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Short and Medium-Term Maternal and Neonatal Outcomes After COVID-19 Infection

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Abstract

Background: Comparing the maternal and neonatal complications of COVID-19 with a healthy control group is important to identify the most accurate and up-to-date information about the effects of this disease on the health of mothers and neonates.
Objectives: The study aimed to determine the maternal and neonatal complications and consequences related to COVID-19 infection.
Methods: This case-control study was conducted from February 2021 to February 2022 on women who were infected with COVID-19 during their pregnancy to evaluate the short and medium-term maternal and neonatal outcomes and compare them in the control group. Maternal outcomes, such as the rate of miscarriage, preterm delivery, stillbirth, and type of delivery, as well as gestational diabetes and preeclampsia, were evaluated. Indeed, neonatal complications, including hearing impairment, low birth rate, intrauterine growth restriction, and the rate of hospitalization in the neonatal intensive care unit, were evaluated and compared between groups.
Results: In total, 600 women (300 cases in each group) participated in the study. The results showed that the frequency of cesarean delivery in patients with COVID-19 was 38%, while this rate was 20% in the control group. This difference was significant. It was also found that pregnant women suffering from COVID-19 had significantly more preterm labor. Babies born to mothers infected with COVID-19 had a significantly higher hospitalization rate in the intensive care unit than in the control group. Other maternal and neonatal complications were not significantly different between the two groups.
Conclusions: Women who are infected with COVID-19 during pregnancy face new maternal and newborn complications. Therefore, it is necessary to carry out further research on the long-term effects of COVID-19 on the health of the mother and baby in order to determine the appropriate strategies for the prevention and treatment of these complications.

Keywords: COVID-19, Pregnancy, Complication

1. Background

The recent outbreak of a novel human Coronavirus (COVID-19), which is called severe acute respiratory syndrome Coronavirus 2 (SARS-nCoV-2) and is growing rapidly with human-to-human transmission, has led to public concern about this pandemic (1). Clinical symptoms of COVID-19 infection in serious cases can manifest as severe pneumonia, acute respiratory distress syndrome, various organ failure, and even mortality. In contrast, in non-severe cases, it can be an asymptomatic condition or normal symptoms of respiratory system infection (1, 2). Pregnant women are affected by COVID-19 infection, both during and after pregnancy, with potential side effects (3). Therefore, determining the prevalence, risk factors, clinical symptoms, and consequences of pregnancy are the most important factors for planning the care and clinical management of the mother (4).

Physiological changes occur during pregnancy to reduce anti-inflammatory immune responses to prevent fetal rejection, making women more vulnerable to severe diseases after exposure to viruses, especially respiratory viruses (5). Studies have shown that COVID-19 infection during pregnancy may cause adverse pregnancy outcomes, including preterm birth, maternal mortality, neonatal intensive care unit (NICU) admission, and death. Therefore, there are concerns about the serious consequences of the COVID-19 epidemic for pregnant women and babies (6).

2. Objectives

According to the materials mentioned above and the importance of the impact of COVID-19 infection on the health of pregnant women and infants as a high-risk group, the present study was conducted with the aim of determining the effect of COVID-19 infection on pregnant women and their infants. This study aimed to determine maternal and neonatal complications and consequences related to COVID-19 infection.

3. Methods

3.1. Study Setting

This case-control study was conducted on pregnant women with COVID-19 infection between February 2021 and February 2022. The inclusion criteria were women aged between 15 - 45 years being infected with COVID-19 during pregnancy based on laboratory (positive polymerase chain reaction (PCR) test) and imaging findings. Indeed, only hospitalized women with moderate to severe disease were included. The exclusion criteria were the underlying chronic diseases such as heart and liver failure or end-stage renal disease (ESRD). Also, patients with a history of previous infection with COVID-19 (before pregnancy) were excluded from the study. At the same time, the pregnant women who had no evidence of COVID-19 infection were entered as a control group. The case and control group patients were matched in terms of age and other demographic and anthropometric information.

3.2. Ethical Consideration

The Alborz University of Medical Sciences Ethical Committee gave its approval to this experiment (IR.ABZUMS.REC.1400.332), and informed consent was obtained from patients prior to their enrolment.

3.3. Initial Evaluation and Follow-up

A questionnaire was designed to obtain demographic and obstetric information such as age, body mass index (BMI), gravida, current and past medical histories, as well as pregnancy outcomes such as abortion, preterm delivery, stillbirth, preeclampsia, gestational diabetes mellitus, and type of delivery. In pregnancy with COVID-19 infection, the duration of hospitalization, the severity of the disease, lung involvement by chest CT scan, and admission to the intensive care unit (ICU) were evaluated and recorded. Indeed, the participants were followed up until delivery and 6 months post-partum, and the neonatal outcomes such as admission to the neonatal intensive care unit, low birth weight, intrauterine growth restriction, and hearing defect of the neonates were collected. All data were gathered and compared between groups.

3.4. Statistical Analysis

All data were analyzed using IBM's SPSS statistics (Statistical Package for Version 20). Fisher's exact testing and chi-square analysis were employed to establish the association. To compare the outcomes of the pregnancy in two groups, an independent t-test was performed. A P-value < 0.05 was used to determine statistical significance.

4. Results

A total of 300 pregnant women with COVID-19 infection who were hospitalized and 300 healthy pregnant women as controls were included in the study. The characteristics of the participants are summarized in Table 1. The most common underlying diseases in pregnant women with COVID-19 and the control group were cardiovascular diseases (3.3% and 4.3%), hypothyroidism (3% and 4%) and diabetes (2.7% and 3%), respectively. There was no statistically significant difference between the two groups in terms of underlying diseases ($P > 0.05$) (Table 1).

