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Evaluation of Neutrophil Lymphocyte Ratio In Patients of Stable and Acute Exacerbation of Chronic Obstructive Pulmonary Disease

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ABSTRACT
COPD is a heterogeneous lung condition characterized by chronic respiratory symptoms (dyspnea, cough, expectoration) due to abnormalities of airways (bronchitis, bronchiolitis) or alveoli (emphysema) that causes persistent, often progressive airflow limitation. Post Bronchodilation FEV1/FVC <0.70 confirms the diagnosis of COPD. Neutrophil Lymphocyte Ratio is a tool which helps to find out the severity of disease and also the activity status of the disease in COPD patients. NLR can also predict the prognosis of the COPD patient by comparing it with the BODE index. To calculate Neutrophil-Lymphocyte Ratio and differentiate between Stable and Acute Exacerbation of COPD. The study was performed at AIMSR, Bathinda wherein 55 patients each of Stable COPD and Acute Exacerbation of COPD (AECOPD) were enrolled. The Neutrophil Lymphocyte Ratio was calculated from Haemogram of patients. Continuous variables were summarized as mean with standard deviation and compared between groups using Unpaired t test. In Stable COPD, the mean NLR of patients was 2.0038±.2070 and in Acute Exacerbation COPD, the mean NLR of patients was 4.8022±.3822. NLR is an easily available biomarker of inflammation and can be used as a predictor of exacerbation in patients of COPD. The severity of the exacerbation state can be stated by the NLR value without the help of spirometry. NLR can also predict the prognosis of the COPD patient by comparing it with the BODE index.

INTRODUCTION

A significant worldwide public health issue, COPD is typified by abnormalities in the alveoli and/or inadequately reversible airflow restriction. It is frequently associated to the disease's progression, persistent respiratory symptoms and, in certain cases, recurrent acute exacerbations[1]. The 4th most frequent reason for passing away globally in 2012 was COPD, which accounted for 6% of all deaths. It is anticipated that the frequency of COPD would rise during the next 10 years. The conventional understanding of pathophysiology of COPD identifies persistent lung parenchymal inflammation and airways to growth of goblet cells, gland hyperplasia, fibrosis, small airway collapse and parenchymal injury[2]. There is mounting proof that COPD can also cause extra pulmonary symptoms and systemic inflammation[3]. Individuals with COPD exacerbation that is sudden (AECOPD) showed more severe systemic and airway inflammation than individuals with stable illness. AECOPD is linked to longer treatment plans, declining lung function, more severe clinical symptoms, increased hospital and critical care unit admission rates, among other things[4]. Infections with bacteria or viruses are the main cause of COPD exacerbations., other microorganisms or other factors account for 15% to 20% of cases. In ordinary clinical practice, little is known about inflammatory indicators in stable and agitated patients. However, because of its price, use and accessibility, a recent study has demonstrated that the Neutrophil-Lymphocyte Ratio (NLR) is a frequently done test as well as a trustworthy indicator of inflammation throughout the body. The ratio between these two groups has been measured in a number of diseases, such as end-stage renal illness, lung cancer, colorectal cancer and acute coronary syndrome. Based on the circulating leukocytes' typical reaction to inflammatory stressors, this results in neutrophils and lymphocytes are rising[5]. With 3 million deaths, COPD is a long term lung obstructive condition[6]. One of the main pathogenic causes of COPD is persistent inflammation of the airways, which is followed by changes in the structure and constriction of the small airways[7]. The use of pulmonary biomarkers to monitor and assess airway inflammation in COPD patients is growing. The systemic inflammatory response, which is closely linked to the co-occurring diseases in patients, is another significant feature of COPD. Recently, there has been interest in the Neutrophil-Lymphocyte Ratio (NLR) in peripheral blood as a possible indicator of systemic inflammation. For a number of solid tumours, NLR has been studied independently for prognostic prediction, such as stomach, ovarian, lung, colorectal, pancreatic, breast and pancreatic cancers. Furthermore, for patients with a range of cardiovascular illnesses (CVDs), NLR may be able to predict cardiovascular outcomes independently[8]. Nevertheless, despite COPD being a chronic inflammatory disease, little study has been done on the function of NLR in people with this condition. The current standard of therapy for patients with severe episodes of AECOPD is Non-Invasive Ventilation (NIV)[9]. Those in NIV group experienced fewer complications and shorter stays in the hospital and critical care unit when compared to those receiving IMV. On the conversely, the patient's NIV failure rate with AECOPD is about 20%. In contrast to patients who were intubated without participating in a NIV trial, NIV is linked to increased death odds and a composite complication risk (desaturation, hypo tension, or aspiration). The death rate (29.3%) is lower for AECOPD patients who begin IMV treatment early than those who do so later[10]. In contrast, patients with high-risk AECOPD individuals for NIV failure had a decreased hospital death rate when they were intubated early. Thus, it is recommended to increase the early diagnosis accuracy for patients with AECOPD for whom NIV would not be beneficial. Because it is inexpensive and simple to measure, the ratio of neutrophils to lymphocytes (NLR) in peripheral blood is being investigated more and more as a possible indicator of systemic inflammation. Numerous investigations discovered that a higher NLR was linked to a worse outcome in specific therapeutic contexts[11]. As the NLR level rose, individuals with chronic obstructive pulmonary disease (COPD) that is stable, displayed a marked deterioration in clinical symptoms and life quality. Additionally, both in absolute and anticipated values, there was an inverse connection between NLR levels and the forced expiratory volume (FEV1) in first second, a measure of airway tightness. It has been demonstrated that NLR is a more accurate indication of AECOPD than other traditional inflammatory markers. Chronic inflammation of the airways, both systemic and localized, is a feature of COPD. Studies showed that AECOPD patients in the failure group had greater serum levels of inflammatory indicators (PCT and CRP) compared to individuals who had successful NIV[12]. Consequently, patients who respond to inflammation more strongly may be more likely to experience NIV failure. This prospective observational study looked into the possible advantages of NLR for people with COPD. We assessed the potential of NLR to predict the requirement for respiratory hospitalization and could function as a biomarker for an aggravation of COPD.

