BioSCIENCE Original Article
DOI: https://doi.org/10.55684/2024.82.e00012

Characteristics of pregnant and puerperous womenhospitalized with COVID-19

Características de gestantes e puérperas internadas com COVID-19

Phallcha Luízar Obregon[1], Laura Grespan[1], Fabiana Severino Kupka[1]

ABSTRACT

Introduction: COVID-19 has shown to be more aggressive in some at-risk populations, including pregnant women.

Objective: To evaluate the demographic and clinical characteristics of pregnant and postpartum women hospitalized according to the degree of severity of the disease.

Methods: Descriptive and quantitative study, based on secondary information. Sociodemographic, clinical and obstetric data were collected from the participants.

Results: 288 women were included, of which 53 cases occurred in 2021 and 235 in 2022. Maternal mortality was 0.7% in the period. The severe form of COVID-19 corresponded to 4.2%, the moderate form 4.5% and asymptomatic 91.3%. Of the registered cases, 96% were pregnant women and 4% had recently given birth; 45% had some comorbidity and 76% were vaccinated. Premature births (11.4%), fetal deaths (1.1%), and maternal death (0.7%) were observed.

Conclusion: The disease was more aggressive in 2021, when the majority of cases were not protected by the vaccine. Comorbidities and non-vaccination of pregnant women proved to be important negative factors for the evolution of severe forms. Premature birth, stillbirths and maternal death were unfavorable outcomes in this study.

KEYWORDS: High-risk pregnancy. COVID-19. Maternal mortality. Obstetric labor.

RESUMO

Introdução: COVID-19 mostrou ser mais agressiva em algumas populações de risco, entre elas as gestantes.

Objetivo: Avaliar as características demográficas e clínicas de gestantes e puérperas internadas conforme o grau de gravidade da doença.

Métodos: Estudo descritivo e quantitativo, baseado em informações secundárias. Foram coletados dados sociodemográficos, clínicos e obstétricos das participantes.

Resultados: Incluiu-se 288 mulheres, dentre as quais 53 casos ocorreram em 2021 e 235 em 2022. A letalidade materna foi 0,7% no período. A forma grave da COVID-19 correspondeu a 4,2%, a moderada 4,5% e assintomáticos 91,3%. Dos casos registrados, 96% eram gestantes e 4% puérperas; 45% apresentavam alguma comorbidade e 76% estavam vacinadas. Foram observados partos prematuros (11,4%), óbitos fetais (1,1%), e morte materna (0,7%).

Conclusão: A doença foi mais agressiva em 2021, quando a maioria dos casos não estava protegida com a vacina. As comorbidades e a não vacinação de gestantes se mostraram fatores negativos importantes para a evolução das formas graves. O parto prematuro, os natimortos e o óbito materno foram desfechos desfavoráveis neste estudo.

PALAVRAS-CHAVE: Gestação de alto risco. COVID-19. Mortalidade materna. Parto prematuro.

Monthly and cumulative frequency of COVID-19 cases

Central message

COVID-19 has been shown to be more aggressive in some at-risk populations, including pregnant women. Thus, evaluating the demographic and clinical characteristics of hospitalized pregnant and postpartum women, and divided according to the degrees of disease severity, is important as a guiding factor for future endemic diseases in this population. This study lasted 2 years, incorporating the period of greatest aggression of the disease.

Perspective

Comorbidities and non-vaccination of pregnant women with COVID-19 proved to be important factors for the evolution of severe forms with maternal death, whose lethality in the group was 0.7%. Premature birth, stillbirths and maternal death were unfavorable outcomes observed, and thus special care is suggested in this study in this group to prevent these serious consequences.

[1]*Hospital Universitário do Oeste do Paraná, Universidade Estadual do Oeste do Paraná, Cascavel, PR, Brazil*

Conflict of interest: None | Financial source: None | Received: 02/01/2024 | Accepted: 18/02/2024 | Correspondence: phallcha@terra.com.br | Associate Editor: Nelson Adami Andreollo

How to cite:
Obregon PL, Grespan L, Kupka FS. Características de gestantes e puérperas internadas com COVID-19. BioSCIENCE. 2024;82:e012

INTRODUCTION

The World Health Organization (WHO) declared, in March 2020, the pandemic by the COVID-19 disease (Coronavirus Disease-2019), caused by the new Coronavirus – SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2). The rapid spread of the disease has led the scientific community to work assiduously to understand the pathogen and the disease. Soon, there was the rapid development of diagnostic means, therapeutic potentials and vaccines to fight and control the disease. The high morbidity and mortality rate worried governments around the world and 36,331,281 were confirmed in Brazil with 693,853 deaths.[1]

