in the affirmative. The most reported symptoms were loss of smell (n = 50; 64.9%), fatigue/tiredness (n = 48; 62.3%), headache (n = 46, 59.7%) and loss of taste (n = 43; 55.8%). COVID-19 was diagnosed more frequently in the third (n = 18; 23.1%) and second gestational trimester (n = 16; 20.5%), while 16.7% (13) were diagnosed in the postpartum period. As for the severity of the cases, four required hospitalization due to the infection (1.3%), two (50%) were admitted to the institution where they would give birth, and two were transferred (50%). Regarding pneumonia, two were unable to answer (50%) if they had, one (25%) had pneumonia during hospitalization and one (25%) did not. All four women used oxygen therapy through a catheter, but none was intubated. One (25%) required hospitalization in an intensive care unit, where she remained for 10 days. Data regarding coronavirus infection among the participants are shown in Table 1.

Characterization of gestational outcomes

Cesarean section was the outcome of 65.9% of pregnancies, but only one (0.8%) was reported as an indication related to COVID-19. The indications for cesarean section were supported by the secondary stop of dilation (11.7%; n = 14) and the choice of the parturient (9.2%; n = 11). Ten respondents were unable to report the reason (8.4%). There was a predominance of deliveries performed by medical professionals (79.9%; n = 155), followed by obstetric nurses and midwives, both with the same frequency

Table 1. Distribution of data from pregnant/postpartum women diagnosed with COVID-19

Variables	n(%)
Coronavirus infection	
Had COVID-19	78(25.7)
Did not have COVID-19	197(64.8)
Do not know/did not answer	29(9.5)
Most frequently reported symptoms of COVID-19	
Loss of smell	50(64.9)
Fatigue/tiredness	48(62.3)
Migraine	46(59.7)
Loss of taste	43(55.8)
Runny nose	41(53.2)
Dry cough	34(44.2)
Fever	33(42.9)
Dyspnoea	25(32.5)
Diarrhea	9(11.7)
Did not show symptoms	3(3.9)
Myalgia	2(2.6)
Sneezing	2(2.6)
Sore throat	1(1.3)
Eye pain	1(1.3)
Period of diagnosis of COVID-19	
Third trimester of pregnancy	18(23.1)
Second trimester of pregnancy	16(20.5)
Postpartum period	13(16.7)
First trimester of pregnancy	9(11.5)
Did not know how to answer	22(28.2)
Need for hospitalization	
Yes	4(5.1)
No	74(94.9)

(8.2%; n = 16). Three women reported home birth with the help of a doula (1.5%); three (1.5%) reported having a home birth without professional assistance or a support network, and one reported having her birth assisted by a traditional midwife. Twenty-six postpartum women did not respond to this item on the form. Data about the newborn were completed by 194 postpartum women. Of these, 14 were born prematurely (7.2%) and ten (10.2%) were classified as having low birth weight (weight less than 2,500 grams). In addition, 28 (15.2%) had neonatal complications and 14 (7.3%) required hospitalization in neonatal units, respiratory distress being the main reason (64.3%; nine). Nine (4.7%) neonates collected PCR (C-reactive protein) for COVID-19 and all tested negative.

Factors associated with COVID-19 in the pregnancy-puerperal cycle

Table 2 presents the bivariate analysis of the association between sociodemographic, clinical and obstetric variables and COVID-19.