MATERIALS AND METHODS

Setting: Institutional Study Duration-1 year for data collection.

Type of Study: Cross Sectional Study.

Subjects: Stable and Acute Exacerbation of Chronic Obstructive Pulmonary Disease (COPD) patients.

Table 1: Distribution of Mean Total Leucocyte Count (TLC): Group

		No.	Mean	SD	Min	Max	Median	T Statistic
TLC	Acute Exacerbation COPD	55	12954.54	2402.14	8600.00	17200.00	12900.00	12.91
	Stable COPD	55	8445.45	964.71	5600.00	10000.00	8700.00	

Table 2: Distribution of Mean Neutrophil (N) Count: Group

		No.	Mean	SD	Min	Max	Median	T Statistic
N	Acute Exacerbation COPD	55	393.27	126.52	160.00	650.00	400.00	16.84
	Stable COPD	55	105.00	9.76	90.00	125.00	105.00	

Table 3: Distribution of Mean Lymphocyte (L) Count: Group

		No.	Mean	SD	Min	Max	Median	T Statistic
L	Acute Exacerbation COPD	55	82.03	26.85	35.00	160.00	84.00	7.78
	Stable COPD	55	52.90	6.99	40.00	70.00	50.00	

Table 4: Distribution of Mean Eosinophil Count (E): Group

		No.	Mean	SD	Min	Max	Median	T Statistic
E	Acute Exacerbation COPD	55	3.94	2.88	0.00	12.00	4.00	8.27
	Stable COPD	55	0.56	0.93	0.00	5.00	0.00	

Table 5: Distribution of Mean Neutrophil-Lymphocyte Ratio (NLR): Group

		No.	Mean	SD	Min	Max	Median	T Statistic
NLR	Acute Exacerbation COPD	55	4.80	0.38	3.88	5.50	4.87	47.74
	Stable COPD	55	2.00	0.20	1.69	2.55	2.00	

Sample Size: 110 patients using Danial's Formula.

Sample Size = $\dfrac{Z^2 (1-P)}{D^2}$

Where Z is Level of Confidence (1.96) P is Prevalence (7%). D is Precision (5%).

Place: Department of Respiratory Medicine.

Inclusion Criteria: Stable or Acute Exacerbation of COPD patients aged >40 years.