Because it is a new disease, its behavior in women in the pregnancy-puerperal period was unknown. There was concern about the changes that occur during pregnancy and whether they could favor infection by SARS-CoV-2, as had already been observed with other respiratory viruses. In the literature, studies dedicated to the obstetric population (pregnant and puerperal women) mention that changes in respiratory and immunological physiomodulation, which occur in the pregnancy-puerperal cycle, could leave women susceptible to infections.[2] Thus, during the H1N1 influenza pandemic in 2009, maternal lethality between 1% and 4.[3%] was described in this population.[2,3] Regarding COVID-19, studies in several countries have indicated prevalences between 3.[8%] and 19.[9%.4] In Brazil, data published in 2021, based on the analysis of the Influenza Epidemiological Surveillance Information System (SIVEP Gripe) of the Ministry of Health, pointed to a lethality rate of more than 10% in the obstetric population.[3] In this way, it became clear that respiratory viruses can be especially deadly for pregnant women.[2,3]

To identify cases, the American College of Obstetricians and Gynecologists (ACOG)5 recommended that all women should be tested, in addition to those exposed, that is, without protection against confirmed cases of COVID-19. According to the National Institute of Health (NIH)6, symptomatic cases can be classified as: 1) mild disease (without clinical or radiological evidence of pulmonary disease); 2) moderate (with clinical or radiological evidence, without organ dysfunction); and 3) severe (respiratory dysfunction, with a drop in SatO2 ≤92% or tachypnea ≥30 breaths per minute) and critical (with installation of systemic inflammation, sepsis, or multiorgan dysfunction). Due to the lack of predictors for the worsening of the disease and because it is known that progression to the severe form can occur abruptly, it was recommended that mild to moderate cases be monitored and evaluated to allow the rapid identification of progression to the severe form.[7]

To understand the behavior of COVID-19 in women in the pregnancy-puerperal period, universal screening was conducted in different countries, whose results showed that most of the positive cases identified were asymptomatic women.[4] Another study highlighted the predominance of mild or asymptomatic forms of the disease and pointed out that the infection affected pregnant and non-pregnant women with the same frequency and severity.[8] In this sense, the greatest concern of COVID-19 arose in pregnant women at high obstetric risk who usually have comorbidities, such as hypertension, diabetes, and obesity, and who could progress to the severe form of the disease, as was being observed in the general population.[8] Thus, the severe form was recognized between 1% and 5% of pregnant and puerperal women. Thus, they needed care in intensive care units, especially in the last 2 trimesters of pregnancy and the postpartum period, given that maternal mortality varied between 0.[6%] and 2%.[8]

Although there are differences between populations, studies have shown that pregnant women with the disease have a higher risk of developing preeclampsia (RR 1.76), premature birth (RR 1.59), severe infections (RR 3.38), admission to the intensive care unit (RR 5.04), maternal mortality (RR 22.3), higher rates of severe perinatal morbidity and perinatal mortality (RR 2.14)[9.] Thus, the Ministry of Health recommended specific guidelines for the care of the obstetric population, considering pregnant and postpartum women up to the 14th day postpartum as a risk group for COVID-19.[8]

In the western region of the state of Paraná, Brazil, there are still few studies that present results of COVID-19 in the obstetric population10, and there are gaps in the behavior of the disease in the region. In view of the above, the objective of the study was to evaluate the demographic and clinical characteristics of pregnant and postpartum women with COVID-19, according to the degree of severity of the disease, admitted to a teaching hospital in Paraná in 2021 and 2022.

METHOD

This study was approved by the Research Ethics Committee of the Universidade Estadual do Oeste do Paraná under opinion No. 5.539.539, Cascavel, PR, Brazil. This is a cross-sectional, retrospective, and quantitative study, based on the medical records of pregnant and postpartum women diagnosed with COVID-19 hospitalized in a reference teaching hospital in obstetric care and cases of the disease, from January 2021 to December 2022.

The reasons that led to hospitalization in the pregnancy-puerperal period were: 1) pregnant women for clinical-obstetric treatment or childbirth; 2) pregnant women with severe acute respiratory syndrome (SARS); and 3) postpartum women with home birth and COVID-19, in the moderate or severe form of the disease.

At the time of admission, the patients were evaluated for the presence of flu-like symptoms and underwent laboratory testing (RT-PCR or antigen test). With a positive result, the patient was directed to the COVID-19 area of the hospital (ward or ICU). When

hospitalized for childbirth, the pregnant woman who tested positive and her newborn (NB) remained in the COVID-19 sector, preferably in a rooming-in room.

Inclusion and exclusion criteria

The inclusion factors were: 1) being pregnant or puerperal; 2) COVID-19 confirmed by laboratory criteria – by reverse transcriptase reaction test followed by RT-PCR (Reverse Transcription Polymerase Chain Reaction) or rapid SARS-CoC-2 antigen test in nasal and oropharyngeal swabs; 3) hospitalization during the study period.

The exclusion groups were pregnant and postpartum women who did not undergo the test for COVID-19 at the time of admission, or who tested negative.

