The Effect of COVID-19 Infection on the Hematological Parameters in Pregnant Women

Running title: COVID-19 and pregnancy

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Abstract

Background: To analyze the hematological parameters in pregnant women who are COVID-positive in a tertiary care hospital and to observe if there is an association between the findings and disease severity.

Methods: This was a retrospective study that included 64 COVID-positive pregnant patients who were admitted to our hospital, under the obstetrics department, in the period from June 2020 to December 2020. The hematological parameters like 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. 1 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. 49 of them underwent caesarean section for various reasons; most common reason being previous caesarean section. 62 deliveries were done at term. Only one of the babies delivered had anemia at birth. The 1- and 5-minutes APGAR scores recorded for all the babies were 7 to 9. 15 babies delivered underwent RT-PCR testing and were found to be negative.

Conclusion: The laboratory parameters most commonly seen amongst the COVID-19 pregnant women were anemia, leukocytosis and neutrophilia, which is comparable to the physiologic 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 amongst the tested neonates.

Key words: Covid-19, Hematological parameters, Pregnancy

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 takes 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 about prevention, diagnosis and management of SARS-CoV-2.(2) This concern is based on experience of the severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS), caused by related corona viruses, which were found to be associated with worse outcomes during pregnancy.(3-5) Basic haematological parameters can provide significant information on the health of a person. Many physicians and obstetricians rely on haematological 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 haematological 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 the Helsinki Declaration. In the current retrospective cohort study, 64 covid-19 positive patients who were admitted in our hospital, under obstetrics department, in the 6-month study period were included. The hematological parameters like 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 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. 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 2 presents the laboratory parameters of these patients including normal range in third trimester. 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 88.3Fl and the median MCH was 29 pg. The anemia for patients with normal MCV and MCH was due to chronic inflammatory conditions like rheumatoid arthritis, systemic lupus erythematosus and myxedmea. 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. Majority of the patients (49/64) gave birth by caesarean delivery, most common

reasons being previous caesarean section or maternal request. Two were augmented due to obstetrical reasons. 2 deliveries were done at pre-term due to hypertensive state of the mothers. SARS-CoV-2 infection was per se not a limitation to give birth vaginally. APGAR score of the first and fifth minutes in all neonates was ≥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.

Discussion

The findings of our study are similar to those in several previous reports about patients with COVID-19 who had 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, studied 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 haematological abnormalities related to SARS-CoV-2 infection and delay in early detection of the disease in pregnancy.

Liu at al (8) studied 16 COVID-19 infected pregnant women and found that leukocytosis and 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 was retrospectively analyzed. They observed that 5 out of the 9 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 was 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.

Though thrombocytopenia was reported in many studies, in our study population, the platelet count was within 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 has presented no notable clinical symptoms suggestive of COVID-19 infection in the neonates born to positive mothers, and also, samples were negative for SARS-CoV-2. A recent study showed some pregnant women who developed severe COVID-19 disease underwent an emergency cesarean section (19).

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

This study is among the very few studies done in the Asian subcontinent amongst the 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 limitation of this study.

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.

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. Laboratory parameters of the study population

Parameter (Unit)	Normal range during the third trimester	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 ($\times 10^9$/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 ($\times 10^9$/L)	146-429	212 (108-421)

Data are presented as median and interquartile range.

[a] Abbassi-Ghanavati (21)

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

Ethics statement

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

Consent for publication

Consent for publication was obtained from the Institutional Ethics Committee.

Data availability statement

All data are available by request from the corresponding author.

Competing interests

The authors declare that they have no conflict of interest.

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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 complemented the manuscript. All authors read and approved the final manuscript.

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