

## Original research article: Study of hematological and biochemical Markers in COVID-19 patients admitted in a tertiary care centre of Middle Gujarat, India

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### ABSTRACT:

**Background:** COVID-19 pandemic originated in the city of Wuhan in Hubei province of China and within three months of its origin the disease extended to nearly 221 countries in the world.

**Objective:** The objective is Study of hematological and various biochemical Markers in COVID-19 patients admitted in a tertiary care centre .

**Methodology:** In this single-center study, records of 170 patients hospitalized with COVID-19 were studied for hematological profile and biochemical markers. Records of patients with laboratory-confirmed COVID-19 disease hospitalized between April 2020, to August 2020, were included in the analysis.

**Result:** A total of 170 patients were enrolled of Age Group 20-80 year of which 80% (136/170) were asymptomatic and 20% (34/170) symptomatic. 17% patients had co-existing illnesses. Clinical spectrum among COVID-19 patients varied from being asymptomatic to having symptoms like fever, dry cough, breathlessness with few progressing to respiratory failure and multi-organ failure. In our study, 96.0% (163/170) recovered while 4.0% (7/170) died. Mean age, total leucocyte count (TLC), neutrophil to lymphocyte ratio (NLR), platelet to lymphocyte ratio (PLR), and lactate dehydrogenase (LDH), Procalcitonin, CRP, D dimer of severely ill patients were significantly higher than those of patients with non-severe illness.

**Conclusion:** The clinicians may consider the hematological and biochemical parameters in the patients with COVID-19 in future decision-making. Elevated NLR, TLC, LDH, C-Reactive Protein, Procalcitonin, D dimer and lymphopenia were seen in the symptomatic patients especially manifesting severe disease. Early intervention and periodic monitoring of these parameters in patients, especially with severe disease may help in improving disease outcome.

**Key words:** Covid 19, WBC , Biochemical marker

## INTRODUCTION:

Coronavirus disease (COVID-19) is an infectious disease caused by the SARS-CoV-2 virus. Most people infected with the virus will experience mild to moderate respiratory illness and recover without requiring special treatment. However, some will become seriously ill and require medical attention. Older people and those with underlying medical conditions like cardiovascular disease, diabetes, chronic respiratory disease, or cancer are more likely to develop serious illness. Anyone can get sick with COVID-19 and become seriously ill or die at any age. <sup>[1]</sup>

The disease has an incubation period of 2 to 5 days and spreads by droplet infection and surface contact. The lock down implemented in India controlled the spread of pandemic to some extent.

Autopsies done in Europe revealed the pathology of respiratory failure and ARDS in COVID-19 disease. Extrapulmonary manifestations involving heart, lung, kidneys and bone marrow were found. Microvascular injury and thrombosis were detected in pulmonary vessels. <sup>[2]</sup> Electron microscopy and molecular diagnosis helped in better understanding of the pathology predominantly occurring in the respiratory tract. <sup>[3,4]</sup> Endothelial inflammation, diffuse alveolar damage are associated with hyperreactivity and hyperinflammation of cellular immune system leading to severe hypoxia and acute respiratory distress syndrome. <sup>[5]</sup>

Early identification of severe illness risk factors can help clinicians facilitate appropriate remedial measures and help control mortality. Earlier existing literature on laboratory-confirmed coronavirus cases reported changes in the patients' biochemical parameters, including study reported changes in inflammatory markers in patients with COVID-19, including C-reactive protein (CRP), erythrocyte sedimentation rate (ESR), and Interleukin-6. Likewise, another work reported lymphocytopenia, high blood sugar, C Reactive protein, Procalcitonin, high lactate dehydrogenase (LDH) in more COVID-19 patients. <sup>[6,7]</sup>

## MATERIAL & METHOD:

This cross sectional observational study was conducted at Parul sevashram hospital, vadodara, Gujarat from April to August 2020

This study includes total 170 patients with positive SARS-CoV-2 nucleic acid test results . suspected cases underwent nasopharyngeal/oropharyngeal swab testing and WHO approved kits based on real time reverse transcription polymerase chain reaction (rRT-PCR) were used. Informed consent was obtained from each patient included in this study.