Data collection

The data analyzed were: 1) sociodemographic: age, skin color, education, marital status and origin; 2) obstetric: gestational age at hospitalization, gestational history, mode of delivery, outcome of the mother and the newborn; and 3) clinical: laboratory diagnosis (RT-PCR or rapid antigen test), clinical forms regarding disease severity, length of hospital stay, comorbidities, COVID-19 vaccination status, need for ventilatory support, type of ventilatory support (non-invasive mechanical ventilation, mechanical ventilation), complications such as ventilator-associated pneumonia (VAP) and acute renal failure (AKI).

To better understand the risk of pregnancy at the time of hospitalization, the patients were stratified by obstetric risk according to the criteria of the Paraná maternal and child care guideline11, which considers: 1) pregnant women at usual risk (without individual, sociodemographic, previous reproductive history, disease or injury risk factors); 3) intermediate risk (black or indigenous, under 15 or over 40 years of age, illiterate or with less than 3 years of schooling, under 20 years of age with 1 previously deceased child, and under 20 years of age with more than 3 children); and 4) high risk (with pre-existing diseases specific to the gestational period).

Three comparison groups were formed to identify the severity of COVID-19 and the following criteria determined by the Ministry of Health12 were used: asymptomatic, moderate form, and severe form. Mild cases were not observed. According to the definition of the Ministry of Health, mild cases are characterized by flu-like syndrome, with outpatient and home monitoring, without the need for hospitalization. The moderate form, in addition to the flu-like syndrome, presents maternal risk factors (obstetric/neonatal) and may require hospitalization in wards; and the severe form, the most dangerous, is characterized by the development of severe acute respiratory syndrome (SARS), usually requiring ICU admission. Also, pregnant women at high obstetric-neonatal risk are those who have comorbidities such as lung diseases, tuberculosis, heart diseases, hypertensive syndromes, nephropathies, liver diseases, hematological diseases, diabetes, obesity, among others.[12]

Statistical analysis

For the quantitative variables (age, year of hospitalization, length of stay), the mean, standard deviation, and minimum and maximum values were calculated. For the qualitative variables, the values were expressed as absolute (n) and relative (%) frequency. The case fatality rate was calculated using the number of deaths from COVID-19 divided by the number of COVIDx100 cases, referring to the study period. To compare the groups, according to the severity of the disease, the chi-square test was used, with a confidence level of 95%, in which a p-value of less than 0.[05] was considered significant. Statistical analysis was performed using the JAMOVI software.

RESULTS

In this study, COVID-19 in women in the pregnancy-puerperal period represented 19.1% of the total number of hospitalized cases. In all, 288 women were affected, of which 96% were pregnant and 4% were postpartum. There were 2 maternal deaths from the disease, with a lethality rate of 0.7%.

The distribution of new and accumulated cases is shown in the Figure. There was a continuous and increasing cumulative trend and monthly/year distribution with an oscillatory trend, with waves of different amplitudes and duration. Of the total cases, 18% (n = 53) of them occurred in 2021 and 82% (n = 235) in 2022.

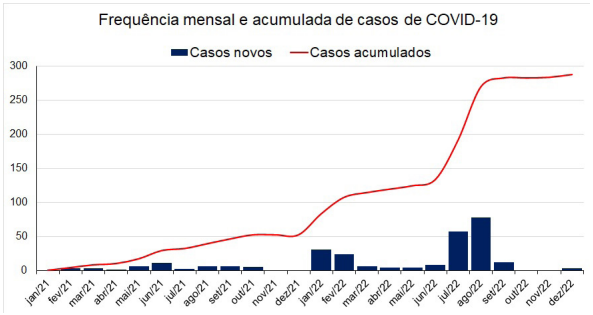

FIGURE — Monthly and cumulative frequency of COVID-19 cases

The main sociodemographic characteristics, according to the form of severity, are described in Table 1. The 3 comparison groups by severity were divided into asymptomatic (91.3%, n = 263); moderate form (4.5%, n= 13) and severe form (4.2%, n = 12). All cases with the severe form (n = 12) and 92% with the moderate form occurred in 2021, while the asymptomatic one prevailed in 2022. The mean age was 26.[9] years, with a minimum age of 14 years and a maximum age of 46 years (SD ± 6.[5]). The predominant age group ranged from 20 to 24 years (36%). There was also a predominance of white women (72%), married or in a stable union (69%), with high school education (60%) and from the municipality of Cascavel, PR, Brazil (58%). In 2021, the cases came from 15 municipalities and in 2022 from 22 municipalities, with the city of Cascavel predominating, followed by the cities of Santa Tereza do Oeste, Quedas do Iguaçu, Guaraniaçu, Nova

Aurora, Três Barras do Paraná, among others in Paraná. The year of hospitalization and the maternal age group were significant (p <0.001) in relation to the moderate and severe forms of the disease.

