



A STUDY ON HAEMATOLOGICAL PARAMETERS IN COVID-19 PATIENTS-A TERTIARY CARE CENTRE STUDY.

Pathology

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ABSTRACT

Aim: In this study, the roles of biomarkers from a peripheral blood sample in the diagnosis of COVID-19 patients who have visited government medical college suryapet have been evaluated. **Materials & Methods:** Peripheral blood parameters, neutrophil lymphocyte ratio (NLR) and plateletlymphocyte ratio were compared in patients with and without confirmed COVID-19 infection. **Results:** Comparisons made according to real-time PCR test results revealed that while no statistically significant difference was observed between test groups (negative-positive) regarding lymphocyte and platelet lymphocyte ratio values ($p > 0.05$), a statistically significant difference ($p < 0.05$) was found between the test groups regarding platelet, hemoglobin, leukocyte, neutrophil, NLR and SII values. **Conclusion:** Leukocyte, neutrophil, platelet count, NLR can be used in the diagnosis of COVID-19.

KEYWORDS

biomarkers COVID-19 diagnosis infection neutrophil lymphocyte ratio

INTRODUCTION

Blood tests have an important role in early diagnosis of the disease, considering the information they provide to physicians regarding the inflammatory process. This information includes leukocyte count and characteristics such as neutrophil- or lymphocyte-dominance, inflammation (CRP), collateral organ damage (acute renal failure, acute liver failure) and the severity of the disease. Furthermore, biomarkers provide information regarding the nature of pneumonia, meaning that physicians can determine whether a disease is bacterial or due to other etiologies by analyzing blood test results [8].

Complete blood counts (CBC) are easily performed and inexpensive.

Considering previous research, the use of circulating biomarkers representing inflammation and the immune system have been considered as a prognostic indicator in COVID-19-positive patients. However, their utility in terms of diagnosis has not been explored [13]. In this study, the roles of biomarkers from a peripheral blood sample in the diagnosis of COVID-19 patients who have come Government medical college suryapet have been examined.

Systemic inflammatory index (SII) = thrombocyte count $\times$ neutrophil count/lymphocyte count. Neutrophil lymphocyte ratio (NLR) = absolute neutrophil count/absolute lymphocyte count. Platelet lymphocyte ratio = absolute PLT/absolute lymphocyte count.

MATERIALS & METHODS

This retrospective study was carried out in Government medical college and General Hospital, Suryapet, Telangana State dated 14 March 2020 and numbered 12 April 2021 on 282 patients.

The selection of possible COVID-19 patients. These criteria, consist of patients with either at least one sign or symptom of either fever or acute respiratory disease (cough and respiratory distress), or the presence of clinical features that are unexplainable by any other disease, or history of travel to another country in the previous 14 days before onset of symptoms of the patient or a relative, or close contact with a patient confirmed positive for COVID-19 by real-time PCR (RT-PCR) [14]. Patients from whom a throat swab was obtained and those who were thereafter hospitalized with an initial diagnosis of COVID-19 were studied retrospectively. Only patients above the age of 18 years were included in the study. The presenting complaints, epidemiological features and blood test results of patients were obtained from the patient files. Only the results of the initial RT-PCR and CBC tests were used and no further tests were performed on these patients.

RESULTS

Of the 282 patients included in the study, 62.8% were male and the average age was 47.6 ± 16.9 years. RT-PCR analyses of 163 patients

(57.8%) were positive. The most common complaints during ER visits were fever (37.2%), cough (15.2%), sore throat (5.3%), shortness of breath (3.9%) and myalgia (3.2%).

Comparisons made according to the PCR test results of patients included in the study, revealed that no difference of statistical significance regarding age and test results (negative or positive) was found ($p > 0.05$).

Binary logistic regression was used to further evaluate whether age was a risk factor and as a result, it was determined that age of the patients was not a risk factor for COVID-19 ($p = 0.098$; OR: 0.998; 95% CI: 0.974–1.002).

The role of hematological parameters in COVID-19 patients Research Article

Comparisons of patient features according to PCR test results.

Patient features Total (n = 282) Negative (n = 119) Positive (n = 163) p-value

Gender Female 105 (37.2%) 55 (46.2%) 50 (30.7%) 0.008
Male 177 (62.8%) 64 (53.8%) 113 (69.3%)
Symptoms Fever 105 (37.2%) 70 (58.8%) 35 (21.5%)
Cough 43 (15.2%) 15 (12.6%) 28 (17.2%)
Fever – sore throat 15 (5.3%) 3 (2.5%) 12 (7.4%)
Dyspnea 11 (3.9%) 7 (5.9%) 4 (2.5%)
Myalgia 9 (3.2%) 6 (5.0%) 3 (1.8%)
Malaise and fatigue 3 (1.1%) 1 (0.8%) 2 (1.2%)
Fever – shortness of breath 2 (0.7%) 1 (0.8%) 1 (0.6%)
Headache 2 (0.7%) 2 (1.7%) – Chest pain 2 (0.7%) 2 (1.7%) –

The values in bold are statistically significant.

