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Acomparative analysis of neutrophil to lymphocyte ratio in chronic obstructive pulmonary disease patients and healthy individuals

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***Abstract**:*

Background/aims: COPD is among the significant health complications in entire world; studies have shown that there is systemic inflammation with pulmonary inflammation in case of COPD. To detect the systemic inflammatory response, neutrophil lymphocyte ratio (NLR) in peripheral blood which is important biomarker. NLR hasn't been studied in patients having chronic obstructive pulmonary disease (COPD). Current study was targeted to determine the importance of NLR as inflammatory marker in patients with COPD.

Methods: The neutrophil and lymphocyte count in the peripheral blood was found out from blood count (CBC) reports. The NLR was determined by dividing neutrophil count from lymphocyte count. COPD patients were diagnosed with Spirometry. Then the NLR was compared in patients having stable COPD (n = 50), and healthy controls (n = 50.

Results: The neutrophil count was considerably greater in COPD patients matched with the healthy individuals (p < 0.001) whereas the lymphocyte count was suggestively lower in patients having COPD patients when compared to perfectly healthy individuals (p < 0.001).NLR values were considerably higher among patients with stable COPD patients than controls (p < 0.001). There were no noteworthy variance in the total leucocyte of COPD patients and healthy individuals.

Conclusion: It is concluded that the increase in the neutrophil-lymphocyte ratio in COPD patients compared to healthy individuals may be an indicator of systemic inflammation in patients with COPD.

Keywords: neutrophil count, lymphocyte count, neutrophil-lymphocyte ratio,COPD

1. INTRODUCTION:

COPD is among the major health problems across entire globe, characterized by almost irreversible airflow limitation and/or abnormalities at the alveolar level. The main feature of COPD are persistent respiratory symptoms, the progression of the disease, and, in a few

patients, even acute exacerbations occur[1]. The acute exacerbation in COPD is mostly due to infections in the respiratory tract, and there is an upsurge in the number of 'acute-phase proteins' and also a rise in the circulatory inflammatory cells in [2-4]. However, even in stable COPD patients few patients show low-grade systemic inflammation and have amplified level of many 'inflammatory markers' like C-reactive protein (CRP), and there is also an increase in the leucocyte count [5]. Recently it has been emphasizedsystemic inflammation plays an essential part in the pathogenesis of COPD. One of the significant component COPD is a systemic inflammatory response and is closely associated with a no. of comorbid conditions in patients with COPD[6,7,8]. The total Leucocyte count, as well as its subtypes, are the commonly used inflammatory markers [9,10].During stressful conditions, due to the physiological response of the leucocytes the neutrophil count increases and the lymphocyte countdecreasesin the circulation, the ratio of the two parameters to one another is utilized in clinical practices[11].Recent studies show, the neutrophil-lymphocyte ratio (NLR) is repeatedly assessed to find out possible role in inflammationin chronic diseases [12,13,14]. Neutrophil-lymphocyte ratio (NLR) is a considered as novel biomarker inflammatory state that indicates the immune system balance and reflects systemic inflammation. However, though NLR is studied broadly in a number of disorders complicated with acute and chronic inflammation but, the relationship of this biomarker, with COPD, has least been evaluated. Thus, in this study, we have compared the NLR in healthy individuals with COPD patients and tried to establish the relationship between NLR and COPD.

2. MATERIAL AND METHODS

The study took place in the Physiology Department of IMS and SUM Hospital, during the period between July 2019 and September 2019. The current study included a total of 100 subjects consisting of 50 stable COPD patients admitted to Pulmonary Medicine Department and 50 healthy individuals (apparently healthy individuals, age as well as sex-matched group not suffering from COPD or any other disease). We excluded the COPD patients possessing other respiratory diseases, malignancy or any other inflammatory diseases. This study took place after sanction from the institutional ethical committee. After providing informed consent, the patients underwent full medical history taking, complete physical examination and chest radiograph examination. The lung function tests were carried out using Spirometry. Spirometric- indices were calculated using best of three technically satisfactory trials following the recommendation of American Thoracic Society [15]. The diagnosis of COPD patients was based on modified criteria by GOLD 2017 guideline [16]."Stable COPD patients are those who didn't have any major alterations in symptoms over the last 3 months and the patients who didn't need any additional inhaler treatment dosages or may be other additional treatments"[17].

In the study population (both healthy subjects and COPD patients) "complete blood count (CBC), Erythrocyte sedimentation rate (ESR) and C-Reactive protein (CRP)" were measured from peripheral venous blood samples. The ratio between neutrophil and lymphocyte were determined by dividing neutrophil count with the lymphocyte count.

