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Relationship between Peripheral Blood Eosinophil Count and Neutrophil/Lymphocyte Ratio with Number of Attacks Leading to Hospital Admission in Chronic Obstructive Pulmonary Disease

Maryam Mirzaee [1]***, Mohammad Amin Abbasi*** [2]***, Abbas Fadaii*** [1]*******

[1] *Department of Pulmonology and Intensive Care Medicine, Shahid Labbafinejad Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran*

[2] *Firoozabadi Clinical Research Development Unit (FCRDU), Iran University of Medical Sciences (IUMS), Tehran, Iran*

***Corresponding authors:** Abbas Fadaii, **Address**: Department of Pulmonology and Intensive Care Medicine, Shahid Labbafinejad Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran, **Email**: abbasfadaii@gmail.com
Tel: +982151048000

Abstract

***Background & Aims*:** Chronic obstructive pulmonary disease is an important common respiratory disorder. Determination of the prognostic factors is important to improve the outcomes and decrease the burden of problem. We aimed to determine the relationship between peripheral blood eosinophil count and neutrophil/lymphocyte ratio (NLR) with number of attacks leading to hospital admission in patients with chronic obstructive pulmonary disease.

***Materials & Methods*:** In this cohort study, 200 consecutive patients with chronic obstructive pulmonary disease from 2016 to 2018 were enrolled including those with and without attacks leading to hospital admission and eosinophil and NLR were compared in them.

***Results*:** The results in this study demonstrated that mean eosinophil was 1.5 and 1.4 in those without and with attack without significant difference (p=0.641). The mean NLR was 4.6 and 5.9 in those without and with attack with significant difference (p=0.022).

***Conclusion*:** Totally, according to the obtained results, it is concluded that higher NLR is related to further attacks leading to hospital admissions but the eosinophil count has no significant effect in this area.

Keywords: Eosinophil, NLR, COPD, Exacerbation

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Introduction

Chronic obstructive pulmonary disease (COPD) has prevalence rate of 0.2 to 37 percent worldwide with male and early predominance leading to mortality rate of 3 to 111 cases per 100 000 subjects annually (1). It is different by race and geographic distribution (2, 3). Determination of contributing factors for disease severity in COPD cases is important to decrease the burden of disease (4, 5). Global Institute for chronic obstructive lung disease has defined COPD as partially reversible airway obstruction with progressive pattern and abnormal pulmonary pattern against dangerous gas and particles (6, 7). It is the fourth cause of death after

cardiovascular disease, cancer, and vascular disorders (8). It is the fifth disabling disease worldwide (7).

Exacerbations of this disease are related to worse quality of life and increased morbidity and mortality (8, 9). During exacerbations, there is inflammation and three percent increase of neutrophils in airways (10, 11). Corticosteroids are used for treatment of exacerbations (12) and are especially effective in cases with higher inflammation and eosiniphil percentage (13-15). Neutrophils are introduced as novel prognostic markers and predictive for disease severity and exacerbations (16). Determination of the prognostic factors is important to improve the outcomes and decrease the burden of problem. Accordingly, we aimed to determine the relationship between peripheral blood eosinophil count and neutrophil/lymphocyte ratio with the number of attacks leading to hospital admission in patients with COPD.

Methods

In this cohort study, 200 consecutive patients with COPD from 2016 to 2018 in Labafinejad Hospital, Tehran, Iran were enrolled. Inclusion criteria were age range from 20 to 100 years, FEV1/FVC ratio less than 0.7, and minimal 10 pack/year smoking history. Exclusion criteria were systemic corticosteroid use in the last three months and over a 12% increase in FEV1 after bronchodilator use.

Clinical and laboratory assessments:

The study was approved by the ethical committee in Shahid Beheshti University of Medical Sciences, Tehran, Iran including those with and without severe attacks leading to hospital admission and eosinophil and NLR were compared in them. Severe attacks were defined as those needing admission and medium grade was considered as cases that only received corticosteroids with/without antibiotic. Data were gathered from medical documents and recorded in the checklists.