Regarding gestational risk (Table 2), the results showed that intermediate and high gestational risks, together, represented 56% (n = 161) of the cases, and 67% of the women with the severe form already had factors for high gestational risk. Also, the results pointed to a predominance of pregnant women (96%), mostly multipregnant women (70%). Laboratory confirmation of the disease was by the antigen test method in 89% (n = 255). It is noteworthy that in the 1st year of this study, there was a predominance of the use of the gold standard test (RT-PCR); in the 2nd, the antigen test was the most used due to the increase in demand for tests. Previous comorbidities were present in 45% (n = 131), while diabetes mellitus and pregnancy-specific hypertension were the most prevalent diseases. In all, 24% (n = 70) did not receive the COVID-19 vaccine. Maternal vaccination status and the presence of comorbidities were significant (p <0.001) with the moderate and severe forms of the disease.

TABLE 1 — Sociodemographic characteristics of the cases

Demographic characteristics	COVID-19 Severity Rating: Maternal						Total n = 288		p
	Asymptomatic (n=263)		Moderate (n=13)		Serious (n=12)				
	n	%	n	%	n	%	n	%	
Year									
2021	29	11%	12	92%	12	100%	53	18%	<0.001
2022	234	89%	1	8%	0	0%	235	82%	
Skin color									
White	189	72%	7	54%	11	92%	207	72%	0,314
Brown	58	22%	6	46%	1	8%	65	23%	
Black	15	6%	0	0%	0	0%	15	5%	
Yellow	1	0,4%	0	0%	0	0%	1	0%	
Age group									
14-19	38	14%	0	0%	0	0%	38	13%	0,004
20-24	97	37%	3	23%	3	25%	103	36%	
25-29	47	18%	4	31%	2	17%	53	18%	
30-34	51	19%	3	23%	1	8%	55	19%	
35-39	24	9%	1	8%	4	33%	29	10%	
≥ 40	6	2%	2	15%	2	17%	10	3%	
Schooling									
No schooling	2	1%	0	0%	0	0%	2	1%	0,616
Elementary school	59	22%	6	46%	2	17%	67	23%	
Middle school	159	60%	6	46%	7	58%	172	60%	
Superior	24	9%	1	8%	1	8%	26	9%	
No information	19	7%	0	0%	2	17%	288	100%	
Marital status									
Single	81	31%	3	23%	2	17%	86	30%	0,558
Stable union	112	43%	6	46%	3	25%	121	42%	
Married woman	67	25%	4	31%	7	58%	78	27%	
Divorced	3	1%	0	0%	0	0%	3	1%	
Origin									
Cascavel	155	59%	6	46%	6	50%	167	58%	<0.001
Other municipality	108	41%	7	54%	6	50%	121	42%	

The results on the evolution and outcome of the cases are described in Table 3. The use of invasive or noninvasive respiratory support was required in severe or moderate forms of COVID-19. The need for ICU occurred in moderate and severe forms, and the main complications were ventilator-associated pneumonia (VAP) and/or acute renal failure (AKI). Regarding the length of hospital stay, the clinical logic prevailed, i.e., in asymptomatic cases, the period was short and in moderate or severe cases it was longer. The mean length of hospital stay was 13 days (1-36). Regarding the maternal outcome, 98% (n = 284) were discharged from the hospital, and maternal mortality was 0.7% (n = 2). Regarding the gestational outcome, 91.7% (n = 264) progressed to vaginal delivery or cesarean section, 1% (n = 4) to abortion and 7% (n = 20) did not go into labor at the time of hospitalization. The need for ventilatory support, presence of complications, unfavorable maternal outcome, and longer hospital stay were significant (p<0.05) with the severe form of the disease.

TABLE 2 — Obstetric characteristics of the cases

Features	COVID-19 Severity Rating: Maternal						Total		p
	Asymptomatic (n=263)		Moderate (n=13)		Serious (n=12)		n = 288		
	n	%	n	%	n	%	n	%	
Gestational risk									
Usual risk	120	46%	5	38%	2	17%	127	44%	0,063
Intermediate risk	71	27%	4	31%	2	17%	77	27%	
High risk	72	27%	4	31%	8	67%	84	29%	
Gestational status									
Pregnant	252	96%	13	100%	11	92%	276	96%	0,581
Postpartum woman	11	4%	0	0%	1	8%	12	4%	
Gestational history									
Multigesta	181	69%	11	85%	9	75%	201	70%	0,443
Primiparous	82	31%	2	15%	3	25%	87	30%	
Laboratory diagnosis									
RT-PCR	18	7%	9	69%	6	50%	33	11%	<0.001
Antigen test	245	93%	4	31%	6	50%	255	89%	
Comorbidities									
No comorbidity	147	56%	6	46%	4	33%	157	55%	0,439
A comorbidity	80	30%	6	46%	4	33%	90	31%	
Two or more	36	14%	1	8%	4	33%	41	14%	
Main comorbidities									
Diabetes mellitus	22	8%	1	8%	2	17%	25	9%	<0.001
Hypertensive Disease	19	7%	0	0%	5	42%	24	8%	
Infectious	12	5%	1	8%	0	0%	13	5%	
Obesity	2	1%	0	0%	0	0%	2	1%	
Hypothyroidism	12	5%	0	0%	0	0%	12	4%	
Epilepsy	0	0%	2	15%	1	8%	3	1%	
Mental disorder	10	4%	0	0%	0	0%	10	3%	
COVID-19 vaccine									
1st dose	27	10%	3	23%	1	8%	31	11%	<0.001
2nd dose	134	51%	1	8%	2	17%	137	48%	
Reinforcement	50	19%	0	0%	0	0%	50	17%	
No vaccine	52	20%	9	69%	9	75%	70	24%	

