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A COMPARATIVE ANALYSIS OF NEUTROPHIL TO LYMPHOCYTE RATIO BETWEEN CHRONIC OBSTRUCTIVE PULMONARY DISEASE PATIENTS AND HEALTHY INDIVIDUALS

Physiology

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ABSTRACT

Background: COPD is one of the significant health problems in the world. It is associated with systemic inflammation along with pulmonary inflammation. To detect the systemic inflammatory response, neutrophil to lymphocyte ratio (NLR) in peripheral blood is a useful biomarker. This study aimed to evaluate the usefulness of NLR as an inflammatory marker in patients with COPD.

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

Results: The neutrophil count was significantly higher in COPD patients compared to the healthy individuals ($p < 0.001$) whereas the lymphocyte count was significantly lower in patients with COPD patients compared to healthy individuals ($p < 0.001$). NLR values were significantly higher in patients with stable COPD patients than controls ($p < 0.001$). However, there was no significant difference in the total leucocyte of COPD patients and healthy individuals.

Conclusion: We conclude 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.

INTRODUCTION

COPD is one of the major health problems across the world. Recently it has been emphasized systemic inflammation plays an essential role in the pathogenesis of COPD. One of the significant component COPD is a systemic inflammatory response and is closely associated with a number of comorbid conditions in patients with COPD [1,2,3]. The total Leucocyte count, as well as its subtypes, are the commonly used inflammatory markers [4, 5]. In recent studies, the neutrophil-to-lymphocyte ratio (NLR) has frequently been evaluated for its possible role in the inflammation during chronic diseases [6,7,8]. Neutrophil-lymphocyte ratio (NLR) is a considered as novel biomarker inflammatory state which indicates the 'balance of the immune system and reflecting systemic inflammation'. However, though NLR has been studied widely in several disorders complicated with acute and chronic inflammation, 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 find out the correlation between NLR and COPD.

MATERIALAND METHODS

Our study was carried out in the Department of Physiology, 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 the Pulmonary Medicine Department and 50 healthy individuals (age and sex-matched group). We excluded the COPD patients who had other respiratory diseases, malignancy or any other inflammatory diseases. Our study was conducted after approval 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 [9]. The diagnosis of COPD patients was based on modified criteria by GOLD 2017 guideline [10]. "Stable COPD" Patients are those patients who did not have any significant changes in their symptoms in the last three months and the patients who did not require any additional inhaler treatment dosages or any other additional treatments [11].

The neutrophil and lymphocyte count in the peripheral blood was found out from the complete blood count (CBC) reports. The NLR was calculated by dividing neutrophil count by lymphocyte count.

STATISTICAL ANALYSIS: Quantitative data were expressed as the mean and standard deviation. The Student's t-test was used to compare two independent groups. Qualitative data were expressed as number and percentage. A p-value of 0.05 or less was considered statistically significant.

RESULT

The study was conducted on 50 healthy individuals taken as a control group and 50 stable COPD patients taken as a study group. Table 1 shows the demographic data of the study group (stable COPD group) and control group (healthy individuals). Table 2 shows the comparative studies between the study group and the healthy control group. There was a significant increase of the mean neutrophil count in the study group than the healthy control group with P <0.0001, also a significant increase of the mean neutrophil to lymphocyte ratio in stable COPD group than the healthy control group, P <0.0001. While there was a significant decrease of lymphocyte count in the study group than in the healthy control group, P <0.0001. But we found no significant difference in the mean total leucocytic count between the study group and healthy control group 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%)

Table 2: 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

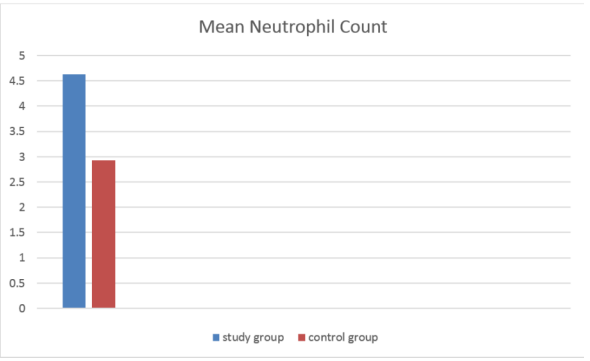

Figure 1: Comparison of mean neutrophil count (×109/L) between the study and control group