Comparisons made according to the RT-PCR test results revealed that while no statistically significant difference was observed between test result groups (negative or positive) regarding lymphocyte and platelet lymphocyte ratio values ($p > 0.05$), a statistically significant difference ($p < 0.05$) was found between the test result groups regarding platelet, hemoglobin, leukocyte, neutrophil, NLR and SII values. In patients with negative test results, it was found that platelet, leukocyte, neutrophil, NLR and SII values were higher, whereas hemoglobin was found to be higher in patients with positive test results. Also, hemoglobin was found to be higher in male patients who tested positive for COVID-19.

Since there was a statistically significant difference between negative and positive groups according to parameters.

DISCUSSION

Considering the high infectivity and mortality rates of COVID-19, early diagnosis of the disease is essential. The definitive diagnosis of this disease is made by proving a viral presence in real-time PCR analyses. Due to factors such as the high number of samples, limited number of staff trained in performing the aforementioned tests Nasopharyngeal swabs were obtained from 282 suspected cases and of these, 163 patients were confirmed positive for COVID-19 by RT-PCR. Out of all the patients diagnosed with COVID-19, 69.3% were males and the average age was 46.2 ± 15.5 years. The average age was found to be lower in males compared with females. In a study conducted by Guan et al., the median age was 47 and 52.1% of the patients were male [15]. Another study by Li et al. revealed that 56% of all patients were male and the median age was 59 [16]. Furthermore, another study conducted by Xu et al. showed a median age of 41 and 56% of the patients were male [17]. Thus, it can be said that COVID-19 is seen more frequently in males and in middle-aged patients.

Upon evaluation of common complaints during ER visits, fever, cough and a sore throat were the most observed, followed less often by myalgia, malaise and fatigue. The results of this study were found to be noticeably compatible with that of previous research. The research conducted by Yang et al. also revealed fever and cough to be the most common complaints [18]. In a study by Guan et al., fever and cough and less frequently nausea, vomiting and diarrhea, were observed [15]. The study by Huang et al. showed that fever (40/41 patients [98%]), cough (31/41 patients [76%]) and myalgia or fatigue (18/41 patients [44%]) were the most commonly seen symptoms at onset of the disease [7].

In the results of this study, which are also consistent with previous research, low thrombocyte, leukocyte and neutrophil counts were revealed in COVID-19 positive patients. Thus, it can be said that thrombocytopenia leukopenia and neutropenia may be indicative of COVID-19 disease. Likewise, thrombocytopenia and leukopenia were noted in Guan et al.'s study [15]. The thrombocyte count was also found to be low in the study by Assiri et al. [19] and leukopenia was noted in another study conducted by Xu et al. [17]. In general, while the leukocyte count was lower than 10,000 in viral pneumonias, leukocytosis was seen in bacterial pneumonias with a leukocyte count of more than 50,000 [20]. Additionally, Xu et al. revealed in their study that thrombocyte counts are significantly low in pneumonia patients and that this decrease is directly proportional to the patients' clinical status [21]. In a study by Fan et al. mild thrombocytopenia and leukopenia was observed in some patients at first admission who were COVID-19 positive [22]. The effects of viral pneumonia on the immune system show a decrease in thrombocyte, leukocyte and neutrophil counts.

Also, hemoglobin levels in COVID-19 positive patients were found to be significantly higher than in COVID-19-negative patients. While no significant difference was observed among females regarding hemoglobin, higher hemoglobin levels were seen in COVID-19 positive male patients. It is possible that these results are also affected by other reasons, such as the presence of comorbidities or anemia, and habits such as cigarette smoking. The patient files used for this study did not include a detailed patient history, and thus, their effect on hemoglobin levels were not accounted for. Also, the normal hemoglobin level in the female population is lower than that of males [23]. Since around 70% of the positive patient group is comprised of males in this study, this is likely to also have an effect on the results.

An apparent relationship, although not certainly proven, exists between a bacterial infection and neutrophilia, and a viral infection and lymphocytosis. Accordingly, NLR of peripheral blood has been used to distinguish between these types of infections [24,25]. In a retrospective study concerning hospitalized patients with a fever of an unknown origin, it has been shown that NLR is higher in those with fever due to bacterial infections than those with fever due to a viral etiology [26].

Similarly, this study found a significantly lower NLR at first visit to the ER for patients with positive test results. Low NLR levels can therefore possibly be used as a diagnostic marker for COVID-19. The following has been observed for NLR: AUC = 0.739, cut-off = 1.8, specificity = 0.765 and sensitivity = 0.595.

A recently proposed prognostic score is the SII, which relies on

thrombocytes, neutrophils and lymphocytes. As an index defining the instability in the inflammatory response, the SII has been proposed as a prognostic indicator in the follow-up of sepsis patients [29]. In addition, SII has been found to be useful in predicting the prognosis of small cell lung cancer and hepatocellular carcinoma [30,31]. In this study, SII was found to be significantly low for COVID-19-positive patients, meaning that it can also be used while diagnosing COVID-19. The cut-off value for SII was noted as being ≤ 479.1 , and the AUC = 0.760 with a sensitivity of 74.9%, and a specificity of 68.9%.

CONCLUSION:

the results demonstrate that low values for NLR, SII, absolute neutrophil and lymphocyte counts, and PLTs may have diagnostic properties concerning COVID-19.

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