



ROUTINE HAEMATOLOGICAL PARAMETERS ALTERATION IN COVID – 19 PATIENTS IN INDIAN SCENARIO : A HOSPITAL BASED STUDY FROM LOWER ASSAM, INDIA.

Pathology

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ABSTRACT

Background : The corona virus disease 2019(COVID-19) is caused by the virus SARS-CoV-2 and is declared as a global pandemic by World Health Organization (WHO). Various hematological parameters alteration has been documented in the Chinese literature in SARS-Cov-2 infection. However, there is a need for research to evaluate the pattern of the hematological parameters of COVID-19 patients in the Indian population. **Aims & Objectives :** The objective of the study is to analyse the hematological parameters like HB%, TLC, DLC, ANC, ALC, NLR, platelet count, PLR etc. alteration in COVID-19 patients along with age and sex distribution in the Indian scenario. **Methods :** It is a Single centre cross sectional study of 60 patients with laboratory-confirmed COVID-19 admitted to Fakhruddin Ali Ahmed Medical College & Hospital, Assam from July to August, 2020. The various haematological datas are collected from Central Clinical Laboratory (CCL) pathology records and analysed to find out the alterations. **Results :** Demographic characterization shows a mean age of 36.35 years (range from 02 days – 82 years), male (41.6%), female (58.3%). The CBC values and NLR, PLR at baseline between the male and the female patients are analysed and have shown leucocytosis, neutrophilia, lymphopenia, anemia, high NLR, and a normal to mild thrombocytopenia in more than 50% of symptomatic cases. **Conclusion :** Majority of the patients are younger and have mild clinical presentation with female predominance. Baseline CBC findings show mild neutrophilia, lymphopenia, anemia, high NLR and normal to mild thrombocytopenia.

KEYWORDS

Corona virus, COVID-19, CBC, NLR, PLR.

INTRODUCTION

In December 2019, pneumonia cases of unknown origins, known as novel corona virus pneumonia (NCP), occurred in Wuhan, Hubei province, China. The World Health Organization has officially named NCP as corona virus disease in 2019 (COVID .19).¹ The 2019 novel corona virus is the seventh member of enveloped RNA corona virus that can infect humans.² The official guidelines (the Guidelines of the National Health Commission of China for COVID-19, 5th edition;³ and the WHO interim guideline⁴) currently recommend two laboratory parameters, “normal/ decreased number of leukocytes” or “decreased number of lymphocytes”, as one of the criteria for diagnosis of COVID-19 infection. On the 11th March 2020, WHO declared the COVID-19 as a pandemic. India confirmed its first case on 30th January 2020 in Kerala.

The Clinical characterization of COVID-19 has been broadly defined by WHO⁵ with most of the confirmed COVID-19 cases have mild to moderate clinical presentation. However, there can be rapid deterioration for severe patients who will undergo respiratory failure, septic shock, or multiple organ dysfunction, threatening life. Efficient laboratory indicators for the disease severity, therapeutic response, and disease outcome have not been fully investigated. Early identification of indicators distinguishing severe patients from mild to moderate ones can facilitate faster medical intervention, thereby lowering the mortality rate. Various hematological parameters alteration has been documented in the current literature review in SARS-Cov-2 infection in the Chinese and the Western population, which signifies the severity and the prognosis of the patient outcome. However, there is a need for research to evaluate the pattern of the hematological parameters of COVID-19 patients in the Indian population.

METHOD:

Patient selection: It is a Single Center cross sectional study of 60 patients with laboratory-confirmed COVID-19 admitted to Fakhruddin Ali Ahmed Medical College & Hospital, Barpeta, Assam from July to August 2020. The diagnosis of COVID-19 was confirmed by RTPCR performed on respiratory samples of the patient. Various haematological datas are collected from the CCL Pathology records and analysed to find out the significant alterations.

RESULTS

Age & Sex :- Age of the patients is ranges from 02 days to 82 years with a mean of 36.35 years and median age is 30 years. Highest number(38.33%) of patients are in third decade and all are female. Out of 60 patients, 35(58.33%) numbers are female and 25(41.66%)

numbers are male with M:F ratio is 0.7.

