Original Article

Hematological parameters and outcome in COVID-19 pregnant females

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Objective: To determine the changes in hematological parameters in COVID-19 positive pregnant females and their relation with disease severity.

Methodology: The study included 47 Covid-19 positive pregnant females as cases and 43 Covid-19 negative pregnant females as controls from April to June 2020. Of the 47 cases, 13 were in asymptomatic, 26 in common group (mild and moderate cases) and 8 were in severe group. Data regarding complete blood count parameters (CBC) and fetal outcome in the delivered cases was collected, analyzed and was compared among cases and controls.

Results: There were significant differences in Total leukocyte count (TLC), absolute lymphocyte count (ALC), Neutrophil to lymphocyte ratio (NRL), Hemoglobin level (Hb) and platelet counts among the cases and controls ($p<0.05$). The mean TLC in severe group was higher as compared to other groups, while ALC was the lowest in the severe group. Most of the patients presented in the third trimester of pregnancy. Cesarean section incidence was higher among the cases.

Conclusion: Monitoring of the hematological parameters may have a role in early identification of the cases requiring critical care having a positive impact on outcome. (Rawal Med J 202;46:262-265).

Keywords: COVID-19; caesarean section, leukocyte count.

INTRODUCTION

An outbreak of fever and respiratory disorder in People's Republic of China was reported to WHO on 31 December 2019. It was found to be caused by novel coronavirus named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) which was later named as Corona virus disease 2019 (COVID-19).[1] Common clinical features are cough and shortness of breath, fever, chills, muscle pain, headache sore throat and new loss of sense of taste or smell.[2]

Pregnant females represent a vulnerable and high-risk population in this outbreak. Both normal pregnancy and COVID-19 affected pregnancy are marked by decreased lymphocytes, NKG2A inhibitory receptors, and increased ACE2, IL-8, IL-10, and IP-10 this may increase the risk in pregnancy.[3-5] Lymphopenia, defined as a lymphocyte count of less than 1.0×10^9 /L, is associated with progression to severe COVID-19 infection. Monitoring of these parameters may be helpful in identification of patients requiring ICU care.

Increased incidence of infection in third trimester, higher rate of cesarean section along with need for mechanical ventilation has been reported in pregnant COVID-19 pregnant females. Evidence regarding fetal distress, preterm births and intrauterine demise in context with fetal outcome has been seen in COVID-19 females in the limited studies.[4,6,7] Data regarding changes in hematological parameters as a result of COVID-19 in pregnant females, relation of derangements with disease severity and effects of infection on outcome is lacking. The aim of this study was to determine the changes in hematological parameters in COVID-19 positive pregnant females and their relation with disease severity.

METHODOLOGY

This case control study was carried out in Sir Ganga Ram Hospital, Lahore from April to June 2020 and included 47 Covid-19 positive pregnant females and 43 Covid-19 negative females. The study was approved by Institutional Ethical Committee. Informed consent was taken from each

of the enrolled patient. Patients having hematological disorders were excluded from the study. Data regarding symptoms of the patients was recorded. CBC was carried out using Sysmex KX-21 hematology analyzer. RT- PCR (reverse transcriptase PCR) was performed on nasopharyngeal swabs for detection of COVID-19. Cases were classified according to WHO guidelines in three groups **Asymptomatic group** (COVID-19 positive with no symptoms), **Common group** including both mild and moderate cases (mild cases were those that showed presence of symptoms consistent with COVID-19 without any hemodynamic compromise or need for oxygen or chest X-ray findings and moderate cases were those having hypoxia (oxygen saturation <94% but >90%) or pneumonia on imaging) and **Severe group** (including cases having signs of pneumonia and plus any of the following 1- Respiratory rate >30/minute , 2- ≤93% PO2 saturation or 3- Chest X ray involving more than 50 % lung fields.

Statistical Analysis: All data analysis was performed using SPSS Statistics 25. T test was used for results.

RESULTS

Mean age of the cases was 28.8±4.5 years while that of controls was 27.4±4.3 years. Mean TLC, mean ANC, mean ALC, mean NLR and mean Hb are shown in Table 1. Clinical feature at the time of presentation were dry cough (61%), fever (57%), sore throat (40%), body aches (30) % and shortness of breath (15%), loose stools (2%) (Fig.).

COVID-19 positive cases were further characterized into three groups' asymptomatic, mild and moderate (common group) and severe group according to WHO guidelines. Mean TLC of asymptomatic group, common group and severe group were 9.1×10^9/L, 9.9×10^9/L and 12.3×10^9/L, respectively. The difference of mean TLC between asymptomatic and common group was not significant (P=0.28). Mean TLC, mean ALC, NLR, mean Hemoglobin and mean platelet counts are shown in Table 2 and 3.

Table 1. Complete blood count parameters of pregnant females.

| Hematological Parameters	Mean Cases (n=47)	Mean Controls (n=43)	P value.
TLC (×10□/L)	10.2	11.4	0.01×
ANC(×10□/L)	7.4	7.9	0.08
ALC (×10□/L)	1.6	2.26	0.0001×
Hemoglobin (g/dl)	10.8	11.3	0.07
Platelets(×10□/L)	238	312	0.0005×
Neutrophil to lymphocyte ratio(NLR)	4.8	3.5	0.004×

Table 2. Blood complete parameters of asymptomatic and common group.

