

## ROLE OF HEMATOLOGICAL PARAMETERS IN EARLY DIAGNOSIS OF COVID-19 IN A TERTIARY CARE CENTRE

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### Abstract

**Aim:** To evaluate the role of biomarkers from blood samples of COVID-19 patients admitted in Index Medical College Hospital & R.C.

**Material & Methods:** Hematological parameters such as Neutrophil lymphocyte ratio (NLR), Platelet lymphocyte ratio (PLR) & Systemic Inflammatory Index (SII) were studied in RT-PCR positive patients to evaluate the utility of these parameters for early diagnosis of COVID-19.

**Results:** The study showed that there was statistically significant difference in test groups in reference to Neutrophil lymphocyte ratio (NLR) & SII values ( $p < 0.05$ ). But no statistically significant difference was observed between test groups in reference to Platelet lymphocyte ratio (PLR) values ( $p > 0.05$ ).

**Conclusion:** Leukocyte, Neutrophil, NLR & SII values can be used in the early diagnosis of COVID-19.

**Keywords:** NLR, SII, Leukocyte, Neutrophil

### Introduction:

At the end of 2019 novel coronavirus i.e. SARS-CoV-2 emerged in Wuhan, China<sup>[1]</sup>. 115 million cases have been diagnosed worldwide till 3<sup>rd</sup> March, 2021 with 2.56 million deaths.

SARS-CoV-2 was recognized as a public health concern & was declared as pandemic on 11<sup>th</sup> March, 2020 by WHO<sup>[2]</sup>. Various modes of transmission of this virus are observed out of which airborne transmission via aerosols is suspected to be the main mode. Other modes are fomites & GI tract<sup>[7]</sup>.

Due to the short time of onset of Acute Respiratory Distress Syndrome after admission to hospital & high mortality rates in COVID-19; an early diagnosis by evaluating hematological parameters play an important role as they provide information to the physicians regarding the ongoing inflammatory processes<sup>[3]</sup>. Complete blood counts (CBC) are inexpensive, readily available and easy to perform. Hematological parameters from CBC which provide information regarding the inflammatory process are the counts of leukocyte, neutrophil, lymphocyte & platelet and we further calculate certain ratios from these values. Therefore, these ratios can be used as inflammatory markers as indicators of early inflammation<sup>[4-6]</sup>.

In early onset of COVID-19 infection neutrophils are the first responders showing neutrophilia & relative lymphopenia and ratio of these two parameters i.e. NLR is also used as an inflammatory marker<sup>[8]</sup>. Use of circulating biomarkers themselves as well as their ratios to one another representing inflammation & the immune response have

been considered as an early diagnostic indicator in COVID-19 positive patients as per previous research work<sup>[9]</sup>.

$$\text{Systemic Inflammatory Index (SII)} = \frac{\text{Platelet count} \times \text{Neutrophil count}}{\text{Lymphocyte count}}$$

$$\text{NLR ratio} = \frac{\text{Absolute neutrophil count}}{\text{Absolute lymphocyte count}}$$

$$\{\text{Absolute neutrophil count}\} = \frac{(\% \text{ segments} + \% \text{ bands}) \times \text{WBC}}{100}$$

$$\text{PLR ratio} = \frac{\text{Absolute platelet count}}{\text{Absolute lymphocyte count}}^{[10]}$$

*\* Use of the optimum cut-off values of laboratory results to discern severe from mild/moderate COVID-19 infection:-*

The analyses of optimal cut off values were calculated by the ROC analysis as no unified laboratory reference value was found. The optimal cut off values were 3.3, 180 & 479.1 for NLR, PLR & SII respectively<sup>[10,14]</sup>.

### Aim

To evaluate the role of biomarkers from blood samples of COVID-19 patients admitted in Index Medical College Hospital & R.C.

### Objective

1. To investigate the blood sample of the patients admitted in Index Medical College Hospital & Research Centre with positive RT-PCR results.