Maternal death was observed in women with the severe form of the disease. Of the 2 who died, 1 had a long course in the ICU and had comorbidities, obesity and epilepsy. She was not vaccinated and, due to the clinical worsening, the delivery (cesarean section) was brought forward to ensure fetal vitality. He was born a premature newborn who, after complications with infections associated with health care, also died. The second patient had

severe respiratory distress. She remained under care in the ICU but had no previous illnesses. She had not received a vaccine and, after delivery (cesarean section) of a full-term newborn, she presented rapid clinical worsening with the need for the use of extracorporeal membrane oxygenation (ECMO) and died a few hours later.

TABLE 3 — Evolution and outcome of the cases

Features	COVID-19 Severity Rating: Maternal						Total		p
	Asymptomatic (n=263)		Moderate (n=13)		Serious (n=12)		n = 288		
	n	%	n	%	n	%	n	%	
Respiratory support									
Invasive	0	0%	0	0%	12	100%	12	4%	<0.001
Non-invasive	0	0%	13	100%	0	0%	13	5%	
Spontaneous ventilation	263	100%	0	0%	0	0%	263	91%	
Complications									
PAV	0	0%	0	0%	7	58%	7	2%	<0.001
IRAS	0	0%	0	0%	4	33%	4	1%	<0.001
Length of hospital stay									
Up to 2 days	205	78%	1	8%	0	0%	206	72%	<0.001
From 3 to 5 days	54	21%	4	31%	0	0%	58	20%	
≥ 6 days	3	1%	8	62%	12	100%	23	8%	
Maternal outcome									
Discharge	263	100%	13	100%	8	66%	284	98%	<0.001
Death	0	0%	0	0%	2	17%	2	1%	
Transfer	0	0%	0	0%	2	17%	2	1%	
Gestational outcome									
Abortion	4	1,5%	0	0%	0	0%	4	1%	0,002
Cesarean delivery	124	47%	6	46%	9	75%	139	48%	
Vaginal delivery	121	46%	3	23%	1	8%	125	43%	
No evolution for delivery	14	5%	4	31%	2	17%	20	7%	

In all, 264 (91.6%) pregnant women went into labor (Table 4), of which 87.5% (n=231) were healthy newborns; 11.4% (n = 30) were premature (less than 36 weeks); and 1.1% (n = 3) stillbirths. According to the results, stillbirths occurred in women in the asymptomatic group and with the moderate form of COVID-19. On the other hand, premature newborns occurred in the 3 severity groups, but with different prevalences, representing 90% in the severe form, 33% in the moderate form and 7.4% in the asymptomatic group.

TABLE 4— Severity of maternal COVID-19 according to mode of delivery and age of newborn

Modes of delivery	COVID-19 Severity Rating: Maternal						Total	
	Asymptomatic (n=245)		Moderate (n=9)		Serious (n=10)		n = 264	
	n	%	n	%	n	%	n	%
Cesarean delivery (n=139)								
Full-term NB	112	45,7%	2	22,2%	1	10%	115	43,6%
Stillbirth (full-term)	0	0%	1	11,1%	0	0%	1	0,4%
Premature newborn	12	4,9%	3	33,3%	8	80%	23	8,7%
Vaginal delivery (n=125)								
Full-term NB	114	46,5%	2	22,2%	0	0%	116	43,9%
Premature newborn	6	2,4%	0	0%	1	10%	7	2,6%
Stillborn (premature)	1	0,4%	1	11,1%	0	0%	2	0,7%

DISCUSSION

In this study, we investigated the characteristics of pregnant and postpartum women with COVID-19 according to the degree of severity of the disease, admitted to a teaching hospital, in the years 2021 and 2022. The results showed that there was a predominance of the asymptomatic form, with severe cases in 4.2%, lethality of 0.7%. Maternal mortality was observed in unvaccinated women.

The values found corroborate those described in the literature, which indicate a predominance of the asymptomatic form10,15,16, and a case fatality rate due to SARS of 6.6%.[2,13-15] However, in relation to the severe forms, the results (4.2%) in this study are lower than those reported in others ranging from 8-40%.[15,17,18] This can be attributed to the different periods of the research, the regional differences and the differences in the care provided to women.

