



PATTERN OF THE HEMATOLOGICAL PARAMETERS IN COVID-19 PATIENTS

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ABSTRACT **Background:** The coronavirus (SARS CoV 2)-related viral disease COVID 19 causes acute respiratory disease with severe symptoms. Numerous biomarkers of infection and inflammation have been found to influence the severity of disease. Acute respiratory infection, fever, pneumonia, cough, tiredness, and inflammation are frequent clinical findings during hospitalisation. The severity of the disease and a possibility of disease progression can be determined by circulating biomarkers like TWBC count, NLR and CRP that reflect inflammation. **Material and Methods:** This is a retrospective study conducted on eighty COVID-19 positive patients admitted at Dr.Pinnamaneni Siddhartha Institute of Medical Sciences & RF, ChinnaAvutapally from 1st January 2021 to 30th June 2021. Results: Among the 80 COVID 19 patients studied, there are 63% males and 37% females. 46% of patients showed leucocytosis, 43% showed increased NLR and 60 % showed raised CRP. **Conclusion:** Hematological parameters in COVID 19 are important for diagnosis, complication management, prognosis, and patient recovery. These parameters must be effectively integrated into clinical algorithms and therapeutic decision making in addition to clinical assessment.

KEYWORDS : COVID 19 disease, pandemic, corona virus, hematological parameters, NLR, CRP

INTRODUCTION

The WHO has classified the 2019 Corona virus disease (COVID-19), which is caused by the SARS-CoV-2 virus, as a global pandemic. Fever, coughing, tiredness, or shortness of breath are common symptoms of COVID 19. Multi-organ failure and acute respiratory distress syndrome (ARDS) are potential outcomes of the disease, which can be fatal. It presents as a broad spectrum of symptoms varying from asymptomatic to critically ill. Patients with COVID-19 infection have dysregulated immune systems.

Alterations in various hematological parameters in COVID 19 have recently been recorded in the international literature. When the SARS-CoV2 virus infects the lungs, it causes a cytokine storm with markedly increased levels of interleukins and TNF, which may promote lymphocyte death. The prognosis of patients with COVID 19 may be predicted by circulating biomarkers that provide information on immunological and inflammatory function.¹

MATERIALS AND METHODS

The present study is a retrospective study conducted on eighty COVID-19 positive patients admitted in our Hospital from 1st January 2021 to 30th June 2021. A COVID-19 positive case is defined as a patient confirmed with positive result on RT-PCR. In these patients Total WBC count, NLR and CRP are studied. The samples of blood collected after admission were processed in six part automated hematology analyzer for CBC and in chemistry auto-analyzer for CRP. NLR is calculated as the ratio of absolute neutrophil count (ANC) and absolute lymphocyte counts (ALC).

STATISTICAL ANALYSIS & RESULTS

The data collected is analysed by descriptive statistics and the results are presented in the following tables and chart. Among the 80 patients studied, there are 50 (63%) males and 30 (37%) females with an age range from 15 to 84 years.

Figure 1: Histogram showing the demographic distribution of data of COVID-19 positive patients. (n=80)

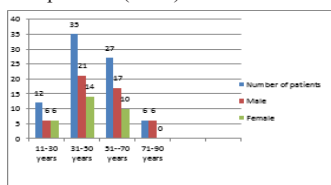
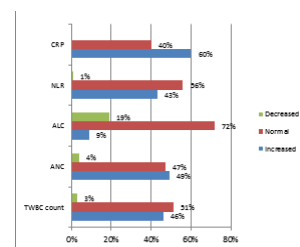


Table 1: Statistical Results of analysed laboratory parameters in COVID 19 patients

S.NO	VARIABLES	MEAN+/-SD	RANGE	MEDIAN
1	TWBC COUNT (x109/L)	11+/-4.6	2.8-22	10.4
2	ANC (x109/L)	8+/-3.9	1.4-18.4	7.5
3	ALC (x109/L)	2.5+/-1.6	0.3-8.5	2
4	NLR	4.9+/-4.6	0.001-22.7	3
5	NLR in DIABETICS (n=17)	8.9+/-2.6	4.16-12.92	8.5
6	NLR in NON-DIABETICS (n=63)	3.9+/-4.5	0.01-22.7	2.68
7	NLR in HYPERTENSIVE S (n=15)	6.3+/-6.2	1-12.7	4
8	NLR in NORMOTENSIV ES (n=65)	4.5+/-4.2	0.001-12.92	2.9
9	CRP (mg/L)	19.3+/-23.7	0.06-138.2	11.7