For each case, epidemiological history and information of other family members was obtained. Information regarding age, sex, previous medical history, clinical manifestations, and vaccinations was obtained. All patients were subjected to detailed clinical evaluation, routine hematological and biochemical investigations, electrocardiogram (ECG) and chest x-ray at the time of admission.

. Symptomatology of patients was recorded and patients were put on treatment according to their clinical condition, decided by the COVID-19 treatment protocol team of our institution.

. Patients who failed to maintain oxygen saturation (SpO<sub>2</sub><94% on room air) were given oxygen via high flow mask or nasal prongs. Indian guidelines of COVID-19 management were followed according to which, rRT-PCR for COVID-19 was done every third day till the report was negative and then it was

repeated after 24 hours. A patient was considered COVID-19 recovered till he/she became asymptomatic along with two negative rRT-PCR tests 24 hours apart.<sup>6</sup> The patients were followed till any of the outcome of disease (cured/discharged with home isolation/death). All data was recorded in a predesigned proforma. Patients with incomplete records or who were transferred to other facilities before recovery were excluded from the study

The data was systematically collected, compiled and statistically analyzed using online student t test calculator. Results of continuous variables were expressed as mean±SD. The observations were tabulated and independent t test was applied to analyze variables between groups. The p value of <0.05 was considered significant <0.001 as highly significant and >0.05 as non-significant.

## RESULTS:

A total of 170 patients with confirmed SARS-CoV-2 infection were enrolled in this study .

and Divided into two groups 1 and 2 based on clinical presentation to compare various biochemical, hematological and radiological parameters.

The mean age of all patients was 35.5 ± 5 years (range 20-85 years).

Outcome	Group 1(Asymptomatic)(n=136)	Group 2(symptomatic) (n=34)
Recovered	136 (80%)	27(16%)
Death	0	7(4%)

**Table 1: Clinical profile and disease outcome in COVID-19 patients.**

Parameter	Group 1(Asymptomatic)	Group 2(symptomatic)	P value
Mean Age(yr)	35.5±4.5	54.5±5.8	<0.001*
Male	106	26	
Female	30	8	
Hb %	14.85±1.90	13.95±2.04	>0.05
TC(/mm <sup>3</sup> )	15467.06±1782.17	9568.06±1560	<0.05*
Neutrophil(%)	76.45±5.85	86.45±8.85	<0.05*
Lymphocyte(%)	16.80±3.85	7.89±6.85	<0.05*
Mean Platlet count (lacs/μl)	2.89±0.85	2.65±0.30	>0.05
NLR	2.67±1.30	5.67±1.32	<0.001*
S.LDH(U/L)	455±50.5	863±78.45	<0.001*

D dimer(ng/ml)	489±145	1947.33±200	<0.001*
Procalcitonin(ng/ml)	0.67±0.12	11.23±1.20	<0.001*
CRP(mg/L)	10.67±1.30	67.78±1.10	<0.001*

**Table 2: Comparison of hematological and biochemical parameters among COVID-19 patients based on their symptomatology.**

(\*Significant)

Total patients	Culture negative	culture positive
170	132	38

**Table 3: classification based on throat culture report**

Total count	Culture negative	culture positive	Total no. of patients
>10000	28	6	34
10000-20000	77	24	101
>20000	27	8	35
Total	132	38	170

**Table 4: Total WBC count in throat culture Positive and Negative patients**

#### DISCUSSION:

With the continuous spread of COVID-19 cases worldwide and different speculations of its effect on the human body are also flashing every day, we are still inexperienced in understanding a few aspects of COVID-19. However, we still have a lot to know about the effect of COVID-9 on different biochemical and hematological profiles in patients who survived or died due to COVID-19. Therefore, we summarised a comparative analysis of hematological and biochemical characteristics of 170 patients. This comparison is useful in the clinical setting to support clinical decisions and improving the survival rate in severely ill patients.<sup>[8]</sup>

Biochemical Parameters are very essential in assessing the severity of COVID-19 disease where extensive inflammation of lung parenchyma along with microvascular changes is responsible for respiratory distress and ARDS leading to severe morbidity and mortality.