During this pandemic, an increase in the prevalence of the disease in women in the pregnancy-puerperal period8 was noted, with an increase in maternal mortality from 21% (n = 17) to 67% (n = 53) in 2021 in 2020, i.e., there was a 3.1-fold increase.[19] In this study, the increase in cases was 4.[5] times higher in 2022 compared to 2021, with the concentration of moderate and severe cases in 2021 and asymptomatic cases in 2022. This can be attributed to the measures adopted by the government, which included isolation, use of masks, identification of cases as the severe form, among others. Such measures made it possible to reduce the number of positive cases, but with a higher occurrence of severe cases. The scenario was changed with the increase in the number of tests in the population at risk and the beginning of vaccination of the population to control COVID-1919,20, which led to an increase in the number of positive cases and a decrease in severe cases. Added to this is the emergence of new variants of the virus, characterized by affecting more people, but with fewer severe cases.[21]

In the literature, the severe form has been described at different ages.[2,22] However, our results showed a predominance of the disease in women aged 35-39 years for severe forms, between 25-29 years for moderate forms, and between 20-24 years for asymptomatic forms. It is recognized that older mothers have risk factors or obstetric comorbidities that can contribute to the worsening of the disease8.

The high number of maternal deaths from COVID-19 was associated with the presence of risk factors and overlapping comorbidities, as well as with social determinants and failures in care.[8,10,15,23] According to some studies, severity was observed in women who were in the 3rd trimester or in the puerperium and as the most frequently cited comorbidities.[2,8,10,15] These results are in line with what has been described in the literature, and that hypertensive disease and gestational diabetes are the most prevalent, and are the ones that were present in more than 50% of the severe and moderate forms of COVID-19, while obesity and epilepsy led to 1 maternal death.

Regarding the mode of delivery in pregnant women with COVID-19, an increase in the number of cesarean sections has been described, which may be related to pregnant women with severe form.[24-26] On the other hand, it is known that cesarean sections and premature births are factors that contribute to the increase in morbidity and mortality of neonates.[27] According to the guidelines of the Ministry of Health8, COVID-19 is not an indication to change the mode of delivery. Therefore, cesarean section should be performed when there are obstetric indications, which may include acute decompensation of the mother with COVID-19 or by fetal indications. In this study, cesarean sections accounted for 75% and 46% in the severe and moderate forms, respectively. When analyzed in time series, it was observed that the percentage of cesarean sections remained the same over the years, regardless of the pandemic. This may be the result of the actions proposed by the study hospital being part of the Baby-Friendly Hospital initiative, which, among the goals, aims to present lower cesarean section rates when compared to hospitals that do not have this strategy.

Vaccination against COVID-19 represented a positive milestone in reducing the severe forms of the disease. The studies, in addition to demonstrating the effectiveness of vaccines against the disease, also pointed out that their use did not present greater risks for pregnant women and their fetuses.[20,28,29] However, vaccination coverage in the pregnant population was slow when compared to the general population. However, with vaccination, there was a reduction in the rate of severe acute respiratory syndrome (SARS) due to COVID-19, from 7.2% in 2020 to 1% in 2021.[29] In this study, 2/3 of the unvaccinated women developed the severe or moderate form of the disease. Among the factors that may have contributed to the lack of protection of these women are the lack of vaccine, the delay in starting vaccination in pregnant women and resistance to being vaccinated, due to fear or insecurity.

In the literature, the occurrences of preeclampsia, preterm birth, stillbirths, maternal and neonatal deaths have also been associated with COVID-19.[8,17] In this study, the unfavorable outcomes observed were abortion, premature birth, stillbirth, and maternal death. Miscarriages (n = 4) were observed in asymptomatic women, suggesting other obstetric causes. Premature births (n =30) occurred in the 3 severity groups, but represented 90%, 33% and 7.4% in the severe, moderate and asymptomatic forms, respectively. The prevalence of preterm birth (11.3%) was similar to described in the literature (11.6%).[16] These results suggest that, in the face of a severe condition of the disease, premature birth was necessary to maintain fetal vitality. In turn, stillbirths (n = 3) occurred in the group of women with the moderate and asymptomatic forms of the disease and it was not clear to what extent COVID-19 could have been responsible for the outcome. Maternal death in these cases has been related to changes in the pregnancy-puerperal period, comorbidities, ICU use, and longer hospital stay (>8 days) as contributing factors to higher risk of death.[2,18,26] In this study, COVID-19 was responsible for the death of 2 maternal deaths in unvaccinated women, with the severe form of the disease, with comorbidity in 1 of the deaths, length of hospital stay longer than 6 days, use of ICU, use of mechanical ventilation, and complications. Our results differ from data presented in the literature on vaccination status not evaluated in other studies.

One limitation of this study was the use of retrospective data, which depend on information collected from medical records of a single center. However, the longer coverage time (2 years) and the analysis of the vaccination status, which has not been observed in other studies, should be highlighted as positive points.

