IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 22, Issue 6 Ser.9 (June. 2023), PP 17-22
www.iosrjournals.org

Prognostic Role Of Neutrophil To Lymphocyte Ratio In COVID-19 Patients In A Tertiary Care Hospital : A Retrospective Study.

Dr Pratibha Meena[1], Dr Shailendra Meena[2] , Dr Rajnikant Ahirwar [3] , Prof. Dr. Gopal Krishna Sawke[3]

[1](Department of Pathology, Atal Bihari Vajpayee Government Medical College ,Vidisha, Madhya Pradesh, India)

[2] (Department of Community Medicine, Atal Bihari Vajpayee Government Medical College ,Vidisha, Madhya Pradesh, India)

[3](Department of Pathology, Atal Bihari Vajpayee Government Medical College ,Vidisha, Madhya Pradesh, India)

[3](Department of Pathology, Atal Bihari Vajpayee Government Medical College ,Vidisha, Madhya Pradesh, India)

Abstract:

Background*: The Coronavirus disease 2019 (COVID-19) is a highly contagious disease . It continues to spread rapidly and causes serious morbidity and mortality in the patients. Circulating biomarkers that can evaluate inflammation and immune status, can be potentially useful in diagnosis and prognosis of COVID-19 patients. Therefore, in the present study , we assessed the potential of the neutrophil to lymphocyte ratio (NLR) as an indicator of severity in severe versus nonsevere COVID-19 cases.*

Materials and Methods*: In this retrospective observational study age, gender, Total Leucocyte Count (TLC), Absolute Neutrophil Count (ANC), Absolut Lymphocyte Count (ALC) and Neutrophil-to-Lymphocyte Ratio (NLR) of 80 patients with laboratory confirmed COVID-19 were investigated and compared among severe and non severe cases. Suitable statistics were applied to compare the data.*

Results*: In the present study we analyzed 80 covid – 19 positive patients, which included 40 severe COVID-19 patients and 40 non severe COVID-19 patients. Maximum number of patients were male (68.8%). Mean age of study group was 52.12 year. We found statistically significant association between age and severity of Covid-19 disease. TLC, ANC, ALC and NLR were found to be statistically significantly associated with the severity of the Covid-19 disease.*

Conclusion: *In present study we found that age and NLR were found to be significantly higher in patients of COVID-19 with severe disease, reflecting an enhanced inflammatory process and a poor prognosis. This dynamic change of Neutrophil to Lymphocyte ratio (NLR) can discriminate severe COVID-19 cases from Non-severe ones. However a multicentric, prospective research is needed to further clarify the role of NLR in COVID-19 patients.*

Key Word*: Coronavirus disease 2019 (COVID-19), Neutrophil-to-Lymphocyte ratio (NLR), Age, Laboratory tests.*

Date of Submission: 08-06-2023 Date of Acceptance: 18-06-2023

I. Introduction

COVID 19 has been declared a pandemic by World Health Organization on the 11th March 2020 and since then it has rapidly spread throughout the world. Initially, there were many cases of pneumonia of unknown etiology reported in Wuhan, China **[1]** **.** The disease had similarities to severe acute respiratory syndrome and has been named as the 2019-novel coronavirus disease by the World Health Organization (WHO). As COVID-19 spreads rapidly and causes serious harm , it is important to continuously improve its clinical diagnosis and treatment research **[2]** . This is a highly contagious virus, mainly transmitted through respiratory droplets and close contact. The COVID -19 infection causes wide range of clinical symptoms, including asymptomatic, nonsevere, and severe forms, which can rapidly lead to death **[3]** . Studies have found that patients with severe pneumonia had a lower lymphocyte count and a lower percentage of helper T cells, as well as slow lymphocyte recovery. This may be related to virus-mediated immune paralysis **[4]** . The neutrophil to

lymphocyte ratio (NLR) is a convenient index that can be calculated from a complete blood count.It has been found in studies that the neutrophil to lymphocyte ratio (NLR) can predict disease severity in patients with COVID-19 infection [5]. The neutrophil-to-lymphocyte ratio (NLR) is also an indicator of the systematic inflammatory Response [6] . Higher values of NLR have been associated with more severe forms of illness with the worst prognosis [7]. A high incidence of lymphopenia in COVID- 19 patients has been reported by Cao and his colleagues [8]. Thus, it is important to consider whether NLR might be a potential predictor for critical illness of COVID-19 [9].

The present study aims to assess the utility of Neutrophil Lymphocyte Ratio in identifying disease severity and to compare and correlate the NLR ratio in patients with severe and non severe COVID -19.