Exclusion Criteria: Patients diagnosed as Bronchial Asthma, Bronchiectasis, Bullous Lung disorders, Pulmonary Tuberculosis, Malignancy, Hepatic disease, Renal disease, Myocardial Infarction, Pneumonia, Dementia.

RESULTS AND DISCUSSIONS

In Acute Exacerbation COPD, mean TLC (Mean±SD) of patients was 12954.54±2402.14. Mean±SD. In Stable COPD, mean TLC (Mean±SD) of patients was 8445.45±964.71. Distribution of mean TLC with Group was statistically significant (p<0.0001).

In Acute Exacerbation COPD, mean N (Mean±SD) of patients was 393.27±126.52. Mean±SD. In Stable COPD, mean N (Mean±SD) of patients was 105.00±9.76. Distribution of mean N with Group was statistically significant (p<0.0001).

In Acute Exacerbation COPD, mean L (Mean±SD) of patients was 82.03±26.85.In Stable COPD, mean L (Mean±SD) of patients was 52.90±6.99. Distribution of mean L with Group was statistically significant (p<0.0001).

In Acute Exacerbation COPD, mean E (Mean±SD) of patients was 3.94±2.88. In Stable COPD, mean E (Mean±SD) of patients was 0.56±0.93. Distribution of mean E with Group was statistically significant (p<0.0001).

In Acute Exacerbation COPD, mean NLR (Mean±SD) of patients was 4.80±0.38. In Stable COPD, mean NLR (Mean±SD) of patients was 2.00±0.20. Distribution of mean NLR with Group was statistically significant (p<0.0001).

The present study was a Cross Sectional Study and Institutional Study. This Study was conducted from 1 year for data collection at Department of Respiratory Medicine. Total 110 patients were included in this study, 55 patients were Stable COPD group and 55 patients were Acute Exacerbation COPD group.

- In our study, the mean TLC was higher in Acute Exacerbation COPD Group [12954.54±2402.14] compared to Stable COPD Group [8445.45±964.71] and this was statistically significant (p<0.0001).
- In our study, the mean Neutrophil count was higher in Acute Exacerbation COPD Group [393.27 ±126.52] compared to Stable COPD Group [105.00 ±9.76] and this was statistically significant (p<0.0001).
- In our study, the mean Lymphocyte count was higher in Acute Exacerbation COPD Group [82.03 ±26.85] compared to Stable COPD Group [52.90±6.99] and this was statistically significant (p<0.0001).
- In our study, the mean Eosinophil count was higher in Acute Exacerbation COPD Group [3.94±2.88] compared to Stable COPD Group [0.56 ±0.93] and this was statistically significant (p<0.0001).
- In our study, the mean Neutrophil-Lymphocyte Ratio was higher in Acute Exacerbation COPD Group [4.80±0.38] compared to Stable COPD Group [2.00±0.20] and this was statistically significant (p<0.0001).

CONCLUSION

- In our study, the mean TLC was higher in Acute Exacerbation COPD Group compared to Stable COPD Group and this was statistically significant.
- In our study, the mean Neutrophil count was higher in Acute Exacerbation COPD Group compared to Stable COPD Group and this was statistically significant.
- In our study, the mean Lymphocyte count was higher in Acute Exacerbation COPD Group compared to Stable COPD Group and this was statistically significant.
- In our study, the mean Eosinophil count was higher in Acute Exacerbation COPD Group compared to Stable COPD Group and this was statistically significant.
- In our study, the mean Neutrophil-Lymphocyte Ratio was higher in Acute Exacerbation COPD Group compared to Stable COPD Group and this was statistically significant.

The Neutrophil-Lymphocyte Ratio (NLR) is a valuable biomarker in assessing the inflammatory status of patients with Chronic Obstructive Pulmonary Disease (COPD). In patients with stable COPD, the NLR remains relatively low, reflecting controlled inflammation. However, during Acute Exacerbations of COPD (AECOPD), the NLR significantly increases, indicating heightened systemic inflammation. This elevation correlates with the severity of the exacerbation and the clinical outcomes. Monitoring NLR can, therefore, serve as a simple, cost-effective tool for clinicians to predict exacerbations, tailor treatments and potentially improve patient management. Further research is warranted to establish standardized NLR thresholds for clinical decision-making in COPD management.

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