Table 2. Association between sociodemographic, clinical and obstetric variables and COVID-19 among pregnant/postpartum women who responded to the survey

Variable	COVID-19		RP	95% CI	p-value
	Yes n(%)	No n(%)			
Age					
18 to 35 years	51(18.0)	131(47.0)	1.036	(0.699- 1.536)	0.888
> 35 years	27(11.0)	66(24.0)			
Skin color					
White	58(21.0)	135(49.1)	1.232	(0.795-1.909)	0.382
Not white	20(7.3)	62(22.6)			
Partner					
Lives with partner	65(23.6)	171(62.2)	0.826	(0.506-1.348)	0.449
Does not live with a partner	13(4.7)	26(9.5)			
Education					
Complete high school or lower	12(4.9)	29(12)	1.032	(0.611-1.839)	1.000
Higher than complete higher education	57(23.6)	144(59.5)			
Paid activity					
Performs paid activity	64(24.2)	160(60.4)	1.065	(0.617-1.839)	
Does not performs paid activity	11(4.1)	30(11.3)			1.000
Health insurance					
Has it	63(23.1)	153(56.0)	1.188	(0.720-1.985)	0.620
Does not have it	14(5.1)	43(15.8)			
SUS user					
Yes	32(11.6)	104(37.8)	0.711	(0.484-1.044)	0.084
No	46(16.8)	93(33.8)			
Chronic disease					
Yes	14(5.1)	43(15.6)	0.837	(0.508-1.379)	0.514
No	64(23.3)	154(56.0)			
Obesity					
Yes	8(2.9)	23(8.4)	0.900	(0.480-1.687)	0.835
No	70(25.4)	174(63.3)			
Asthma					
Yes	3(1.0)	13(4.7)	0.648	(0.229-1.828)	0.569
No	75(27.3)	184(67.0)			
Chronic hypertension					
Yes	3(1.0)	7(2.6)	1.060	(0.403-2.785)	1.000
No	75(27.3)	190(69.1)			
Number of pregnancies					
First born	40(14.8)	110(40.8)	0.889	(0.607-1.301)	0.587
Multigestation	36(13.3)	84(31.1)			
Hypertensive syndrome in pregnancy					
Yes	4(1.4)	14(5.1)	0.779	(0.321-1.890)	0.787
No	73(26.6)	183(66.9)			
Gestational diabetes					
Yes	5(1.9)	27(9.7)	0.525	(0.229-1.202)	0.141
No	72(26.4)	170(62.0)			
Delivery					
Normal	19(9.8)	56(28.9)	1.005	(0.611-1.651)	
Cesarean	30(15.5)	89(45.8)			1.000
Prematurity					
Yes	8(4.1)	6(3.1)	2.509	(1.408-4.564)	0.008
No	41(21.1)	139(71.7)			
Low weight at birth					
Yes	5(5.1)	5(5.1)	2.200	(1.060-4.564)	0.117
No					
Newborn sent to neonatal unit					
Yes	6(3.1)	8(4.2)	1.806	(0.933-3.495)	0.120
No	42(22.0)	135(70.7)			

Prematurity was the only variable that was statistically associated with COVID-19 during pregnancy (p = 0.008). The variables: using the SUS (p = 0.084), gestational diabetes (p = 0.141), low birth weight (p = 0.117) and admission to a neonatal unit (p = 0.120) were included in the regression model, as they had p values lower than 0.20. The variable referring to the type of delivery (p=1.000) was inserted in the model because it is a variable of interest and with a description of relevance in the literature. Table 3 presents the variables inserted in the Poisson regression model, prevalence ratio, p value and respective confidence intervals.

Table 3. Poisson regression model among pregnant/postpartum women with COVID-19 and sociodemographic, clinical, and obstetric variables among pregnant and postpartum women who responded to the survey

Variables	PR	95%CI		p-value
Gestational diabetes	0.063	-0.041	0.167	0.234
SUS user	0.043	-0.052	0.139	0.375
Type of delivery	0.027	-0.066	0.120	0.568
Premature	-0.058	-0.767	-0.348	<0.001
Low weight at birth	0.007	-0.166	0.180	0.937
Newborn sent to neonatal unit	-0.060	-0.264	0.145	0.566

Through the regression model, the variable prematurity (p <0.001) was the only one explained by SARS-CoV-2 infection during pregnancy in the study sample.

Discussion

The present study pointed out the national profile of births and pregnancies of women with internet access, during the COVID-19 pandemic, including those who had the disease and outcomes.

