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Original Research Article

Neutrophil to Lymphocyte Ratio as a Marker of Acute Exacerbation and Disease Severity in Chronic Obstructive Pulmonary Disease at Tertiary Care Hospital

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Abstract:

Background: Our hypothesis is that NLR could be a useful important inflammatory marker that detects the inflammatory status during acute exacerbations of COPD (AECOPD) and could identify early acute exacerbations for early management.

Methods: The cross-sectional study include patients with Chronic Obstructive Pulmonary Disease irrespective of the severity and duration of disease. Study cases are personally interviewed to get relevant details after getting informed signed consent. Based upon inclusion and exclusion criteria a minimum of 100 cases is selected. An exacerbation of COPD is defined as an onset or worsening of more than two respiratory symptoms (ie, dyspnea, cough or wheeze, sputum amount or purulence) for two or more consecutive days.

Results: 46.00% patients' duration of disease was more than 10 year and NLR was 4.45±1.28. The severity wise difference in NLR was statistically significant.

Conclusion: NLR can be used as a new inflammatory marker for assessment of inflammation in COPD patients. It is a good predictor for exacerbation of COPD. It is a quick, cheap, easily measurable with no need for a special request.

Keywords: NLR, COPD, Stable.

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Introduction

Chronic obstructive pulmonary disease (COPD) a preventable and treatable disease which consists of constant expiratory limitation of the flow of air which is not fully reversible. A progressive disease, which comprises of enhanced and chronic inflammatory response to gases and noxious materials of the mucosa of respiratory tract.

Detection of COPD is thought in a patient coming with symptoms of cough, excessive production of sputum, or dysponea, and or exposure to factors which causing the disease will be present.

GOLD defines COPD – "Chronic Obstructive Pulmonary Disease (COPD) is a common, preventable and treatable disease that is characterized by persistent respiratory symptoms and airflow limitation that is due to airway and/or alveolar abnormalities usually caused by significant exposure to gases or noxious particles". [1]

One of the characteristic features of COPD is acute exacerbations, which usually are associated with increased inflammation due to infections (bacterial, viral and combined viral/ bacteria) and or environmental factors. There is a positive relationship between exacerbations of COPD and hospitalization, decline in quality of life and mortality rate. Early detection of acute exacerbation of COPD is essential to avoid these major complications. [2] Inflammation in COPD may be contributed to many celltypes such as the macrophages, the neutrophils and the lymphocytes [3,4]

Table 1: Classification of severity of air flow limitation in COPD as per GOLD criteria

Classification of COPD by impairment of lung function

Stage	Severity	Spirometry (postbronchodilator)
GOLD 1	Mild	FEV_1 ≥80% predicted FEV_1/FVC <0.7
GOLD 2	Moderate	50% ≤ FEV_1 < 80% predicted FEV_1/FVC <0.7
GOLD 3	Severe	30% ≤ FEV_1 < 50% predicted FEV_1/FVC <0.7
GOLD 4	Very severe	FEV_1 <30% predicted FEV_1/FVC <0.7

Neutrophils play an important role in inflammatory conditions more than macrophages. Neutrophils are an important source of proteases, especially reactive oxygen species andneutrophil elastase. They are the hallmark of acute inflammation [5]

Unlike other inflammatory biomarkers e.g., ESR and CRP, the Neutrophil–lymphocyte ratio (NLR) is derived from routine complete blood count (CBC) tests. It does not need a special request. It is also a rapid, easy method, and cost-effective. Many studies have reported an increase of NLR during the inflammatory conditions in different diseases such as pancreatitis, inflammatory bowel diseases, and acute coronary syndrome [6-10]

To our knowledge few numbers of studies have been published about the relationship between neutrophil lymphocyte ratio and respiratory diseases.

Our hypothesis is that NLR could be a useful important inflammatory marker that detects the inflammatory status during acute exacerbations of COPD (AECOPD) and could identify early acute exacerbations for early management.

The aim of this study is to evaluate the potential for NLR to be used as a biomarker of COPD exacerbation.

Materials and Methods

Design of Study: Cross Sectional Study.

Sample Size: 100 patients.

The study includes patients with Chronic Obstructive Pulmonary Disease irrespective of the severity and duration of disease. Study cases are personally interviewed to get relevant details after getting informed signed consent. Based upon inclusion and exclusion criteria a minimum of 100 cases are selected. An exacerbation of COPD is defined as an onset or worsening of more than two respiratory symptoms (ie, dyspnea, cough or wheeze, sputum amount or purulence) for two or more consecutive days.