II. Material And Methods

This was a retrospective, observational study conducted at Atal Bihari Vajpayee Government Medical College And Hospital, a Tertiary care hospital, from Vidisha District in the state of Madhya Pradesh

.

Study Design: Retrospective observational study

Study Population: The study included 80 patients with confirmed SARS-COV 2 infection consecutively hospitalized between October 2020 to December 2020. COVID-19 diagnosis was confirmed using reverse-transcriptase polymerase-chain-reaction (RT-PCR) assay to test nasal and pharyngeal swab specimens according to WHO guidelines. The patients were either asymptomatic or had a severe or non severe form of the disease.

Inclusion criteria

Included all hospitalized patients over 18 years old with confirmed COVID-19 infection.

Exclusion criteria

Patients with confirmed COVID- 19 and with other comorbidities such as cancer, hematological diseases, severe cardiac disease (cardiac failure, recent myocardial infarction , unstable arrhythmia), liver disease, and pulmonary fibrosis.

Non-severe patients

Met following conditions:
(1) Epidemiology history
(2) Fever or other respiratory symptoms
(3) covid care centre or isolation ward admission
(4) Positive result of real time reverse transcriptase PCR.

Severe patients

Additionally met at least one of the following conditions:
(1) Shortness of breath, RR ≥ 30 times/min,
(2) Oxygen saturation (Resting state) ≤ 93%,
(3)ICU admission.

Only the laboratory-confirmed cases with real time reverse transcriptase PCR were included in the study.

Data Collection: Demographic, clinical, laboratory, and treatment data were taken from the laboratory records . NLR ratio was calculated as the absolute count of neutrophils divided by the absolute count of lymphocytes. Blood examinations involved measuring complete blood cell count and differential Values . All laboratory tests were done in the hospital laboratory with standard procedures .

Statistical Analysis : It was performed using EPI info software. Arithmetic means and standard deviation was calculated for quantitative variables.The comparison of two means was performed using Unpaired t-test. Frequencies were compared with the Chi-square test. A value of $P<0.05$ was considered statistically significant.

III. Result

In the present study, we analyzed 80 covid – 19 positive patients, which included 40 patients with severe COVID-19 and 40 patients with non severe COVID-19. Maximum number of patients were male (68.8%). Mean age of study group was 52.12 years. Mean TLC of the study group was 9378 cells/mm^3, mean ANC was 7376 cells/mm^3, mean ALC was 1499 cells/cumm and Mean NLR was 6.93. We found statistically

significant association between age and severity of Covid-19 disease, gender was not significantly associated with the severity of the Covid -19 disease. TLC, ANC, ALC and NLR were found to be significantly associated with the severity of the Covid-19 disease.

Table 1 : Demographic and baseline characteristics of Covid-19 patients (N= 80)

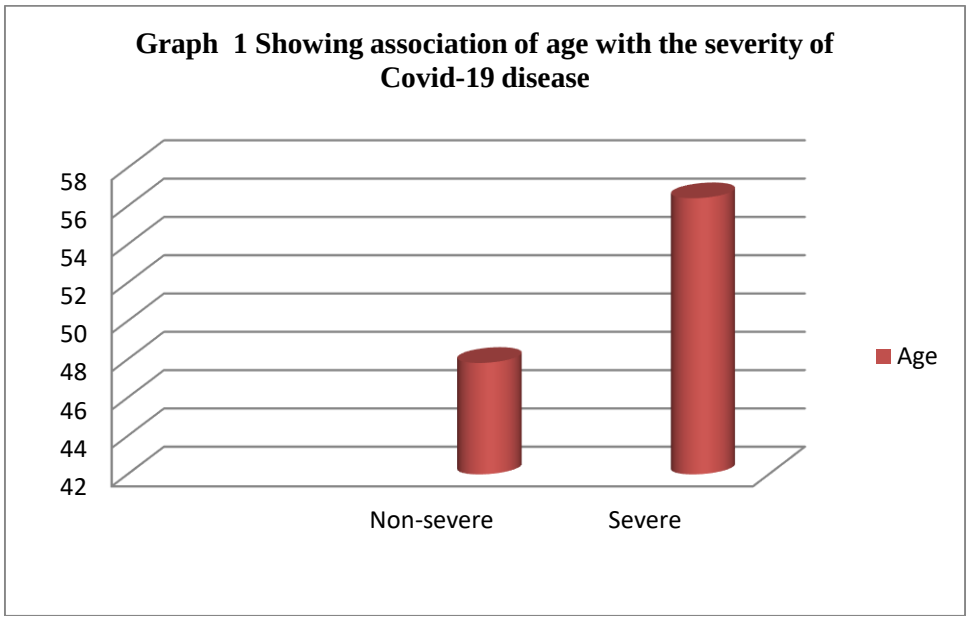
S. No	Patient Characteristics		Value (N=80)
1	Age (Years)	Mean ± SD	52.12 ± 16.1
2	Gender	Male	68.8% (55)
		Female	31.3% (25)
3	Severity	Non severe	50% (40)
		Severe	50% (40)
4	Total leucocyte count (cells/mm^3)	Mean ± SD	9358.8 ± 5600.2
5	Absolute Neutrophil count (cells/mm^3)	Mean ± SD	7376 ± 5485.4
6	Absolute Lymphocyte count (cells/mm^3)	Mean ± SD	1499.9 ± 820.4
7	Neutrophil lymphocyte ratio	Mean ± SD	6.93 ± 6.74