Data analysis was done among 200 cases in two groups by SPSS version 16.0 software. The utilized tests were Kolmogorov-Smirnov, Independent-Sample-T, and ROC analysis. The p-value less than 0.05 was considered statistically significant.

Results

In the present study, 160 male and 40 female patients were enrolled. The mean was 50.23±11.14. Other demographic information can be found in Table 1.

The results in this study demonstrated that leukocyte count was same across the groups (Figure 1, p=0.507). As shown in Figure 2, the mean eosinophil was 1.5 and 1.4 in those without and with attack without a significant difference (p=0.641).

The mean neutrophil count was significantly (p=0.020) higher in exacerbations (Figure 3). The mean lymphocyte count was significantly (p=0.014) lower in exacerbations (Figure 4). The mean NLR was 4.6 and 5.9 in those without and with attack with significant difference (p=0.022). The AUC was 60% and the sensitivity and specificity were 60% by cut-off point of 3.8.

Table 1. Demographic Data of the Study Participants (n = 200)

Characteristic	Total
Age, year	50.23±11.14
Men, n (%)	160 (80%)
Smoking, n (%)	200(100%)
GOLD[a] Stage 2 (%)	120 (60%)
GOLD Stage 3 (%)	80(40%)
Comorbidity	
HTN, n (%)	80(40%)
DM, n(%)	60(30%)
CHF, n (%)	50(43.5)
IHD, n(%)	70 (35%)

a: GOLD: Global Initiative for Obstructive Lung Disease; HTN: hypertension DM: diabetes mellitus; CHF: chronic heart failure and IHD: ischemic heart renal disease

b: Variables are expressed as mean (standard deviation) and categorical data are expressed as number (percentage)