Hemoglobin (Hb) concentration, PCV and RBC count :-

Hemoglobin concentration ranges from 4.6 – 12.4 gm/dl with a mean Hb concentration is 8.7 gm/dl and median value is 9 gm/dl. Out of 60 patients, 40(66.7%) numbers have Hb concentration <10 gm/dl; of which 30(50%) numbers are female. Again, 07(11.6%) patients have Hb concentration <6 gm/dl; of which 04 numbers are male and all patients have ALC >1000/cumm; but NLR ranges from 2.2 to 10.8 and PLR ranges from 43.8 to 271.2.

PCV values of the patients are ranges from 14.1 – 37.9% with a mean PCV is 27.3%. Total RBC count of the patients ranges from 2.03 -5.40 million/cumm with a mean TRBC count is 3.81 million/cumm.

Total WBC count, Differential leucocyte count (DLC) Absolute Neutrophil count (ANC) and Absolute Lymphocyte count (ALC) :-

Total WBC count of the patients ranges from 3410 – 23760/ cumm with a mean Total WBC count is 11297/ cumm and median value is 9665/cumm. Out of 60 patients, 31(51.7%) numbers of patients show leucocytosis; of which 21(35%) numbers are females. Five patients have shown Total WBC count >20000/cumm; of which four are male patients and platelet count of those patients are ranges from 101K to 134K/cumm. The NLR of these five patients have $\geq$ 6.9 and PLR ranges from 46.1 to 143.5. Only one patient of age 35 years has shown leucopenia of Total WBC count 3410/cumm.

Out of 60 patients, 40 (66.7%) numbers of patients have shown neutrophilia in DLC and highest number of neutrophils is 95%. Absolute Neutrophil count (ANC) of the patients ranges from 1930 – 21790/cumm with a mean ANC is 9120/cumm. Out of 60 patients, 16(26.7%) patients have shown ANC >7000/cumm with equal sex distribution.

Parameters	Mean	Range
HB	8.7 gm/dl	4.6 – 12.4 gm/dl
Total WBC count	11297/ cumm	3410 – 23760/ cumm
RBC count	3.81 million/cumm	2.03 -5.40 million/cumm
PCV	27.3	14.1 – 37.9
MCV	72.2 fl	45.9 – 90.3 fl
MCH	23.1 pg	15.4 – 28.4 pg
MCHC	31.9	26.2 – 34.8
RDW	16.9	13.5 – 25.5

Platelet count	1.96 lacs/cumm	0.85 – 5.34 lacs/cumm
Absolute Neutrophil count	9120/cumm	1930 – 21790/cumm
Absolute Lymphocyte count	1438/cumm	580 – 3610/cumm
Neutrophil/ Lymphocyte ratio	7.2	0.86 – 29
Platelet/ Lymphocyte ratio	160.5	40.7 – 593.1

Table showing different haematological parameters and their mean values and ranges obtained from COVID-19 patients

Absolute Lymphocyte count (ALC) is ranges from 580 – 3610/cumm with a mean ALC is 1438/cumm and median value is 1375/cumm. Out of 60 patients, 100% patients have shown ALC <4000/cumm and 37 (61.7%) numbers of patients have shown ALC<1500/cumm; of which 19 (31.7%) numbers are male. Total 15 (25%) numbers of patients have shown ALC<1000/cumm; of which 12 (20%) numbers are male. Total WBC count of these 15 patients ranges from 4950 – 23760/cumm and NLR ranges from 3.7 – 29 with a mean value of 11.32 & PLR ranges from 143.5-593.1 with a mean value of 257.9.

MCV, MCH, MCHC and RDW :-

MCV of the patients are ranges from 45.9 – 90.3 fl with a mean MCV is 72.2 fl. Out of 60 patients, 23 (38.3%) numbers of patients have shown MCV <70 fl. MCH of the patients are ranges from 15.4 – 28.4 pg with a mean MCH is 23.1 pg. MCHC of the patients are ranges from 26.2 – 34.8 with a mean MCHC is 31.9. RDW of the patients are ranges from 13.5 – 25.5 with a mean RDW 16.9.

Platelet count, Neutrophil/ Lymphocyte ratio (NLR), Platelet/ Lymphocyte ratio (PLR) :-

Platelet count of the patients is ranges from 0.85 – 5.34 lacs/cumm with a mean Platelet count 1.96 lacs/cumm. Out of 60 patients, only 03 (05%) numbers of patients have shown platelet count <1 lacs/cumm and >4.5 lacs/cumm. Again, 25(41.7%) patients have platelet count in between 100-150K/cumm; of which 15(25%) numbers are male.

