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CHARACTERIZATION OF NEWBORN BORN TO MOTHERS INFECTED AND NOT INFECTED BY SARS-COV-2 DURING THE PREGNANCY PERIOD

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Abstract: Justification and Purpose: To characterize the mothers affected by SARS-CoV-2 during the gestational period, as well as to present and compare the birth variables of Newborns (NB) of mothers who were infected by SARS-CoV-2 during the gestational period in relation to babies whose mothers were not infected by the virus during the gestational period. **Method:** Quantitative, retrospective research, carried out in the databases of health information systems: SIVEP – Influenza (Information System for Epidemiological Surveillance of Influenza), Notifies Covid-19 and Information System for Live Births (SINASC). The sample consisted of all live births and their mothers in the municipality of Cascavel/PR, from July 2020 to December 2021, compared to those newborns of mothers who were infected with SARS-CoV-2 during pregnancy in that period. Descriptive analysis of data using mean, standard deviation and proportion. **Results:** The study population consisted of 1578 women, 271 (17%) cases of Covid-19 Positive during pregnancy (GCP) and 1307 (83%) cases of Covid-19 Negative (GCN). From this population, the sample was constituted with 1302 live births of these women, in the city of Cascavel/PR, considering nine twins. The GCP was composed of 214 (16%) live births and the GCN with 1088 (84%). The mean gestational age at birth in the GCP was 37 (±3) weeks, in the GCN it was 38 (±2) weeks. Regarding premature births, these occurred in 46 (21.5%) of the deliveries in the PCG, and in 134 (12.3%) of the deliveries in the CGN. Birth via cesarean section occurred in 136 (63%) of the deliveries in the PCG and in 499 (46%) of the deliveries in the CGN. Mean birth weight was 3042 grams (±662 grams) in the GCP and 3163 grams (±589 grams) in the GCN.**Conclusion:** Observing the data presented, a higher proportion of births via cesarean section, a greater tendency for premature births in the PCG, can be observed. The follow-up of pregnant women with adequate prenatal care related to exposure to the virus, as well as the monitoring of babies born under this condition, must be a guideline to be followed by primary care health services, in order to ensure adequate conditions of care. development for these children, given the repercussions related to prematurity and lack of knowledge about possible changes resulting from SARS-CoV-2 contamination during the gestational period.

Keywords: Covid-19; Newborn; pregnant women.

INTRODUCTION

The Covid-19 pandemic, caused by the SARS-CoV-2 virus, discovered in January 2020 in China, resulted in high numbers of cases and deaths around the world (CUI; LI; SHI, 2019; *HU et al., 2021*). Currently, cases exceed 600 million and deaths add up to more than six million. When affected by the virus, the individual may not have symptoms that indicate contamination (asymptomatic cases); may have mild symptoms, similar to a common cold; however, some cases develop more severe forms of the disease, requiring hospitalization and intensive treatment (LIMA, 2020).

Some specific groups tend to have a high risk of being contaminated by the virus, including pregnant women, because the natural changes in pregnancy are intensified in case of illness by the coronavirus. Some studies on the contamination of pregnant women by Covid-19 point to perinatal damage, difficulty in neonatal care, such as a decrease in consultations throughout pregnancy, in addition to outcomes such as premature birth, an increase in cesarean births and maternal death. (BELASCO; FONSECA, 2020; CZERESNIA *et al.,* 2020; CAVALCANTE *et al.*, 2021).

Still, more specific questions about

possible damage to the fetus remain uncertain and need follow-up to be clarified and show whether they will exist in the medium and long term and how these damages can manifest themselves (LAMBELET et al., 2020; KHALIL et al, 2020; VILLAR et al., 2021).

Thus, it is necessary to know the characteristics of mothers and their newborns (NB) in the current scenario of contamination by SARS-CoV-2, so that, through analysis of the variables of this population, the profile of births that occurred in the pandemic period and to understand whether there are changes in this profile in relation to the population of mothers and newborns who were not infected by SARS-CoV-2. Therefore, this study aims to characterize the mothers affected by SARS-CoV-2 during the gestational period in the municipality of Cascavel-PR, as well as to present and compare the birth variables of the NBs of mothers who were infected by SARS-CoV-2 in relation to those whose mothers were not infected by the virus during pregnancy.

METHODOLOGY

A quantitative, retrospective study was carried out in databases available in the information systems on health and monitoring of Covid-19 in the municipality of Cascavel/PR: SIVEP – Influenza (Information System for Epidemiological Surveillance of Influenza) and Notifica Covid-19. From the data contained in these systems, information regarding the period between July 2020 and December 2021 was collected and analyzed, identifying the pregnant women who underwent tests for the detection of SARS-CoV-2 in that period.