Inclusion Criteria: Stable diagnosed COPD patients of age 40 years or older who were current or ex-smokers based on clinical history and examination

Exclusion Criteria

- Age < 40 years.
- Patients with and diagnosed as Bronchial Asthma, Bronchiectasis or Bullous lung disorders.
- Patients with active pulmonary tuberculosis.
- Patients with malignancy.
- Patients with hepatic disease, renal disease, myocardial infection.
- Patients with any other acute or chronic infections.
- Patients with pneumonia.
- Patients with dementia.
- atients with Diabetes Mellitus.
- Patients receiving systemic corticosteroids, antibiotics.
- Patients receiving immunosuppressive treatment.

Methods of study: Data is collected using pretest proformas according to the objectives of the study. After getting informed signed consent detailed history and examination will be done in 100 patients included in the study.

Those patients who satisfied all the inclusion and exclusion criteria will be selected for the study

Investigations

1. **Routine Complete Blood Count**

TC, DC (including neutrophil and lymphocyte counts), Hemoglobin percentage.

2. **Blood Biochemistry**

- Random blood sugar Blood urea.
- Serum creatinine.
- Serum electrolytes: Sodium, Potassium.

3. ECG.

4. Imaging Studies.

- CT Chest.
- Chest X ray PA view.

5. Pulmonary Function Test.

6. sputum AFB, sputum culture and sensitivity (if needed).

Statistical Methods: All the dates will be entered in a data collection sheet in an Excel format and analysed using SPSS Software. Numerical values will be reported using mean and standard deviation or median. Categorical values are reported using number and percentages. Probability value (p) value less than 0.05 will be considered a statistically significant.

Results

Table 2: Age Distribution Age in Years

Age (Yrs)	No of patients	NLR
<50	9	4.8±1.34
51-60	31	3.87±1.8
61-70	48	3.62±1.71
>70	12	4.2±1.4

p-value=0.123

48.00% patients were from 61-70 years age groups and NLR was 3.87±1.8,

Table 3: Sex Distribution

Sex	No of patients	NLR
Male	82	3.83±1.5
Female	18	3.89±1.46

p-value=0.242

88.00% patients were male and NLR was 3.83±1.5.

Table 4: Duration Wise Distribution

Duration (Yrs)	No of patients	NLR
<5	30	2.71±1.47
5-10	24	3.99±1.48
>10	46	4.45±1.28

p-value=0.04

46.00% patients' duration of disease was more than 10 year and NLR was 4.45±1.28.

Table 5: Severity Wise Distribution

Severity	No of patients	NLR
Exacerbation	38	4.56±1.81
Stable	62	2.35±1.16

p-value=0.001

The severity wise difference in NLR was statistically significant.

Discussion

The study is a cross-sectional study pattern where neutrophil lymphocyte ratio was obtained for the COPD patients included in the study, and their disease severity and long-term outcome is predicted.

The patients who underwent the study were clinically examined along with detailed history was taken and complete blood count and spirometry was done along with the routine investigations.

It is well known that the leukocyte counts and its subtypes are inflammatory markers [11,12] On exposure to a physiological stress the leukocyte count changes in the circulation. The number of neutrophils increase, while, the number of lymphocytes decrease. Some authors used the ratio of these subgroups to each other as a marker of inflammation [13] AE-COPD is accompanied with deterioration in lung function. Acute exacerbation of COPD increases the hospitalization rate, decreases the lung function, and deteriorates the patient's quality of life. Severe attacks of exacerbated COPD lead to increased mortality raterker. Presence of a

marker for early detection of the of AE is essential to avoid these major complications. [13]

NLR is a cheap inflammatory marker that can be obtained from the routine laboratory investigations. It has a predictive and prognostic values in systemic inflammatory diseases such as inflammatory bowel disease, kidney disease, cardiovascular disease, and familial Mediterranean fever [14]

We aimed in this study to evaluate the potential for NLR to be used as a biomarker of COPD exacerbation. In the current study, we found that the blood leukocytic count, ESR and CRP was higher in stable COPD patients than in healthy subjects. These results indicate that there is a low grade persistent systemic inflammation even in stable COPD patients. This was described in previous studies [15].

Conclusion

NLR can be used as a new inflammatory marker for assessment of inflammation in COPD patients. It is a good predictor for exacerbation of COPD. It is a quick, cheap, easily measurable with no need for a special request.

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