Table no 1 Shows demographic profile and baseline characteristics of Covid – 19 patients.There were total 80 patients , 40 in the non severe group and 40 in the severe group. Maximum number of patients were male (68.8%). Mean age of study group was 52.12 year. Mean TLC of study group was 9358 cells/mm^3 , mean ANC was 7376 cells/mm^3 , mean ALC was 1499 cells/mm^3 and mean NLR was 6.93.

TABLE 2 Association of Age and Gender with the severity of Covid-19 disease

Patient Characteristics		Non-severe (Mean ± SD)	***Severe*** (Mean ± SD)	***Test statistic***	P
Age		47.82 ± 16.32	56.42 ± 14.87	2.46	0.01
Gender	Male	26	29	0.524	0.469
	Female	14	11		

Table no 2 shows association of age and gender with the severity of Covid-19 disease. Unpaired t test and Chi-square test was applied. Age was significantly associated with the severity of the Covid-19 disease (P=0.01).

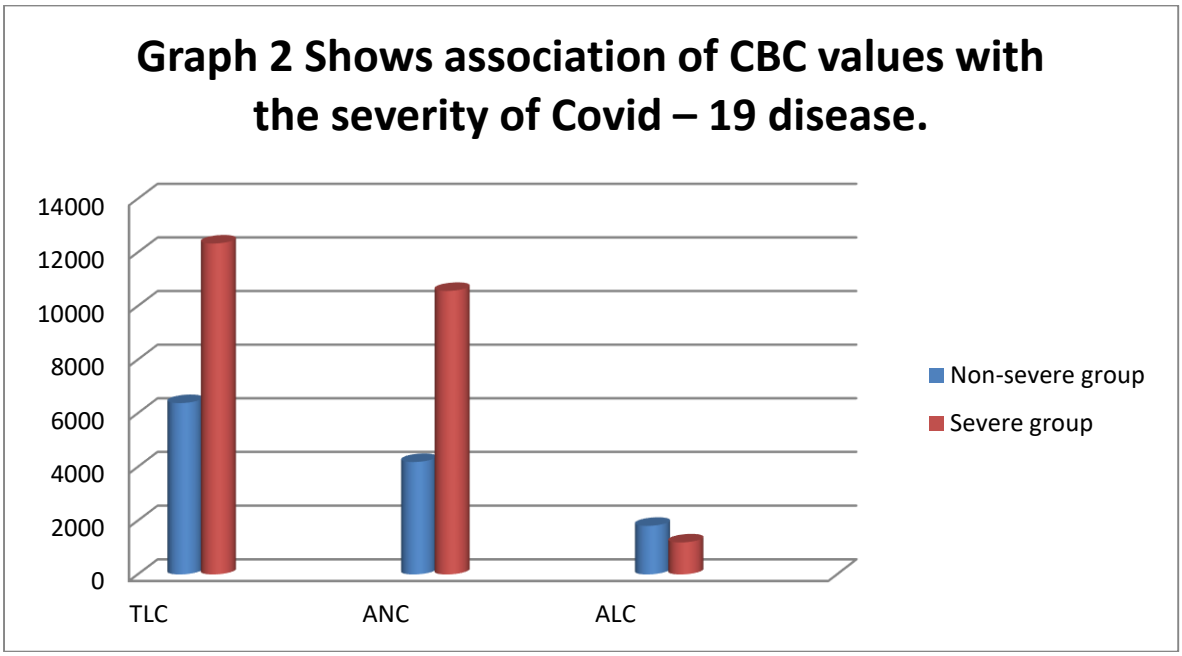


Graph 1 shows association of age with the severity of Covid-19 disease. Age was significantly associated with the severity of the Covid-19 disease .