Normal CRP levels are in the range of less than 10 mg/L. Among the patients of our study 89% of the patients elevated four to five times in COVID-19 patients with moderate disease and eight times normal in COVID- patients with severe disease.

PCT values decrease on recovery. PCT values are also raised with bacterial infection. Linlin Chang et.al study revealed that patients with comorbidities have higher levels of Procalcitonin.<sup>[9,10]</sup>

D-dimer levels are normally below 500 ng/ml. In our study elevated D-dimer levels were found in 74% of our patients. Elevated D-dimer levels also guide the physician in the dosage of anticoagulant. Elevated levels show increased severity of disease and indicate poor prognosis. The values predict mortality in intensive care unit.<sup>[9]</sup> Hypercoagulability state of the patient in COVID-19 disease is accompanied by microthrombi formation and platelet consumption leading to thrombocytopenia. Spike protein of coronavirus directly stimulates and activates the platelets.

In a study by Terpos et al elevated LDH was reported in 41% of patients. Increased LDH has also been associated with higher risk of acute respiratory distress syndrome (ARDS), ICU support and mortality.<sup>12</sup> Monitoring liver function tests is important during the course of COVID-19 especially in patients with higher disease severity.<sup>[11]</sup>

The elevation of several biochemical inflammatory parameters should be considered together in the assessment of inflammatory cytokine storm in COVID-19 disease. The severity of the disease and there by assessment of prognosis is done by lymphopenia, CRP levels, Ferritin, PCT, D-dimer levels , IL-6 levels along with hypoxia status of the patient and elevated HS troponin I. When all the parameters are raised the course of the disease will be unfavorable.<sup>[12,13]</sup>

Elevation of leukocyte count, lymphopenia and neutrophil lymphocyte ratio of >3:1 are considered as important parameters in assessing the severity of COVID- 19 disease. Patients with these parameters have higher frequency of mechanical ventilation, ICU admission and disease severity. Old people with comorbidities tend to have higher leukocyte levels. In our study, lymphopenia was seen in 52.94% (9/17) symptomatic and 11.76% (10/85) asymptomatic patients. During hospitalization, non-survivors demonstrated a more significant deterioration in lymphocyte count. Similarly, lymphopenia was documented in approximately 40% of the hospitalized patients with COVID-19 in Singapore.<sup>[14,15]</sup>

In our study, higher NLR was seen in symptomatic patients especially those manifesting severe disease. NLR may have prognostic value in determining severe cases. In our study, mean NLR in the patients who were symptomatic and died was  $5.67 \pm 1.32$  and  $55.55 \pm 13.34$  respectively.

Currently, our understanding of the spectrum and natural history of SARS-CoV-2-infection remains limited. Our study is unique in the aspect that it involved comparing hematological, biochemical and radiological parameters in a study group involving both asymptomatic and symptomatic COVID-19 patients which provides better assessment regarding disease course and severity of illness. It is important to treat and cure patients at an early stage before irreversible severe respiratory complications take hold, this also further decrease duration of carriage and avoid the spread of the disease. Close monitoring of confirmed COVID-19 cases and administration of hydroxychloroquine led to early recovery and better disease outcome. Therefore, early diagnosis, isolation and management of COVID-19 cases will not only help to contain this pandemic but also might collectively contribute to the reduction in morbidity and mortality from COVID-19.

## CONCLUSION

The clinicians may consider the hematological and biochemical parameters in the patients with COVID-19 in future decision-making. Elevated NLR, TLC, LDH, C Reactive Protein, Procalcitonin, D dimer and

lymphopenia were seen in the symptomatic patients especially manifesting severe disease. Early intervention and periodic monitoring of these parameters in patients, especially with severe disease may help in improving disease outcome.

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