The first highlight in the profile refers to the high level of education and the predominance of women who had paid activities. These data are confirmed by the Brazilian Institute of Geography and Statistics (IBGE), which indicate a predominance of women with complete higher education (29.7%), compared to men (21.4%).[15] Despite the schooling profile, insertion in the labor market is uneven compared to men, 54.5% of women and 73.7% of men. These rates are reflections of motherhood, as women with low education tend not to return to work to take care of their children.[15] The fact that the participants in this study have a high level of education and perform paid activities can be a differential with regard to the answers, on the other hand, this same factor can compromise the internal and external validity, as it reflects the reality of a non-heterogeneous group.

Another highlight of the sample was the fact that, although most participants reported having access to supplementary health, more than half of them used SUS. Throughout pregnancy, prenatal and postpartum consultations lead women to seek health services. The SUS presents care with structured flows in comparison with supplementary health, whose scheduling of appointments and tests are the responsibility of the user, which makes logistics difficult.[16] The centralization of care in a single location and the protocol flow can be a determinant for choosing the SUS. Added to this is the fact that many drugs are made available by the SUS free of charge. Thus, it is worth emphasizing the essentiality of the SUS which, despite its weaknesses, is fundamental for Brazilian health and especially for women in the pregnancy-puerperal cycle, especially due to the bond formed between caregiver, woman and family.

As for COVID-19, there was a high prevalence (25.7%) in the sample, the index being higher than the results of an American cohort study, in which 10.6% of pregnant women had the infection.[17] A similar result brought an online survey from California, in which a percentage of 2.5% of infected people was obtained.[18] However, it must be considered that the prevalence of these studies generally results from universal testing before childbirth, with a range of 10.4 to 19.9% of positive tests being found.[19,20] 54.1 to 100% of pregnant women tested before delivery were asymptomatic,[20] which may reflect the fluctuations of the indices in this population.

Although no association was found between the infection and sociodemographic variables in the sample, studies have pointed to the association with situations of social vulnerability of black women and those who do not have paid work,[20-23] as well

as those who lost their jobs or were already unemployed before the pandemic.[18] A Brazilian study found a higher prevalence of infection among black women and those in conditions of social vulnerability, as well as greater severity and worse outcomes in these cases, a reflection of social disparities in the country,[24] which is similar to the results of the American study.[25] In the profile of the participants in this study, these determinants did not prevail.

Although no association was found, a predominance of diagnoses of infection in the third trimester of pregnancy was identified, similar to the results of other studies,[10,12,18,26] which can be justified by universal testing before childbirth.[27] Although with a lower prevalence in the sample, the study points out that the most serious cases were concentrated among postpartum women,[9,28] due to the important immunological and hormonal alterations of the period.[9]

Gestational diabetes was associated with infection in the bivariate analysis, which was not confirmed by regression. The results differ from other studies that pointed to the association of the infection with maternal comorbidities, such as obesity,[9,18,20,29,30] diabetes,[9,20,31] chronic hypertension,[20,29,31] pre eclampsia,[29] asthma[20,29,31] and, also, with the habit of smoking.[29]

Also, obesity, hypertensive syndromes and gestational diabetes were associated with more severe cases in pregnant women assisted in Sweden.[32] In Brazil, cardiovascular diseases, obesity and diabetes were associated with cases whose outcome was maternal death due to the infection..[14,33] The aforementioned comorbidities already contribute to the increased risk of mortality, but they also reflect the quality of prenatal care and, in this sense, the pandemic has impacted access to health services, which may trigger unfavorable outcomes.[14,33]