Hematological parameters	Asymptomatic group (n=13)	Common (mild and moderate) (n=26)	P value
TLC (×10□/L)	9.1	10	0.28
ANC (×10□/L)	6.1	7.3	0.34
ALC (×10□/L)	1.8	1.59	0.4
Hemoglobin (g/dl)	11.1	11	0.17
Platelets (×10□/L)	203	242	0.06
Neutrophil to lymphocyte ratio (NLR)	3.7	5.1	0.34

Table 3. Comparison of blood complete parameters of common and severe group.

Hematological parameters	Common n=26	Severe group n=8	P value
TLC (×10□/L)	10	12.3	0.4
ANC (×10□/L)	7.3	9.7	0.4
ALC (×10□/L)	1.59	1.1	0.3
Haemoglobin (g/dl)	11	10	<0.05×
Platelets (×10□/L)	242	270	0.4
Neutrophil to lymphocyte ratio (NLR)	5.1	6.7	0.3

Fig. Clinical features of pregnant covid patients.
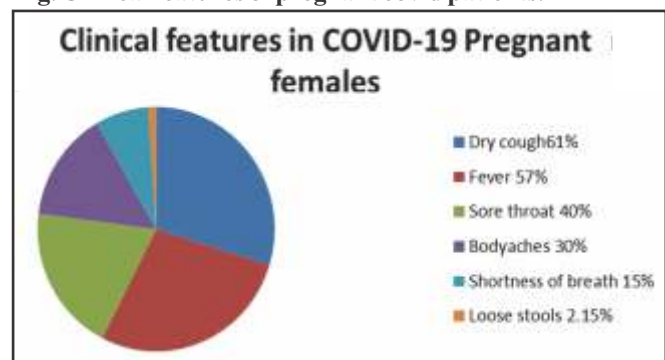
Majority of the patients presented in third trimester (n=38), seven in second trimester while two presented in first trimester of pregnancy. There were two non survivors and both were in the third trimester of pregnancy. There were 16 patients who were delivered, rest were discharged. In the control group, 33 females were in third trimester, six of second trimester and four were in first trimester. Of the 20 females delivered, mode of delivery was spontaneous vaginal delivery in 14 and six females were delivered through cesarean section. One neonate was admitted to nursery due to prematurity. There were more cesarean sections in cases (13 cesarean sections out of 16 delivered) as compared to controls (6 cesarean sections out of 20 delivered).

DISCUSSION

The deranged blood count parameters in the study were low lymphocyte count, high NLR, low TLC and low platelet count. These findings highlight the importance of monitoring of CBC parameters. Mean TLC in the severe group was higher than that of mild and common group might be due to superimposed bacterial infection. Suyu et al from Wenzhou found significantly low lymphocyte counts, low Hb, low TLC and a high NLR in COVID-19 patients.[8] The results are comparable except that of Hb. Hb decreases in pregnancy as a result of physiological changes and increased requirement so it is low in both groups. Terpos et al found lymphopenia and increase in NLR along with increase in other inflammatory markers.[9]

A study by Fan et al from Singapore showed that lymphopenia was more pronounced in the COVID-19 patients requiring ICU care (0.4×10^9/L) versus the non ICU group (1.2×10^9/L).[10] Also a deeper nadir Hb, high peak ANC and higher S/LDH levels were associated with ICU admission. Li et al in Wuhan concluded that in the subjects who died had a higher median TLC, higher median neutrophils and lower median lymphocytes as compared with survivors.[7] The non survivors in this study showed higher mean TLC and NLR as compared to the survivors. The mean platelet count was lower in patients as compared to controls. Similar findings were stated by Chen et al.[12]

It was interesting to note that the comparison of results of blood parameters of asymptomatic cases, common group cases and severe cases did not show significant differences. This was in contrast to the results presented by Sun et al where differences in CBC parameters in Covid-19 positive pregnant females from CBC parameters in Covid-19 positive general population must be considered while monitoring of Covid-19 positive pregnant females.[8] Wang et al reported fever, cough, body aches and headache to be the common presenting features.[13] Clinical feature seen were fever, cough, shortness of breath and diarrhea. This shows a wide range of spectrum of symptoms.[14] The study also provided the results that all of the cases were delivered through caesarean section. The fetal outcome was good and none was admitted to nursery.

Cesarean section was the primary mode of delivery in our study while three neonates were admitted to nursery. The variation in results might depend on the level of care given as well as sample size. Liu et al conducted a study on 19 neonates born to COVID-19 infected females and found none showed any signs of fetal distress.[15] This was in contrast to our study where three neonates required intensive care.

Another study reported that COVID-19 in pregnancy shows association with maternal morbidity and preterm birth.[16] In contrast, there were no preterm births in our study, though maternal morbidity was seen. These variation in the results may be attributed to the different sample sizes in the studies as well as on the level of care given.

CONCLUSION

Monitoring of the hematological parameters may have a role in assessing the severity and prognosis of pregnant females with COVID-19 with early identification of the severe cases requiring ICU care. COVID-19 in pregnant females is associated with increased risk of caesarean section. Overall fetal outcome appears to be good.

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