Statistical Analysis: Mean and standard deviation was used to express quantitative. To compare two independent groups the Student's t-test was used. Qualitative data were expressed in number and percentage. P-value of 0.05 or less was considered to be statistically significant.

3. RESULT

Study was conducted on 50 healthy individuals taken like control group as well as 50 stable (COPD) patients taken as a study group. The demographic data study group (stable COPD group) and control group (healthy individuals) has been demonstrated in Table 1. Table 2 represents the comparative studies among the study group as well as the healthy control group. Significant rise of the mean neutrophil count among the study participants compared to the healthy control group with P <0.0001 was registered, also a substantial increase of the mean "neutrophil to lymphocyte ratio" in stable COPD group than the healthy control group, P <0.0001. While there was a important decrease of lymphocyte count in the study group than in the healthy control group, P <0.0001. But we found the mean total leucocytic count between the study group and healthy control group hadno significant difference with p= 0.795.

Table 1: The demographic data of the study and control groups**.**

VARIABLES		STUDY GROUP n = 50	CONTROL GROUP n = 50
AGE		55.45 ± 4.8	55.50 ± 4.6
SEX	Male	30 (60%)	25 (50%)
	Female	20(40%)	25 (50%)

Table2: Comparison of leucocyte parameters in the study and control group

STUDY PARAMETERS	STUDY GROUP n = 50	CONTROL GROUP n = 50	P VALUE
TOTAL LEUCOCYTE COUNT ($\times 10^9$/L)	5.16 ± 0.66	5.20 ± 0.99	0.795
NEUTOPHIL COUNT ($\times 10^9$/L)	4.63 ± 0.65	2.93 ± 0.51	< 0.0001
LYMPHOCYTE COUT ($\times 10^9$/L)	1.56 ± 0.44	2.15 ± 0.67	< 0.0001
NLR %	3.19 ± 0.97	1.55 ± 0.45	< 0.0001

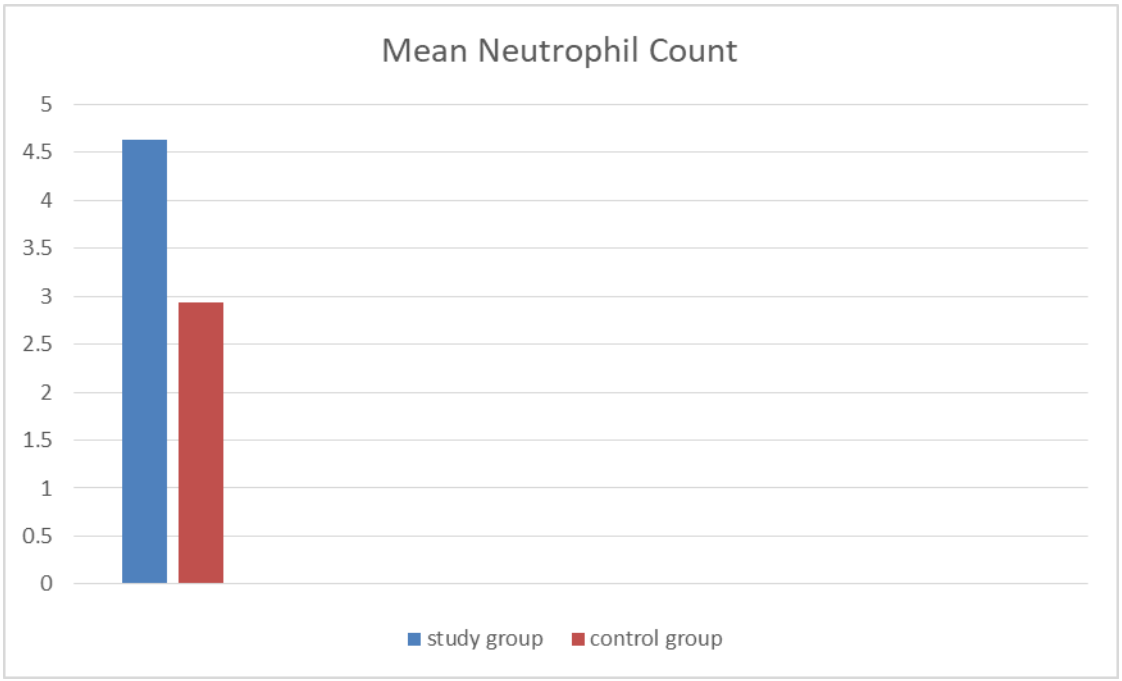

Figure 1: Comparison of mean neutrophil count ($\times 10^9$/L) between the study and control group