Subsequently, the information regarding the Live Birth Certificates (DNV) of the newborns born to those women was analyzed, from the Live Births Information System (SINASC). Next, the NBs were divided into two groups, namely: Covid-19 Positive Group (GCP), formed by NB whose mothers tested positive for SARS-CoV-2 at any stage of the gestational period, and Covid-19 Negative Group (GCN), formed by newborns of mothers who had only negative test results for SARS-CoV-2 during pregnancy. Finally, the variables present in the two groups referring to pregnant women were analyzed: age, self-declared race, education and marital status. As for the NB, variables related to gestational age, prematurity rate, mode of delivery and birth weight were evaluated. The analysis was performed using descriptive statistics using mean and standard deviation, in order to characterize the mothers in each group. For the comparison between the groups, the proportion related to each NB birth variable was calculated.

RESULTS

During the analyzed period, 1578 pregnant women were tested for SARS-CoV-2 in the municipality of Cascavel in western Paraná. Of these, 271 (17%) tested positive for Covid-19 infection during pregnancy, comprising the GCP, and 1307 (83%) tested negative for SARS-CoV-2, integrating the GCN. It must be noted that, in cases where the woman has performed more than one test during pregnancy, she was only considered for the GCN if all tests had negative results. From these women, the study sample was constituted with 1302 live births between July 2020 and December 2021, considering nine twins. The GCP was composed of 214 (16%) live births and the GCN of 1088 (84%) NB, totaling a sample of 1302 NB. (Figure 01).

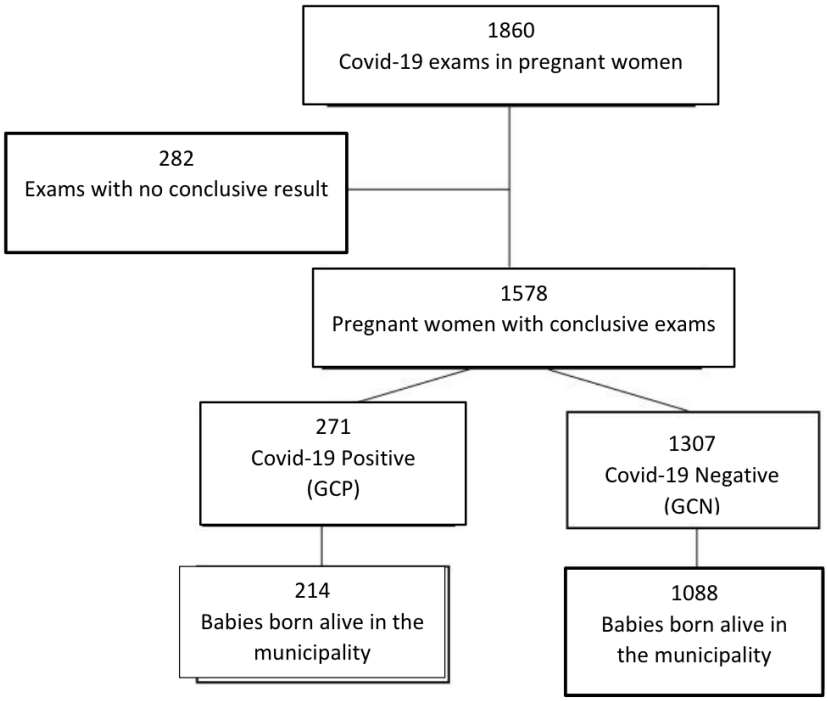

Figure 01: Population flowchart and study sample.
Source: the authors.

Regarding maternal characteristics (Table 01), it was observed that the average age in the GCP was 29±6 years and in the GCN 27±6 years. The majority declared themselves as white women in the GCP (177; 83%) and in the GCN (881; 81%). Most of the sample in both groups lived in a stable relationship (GCP= 75; 35%, GCN= 521; 48%) or were married (GCP=87; 41%, GCN= 283; 26%). Schooling related to high school (08 to 11 years of complete study) was reported by 112 (52%) women in the GCP and by 779 (72%) in the GCN group.

