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The effect of COVID-19 infection on the hematological parameters in pregnant women

Eliz Thomas [1]* , Nidhya Ganesan [1] , Lawanya Gunaseelan [1] , Subbarao Tadury Madhukar [1]

1. Department of Pathology, PSG Institute of Medical Sciences and Research, Coimbatore, Tamil Nadu, India
* Correspondence: Eliz Thomas. Department of Pathology, PSG Institute of Medical Sciences and Research, Coimbatore, Tamil Nadu, India.
Tel: +919943373906; Email: elshaddai4eliz@gmail.com

Abstract

Background: This study aimed to analyze the hematological parameters in pregnant women who were COVID-positive in a tertiary care hospital and to observe whether there was an association between the findings and disease severity.

Methods: This retrospective study included 64 COVID-positive pregnant patients who were admitted to our hospital, under the obstetrics department, during the period from June 2020 to December 2020. The hematological parameters, such as hemoglobin, MCV, RDW, etc., of these women during the third trimester were assessed, and the outcome of the pregnancy was recorded.

Results: Among 64 COVID-positive pregnant women, 14 complained of the usual symptoms like fever, cough, or headache. One complained of increased breathlessness. After hematological work-up, 46 (72%) patients were recorded to have anemia, and 38 (59%) showed leukocytosis. Neutrophilia was seen in 34 patients. The platelet count was within normal limits for all. Forty-nine of them underwent caesarean section for various reasons, the most common being previous caesarean section. Sixty-two deliveries were done at term. Only one of the babies delivered had anemia at birth. The 1- and 5-minute APGAR scores recorded for all the babies were 7 to 9. Fifteen babies delivered underwent RT-PCR testing and were found to be negative.

Conclusion: The laboratory parameters most commonly seen among the COVID-19 pregnant women were anemia, leukocytosis, and neutrophilia, which are comparable to the physiological changes in pregnancy. There was no adverse outcome observed in any of the pregnancies, and all the fetuses were normal. There was no incidence of vertical transmission of the virus among the tested neonates.

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Introduction

The coronavirus disease 2019 (COVID-19) pandemic, caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), brought about a wave of unprecedented anxiety and fear. Amidst this, pregnancy would have been an overwhelming experience for many. Alterations in cell-mediated immunity take place in pregnancy, and this could increase the susceptibility of pregnant women to infectious diseases (1). Given the maternal physiologic changes, particularly in the immune system, pregnant women are vulnerable to respiratory viruses and need special attention regarding prevention, diagnosis, and management of SARS-CoV-2 (2). This concern is based on the experience of SARS and Middle East respiratory syndrome (MERS), caused by related coronaviruses, which were found to be associated with worse outcomes during pregnancy (3-5). Basic hematological parameters can provide significant information on the health of a person. Many physicians and obstetricians rely on hematological investigations for the prognosis and management of pregnant women with underlying illnesses. Laboratory abnormalities, which characterize SARS-CoV-2 infection, have been identified; however, data related to the hematological characteristics of pregnant women with SARS-CoV-2 are limited (6-11).

Methods

The study was approved by the Institutional Ethics Committee (IHEC 20/168) and conducted in accordance with the Helsinki Declaration. In the current retrospective cohort study, 64 COVID-19 positive patients who were admitted to our hospital, under the obstetrics department, during the 6-month study period were included. The hematological parameters such as hemoglobin, MCV, MCH, RDW, total and differential leukocyte count, and platelet counts of these women during the last trimester were assessed, and the outcome of the pregnancy was recorded to evaluate if any of the hematological changes were reflected in the outcome of the pregnancy.

Results

The study group included 64 pregnant women in their third trimester who were diagnosed with SARS-CoV-2 infection by RT-PCR testing. Table 1 displays the clinical characteristics of these pregnant women. The majority of the women were asymptomatic and were found to be COVID-positive only as part of routine testing. The most common symptomatic presentation was fever. Only one woman complained of increased breathlessness, which was attributed to the infection. Hospitalization was not needed for any of them until at term.

Table 1. Clinical characteristics of COVID-19 pregnant women

Symptom	Count (%)
Fever	6 (9)
Cough	3 (5)
Cold	2 (3)
Headache	2 (3)
Breathlessness	1 (2)
Anosmia	1 (2)
Asymptomatic	49 (76)

Table 2 presents the laboratory parameters of these patients, including the normal range in the third trimester. The majority of the patients (48/64, 75%) had anemia, which is reflected by the hemoglobin values. Only 4 out of the 64 patients in the study population had associated iron deficiency anemia, which was also reflected in the mean corpuscular volume (MCV) and mean corpuscular hemoglobin (MCH) for these patients. The median MCV was 88.3 fL and the median MCH was 29 pg. The anemia in patients with normal MCV and MCH was due to chronic inflammatory conditions such as rheumatoid arthritis, systemic lupus erythematosus, and myxedema. Cases with early iron

deficiency anemia were also identified. Some of the patients were already on iron correction. The median red cell distribution width (RDW) was also within the normal range as expected, with only those having associated iron deficiency anemia showing increased values. Leukocytosis was seen in 38/64 (59%) of the study population. Neutrophilia with relative lymphopenia was seen in 34/64 (53%) patients. Platelet count was within the normal range for all the patients. The majority of the patients (49/64) gave birth by caesarean delivery, the most common reasons being a previous caesarean section or maternal request. Two were augmented due to obstetrical reasons. Two deliveries were done at preterm due to hypertensive states of the mothers. SARS-CoV-2 infection was not, per se, a limitation for vaginal birth. APGAR scores at the first and fifth minutes in all neonates were ≥7 and ≥8 out of 10, respectively. Testing for the virus was done in only 15 of the neonates, and it was negative in all of them. All the newborns were monitored for any respiratory symptoms or other adverse clinical outcomes.