The most frequently reported symptoms in the sample were anosmia, fatigue/tiredness, headache and ageusia. It is noted from the studies that there is no characteristic pattern of the disease in the obstetric population. A meta-analysis showed a predominance of asymptomatic patients, followed by symptoms of cough, fever, fatigue and anosmia.[29] Another review highlighted fever and cough as the main symptoms.[30] Nasal congestion, cough, headache and changes in smell and taste were mentioned in another review,[28] and, in an online survey, headache, cough, anosmia and fever predominated, with 20% asymptomatic.[18] In view of the above, there is a diversity of manifestations of the infection during pregnancy/postpartum period, but they are not different from those commonly found in the general population, with the exception of fatigue, which can be accentuated by changes in the condition of pregnancy/postpartum period.[6] Furthermore, low rates of hospitalization were observed, similar to data presented by other reviews.[9,30]

Cesarean sections were used in most births, a trend confirmed by other review studies and meta-analyses.[9,29] Infection with SARS-CoV-2, by itself, is not an indication for its performance, it also happens when there are clinical conditions of the pregnant woman, such as gestational age and fetal conditions/viability, and should be evaluated for individual indication.[2,9] Cesarean rates in Brazil are already high, even before the pandemic period, corresponding to the majority of births in the country. However, it should be noted that it should be very well indicated and evaluated, since, in the presence of COVID-19 infection, it can increase the risk of maternal mortality, including thromboembolic risks,[34] reflecting on the worsening of conditions in the puerperium.[28]

Regarding neonatal outcomes, 10.2% had low birth weight, and in the literature, the index ranged from 7 to 16.6%[28,29] Studies have shown a correlation between its occurrence and COVID-19,[31] not verified in this sample. Among neonates, 7.3% were referred to neonatal units, a percentage similar to other studies that showed rates between 3 and 23.7%.[29,35] However, hospitalizations were not justified by the occurrence of maternal infection. All neonates tested in the sample for COVID-19, which represented a percentage of 4.7%, had a negative result, and this collection rate is similar to that found in a review study, which pointed out the need for testing from 1.6 to 10% of neonates, with a predominance of negative results.[35]

Finally, the study pointed to the association between premature births and COVID-19, confirm-

ing the scientific evidence.[20,31] However, the rate of 7.2% of births was lower than the rates identified in other studies, which range from 23 to 52.3%.[29,35] Prematurity, in cases of infection, can be explained by cases of maternal pneumonia, which compromise the placental flow[10]

As limitations of the study, the possibility of biases is mentioned: recall, since the data were based on the participants' responses; and prevalence, since pregnant/postpartum women who died from the disease did not make up the case series. Another important limitation is the profile of the participants, who were mostly women with access to the internet, with high education, with formal paid employment, white, residing in the Southeast region and users of supplementary health (health plan/insurance). Therefore, this profile may not reflect the reality of other Brazilian women. The fact can be justified by being a study with online collection, which limits universal participation. In addition, the fact that it was an online survey did not allow the severity of the cases to be classified.

Another point worth discussing is that the study took place in a population with high purchasing power, with access to adequate food, medication, differentiated health services, information, which may have contributed to better results regarding the infection and the pregnancy itself.

Despite these limits, this study has the potential for new research, with other designs, innovating by presenting the profile of the disease in a national sample, with a cross-sectional design. It is noteworthy that the study will be replicated with the same sample, from the cohort of pregnant/postpartum women and may reveal new results that help to elucidate the theme.

Conclusion

The study demonstrated a high prevalence of COVID-19 among Brazilian pregnant/postpartum women, with a predominance of diagnoses in the third trimester of pregnancy and with a wide range of symptoms, the most frequent being anosmia. There was a predominance of SUS users in the sample, in addition to a higher occurrence of cesarean deliveries, and the infection was not the justification for its performance. Among the obstetric outcomes, there was an association between COVID-19 and premature births, as already indicated in international and population studies.

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Collaborations

Ruiz MT, Angotti HFT, Silva JA, Borges EBO, Wernet M, Fonseca LMM, Bussadori JCC and Resende CV contributed to the conception and design, analysis and interpretation of data, writing of the article, critical review and final approval of the version to be published.

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