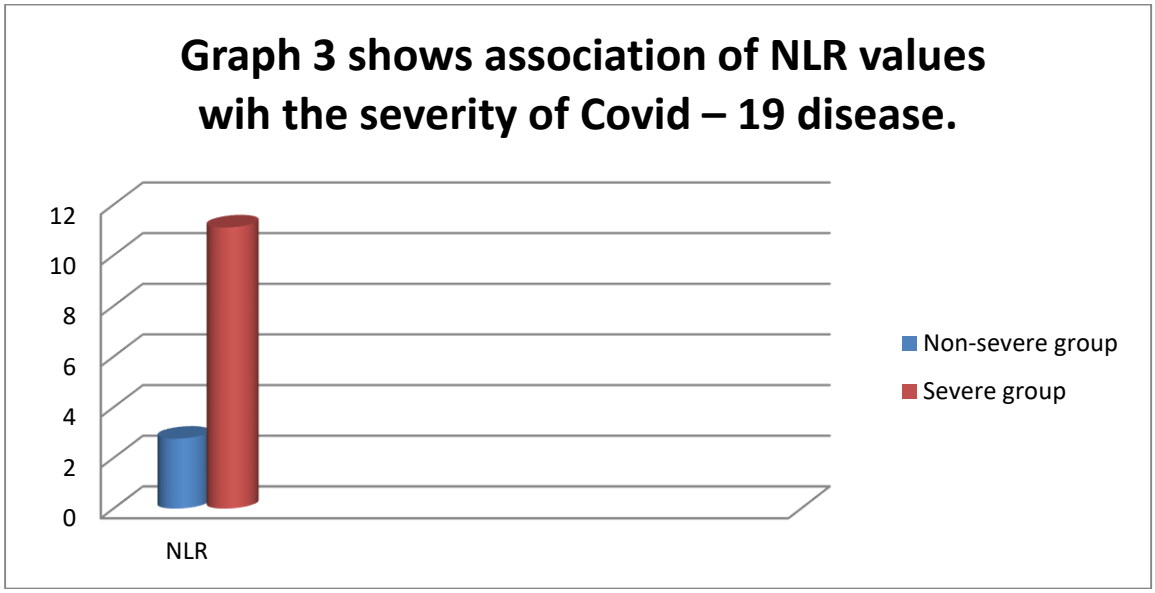
Table 3. Association of CBC values and Covid-19 disease severity

VARIABLE	Non-severe group (n=40) Mean ± SD	Severe group (n=40) Mean ± SD	P value
TLC	6382 ± 3316	12335 ± 5861	0.001
ANC	4185 ± 2940	10566 ± 5605	0.001
ALC	1808 ± 904	1191 ± 592.5	0.001
NLR	2.76 ± 2.5	11.1 ± 8.81	0.001

Table 3 shows association of CBC and NLR values with the severity of Covid – 19 disease. We found that TLC , ANC and ALC were significantly associated with the severity of the Covid – 19 disease. The NLR (Neutrophil to Lymphocyte Ratio) is also found to be significantly associated with the severity of the disease. Unpaired t test was applied as test of significance with the P Value of < 0.05 .



Graph 2 Shows association of CBC values with the severity of Covid – 19 disease. We found that TLC and ANC was significantly associated with the severity of the Covid – 19 disease.



Graph 3 shows association of NLR values with the severity of Covid – 19 disease. We found that NLR was significantly associated with the severity of the Covid – 19 disease.

IV. Discussion

COVID-19, is a highly infectious disease caused by SARS-CoV-2, which mainly targets the lungs and in severe cases may result in multiorgan injury and death [4] . SARS-CoV-2 binds to the alveolar ACE2 receptors and induces the release of inflammatory factors, which in turn activate the immune system, leading to a cytokine storm [10, 11]. Thus, timely and accurate identification of severe COVID-19 cases after diagnosis is important for the immediate treatment of high-risk patients. Significantly lower lymphocyte and higher neutrophil counts have been observed in patients with severe COVID-19 compared to those with mild disease [12] . The present study aimed to compare the prognostic value of NLR for prediction of COVID-19 severity.

The present study included 80 patients admitted to hospital with positive RT-PCR tests for COVID-19. Most patients were non-smokers, not diabetic, non hypertensive. In present study we observed highly significant positive relationships between COVID-19 severity and neutrophil levels, total leukocyte counts and NLR. We also observed a significant negative association between lymphocyte levels and COVID-19 severity.

The results of several previous studies agree with the data reported here, showing that severe COVID-19 (including fatal cases) was associated with higher neutrophil counts , lower lymphocyte counts and high NLR compared with non severe COVID-19 cases [4,5,7,9] .