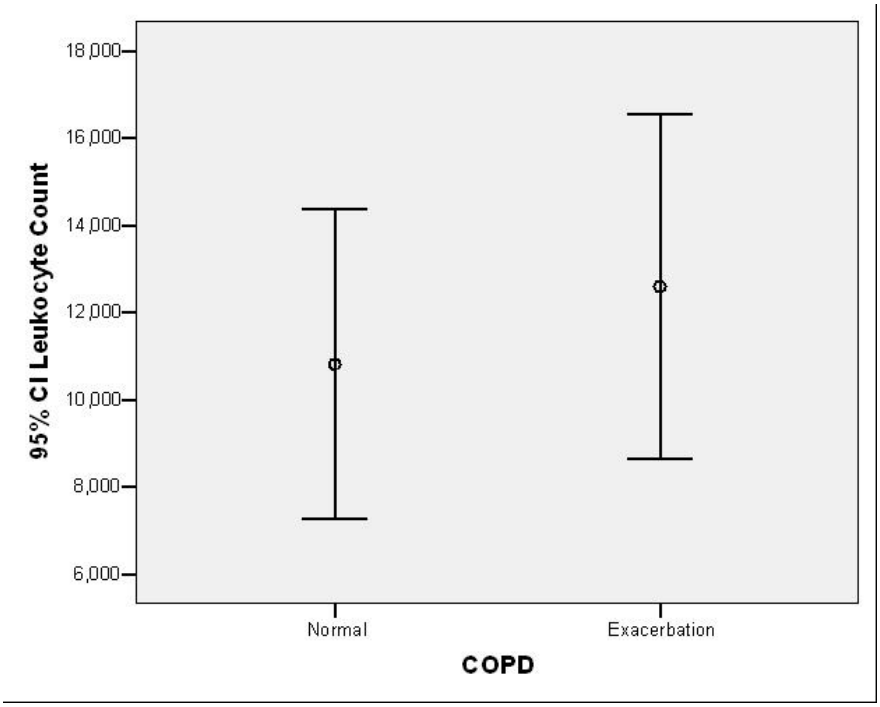

Figure 1: Leukocyte count according to exacerbation

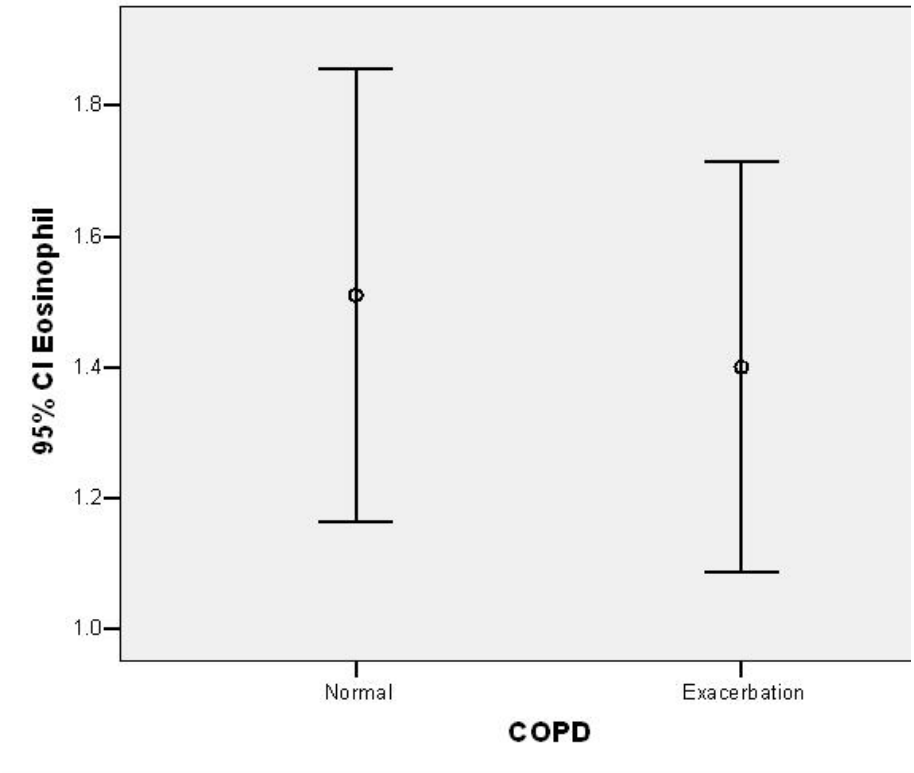

Figure 2: Eosinophil count according to exacerbation

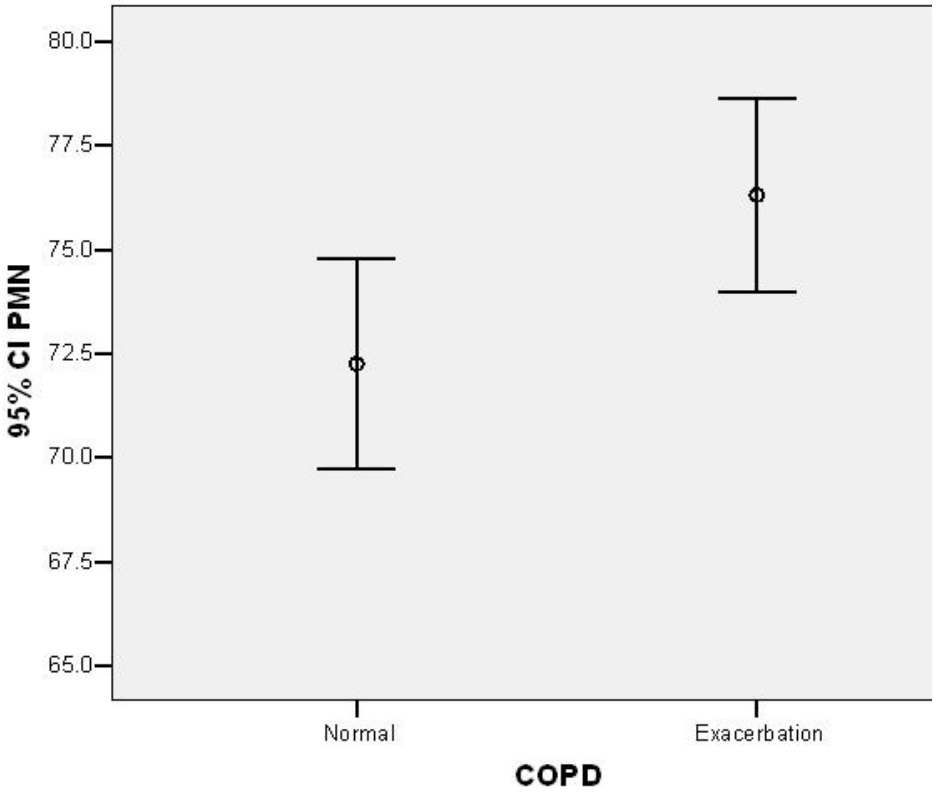

Figure 3. Neutrophil count according to exacerbation

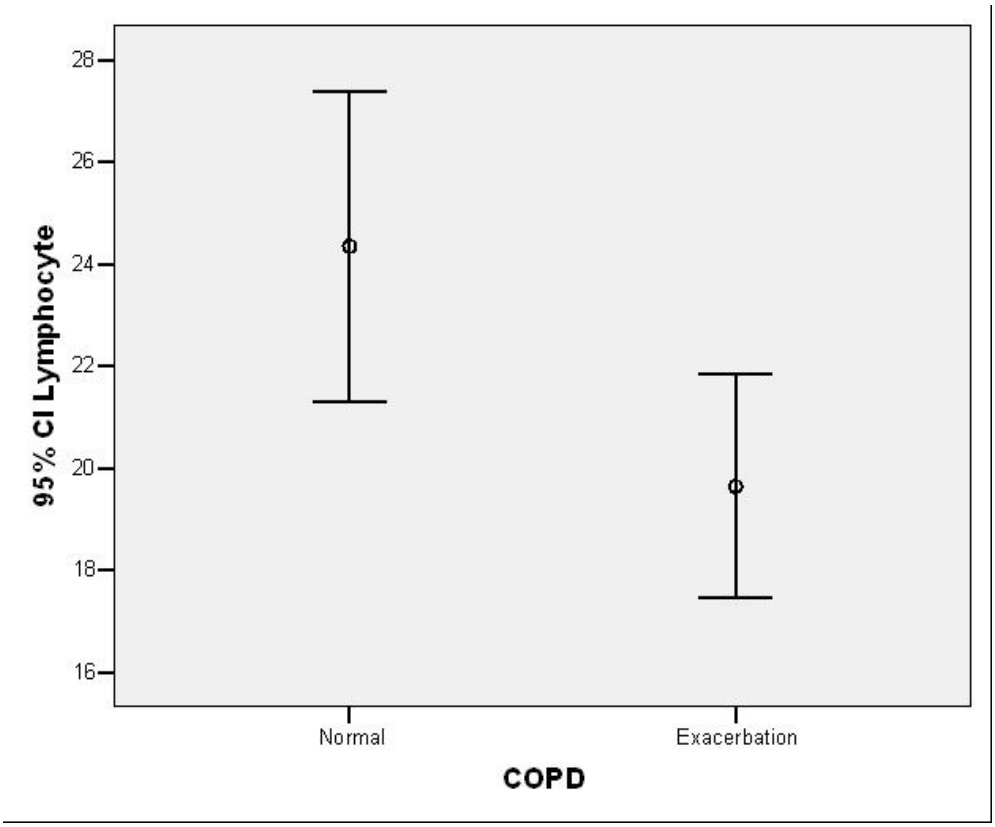

Figure 4. Lymphocyte count according to exacerbation

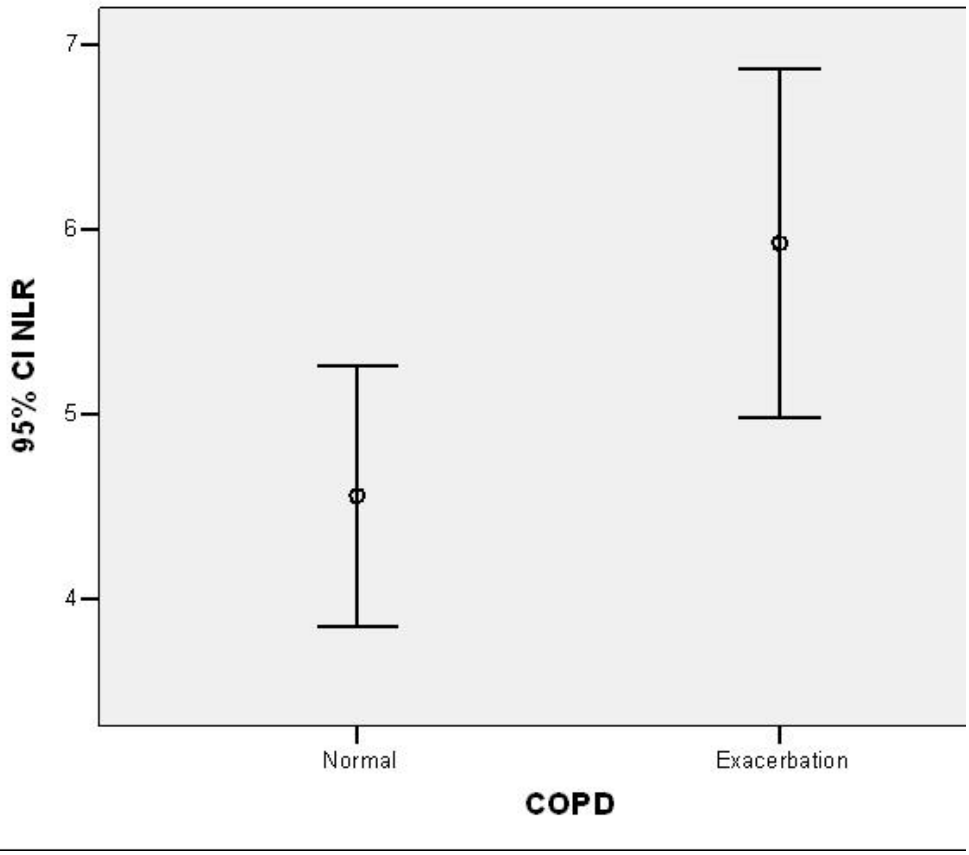

Figure 5. NLR count according to exacerbation

Discussion

This study was done to determine the importance and value of CBC factors especially eosinophil and NLR in prediction of exacerbations. In our study the eosinophil was same between those with and without exacerbations but significantly higher NLR was seen in acute exacerbations. In the current study, the sensitivity and specificity were 60% with cut-off point of 3.8.