In the case group, the mean hospital stay among pregnant women with COVID-19 infection was 4.59 ± 1.2 days. 78.3% of patients suffered from moderate disease severity, and 21.7% of them suffered from severe disease. It was also found that 56.3% of patients had no significant lung involvement in chest CT, while mild, moderate, and severe lung involvement in this group was 28.7%, 14.7%, and 2%, respectively. Finally, 22.3% of these patients were admitted to the intensive care unit.

The maternal and neonatal outcomes of the studied patients are listed in Table 2. The results showed that the frequency of cesarean delivery in patients with COVID-19 was 38%, while this rate was 20% in the control group. This difference was significant and significant ($P = 0.001$). It was also found that pregnant women suffering from COVID-19 had significantly more preterm labor ($P = 0.01$). Babies born to mothers infected with COVID-19 had a significantly higher hospitalization rate in the intensive care unit than the control group ($P = 0.001$). Other maternal and neonatal complications were not significantly different between the two groups.

5. Discussion

Pregnant women with COVID-19 infection can be at an increased risk of adverse maternal and pregnancy

Table 1. Comparison of the Characteristics of the Participants in the Case and Control Groups [a]

Variables	Case	Control	P-Value
Age, y	31.35 ± 3.2	28.86 ± 3.5	0.07
Gestational age, week	29.4 ± 1.8	28 ± 1.6	0.23
Gravidity,			0.54
1	76 (25.3)	92 (30.6)	
2	114 (38)	129 (43)	
2 >	110 (36.6)	79 (26.3)	
Parity			0.79
Nulliparous	106 (35.3)	125 (41.6)	
Multiparous	194 (64.6)	175 (58.3)	
Past medical history			
History of abortion	34 (11.3)	31 (10.3)	0.89
Hypothyroidism	9 (3)	12 (4)	0.50
Cardiovascular disease	10 (3.3)	13 (4.3)	0.38
Gestational diabetes mellitus	8 (2.7)	9 (3)	1.00

[a] Values are expressed as mean ± SD or No. (%).

Table 2. Maternal and Neonatal Outcomes of Pregnant Women with COVID-19 and Control Group [a]

Variables	Case	Control	P-Value [b]	CI95%
Maternal outcomes				
Cesarean section	114 (38)	60 (20)	0.001	1.3 - 2.03
Vaginal delivery	186 (62)	240 (80)	0.01	1.2 - 2.5
Preterm labor	42 (14)	31 (10.3)	0.01	0.6 - 1.6
Gestational diabetes mellitus	25 (8.3)	31 (10.3)	0.4	0.8 - 1.5
Preeclapsia	19 (6.3)	21 (7)	0.7	0.75 - 1.4
Neonatal outcomes				
Intrauterine growth restriction	25 (8.3)	22 (7.3)	0.6	0.47 - 1.58
Admission to the intensive care unit	31 (10.3)	11 (3.6)	0.001	1.03 - 3.01
Hearing defect	3 (1)	2 (0.7)	0.6	0.4 - 1.7
Stillbirth	16 (5)	12 (4)	0. 39	0.95 - 2.44
Low birth weight	49 (16.3)	42 (14)	0.4	0.7 - 1.12

[z] Abbreviation: CI, confidence interval.
[a] Values are expressed as No. (%).
[b] P-value < 0.05 was considered significant.

outcomes. It seems pregnant women are more susceptible to respiratory pathogens and pneumonia due to their immunosuppressive status and physiological differences that often lead to severe hypoxia. Therefore, it is expected that COVID-19 infection during pregnancy increases the risk of maternal and fetal complications, and therefore, women with severe pneumonia are more at risk of adverse pregnancy outcomes. However, the results of different studies on the severity of the disease and adverse pregnancy outcomes in pregnant women with COVID-19 are different (7).

The most common complications reported in the studied pregnant women include the need for emergency cesarean section in the third trimester and premature delivery (8, 9). Also, Karacam et al. reported that complications such as premature delivery, the need for cesarean section, and maternal mortality are significantly higher in pregnant women with COVID-19 infection (10).

In fact, one of the possible reasons for this can be the higher rate of disease induction in women with COVID-19 in the third trimester of pregnancy mentioned. Seif et al. (11) also showed in their study that the frequency of premature delivery was higher in patients who were infected with COVID-19 in the first trimester of pregnancy than in patients who were infected in the second and third trimesters.

Infants who were born to pregnant women with COVID-19 infection were significantly more likely to require hospitalization in the intensive care unit compared to the control group. These infants were mostly hospitalized due to pneumonia and respiratory infections, but the control group infants were mostly hospitalized due to jaundice. Also, the babies in the two groups had no significant differences in terms of hearing defects and growth. In line with the results of the present study, it was also found in the evaluations carried out by Karacam et al. that the need for hospitalization of infants in the neonatal intensive care unit was significantly higher in pregnant women with COVID-19 infection (10).

5.1. Conclusions

The results of this study showed that COVID-19 can cause some maternal complications. Therefore, pregnant women should be prepared for this infection. It is suggested to implement awareness programs to prevent maternal infection in order to improve outcomes and access to special care. Also, by adopting preventive health and treatment measures, pregnant mothers, who are a vulnerable group to this virus, can be prevented from getting infected and from heavy medical expenses for these mothers and their babies.

Footnotes

Authors' Contribution: MJ: Writing and editing, B.B: Management and supervision, MG: Data analysis and data gathering.

Conflict of Interests: Third author is the editorial board member, but the author is blind to the review process and decision.

Data Reproducibility: It was not Declared by the authors.

Ethical Approval: The Alborz University of Medical Sciences Ethical Committee gave its approval to this experiment (IR.ABZUMS.REC.1400.332).

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Informed Consent: Written informed consent was obtained from all participants.

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