2. To study the role of biomarkers from blood samples of COVID-19 patients as an early diagnostic marker of COVID-19.

### Materials & Methods

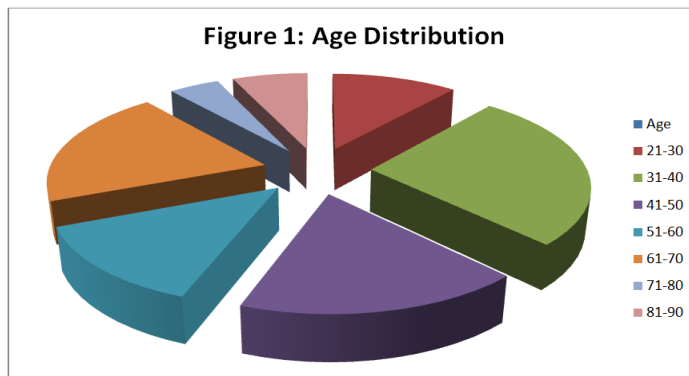
This retrospective study was carried out in line with research regulations in patients admitted in IMCHRC

between May 2020 to June 2020. This study included 45 RT-PCR positive COVID-19 patients from Ward & ICU of IMCHRC.

### Result

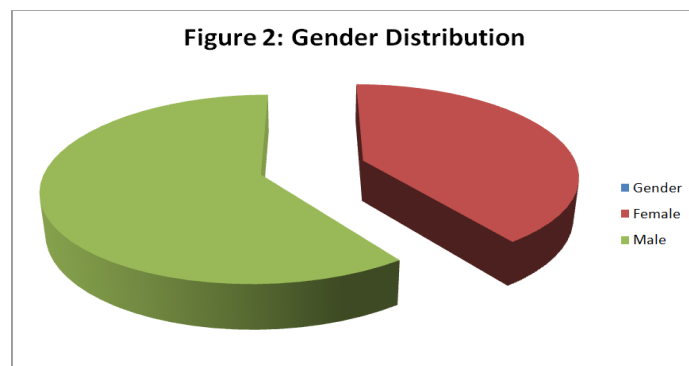
**Table 1: Age Distribution**

S. No.	Age	Number	Percentage
1.	21-30	5	11.1
2.	31-40	12	26.6
3.	41-50	8	17.7
4.	51-60	6	13.6
5.	61-70	9	20
6.	71-80	2	4.4
7.	81-90	3	6.6
<b>TOTAL</b>		45	100



**Table 2: Gender Distribution**

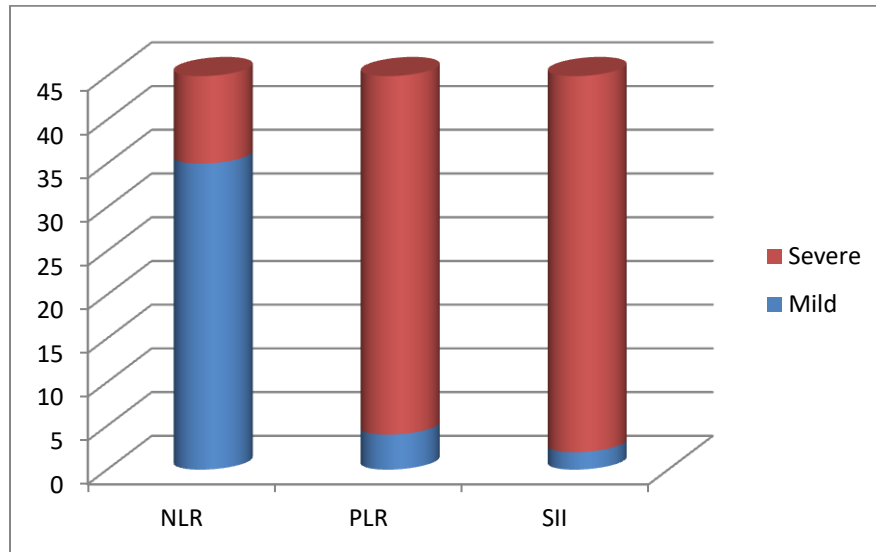
S. No.	Gender	Number	Percentage
1.	Female	18	40%
2.	Male	27	60%
<b>TOTAL</b>		45	100



The median age of study population is 55.5 (21-90) and 60% of patients were male.