Figure 2: Histogram showing distribution of various hematological parameters in COVID-19 positive patients. (n=80) CRP-C- Reactive Protein, NLR- Neutrophil Lymphocyte Ratio, ANC- Absolute Neutrophil Count, ALC- Absolute Lymphocyte Count



DISCUSSION

In this study most of the COVID 19 patients belonged to age group of 31-50 years (44%) and there is male predominance (63%) whereas in studies by Pujani, M. et al.² and Patel, K. A. et al.³, majority are >50 years

and showed male predominance^{3,4}. According to Urbano, M. et al.⁵, leucocytosis, neutrophilia, and lymphopenia were the major hematological abnormalities seen in COVID-19 and similar results are reported in other studies². A study by Elderderly, A. Y. et al.⁶ found no significant difference in Total White Blood Cell count. 46% of patients in this study showed leucocytosis which is in agreement with other studies.^{3,5} According to Zhu, B. et al⁷, higher levels of WBC count ($6.16 \times 10^9/L$) should receive more attention in the treatment of COVID-19 as they may be associated with increased death rate. 3% of patients showed leucopenia in this study. Lymphopenia is frequently observed in majority of the studies⁵ on COVID 19 patients like Patel, K. A. et al.³, Pujani, M. et al.² and it is strongly correlated with severity of the illness. It occurs as a consequence of the cytotoxic effects of SARS-CoV-2 on lymphocytes. In our study lymphopenia is observed in 19% of patients. A decreased lymphocyte count and a lower proportion of helper T cells are seen in patients with severe pneumonia due to immunological paralysis caused by virus.⁸ When compared to individual cell counts, the derived inflammatory index, NLR, accurately represents the hematological condition.² The neutrophil-lymphocyte ratio (NLR) has gained recognition as one of the newer indicators of immunological damage and inflammatory response in recent years. The NLR can also be utilised as a marker for sepsis in severely ill patients.⁹ Several cytokines are produced in response to neutrophils. A significant factor in the severity of COVID-19 may be an abnormal host immune response and cytokine storm. The function of hematopoietic cells, particularly of neutrophils and lymphocytes, may be significantly affected as a result of the inflammatory cytokines.² The lymphocyte count declines when IL-6 levels are high. Elevated NLR1 is the outcome of both of these causes.¹ In this study 49% of patients showed neutrophilia and 34% showed elevated NLR. Elevated NLR and its association with disease severity are reported by Pujani, M. et al.², Toori, K. U. et al.¹ and many other studies.^{5,9,10,11} In this study 17 patients are diabetics and 15 patients are hypertensives and in these patients, NLR is elevated more than those without comorbidities which is in agreement with the study by Anurag, A. et al.¹² NLR is an effective early prognosticator of a poor outcome during hospitalisation. When compared to individuals with a milder form of COVID-19, people with severe illness had considerably higher NLR at admission.¹³ CRP is a non-specific acute-phase protein generated by hepatocytes and acts as an early indicator of inflammation or infection. The immune system's classical complement cascade is activated by CRP.¹¹ The importance of CRP in the opsonization of infectious pathogens and dead or dying cells is supported by the fact that it modifies the activity of phagocytic cells.¹⁴ Acute lung damage is aggravated by elevated viral load and high CRP values.⁴ In COVID-19 patients, inflammatory cytokines and tissue damage cause CRP production.¹⁵ The management of COVID-19 patients can be guided by the CRP level at admission, which is a sensitive and early predictor of the severity of the disease.¹⁴ An elevated risk of disease progression and mortality may be indicated by a CRP of 40 mg/L at admission.¹⁶ Ahnach, M. et al.¹⁴ demonstrated that patients with COVID-19 had higher CRP levels.^{4,11} In this study CRP is increased in majority of the patients (60%).

CONCLUSION

In COVID-19 patients, reliable biomarkers are necessary for resource allocation, high risk patient categorization and efficient medical care. Physicians can help COVID-19 patients to receive immediate medical attention by evaluating laboratory markers. Lower lymphocyte counts, higher TWBC counts, higher NLR levels and elevated CRP levels are more common in severe cases. These inflammatory and haematological markers can help to lower disease morbidity and mortality.

LIMITATIONS

This study is a single-center study. These conclusions need to be further verified by larger samples and multi-center data. We were unable to completely rule out the effects of other medications received before hospital admission, which could have led to an overestimation of the NLR

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