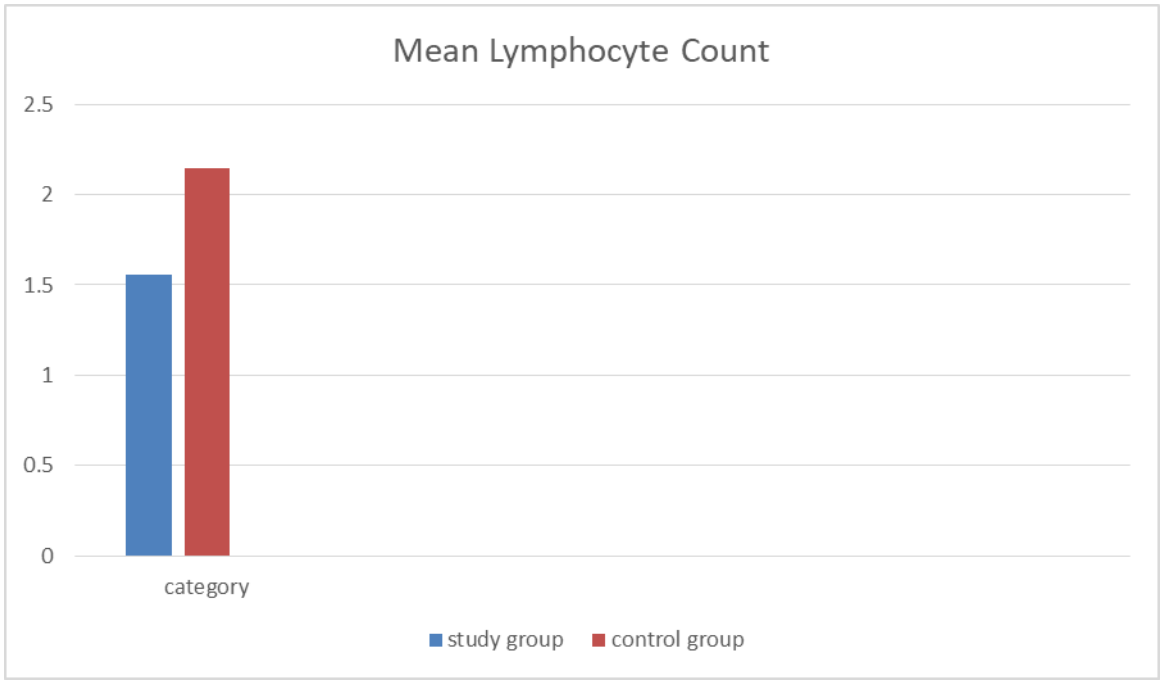

Figure 2: Comparison of mean lymphocyte count ($\times 10^9$/L) between the study and control group