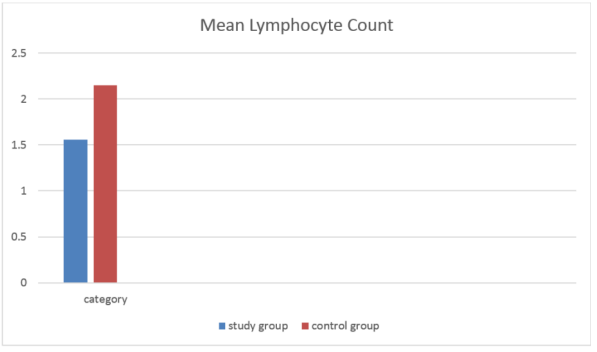

Figure 2: Comparison of mean lymphocyte count (×109/L) between the study and control group

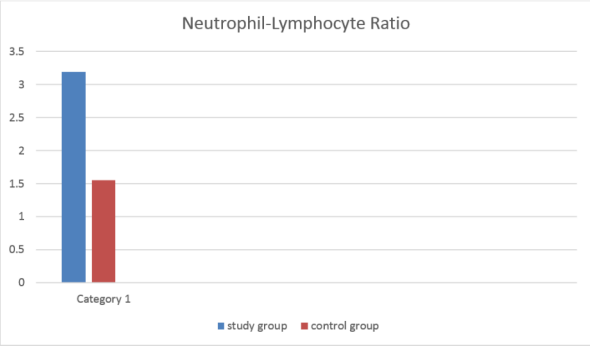

Figure 3: Comparison of mean neutrophil-lymphocyte ratio (%) between the study and control group

DISCUSSION

Chronic obstructive pulmonary disease (COPD) is one of the primary causes of death worldwide [12]. There is increasing evidence of systemic inflammation and systemic extra-pulmonary features in COPD and is associated with many comorbid conditions [13,14,15]. According to Agusti [16], COPD is a multicomponent disease and pointed out that systemic inflammation plays a pivotal role in the development of comorbid conditions like COPD.

The neutrophil to lymphocyte ratio (NLR) is the ratio of neutrophils to lymphocytes in peripheral blood. Recently there is an increasing number of studies on NLR as a marker of systemic inflammatory, as it is a comparatively inexpensive and is available widely as an assessment tool, obtained in a routine blood count analysis. As per recent studies, NLR is an inflammatory indicator that can efficiently predict the prognosis of cancer and cardiovascular diseases [17,18,19].

Likewise, we found a significant elevation of the mean (SD) of neutrophil to lymphocyte ratio in stable COPD patient group than the healthy control group. This result was in agreement with In et al., 2016 study [20], who demonstrated that there was an increase in the neutrophil to lymphocyte ratio in a stable COPD group when compared with the healthy control group. A study by Jaroenpool et al. 2016 [21] 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 COPD patients. In the current study, we found a significant elevation in the levels of circulating total leukocytic count, neutrophil count, and neutrophil to lymphocyte ratio, but significantly decrease of lymphocyte count in stable COPD patients than in the healthy control group. This result was in agreement with a study done by Günary et al. 2014 [22]. Şahin et al., 2019 [23]. The neutrophil to lymphocyte ratio was increased when the severity of COPD progressed. A similar finding was reported by Yousef and Alkhiary study 2017 [24] who found that neutrophil to lymphocyte ratio was elevated with the severity of COPD.

CONCLUSION

From this study, it was concluded 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 used 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, further studies on the role of the NLR in predicting prognosis of patients with COPD are recommended.

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