

Evaluation of Absolute Eosinophil Count and Peak Expiratory Flow Rate in COPD Patients

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Abstract

Background: Chronic obstructive pulmonary disease (COPD) is a major public health problem leading to high health care utilizations, poor health-related quality of life, and substantial cost burden and deaths worldwide.

Aim: To assess the peak expiratory flow rate (PEFR) and absolute eosinophil count (AEC) in COPD patients.

Method: This observational study was carried out among 80 COPD patients, volunteers referred from Medicine department of Santhiram Medical College. PEFR recorded was correlated with eosinophils.

Results: The mean PEFR value was 214.7 ± 49.39 and mean absolute eosinophil count value was 749.7 ± 152.01 . There was strong negative significant correlation (-0.80) between PEFR and absolute eosinophil count ($p < 0.05$).

Conclusion: The findings indicated that whenever the blood parameter eosinophils increased, there was a decrease in the PEFR in COPD patients.

Keywords: COPD, Peak expiratory flow rate, absolute eosinophil count.

Introduction

Chronic obstructive pulmonary disease (COPD) is the fourth leading cause of death in India and a major worldwide healthcare problem. Chronic obstructive pulmonary disease (COPD) is characterised by the progressive, partially reversible air flow limitation which occurs in association with a chronic inflammatory reaction triggered by smoking or other inhalation in predisposed subjects^{1,2}. Leucocytes are important cells, which mediate various inflammatory responses. Inflammation has been identified as an important factor for disease exacerbation in obstructive lung disease. In this study, we used neutrophil and eosinophil counts as biomarkers for exacerbation in obstructive lung disease.

It has been suggested that with severe COPD, there is an increased number of leucocytes, which is correlated with PFT suggesting a role for this inflammatory response in the clinical progression of the disease³. Elevated eosinophil blood count has generally been associated with indications of an allergic reaction. Peak expiratory flow rate is a good parameter for detecting patients with COPD and tests of PEFR reflect changes in airways caliber^[8]. So the objective of this study was to investigate the effect of PEFR and circulating eosinophils in COPD patients.

Materials and Method

Study Design: 80 adults (50 males and 30 females) between 40 to 65 years of age were selected for the study. The study group consisted of 80 COPD patients referred from Department of Medicine of Santhiram Medical College, Nandyal. Institutional ethical committee approval was taken before the start of the research and all subjects who participated in the study were given a consent form to sign before the experiment was carried.

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The recordings were collected and completed in Six months duration (Jan-June 2018).

Selection criteria

Inclusion Criteria

- Patients with COPD only.
- Age between 20 - 60 yrs.
- Both gender.
- Chronic bronchitis.
- Emphysema.
- Bronchiectasis.
- Bronchial asthma (with attack and follow-up).

Exclusion Criteria

Subjects with the following diseases were excluded

- Epilepsy.
- Infective diseases.
- Cardiac diseases.
- Mentally retarded subjects.

Absolute Eosinophil Count (AEC): The blood was diluted 10 times in the white blood cell (WBC) pipette, using eosinophil solution, which lyses the red blood cells and leucocytes other than eosinophils so that it can be counted easily in Neubauer counting chamber ⁴

Peak Expiratory Flow Rate(PEFR): A mini Wright peak flow meter was used. The meter was set to zero and subjects blew into the device three times, while standing straight, with the device held horizontal to the mouth, without wearing a nose clip. After proper rest, subjects were asked to take a deep breath and exhale as forcefully as possible in one single blow into the instrument. Subjects were observed carefully in order to assure the correct technique was done during the blowing. After each blow, the meter was always reset to zero before the next reading was taken. The highest of the three readings obtained was taken as the final PEFR for each subject⁵.

Statistical analysis: Data was analyzed using SPSS; version 14 for windows (SPSS Inc., 2005) . Comparisons between groups were performed with Student’s t-test. Pearson correlation analysis was conducted to assess associations between variables. Values of P < 0.05 were considered as statistically significant.

Results

The present study evaluated the absolute eosinophil count and PEFR in COPD patients and also to establish a relationship between absolute eosinophil count and PEFR in COPD The demographic data of COPD patients who participated in the study are shown in Table 1.

From table 2, The mean PEFR value was 214.7 ± 49.39 and mean absolute Eosinophil count value was 749.7 ± 152.01 in COPD patients. On comparing these two values the result showed that there was strong negative significant correlation (-0.73) existing between PEFR and absolute Eosinophil count (p < 0.05), which means decrease in PEFR is associated with increase in AEC.

Table 1: Physiological variables in COPD patients

Physiological Variables		Smoking Volunteers
Mean age (years) ±SD		40.7± 12.8
Sex (%)	Male	54.9%
	Female	25.00%
Mean BMI (kg/m ²)		23.4± 4.1
Exercise (no. of times/month)		0.33± 0.40
Heart Rate (beats/min)		81.6± 9.3
Blood Pressure (mm Hg)	SBP	119.8± 10.8
	DBP	75.1± 8.6

* NS : Not significant.

Table 2: Showing mean PEFR and Absolute Eosinophil Count in COPD patients

Subjects	Mean PEFR ±SD (L/min)	Mean Eosinophil Count ±SD (cells/mm ³)
COPD patients	214.7± 89.9	749.7± 179.2

Discussion

Chronic obstructive pulmonary disease (COPD) is a major public health problem leading to high health care utilizations, poor health-related quality of life, and substantial cost burden and deaths worldwide. COPD affects approximately 10% of adults 40 years of age or older as determined by lung function testing, which is the best marker of the disease. Biomarker measurement

in sputum and blood during acute COPD exacerbations identify four major phenotypic clusters of patients: bacterial (35%), viral (30%), eosinophilic (24%), and paucinflamatory with minimal inflammatory changes (11%)^{6,7,8}.

It has been suggested that with severe COPD there is an increase in number of leucocytes, which is correlated with PFT suggesting a role for leucocytes in this inflammatory response in the clinical progression of the disease. Leucocytes are important haemocytic cells, which mediate various inflammatory responses. Inflammation has been identified as an important factor for disease exacerbation in obstructive lung disease. As the leucocyte have the important role in body's defense mechanism, it is natural that their number increase with the severity of COPD. The present result also supports the above mentioned fact. Further, to find out the relative role of individual leucocytes, the PFTs were compared with different leucocytes.. An increase in the white blood cells that may be produced during an allergic reaction (eosinophils) may indicate that a condition such as asthma is causing the symptoms^{9,10,11}. In our result also, there was significantly high increase in absolute eosinophil count with decrease in PEFr.

Thus, our study concludes that both pulmonary and AEC parameter showed a negative correlation and signifying the inverse relationship between the AEC and pulmonary parameter. This inverse relationship if established may help the family physician to understand the severity of COPD and direct them to the referral centre for early diagnosis and treatment.

Conclusion

In short, the findings of this study indicate that the severity of COPD diagnosed with pulmonary function tests have negative correlation with the AEC, i.e. whenever the blood parameter (eosinophil) increases there was a decrease in the pulmonary test parameter in COPD patients

Conflict of Interest: Nil

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