Variable (n=1302)	**GCP (n=214)**	**GCN (n=1088)**
Maternal age (average ±)	29 (± 6 years)	27 (± 6 years)
Minimum maternal age	14 years	13 years
Maximum maternal age	45 years	44 years old
Self declared race*		
White	177 (83%)	881 (81%)
Black	6 (3%)	67 (06%)
Yellow	1 (0,5%)	0 (0%)
brown	29 (13,5%)	139 (13%)
Marital status *		
Single	49 (23%)	274 (25%)
Married	87 (41%)	283 (26%)
Widow	0 (0%)	02 (0%)
Judicially Separated	03 (1%)	07 (1%)
Stable union	75 (35%)	521 (48%)
Schooling *		
None	1 (0,5%)	01 (0,1%)
From 1 to 3 full years	0 (0%)	08 (0,7%)
From 4 to 7 full years	19 (9%)	128 (12%)
8 to 11 full years	112 (52%)	779 (72%)
12 or more full years.	82 (38%)	171 (16%)

Subtitle:**GCP=** Covid-19 Group Positive;**GCN=** Group Covid-19 Negative.± Standard deviation.

* n=1087 was considered in the GCN for this variable, due to the non-availability of information on a patient in this item.

Table 01: Characterization of mothers from the GCP and GCN groups (n=1302). Cascavel, Paraná, 2022.

Regarding the variables at birth, illustrated in Table 02, when analyzing the mean gestational age at birth, it was evidenced that in the GCP it was 37 (±3) weeks and in the GCN it was 38 (±2) weeks. Premature births occurred in 46 (21.5%) of the deliveries in the PCG, and in 134 (12.3%) of the deliveries in the CGN. Birth via cesarean section occurred in 136 (63%) of the deliveries in the PCG and in 499 (45.8%) of the deliveries in the CGN.

Also, the average birth weight was 3042 grams (±662 grams) in the GCP and 3163 grams (±589 grams) in the GCN. However, occurrences of Low Birth Weight (LBW), characterized by births below 2500 grams, were present in 36 (17%) NBs from the CPG and in 114 (10.4%) of the births from the CGN.

Variable (n=1302)	GCP (n=214)	GCN (n=1088)
Gestational age (weeks)	37 (±3)	38 (±2)
Premature Births	46 (21,5%)	134 (12,3%)
Way of childbirth		
Cesarean delivery	136 (64%)	499 (46%)
Normal birth	78 (36%)	589 (54%)
Birth weight (grams)	3042 (±662)	3163 (±589)
Low weight at birth		
Births below 2500 grams	36 (17%)	114 (10,4%)
Average weight (grams)	1878 (±530)	1977 (±456)

Caption: GCP= Covid-19 Positive Group; GCN= Group Covid-19 Negative.

Table 02: Comparison of variables at birth between the GCP and GCN groups (n=1302). Cascavel, Paraná, 2022.

DISCUSSION

The results found in this analysis corroborate with characteristics identified in other studies about the profile of pregnant women infected with SARS-CoV-2 and their children. These studies have analyzed the outcomes of pregnancies whose mothers were infected with SARS-CoV-2 and one of the characteristics has been premature birth and low birth weight (WOODWORTH et al, 2020; KHALIL et al., 2020), the which was also present in our research.

When comparing maternal characteristics, the study by Metz and collaborators (2022), carried out in a hospital in the United States, analyzed 14,104 patients, divided into Covid-19 positive and Covid-19 negative. The average of positive cases evidenced was 16%, data similar to this research. Also, the average maternal age in our study was 29 years, the same age group described in the study by Amorim et al. (2022), carried out with pregnant women diagnosed with Covid-19 in Brazil. This is also the average age presented in other studies that characterize pregnant women affected by SARS-CoV-2 (METZ et al., 2022; WANG *et al*., 2020; KNIGHT *et al.,* 2020).

By characterizing pregnant women affected by the virus in relation to race, the data from our research attest to the findings of Amorim et al. (2022), who, when analyzing Brazilian pregnant women affected by Covid-19, showed greater involvement in white women. However, they run counter to the demographic profile of other countries such as the United States of America and the United Kingdom, where racial and ethnic minority groups comprise a disproportionately high number of Covid-19 infections and deaths, which the authors likely link to underlying disparities in social determinants of health (KNIGHT et al., 2020; KHAN et al., 2021; NHS. 2022).

Other characteristics explored relate to marital status and education. Regarding marital status, a study carried out in the northeast region of Brazil pointed out that 95.8% of the pregnant women interviewed lived with their partner (ARRUDA; SOUSA, 2022), a situation similar to that found in the profile of our study, in which most of the women mothers are married or live in a stable relationship with their partner, in both groups. When describing maternal education,

another survey carried out in northeastern Brazil shows that 40% of the participants had completed high school (BRITO et al., 2021), data similar to that observed in our analysis.