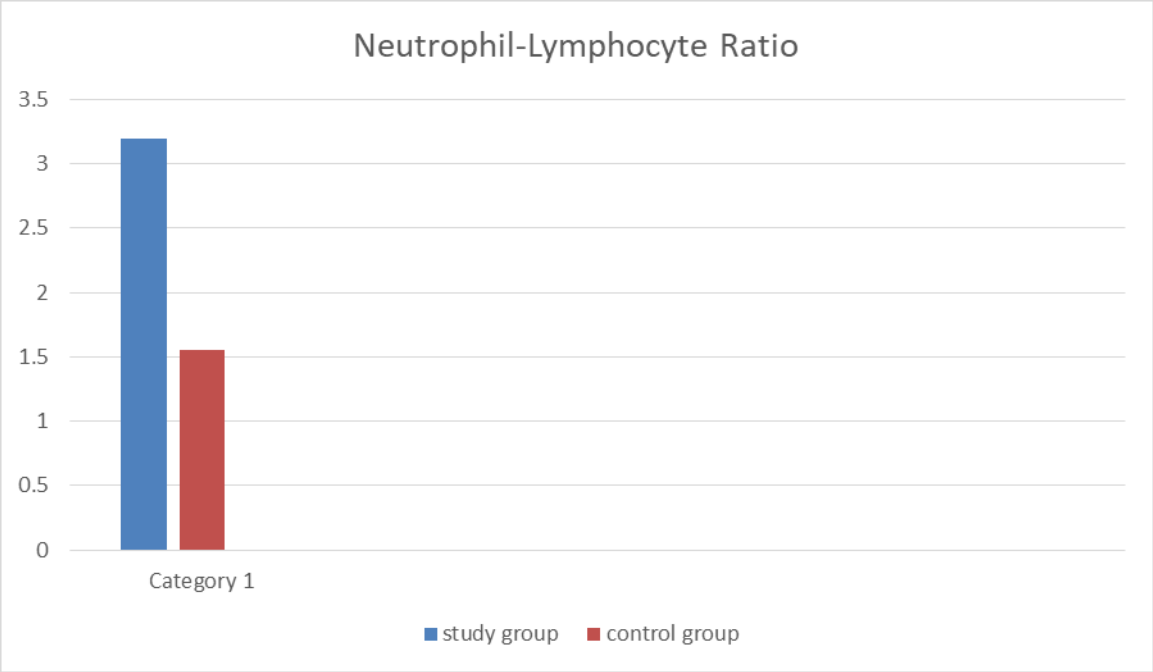

Figure 3: Comparison of mean neutrophil-lymphocyte ratio (%) between the study and control group

4. DISCUSSION

COPD is one of the major reason of death worldwide [18].In COPD patients there are persistent respiratory symptoms, and also there is a restriction to the airflow due to abnormalities in the respiratory passage and even in some cases alveolar defects which is a result of exposure to harmful particle or noxious gases. COPD is considered to be a preventable as well as treatable disease [19]. There is growing evidence of systemic inflammation and systemic extra-pulmonary features in COPD and is associated with many comorbid conditions[20-22]. According toAgusti[23],COPD is a multicomponent disease and pointed out thatsystemic inflammation plays a pivotal role in the development of comorbid conditions like COPD.

The neutrophil to lymphocyte ratio (NLR) is known as the ratio between neutrophils and lymphocytes in peripheral blood. Recently there is an increasing number of studies on NLR as a marker of systemic inflammatory, as it is a comparativelynot expensive and is available widely as an assessment method, obtained in ablood count analysis. There are studies on NLR in ICU patients as an inflammatory biomarker [24]. Additionally, there are many biomarkers that can predict the existence of low-grade systemic inflammation as leucocytic count, acute phase proteins, and many other inflammatory markers. As per recent studies, NLR is an inflammatory indicator capable of predicting the prognosis of many diseases such as cancer as well as cardiovascular diseases [25,26,27]. Studies on patients in emergency represented that the NLR is a useful predictor of bacteraemia among other routine parameters such as C-reactive protein (CRP) level, WBC count and Neutrophil count[28]. Some of the previous studies have shown that a decline of lung functions in COPD has been associated with a “low-grade systemic inflammation besides the pulmonary inflammation”.

Likewise, we found a significant elevation of the mean (SD) of neutrophil to lymphocyte ratio in stable COPD patient group than the healthy individuals. This result was in agreement with In et al., 2016 study [29], who demonstrated that there was a rise in the ratio between neutrophil and lymphocyte ratio in a stable COPD group when related with the healthy

control group. A study by Jaroenpool et al. 2016 [30] demonstrated a significantly increased of circulating neutrophil percentage with a decrease of phagocytic functions in heavy smoker COPD patients in contrast to circulating lymphocyte percentage which decreased in patients with COPD. In current study, it was found that there was a significant elevation in the levels of circulating total neutrophil count, leukocytic count and neutrophil to lymphocyte ratio, but significantly decrease of lymphocyte count in stable COPD patients than in the healthy control group. This outcome was in alignment with a study done by Günary et al. 2014 [31].Şahin et al. 2019 [32] recognized a lower circulating lymphocyte count in COPD patients along with acute exacerbation than those in a stable stage or healthy control and in lower in stable COPD patients than in healthy control. These results suggested that there is an ongoing mild degree in stable COPD patients. The NL ratio was increased when the severity of COPD was progressed. A similar finding was reported by Yousef and Alkhiary study 2017 [33] who found that NLR was elevated with the severity of COPD. A previous study also showed that the neutrophil to lymphocyte ratio increased with the severity of airflow obstruction and emphysematous change, suggesting that the NLR may reflect the extent of airflow obstruction [34-36].

5. CONCLUSION

From the study, it can be determined that NLR is increased in stable COPD patients in comparison to healthy subjects suggestive of an inflammatory state in COPD patients. The neutrophil to lymphocyte ratio can, therefore, be utilized as a quickly done and cheap follow-up inflammatory marker of COPD patient and also to assess the progression and the severity of the disease. However, more studies over NLR job in dealing with patients having COPD are recommended.

Conflict of interest**:** nil
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