Table 2. Laboratory parameters of the study population

Parameter (Unit)	Normal range during the third trimester (21)	Pregnant COVID-positive patients (n=64)
Hemoglobin (g/dl)	11-15	11.1 (8.3-13.5)
MCV (fL)	82.4 - 100.4	88.3 (68-100.5)
MCH (pg)	29-32	29 (24-33.5)
RDW (%)	11.4 - 16.6	15 (12.3- 35.6)
WBC count (× 10^9/L)	5.6-16.9	9.2 (6.1 – 17.4)
Neutrophil (%)	40-74	79.2 (48-89)
Lymphocyte (%)	20-40	11 (7-43)
Platelets (× 10^9/L)	146-429	212 (108-421)

Data are presented as median and interquartile range.

Discussion

The findings of our study are similar to those in several previous reports about patients with COVID-19 who suffered from fever and cough as the most common symptoms at admission (12-15). In addition, a common laboratory finding was lymphopenia.

The iron deficiency anemia seen in 4 of the patients was attributed to nutritional deficiency, which is common in the Indian subcontinent. It had no correlation with the COVID-19 infection.

Mohr-Sasson A et al. (6), in a retrospective study, examined 11 pregnant women with SARS-CoV-2 and compared them with 25 non-pregnant controls for clinical and laboratory characteristics. They concluded that a trend of lymphopenia was seen in the pregnant women, but no other laboratory differences were observed between pregnant and non-pregnant women. They also stated that the physiological changes in laboratory parameters during pregnancy, including relatively elevated WBC count, neutrophilia, and lower thrombocyte count, could mask the hematological abnormalities related to SARS-CoV-2 infection and cause delays in early detection of the disease during pregnancy.

Liu et al. (8) studied 16 COVID-19-infected pregnant women and found that leukocytosis and an elevated neutrophil-to-lymphocyte ratio were the most characteristic hematologic findings.

In a study by Chen et al. (9) published in The Lancet, the laboratory data of 9 pregnant women were retrospectively analyzed. They observed that five out of the nine patients had lymphopenia. As all the patients developed COVID-19 pneumonia subsequently, caesarean section was done for them at term to avoid any risk of transmission, as limited data were available regarding vertical transmission. We saw a similar trend in the laboratory parameters in our study, along with lymphopenia, although this did not translate into poorer outcomes.

Although thrombocytopenia was reported in many studies, in our study population, the platelet count was within the normal range.

With respect to maternal outcomes, there were no recorded cases of maternal mortality.

At 1 and 5 minutes, APGAR scores of all neonates were greater than 7, and only one of the neonates was found to have fetal anemia.

Our findings were concordant with some studies (16-18) that presented no notable clinical symptoms suggestive of COVID-19 infection in the neonates born to positive mothers, and also reported that samples were negative for SARS-CoV-2. A recent study showed that some pregnant women who developed severe COVID-19 disease underwent emergency caesarean section (19).

A study done in Iran showed that pregnant women with COVID-19 had an increased risk of pre-eclampsia, preterm labor, and caesarean delivery (20).

This study is among the very few conducted in the Asian subcontinent among COVID-infected pregnant women. However, since all the enrolled women were in the third trimester, laboratory changes in the first and second trimesters of pregnancy are not reflected in our study, which is one of its limitations.

List of abbreviations: COVID-19: Corona Virus Disease 2019; SARS-CoV-2: Severe Acute Respiratory Syndrome Corona Virus 2; MERS: Middle East Respiratory Syndrome; APGAR: Appearance, Pulse, Grimace, Activity, and Respiration.

Conclusion

In our present study, we found that the characteristics of SARS-CoV-2 infection in pregnant women, as reflected in hematological parameters, are very similar to those seen in COVID-negative pregnant women, although a trend for lymphopenia is quite predominant. This could be of value to the treating physician. We also did not find any evidence of intrauterine or peripartum transmission of COVID-19 from mother to baby. Although our conclusions are limited by the small sample size, we believe that the findings reported here are important for understanding the clinical and hematological characteristics of COVID-19 infection in pregnant women. Further investigations are necessary to assess any long-term outcomes or adverse effects in these neonates.

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Ethical statement

The study was approved by the Institutional Ethics Committee (IHEC 20/168) and conducted in accordance with the Helsinki Declaration.

Conflicts of interest

The authors declare that they have no conflicts of interest.

Author contributions

All authors contributed to the study conception and design. Material preparation, data collection, and analysis were performed by ET and NG. The first draft of the manuscript was written by ET, and all authors reviewed and commented on the manuscript. All authors read and approved the final manuscript.

Data availability statement

All data are available upon request from the corresponding author.

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