CONCLUSION

COVID-19 is a disease that affects women in the pregnancy-puerperal period and presents itself in different forms of severity and can lead to maternal death. Comorbidities and non-vaccination of pregnant women proved to be important factors for the evolution of severe forms with maternal death, whose lethality in the group was 0.[7%.] Preterm birth, stillbirths, and maternal death were unfavorable outcomes observed.

Authors' contributions
Conceptualization: Phallcha Luízar Obregón
Research: Phallcha Luízar Obregón
Methodology: Phallcha Luízar Obregón,
Project Administration: Laura Grespan1, Fabiana Severino Kupka1
Writing (proofreading and editing): All authors

REFERENCES

1. Organização Mundial da Saúde, Organização Pan-americana da saúde. Doença causada pelo novo coronavírus (COVID – 19). 2022. Disponível em: https://www.saude.pr.gov.br/Pagina/Coronavirus-COVID-19. Acesso em: 09/11/2023
2. Godoi APN, Bernardes GCS, de Almeida NA, de Melo SN, Belo VS, Nogueira LS, et al. Síndrome respiratória aguda grave em gestantes e puérperas portadoras de COVID-19. Rev Bras Saude Mater Infant. 2021; 21(2). Doi : 10.1590/1806-93042021100S200008
3. Takemoto MLS, Menezes MO, Andreucci CB, Knobel R, Sousa LAR, Katz L, et al. Maternal mortality and COVID-19. J Matern Fetal Neonatal Med. 2020. Doi: 10.1080/14767058.2020.1786056
4. Royal College of Obstetricians and Gynaecologists. Coronavirus (COVID-19) infection in pregnancy: information for healthcare professionals. London: RCOG; 2021 [cited 2021/02/27]. Available in: https://www.rcog.org.uk/globalassets/documents/guidelines/2021-02-19-coronavirus-covid-19-infection-in-pregnancy-v13.pdf
5. American College of Obstetricians and Gynecologists. Outpatient assessment and management for pregnant women with suspected or confirmed novel Coronavirus (COVID-19). Washington: ACOG; 2020 [cited 2020/04/18]. Disponível em: https://www.acog.org/-/media/project/acog/acogorg/files/pdfs/clinical-guidance/practice-advisory/covid-19-algorithm.pdf
6. National Institute of Health. Clinical spectrum of SARS-CoV-2 infection. Bethesda: NIH; 2021 [cited 2021/09/07]. Available in: https://www.covid19treatmentguidelines.nih.gov/overview/clinical-spectrum/.
7. Guida JPS, Santos TRZ, Nascimento, MLC. Parto em paciente com Covid-19. 2021:117–41. Doi:10.5935/978-65-5848-291-8.C0003
8. Brasil. Ministério da Saúde. Manual de Recomendações para a Assistência à Gestante e Puérpera frente à Pandemia de Covid-19. Brasília: Ministério da Saúde; 2021 [citado 2021/04/02]. Disponível em: https://

bvsms.saude.gov.br/bvs/publicacoes/manual_assistencia_gestante_puerpera_covid-19_2ed.pdf

9. Healy CM. Covid-19 in Pregnant Women and Their Newborn Infants. JAMA Pediatrics. 2021;175(8): 781-3.

10. Costa LD, Ruaro FC, Popp NA, Roll JS, Bruxel ECD, Fachinello G, et al. Desfechos de partos em gestantes e recém-nascidos que positivaram COVID-19 em município paranaense. R Saúde Públ Paraná. 2022;5(2). Doi: 10.32811/25954482-2022v5n2.615

11. Paraná. Secretaria de Saúde. Divisão de Atenção à Saúde da Mulher. Linha guia – Atenção materno infantil: gestação. Secretaria de Estado da Saúde do Paraná. 8. ed. Curitiba: SESA; 2022 [citado 2022/05/22]. Disponível em: https://www.saude.pr.gov.br/sites/default/arquivos_restritos/files/documento/2022-03/linha_guia_mi-_gestacao_8a_ed_em_28.03.22.pdf

12. Brasil. Ministério da Saúde. Manual de recomendações para assistência à gestante e puérpera frente à pandemia de Covid-19. Brasilia: Ministério da Saúde; 2021 [citado 2021/07/13]. Disponível em: http://bvsms.saude.gov.br/bvs/publicacoes/manual_assistencia_gestante_puerpera_covid-19_2ed.pdf.