**Table 3: Categorisation to Mild/Moderate & Severe according to optimal cut off values of NLR, PLR & SII. \*Refer to page number two.**

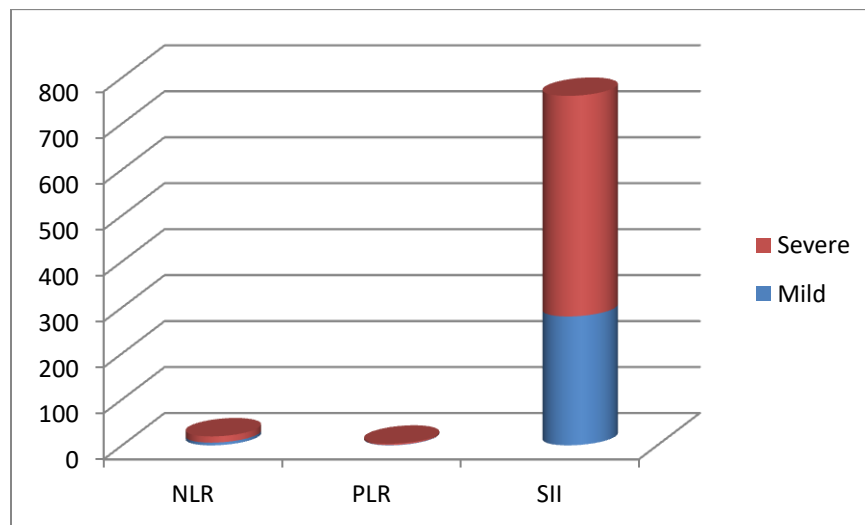
Biomarkers	Mild/Moderate	Severe	Total
NLR	35	10	45
PLR	4	41	45
SII	2	43	45



**Figure 3: Categorisation to Mild/Moderate & Severe**

**Table 4: Mean Value**

Biomarkers	Mild	Severe
NLR	5.94	13.6
PLR	0.72	2.92
SII	280.44	479.9



**Figure 4: P value for NLR & SII is 0.02 & 0.041 respectively and are statistically significant while p value for PLR is 0.081 and is statistically insignificant.**

## Discussion

Early diagnosis of COVID-19 is essential because of the high infectivity & mortality rates of this disease. RT-PCR is used for the definitive diagnosis of this disease for which specimens from upper & lower respiratory tract are obtained from patients. RNA is extracted and tested by real time RT-PCR with SARS-CoV-2 specific primers & probes. A cycle threshold value (Ct-value) <37 is defined as a positive test & a Ct-value  $\geq 40$  as negative test<sup>[1]</sup>. The time to receive results from this test can be prolonged because of higher number of samples, limited number of staff trained in performing these tests and insufficient lab capacities. So to aid in the early diagnosis of the infection the indices such as NLR, PLR & SII obtained from blood sample have been used in this study<sup>[10]</sup>. There is an apparent relation between a bacterial infection & neutrophilia and a viral infection & lymphocytosis. To distinguish between these different types of infection NLR has been used<sup>[11,12]</sup>. SII is a prognostic score proposed recently which is based on platelets, neutrophils & lymphocytes<sup>[13]</sup>. In this study, SII was found to be significantly low for COVID-19 positive patients so it can also be used for the diagnosis of COVID-19. Lastly the results from the study show that NLR, SII, PLR, absolute neutrophil & lymphocyte counts are helpful diagnostic markers for the early detection of COVID-19.

## Conclusion

Biomarkers such as NLR, SII and PLR obtained from the blood samples of COVID-19 positive patients are helpful for initial and rapid diagnosis of disease as the definitive results obtained from RT-PCR have a longer TAT thus delaying the diagnosis. This leads to delay in starting treatment & precious time is lost leading to avoidable morbidity & mortality. Moreover the ease of performance, availability & low cost also underscore the utility of these procedures for early diagnosis of COVID-19.

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