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COMPARISON OF LABORATORY FINDINGS OF PREGNANT AND NON-PREGNANT WOMEN WITH COVID-19 INFECTION IN A TERTIARY CARE HOSPITAL

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Abstract

Coronavirus disease (COVID-19) is an infectious disease caused by the SARS-CoV-2 virus. Anyone can contract this viral illness and may need emergency care at any age. In general, Covid-19 patients who are pregnant do not appear to have severe symptoms than non-pregnant women. But sometimes they are likely to become seriously ill than non-pregnant women. The danger particularly increases during the third trimester .Preterm births have been reported .Pregnant women (PWs) have different laboratory findings from non-pregnant women (NPWs). Many of the physiological adaptations of pregnancy can be mistaken as pathological, or they may conceal the identification of a disease condition if these are not taken into consideration when analyzing the laboratory results of PWs . The mean leucocyte count in PW was higher when compared to the mean leucocyte count of NPW. We found a significant difference in mean lymphocyte count between PW and NPW [24.47±15.52 vs 33.10±13.60] and mean platelet lymphocyte ratio[0.0005]. Among pregnant COVID-19 women, CRP and ferritin were the inflammatory markers that were mostly associated with disease severity but both showed no difference in our study. We had leucocytosis in addition.

Conclusion

Though the laboratory findings may differ between pregnant and non-pregnant women, we found that pregnancy had no impact on laboratory results during the COVID-19 infection period.

Keywords: COVID-19 infection, Pregnant women, Non-pregnant women, Laboratory findings, Inflammatory markers

INTRODUCTION

Coronavirus disease (COVID-19) is an infectious disease caused by the SARS-CoV-2 virus. When an infected person coughs, sneezes, speaks, or breathes, the virus can spread from their mouth or nose as minute liquid particles. Most people infected with the virus will experience a mild to moderate respiratory illness and recover without requiring special treatment. However, some will become seriously ill and require medical attention. Anyone can contract COVID-19 and may need emergency or critical care at any age [1]. In general, Covid-19 patients who are pregnant do not appear to have severe symptoms than non-pregnant people [2]. But sometimes they are likely to become seriously ill than non-pregnant women. The danger to pregnant mothers appears to rise especially during the third trimester of pregnancy. Preterm births have been reported in women with COVID-19, but it is not clear whether it was spontaneous or induced. Pregnant women (PWs) have different laboratory findings from non-pregnant women (NPWs). These differences even apply to various trimesters. During a normal pregnancy, the leukocyte count and alkaline phosphatase levels consistently increase. Similar to this, the D-dimer value doubles in the second trimester. It is also known that a number of hormones and coagulation factors significantly rise. Additionally, elevated levels of inflammatory markers, including serum ferritin and C-reactive protein, are noted. Many of the physiological adaptations of pregnancy can be mistaken as pathological, or they may conceal the identification of a disease condition if these are not taken into consideration when analyzing the laboratory results of PWs [3].

OBJECTIVE

To determine whether the laboratory results were different in pregnant women and non-pregnant women of reproductive age who were diagnosed with COVID-19 infection.

METHOD and MATERIALS

This was a tertiary care hospital-based, single-centered, both retrospective and prospective study conducted in the department of Obstetrics and Gynaecology at PSG Institute of Medical Science and Research, Coimbatore, Tamil Nadu, India, from October 2021 to September 2022. Institutional Human Ethical Committee approval was obtained [PSG/IHEC/2021/Appr/Exp/239, Project number 21/256]. A written informed consent was obtained from the study participants. During the period of one year, 85 pregnant patients in the age group of 18-42years and 85 non-pregnant patients in the age group of 18-42 years who were tested positive for COVID-19 infection were selected based on inclusion and exclusion criteria. COVID-19 positivity was detected by either nasopharyngeal or oropharyngeal swabs for PCR.

Group A included pregnant women aged 18-42 years, of any gestational age, who tested positive for COVID-19 and were hospitalized with or without symptoms.

Group B included non-pregnant women of reproductive age (18-42years), who tested positive for COVID-19 and were hospitalized with or without symptoms.

Female patients below 18 years and above 42 years of age, patients without laboratory findings specific to COVID-19 disease, who were negative after polymerase chain reaction (PCR) test, and those who were not willing to participate were excluded.

Age, presenting complaints, vital parameters, laboratory parameters like IL6, D-dimer, platelet count, total leucocyte count, total lymphocyte count, CRP, and hemoglobin levels were collected from the hospital database. Any preexisting comorbid conditions were also taken into consideration.

All data are collected and results are analyzed for statistical significance [<0.005] using Excel Data Analysis.

RESULTS

A total of 170 women were included in our study. Among them, 85 were pregnant [PW] and another 85 were non-pregnant [NPW].

The majority of the Covid-19 positive pregnant women were in the age group of 26- 30, whereas non-pregnant patients were more in the 18-25 years of age group, which is shown in Table -1. Among 170 patients, 104 were symptomatic and 66 were asymptomatic. The most common symptom was fever. As seen in Table -2, most of the pregnant women were in their third trimester [91.8%]. This could be the reason for admission even without symptoms among pregnant women.

Table 3 shows the statistical analysis of vital parameters between PW and NPW. The mean SD for systolic blood pressure, diastolic blood pressure, and respiratory rate are statistically significant. There was no significant difference in pulse rate and oxygen saturation. The analysis of laboratory parameters, including inflammatory markers, was tabulated in Table 4. The mean leucocyte count [0.005], the mean lymphocyte count[<0.001], and the mean platelet lymphocyte ratio[0.0005] showed statistical significance between the two groups. There is no significant difference in the mean haemoglobin level on admission and discharge between the two groups. On comparing inflammatory markers, Interleukin 6, D-Dimer, and serum ferritin levels were higher, and CRP level was lower in PW when compared to NPW. The mean of IL-6 on admission between PW and NPW was not statistically significant. But the mean of IL-6 on discharge was <0.001, which is significant. The mean of D-Dimer is 0.002, which is also significant. The mean of ferritin and CRP between PW and NPW showed no statistical significance.