Krogh et al. (15) reported that eosinophil over 3.4 was related to exacerbations and the amount was 1.15 and 1.8 for increased risk in severe and medium attacks. The difference in our study was 0.1 that showed no difference. Song et al. (17) assessed 467 cases and found that there is no significant association between exacerbation and eosinophil as well as FEV1. It was in congruence with our study.

Pascoe et al. (18) assessed the possible role of eosinophil for prediction of therapeutic response to inhalational corticosteroids and there was significant role. However, the treatment response was not assessed in our study but may be assessed in future studies. Ye et al. (19) similarly reported that higher NLR is related to higher severity of COPD with significant prognostic role. Also in their study the mortality rate was related to NLR.

Teng et al. (20) assessed 698 cases with COPD and found that AUC was 74 percent with sensitivity and specificity of 61 and 75 percent. The sensitivity was same in our study but the AUC and specificity were lower in our study that may be due to the smaller sample population. Liu et al. (21) reported AUC of 74 percent for NLR with cut-off point of 4.2 and the specificity and sensitivity were 71 and 74 percent, respectively. The cut-off point was near 3.8 points and the sensitivity and specificity were lower in our study. El-Gazzar (22) reported significantly higher NLR in exacerbations that is in line with our findings.

Conclusion

Totally, according to the obtained results, it is concluded that higher NLR is related to further attacks leading to hospital admissions but the eosinophil count

has no significant effect in this area. However further studies with a larger sample size and multi-center sampling are required to attain more definite results. Also, evaluation of the possible role of the other hematological factors is recommended for COPD exacerbations.

Conflict of interest

The authors have no conflict of interest.

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