NLR of the patients are ranges from 0.86 – 29 with a mean NLR is 7.2 and median value is 6.3. Out of 60 patients, 16 (26.7%) numbers of patients have shown NLR>10; of which 11 (18.3%) numbers are male and 38 (63.3%) numbers of patients have shown NLR>5; of which 17 (28.3%) numbers are male.

PLR of the patients are ranges from 40.7 – 593.1 with a mean PLR is 160.5 and median value 128.0. Out of 60 patients, 17(28.3%) patients have PLR value >200; of which 12 (20%) patients are female and have platelet count ranges from 140 – 534K/cumm with a mean value of 321.2K/cumm.

DISCUSSION

Corona virus disease 2019 (COVID-19) is a respiratory tract infection caused by a newly emergent Corona virus, SARS-CoV-2, that was first recognized in Wuhan, China, in December 2019.

The demographic characteristics of our study showed that females were affected more often than men; which is similar to the Indian study by Devajit Nath et al⁸. This is in contrast to various studies conducted by Guan WJ et al⁷, Zhang JJ et al⁸. Nanshan Chen et al⁹, where the disease incidence was more in men as compared to females. The change in the gender pattern in the Indian population could be due to immunological, ethnic, or racial variation. This area needs further research, and a larger cohort study may be suggested to establish the fact.

In our study, age ranges from 02 days to 82 years with a mean of 36.35 years and median age is 30 years; which is similar to one Indian study by Devajit Nath et al⁸. In contrast, a study conducted by Li et al¹⁰ in Wuhan; China showed that the patients' median age was 59 years, with a range of 15 to 89 years.

In our study, the leucocytosis was accompanied by an increase in ANC and neutrophil percentage of 95% ; which is similar to the study by Zhang et al¹¹.

Lippi G et al¹² carried out a systematic literature review and highlighted that the most important hematological parameter abnormalities observed in COVID-19 patients, which may predict the progression

toward severe or critical forms of COVID-19, include leucocytosis, neutrophilia, and lymphopenia. In our study also, we have found similar findings.

In our study, 100% patients have shown lymphopenia and (61.7%) numbers of patients have shown ALC<1500/cumm; which is similar to other studies like Huang C et al¹³, Yang X et al¹⁴, Bai et al¹⁵. Huang C et al¹³, Yang X et al¹⁴ mentioned that 85% of the critically ill patients of their study group with COVID-19 showed lymphopenia. The presence of lymphopenia as a signature of severe COVID-19 was confirmed by Bai et al¹⁵, who reported that ICU patients suffering this infection had a median lymphocyte count of 800 cells/mm.

The Neutrophil-to-Lymphocyte ratio (NLR) is a biomarker for the assessment of the severity of bacterial infections and the prognosis of patients with pneumonia and tumor. In a study by Forget et al¹⁶, it was identified that normal NLR values in an adult, non-geriatric population in good health are between 0.78 and 3.53. Whereas, in another study by Jingyuan Liu¹⁷, it was concluded that Patients with age ≥50 having NLR ≥3.13 are at risk of severe illness, and they should get rapid access to the intensive care unit, if necessary. In our study, NLR of the patients are ranges from 0.86 – 29 with a mean NLR is 7.2 and median value is 6.3. Out of 60 patients, 16 (26.7%) numbers of patients have shown NLR>10; of which 11 (18.3%) numbers are male and 38 (63.3%) numbers of patients have shown NLR>5; of which 17 (28.3%) numbers are male. So, high NLR may be a good indicator of COVID-19 infection and severity of disease; however, a larger follow-up cohort is needed to arrive at a statistical significance.

In our study, higher PLR are observed in females which is similar to other studies like Wu et al¹⁸. Some studies show that the changes in the platelet/lymphocyte ratio in peripheral blood during treatment could reflect the disease progression and prognosis of COVID-19 patients. The larger the PLR, the more severe the cytokine storm, and the longer the hospital stay, the worse the prognosis. But in our study, single value is taken; so larger follow up Cohort is needed for statistical significance.

CONCLUSION:

The study of 60 symptomatic COVID-19 cases of Indian population shows that majority of the patients are younger and have a higher incidence in the female population. Baseline CBC findings of symptomatic cases show leucocytosis, neutrophilia, lymphopenia, high NLR, low Hb% and a normal to mild thrombocytopenia in more than 50% of symptomatic cases. However, a larger follow-up cohort is needed to arrive at a statistical significance.

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