At birth, both groups had a median GA ≥ 37 weeks. However, when analyzing the frequency of occurrence of premature births separately in each group and between them, it is noted that in the PCG, the cases of prematurity were proportionally higher when compared to the GCN. The risk of premature births, in case the mother has been affected by SARS-CoV-2, has been evidenced in several studies that investigate the outcomes of this contamination during pregnancy (ALLOTEY et al., 2020; KHALIL et al., 2020; WOODWORTH et al., 2021; VILLAR et al., 2021). Villar et al. (2021), obtained from a multicenter study, which included Brazil and other countries, a rate of 22.5% of premature births in case of contamination by Covid-19 against 13.6% in pregnancies without contamination by the virus, data similar to those found in our sample. These studies also propose that there is an increased risk for births before 32 weeks of gestation, that is, very premature newborns according to the classification of the World Health Organization (World Health Organization, 2012).

Premature birth is one of the factors responsible for deaths in children up to five years old. In addition, it can lead to chronic changes that accompany the individual into adulthood, damage to health, growth, motor, sensory and cognitive development, as well as psychological disorders and the effects associated with each of these factors (BRASIL, 2021).

Birth weight has also been analyzed in research on births during the pandemic (WOODWORTH et al, 2020; KHAN et al., 2021; YAN et al, 2021; SOLÍS-GARCIA et al., 2021). In our study, when analyzing the mean birth weight in general, in each group, an average of 3042 grams (±662) was obtained in the PCG and 3163 grams (±589) in the CGN, in line with the study by Solís -Garcia and collaborators, carried out in Spain, in which they obtained an average weight at birth of 3050 grams, of the 75 babies included in the research; likewise, a study carried out in China, which related the contamination of mothers and its possible effects on the NB, including birth weight data (YAN et al, 2021) obtained an average weight of 3250 grams.

However, when we analyzed only births weighing less than 2500 grams, which constitute LBW, in both groups, we obtained a trend of LBW in the GCP (17%) when compared to the GCN (10.4%). This finding corroborates research that has explored the birth weight of babies born to mothers who had Covid-19 during pregnancy, and evidenced the increase in LBW in this population (WOODWORTH et al, 2020; KHAN et al., 2021). LBW can lead to damage to the child's development, in addition to representing a mortality risk about 20 times higher when compared to children who are born with adequate weight (BRASIL, 2021).

Another outcome that has been found in studies developed throughout the pandemic is the trend of cesarean deliveries in women who test positive for Covid-19. Likewise, in our research, it was observed that the proportion of births via cesarean section is higher in the PCG, when compared to the GCN. It is known that the cesarean section, by submitting the woman to surgery, can entail risks, demand greater attention in the recovery and, in cases of Covid-19, be another risk factor that can negatively influence the maternal clinical condition. Positive testing for Covid-19, by itself, is not indicative of a cesarean section (ALLOTEY et al., 2020; CARVALHO et al., 2021; KHALIL et al., 2020; METZ et al., 2022). However, the clinical worsening of

the pregnant woman may be a factor that increases the indication of cesarean sections among those infected with SARS-CoV-2.

In addition to the repercussions presented, studies (ALLOTEY et al., 2020; CARVALHO et al., 2020) also point to other maternal risks in case of contamination by SARS-CoV-2, such as an increased possibility of hospitalization in an intensive care unit, maternal death, increased morbidity due to complications associated with the disease, among other outcomes that may be related in the future.

With regard to possible repercussions for children born to mothers infected during pregnancy, studies have suggested the follow-up and monitoring of these children, in view of the uncertainty related to possible harm that SARS-CoV-2 can cause. Some studies point to Maternal Immune Activation (MIA) as a potentiating agent for possible changes in fetal neurodevelopment (REYES-LAGOS *et al.*, 2021).

CONCLUSION

The findings observed in our research portray the condition of the municipality of Cascavel/PR in relation to maternal and neonatal characteristics related to contamination by Covid-19.

The findings related to the increase in the proportion of premature births, LBW and cesarean sections solidify what has been found in other studies. Knowing this outcome can support actions to monitor pregnant women, with adequate prenatal care related to exposure to the virus, as well as the monitoring of babies born under this condition, in order to ensure adequate conditions for the development of these children. Due to conditions related to prematurity, LBW and lack of knowledge about possible changes related to SARS-CoV-2 contamination during pregnancy.

The pandemic condition experienced between 2020 and 2021 led to the exhaustion of the health system, in which overloaded services often had difficulties in providing an adequate response to the health needs of populations. Among them, pregnant women, whose prenatal care schedules were canceled, which may have contributed to the increase in premature births.

Enabling pregnant women to have access to adequate prenatal care and antenatal screenings, skilled delivery care, postnatal care services and COVID-19 related care are emerging and essential issues to prevent possible sequelae such as premature birth and BPN, as well as those arising from the SARS-CoV-2 infection itself.

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