Similar results were obtained by Yang et al . They proposed that elevated NLR is an independent prognostic biomarker for COVID-19 patients [2]. The findings of Sayed and co-workers agreed with our results and showed that NLR was of prognostic value in COVID- 19 patients and should thus be closely monitored [13].

The present study was conducted to compare the prognostic value of total leucocyte counts, neutrophil counts, and NLR in predicting COVID-19 severity.

V. Conclusion

The present retrospective study focuses on hematological parameters in patients with severe COVID-19 disease when compared with non severe patients. It evaluates easily accessible and widely uses

inflammatory markers (neutrophils, lymphocytes ,NLR) in COVID-19 patients.The present study concludes that NLR can serve as a prognostic marker to predict the severity of COVID- 19, which can permit laboratory-based differentiation of nonsevere and severe cases. Early recognition of the severe cases allows for timely initiation of management. This marker is cost-effective and easily accessible in all laboratories. However, further studies with larger sample size are needed to confirm these findings by including patients from different ethnic backgrounds and geographic regions.

References

[1]. Q. Li, X. Guan, P. Wu, X. Wang, L. Zhou, Y. Tong, R. Ren, K.S.M. Leung, E.H.Y. Lau, J.Y. Wong, et al., Early transmission dynamics in Wuhan, China, of novel coronavirus- infected pneumonia, N. Engl. J. Med. (2020) 10–1056.

[2]. Yang AP, Liu JP, Tao WQ, Li HM. The diagnostic and predictive role of NLR, d-NLR and PLR in COVID-19 patients. Int Immunopharmacol. 2020;84:106504. doi:10.1016/j.intimp.2020.106504N.

[3]. Chen, M. Zhou, X. Dong et al., "Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study," Lancet, vol. 395, no. 10223, pp. 507–513, 2020.
[4]. Ying Wang, Jingyi Zhao, Lan Yang, Junhui Hu, Yinhui Yao, "Value of the Neutrophil-Lymphocyte Ratio in Predicting COVID-19 Severity: A Meta-analysis", Disease Markers, vol. 2021, Article ID 2571912, 10 pages, 2021.
[5]. Gelzo M, Cacciapuoti S, Pinchera B, De Rosa A, Cernera G, Scialò F, Mormile M, Fabbrocini G, Parrella R, Gentile I, Castaldo G. Prognostic Role of Neutrophil to Lymphocyte Ratio in COVID-19 Patients: Still Valid in Patients That Had Started Therapy? Front Public Health. 2021 Jun 15;9:664108. doi: 10.3389/fpubh.2021.664108. PMID: 34211953; PMCID: PMC8239130.
[6]. Sengul EA, Artunay O, Kockar A, Afacan C, Rasier R, Gun P, et al. Correlation of neutrophil/lymphocyte and platelet/ lymphocyte ratio with visual acuity and macular thickness in age-related macular degeneration. Int J Ophthalmol. 2017; 10 (5). PMID: 28546933
[7]. Man MA, Rajnoveanu RM, Motoc NS, Bondor CI, Chis AF, Lesan A, Puiu R, Lucaciu SR, Dantes E, Gergely-Domokos B, Fira-Mladinescu O. Neutrophil-to-lymphocyte ratio, platelets-to-lymphocyte ratio, and eosinophils correlation with high-resolution computer tomography severity score in COVID-19 patients. PLoS One. 2021 Jun 28;16(6):e0252599. doi:10.1371/journal.pone.0252599. PMID: 34181675; PMCID: PMC8238190.
[8]. Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet. 2020;395(10223):497–506.
[9]. Liu, J., Liu, Y., Xiang, P. et al. Neutrophil-to-lymphocyte ratio predicts critical illness patients with 2019 coronavirus disease in the early stage. J Transl Med 18, 206 (2020).
[10]. Z. Xu, L. Shi, Y. Wang et al., "Pathological findings of COVID- 19 associated with acute respiratory distress syndrome," The Lancet Respiratory Medicine, vol. 8, no. 4, pp. 420–422, 2020.
[11]. X. H. Yao, T. Y. Li, Z. C. He et al., "A pathological report of three COVID-19 cases by minimal invasive autopsies," Zhonghua Bing Li Xue Za Zhi, vol. 49, no. 5, pp. 411–417, 2020.
[12]. N. Chen, M. Zhou, X. Dong et al., "Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study," Lancet, vol. 395, no. 10223, pp. 507–513, 2020.
[13]. Sayed AA, Allam AA, Sayed AI, et al. The use of neutrophil-to-lymphocyte ratio (NLR) as a marker for COVID-19 infection in Saudi Arabia: A case-control retrospective multicenter study. Saudi Med J 2021; 42: 370–377.