13. Vieira FRP, Lacerda L, Rodrigues AS. Obstetric Observatory BRAZIL - COVID-19: maternal deaths because of COVID-19 and the unequal access to health care services. Clinics (São Paulo, Brazil). 2022;76. Doi: 10.6061/clinics/2021/e3120

14. Wang H, Li N, Sun C, Guo X, Su W, Song Q, et al. The association between pregnancy and COVID-19: A systematic review and meta-analysis. Am J Emerg Med. 2022;56:188-95. Doi: 10.1016/j.ajem.2022.03.060

15. Alburquerque JSA, Gomes-Neto JNF, Dias HI, Brizeno MO, Santos Neto FC, Magalhães FJ, et al. Alterações laboratoriais em gestantes e puérperas com diagnóstico confirmatório de COVID-19. RBAC. 2021;53(2):148-54, Doi: 10.21877/2448-3877.202102090

16. Dávila-Aliaga C, Hinojosa-Pérez R, Espinola-Sánchez M, Torres-Marcos E, Guevara-Rios E, Espinoza-Vivas Y, et al. Resultados materno-perinatales em gestantes com COVID-19 em um hospital nível III del Rev Peru Med Exp Salud Publica. 2021;38(1):58-63. Doi: 10.17843/rpmesp.2021.381.6358

17. Soares RC, Gaudard AMIS. Transmissão vertical do SARS-CoV-2: uma revisão sistemática. Braz. J. Hea. Rev. 2020;3(3):4236-40. Doi: 10.34119/bjhrv3n3-027

18. Blitz MJ, Rochelson B, Minkoff H, Meirowitz N, Prasannan L, London V, et al. Maternal mortality among women with Coronavirus disease 2019 admitted to the intensive care unit. Am J Obstet Gynecol. 2020;223(4): 595-9.e5.

19. Paraná. Secretaria da Saúde. Nota técnica nº 01/21- SESA-PR. Vacinação contra Covid-19 em gestantes e puérperas no Estado do Paraná. Curitiba: Secretaria da Saúde; 2021 [citado 2021/02/24]. Disponível em: https://www.saude.pr.gov.br/sites/default/arquivos_restritos/files/documento/2021-06/notatecnicasesa01.21.pdf

20. Paraná. Secretaria da Saúde. Plano estadual de vacinação contra a COVID-19. 11ª ed. Curitiba. Curitiba: Secretaria da Saúde; 2021 [citado 2021/02/24]. Disponível em https://www.saude.pr.gov.br/Pagina/Coronavirus-COVID-19.

21. Khateeb J, Li Y, Zhang H. Emerging SARS-CoV-2 variants of concern and potential intervention approaches. Crit Care. 2021;25(1):244. Doi: 10.1186/s13054-021-03662-x

22. Pitilin EB, Lentsck MH, Gasparin VA, Falavina LP, Conceição VM, Oliveira PP, et al. COVID em mulheres no Brasil: tempo de permanência e status das primeiras internações. Rev Rene. 2021;22:e61049. Doi: 10.15253/2175-6783.20212261049

23. Nakamura-Pereira M, Amorin MM, Pacagnella RC, Takemoto MLS, Penso FCC, Rezende-Filho J, et al. COVID-19 e morte materna no Brasil: uma tragédia invisível. FEMINA. 2020;48(8):496-8.

24. Papapanou M, Papaioannou M, Petta A, Routsi E, Farmaki M, Vlahos N, et al. Maternal and neonatal characteristics, and outcomes of covid-19 in pregnancy: an overview of systematic reviews. Int J Environ Res Public Health. 2021;18(2). Doi: 10.3390/ijerph18020596

25. Hernández-Huatuco JA, Fredy JPV, Mick QC, Fiestas-Pflucker GA, Nunes-Rodas M, SalazarCuba X, et al. Características maternas y resultados perinatales em mujeres peruanas infectadas com COVID-19: Um estúdio observacional y transversal. Rev Cuerpo Med HNAAA.. 2021;14(3):344-51. Doi: 10.35434/rcmhnaaa.2021.143.1276

26. Di Toro F, Gjoka M, Lorenzo GD, De Santo D, De Seta F, Maso G, et al. Impact of COVID-19 on maternal and neonatal outcomes: a systematic review and meta-analysis. Clin Microbiol Infect. 2021;27(1):36-46. Doi: 10.1016/j.cmi.2020.10.007

27. Souza HCC, Matos MMR, Costa RA, Lima MAC, Cardoso AS, Bezerra MM. COVID-19 e gestação: manifestações clínicas, alterações laboratoriais e desfechos maternos, uma revisão sistemática de literatura. Braz J Hea Rev. 2020;3(6):15901-18. Doi:10.34119/bjhrv3n6-023

28. Mascolo A, Mauro GD, Fraenza F, Gaio M, Zinzi A, Pentella C, et al. Maternal, fetal and neonatal outcomes among pregnant women receiving COVID-19 vaccination: The preg-co-vax study. Front Immunol. 2022;13:965171. Doi: 10.3389/fimmu.2022.965171

29. Paixão ES, Wong KLM, Alves FJO, Oliveira V de A, Cerqueira-Silva T, Júnior JB, et al. CoronaVac vaccine is effective in preventing symptomatic and severe COVID-19 in pregnant women in Brazil: a test-negative case-control study. BMC Medicine. 2022;20:146. Doi: 10.1186/s12916-022-02353-w