Table 1- Distribution of study population according to age

AGE (Years)	PW	NPW
18-25	18[21.1%]	51[60%]
26 – 30	45[52.9%]	10[11.7%]
31 – 35	20[23.5%]	14[16.4%]
36-40	2[2.5%]	10[11.9%]
Total	85	85

Table 2- Distribution of pregnant COVID-19 patients according to trimester

TRIMESTER	FREQUENCY	PERCENTAGE
FIRST	0	0
SECOND	7	8.2
THIRD	78	91.8

Total	85	100

Table 3- Statistical analysis of the vital parameters

Characteristics	PW Mean ± SD	NPW Mean ± SD	P-value
Systolic blood pressure	116.11±9.89	113.63 ±9.44	0.04
Diastolic blood pressure	73.05 ±7.87	70.23 ±9.99	0.021
Respiratory rate	19.14 ±1.48	19.88 ±1.15	0.0001
Pulse rate	90.48 ±8.85	92.92 ±12.92	0.082
Oxygen saturation	98.6±1.71	98.18 ±2.08	0.08

Table 4- Statistical analysis of laboratory parameters

Characteristics	PW	NPW	P - value
	Mean ± SD	Mean ± SD	
IL6 on admission	20.58 ± 39.40	15.88 ± 55.79	0.2
IL6 on discharge	20.51 ± 27.35	5.90 ± 6.38	<0.001
D – dimer	1.93 ± 2.43	1.00 ± 1.57	0.002
Ferritin	92.52 ± 147.8	74.59 ± 90.60	0.18
CRP level	0.76 ± 0.87	0.97 ± 1.38	0.1
Hemoglobin on Admission	11.70 ± 1.23	11.70 ± 1.40	0.48
Hemoglobin on Discharge	11.28 ± 1.58	11.62 ± 1.70	0.7
Leucocyte Count	8.42 ± 2.97	6.83 ± 4.78	0.005
Lymphocyte Count	24.47 ± 15.52	33.10 ± 13.60	<0.001
Platelet lymphocyte ratio	14.44 ± 11.72	9.88 ± 5.84	0.0005

DISCUSSION

Pregnancy is a unique immunological state, during which there are pro-inflammatory changes as well as increased immune tolerance. A shift occurs from a Th1- to a Th2-predominant immunological profile. As a consequence, certain infections cause more severe disease in pregnancy [4].

Cell-mediated immunity is thought to be replaced by humoral immunity during pregnancy, which could make pregnant women more susceptible to infectious illnesses. They are especially susceptible to respiratory viruses due to physiologic changes in the immunological and cardiovascular systems. The SARS-CoV-19 virus being more infectious, it can cause a wide range of manifestations and more morbidity and mortality during pregnancy [5]. In our study,104 patients were symptomatic, and 61.1% of them presented with fever of various degrees. This was similar to the study done by Chen et al [6] in which 75% of pregnant women presented with fever. Studies conducted by Jie et al and Huang et al also showed fever as the most common symptom, followed by cough and fatigue. There is a decrease in arterial pressures, including systolic blood pressure, diastolic blood pressure, and mean arterial pressure during pregnancy. Diastolic blood pressure and mean arterial pressure decrease more than systolic blood pressure, particularly during the first and second trimesters [7]. In contrast, obese and overweight women had higher blood pressure in the first trimester than normal weight women, and this difference was sustained throughout pregnancy [8]. Our study shows that the mean SD of systolic BP and diastolic BP were higher in PWs than NPWs, and the p values were 0.04 and 0.021, respectively. The mean SD of respiratory rate was lower in PWs; the p-value was 0.0001. A study conducted by Ozer et al had statistical significance in

the mean systolic BP and respiratory rate, but no significant difference in the diastolic BP[9]. Asghar et al showed a significantly low level of haemoglobin among pregnant women[10]. But it was not significant in our study.
The mean leucocyte count in PW was higher when compared to the mean leucocyte count of NPW, and this is statistically significant [0.005]. This was similar to a study done by Ozer et al and Chunchen et al [9,11]. In our study, we found a significant difference in mean lymphocyte count between PW and NPW[24.47±15.52 vs 33.10±13.60] and mean platelet lymphocyte ratio[0.0005], which is similar to a study done by Sebastián et al [12]. Lymphocyte percentage was correlated with the severity of COVID-19 in Chen et al.'s study [13]. Among pregnant COVID-19 women, CRP and ferritin were the inflammatory markers that were mostly associated with disease severity. Elevated CRP value is an important factor before initiating antibiotic therapy. But in our study, the mean CRP value was not significant between PW and NPW, which is similar to that of the Ozer et al and Asghar et al study[9,10]. Though the mean of D-dimer between PW and NPW was statistically significant [0.002]in our study, it was not associated with the degree of illness, possibly due to the physiological elevation of D-dimer [14]. Though lymphocytopenia, thrombocytopenia, and raised CRP levels, elevated lactate dehydrogenase (LDH), and prolonged prothrombin time are among the reported laboratory abnormalities identified in pregnant individuals with COVID-19, we had leucocytosis and low CRP[15].

CONCLUSION

Though the laboratory findings may differ between pregnant and non-pregnant women, we found that pregnancy had no impact on laboratory results during the COVID-19 infection period. It is important to interpret these results carefully to decide on initiating and escalating treatment when required, to avoid mortality. With a larger sample size, a detailed review could be conducted.

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