Eosinophilia in Chronic obstructive pulmonary disease patients: A cross sectional study from Khyber Pakhtunkhwa

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MY FJ ST conceived idea, MY ST FJ LB drafted the study, LB AN NM collected data, MYRU ST did statistical analysis and interpretation of data, MY ST RU critical review manuscript, All approved final version to be published.

Declaration of conflicting interests

The authors declare that there is no conflict of interest.

Abstract

Background: Chronic obstructive pulmonary disease (COPD) is a preventable and treatable disease and is characterized by persistent airflow limitation that is usually progressive and associated with an enhanced chronic inflammatory response in the airways and the lung to noxious particles or gases. To confirm the diagnosis of COPD a simple test, Spirometry is performed. Apart from helping in diagnosis spirometry can also tell us about the stage of COPD. Objective of the present study was to determine the frequency of eosinophilia in chronic obstructive pulmonary disease patients.

Methodology: This cross sectional study was conducted at Pulmonology Department, Ayub Teaching Hospital Abbottabad Pakistan on 118 patients. Study duration was six months, from 26-03-2019 to 25-09-2019. Patients 35-80 years of age and of both gender with diagnosis of Chronic obstructive pulmonary disease (COPD) were included. Patients of Asthma, Allergic bronchopulmonary aspergillosis (ABPA), Churg Strauss syndrome, eosinophilic pneumonias and patients taking oral corticosteroids were excluded from the study.

Results: Among 118 study participants 90 (76.27%) were males and 28 (23.73%) were females. Mean age of study participants was 65.1 (±7.1SD) years. Patients with moderate COPD were 43.2% (FEV1:50%-69%), 29.7% had severe COPD (FEV1:30%-49%) and 27.1% had very severe COPD (FEV1 :< 30%). Among all COPD patients 71.2% were smokers and 28.8% were nonsmokers. The frequency of Eosinophilia in COPD patients was 38.1%.

Conclusion: Eosinophilia is present in a considerable number of patients with COPD and is more common in severe COPD patients.

Key words: Chronic Obstructive Pulmonary Disease; Eosinophilia; Pulmonology

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Introduction

Chronic obstructive pulmonary disease (COPD) is a "preventable and treatable disease and is characterized by persistent airflow limitation that is usually progressive and associated with an enhanced chronic inflammatory response in the airways and the lung to noxious particles or gases".[1] To confirm the diagnosis of COPD a simple test, Spirometry is performed. Apart from helping in diagnosis spirometry can also tell us about the stage of COPD.[2]

COPD is a common disease and is considered to be one of the top five leading causes of death all over the world. With the advancement of industries and newer kinds of industrial pollution its incidence is increasing. Though some genetic factors are responsible for the development of COPD in a small minority of patients, the cause in majority of patients is exposure to cigarette smoke, noxious gases, and some other pollutants in air.[3] Patients with stable COPD are usually having very slowly declining lung function over several years. New and repeated exacerbations caused by some lung infections and air pollutants accelerate this decline.[4]

Repeated exacerbations and co morbidities are considered to be responsible for increased morbidity and mortality in patients with COPD. The COPD patient's quality of life is dependent on a number of factors; co morbidities play a significant role in these patients. Exacerbations and co morbidities increase overall burden of COPD, elevated treatment cost and challenges for health care providers. It is noted with great concern that due to these factors the burden of COPD is on the rise despite enormously available treatment facilities.[2]

Clinically COPD and asthma resemble to a great extent and share so many features. Pathologically asthma is considered to have esosinophilic inflammation in the patients' airways. In contrast in case of COPD it was not established in detail. But current data suggest that some COPD patients do have some eosinophilic inflammation of airways and treatment of COPD needs addressing this feature.[6] Researchers have demonstrated that blood eosinophilia is an important point in predicting future risk and nature of exacerbations in COPD patients. These are considered very helpful in designing new treatment strategies.[7] Sputum eosinophils counts are also considered an indicator for the prediction of treatment outcome and steroid responsiveness but due to some technical problems with this investigation are considered difficult to be performed in a wide majority of cases. In contrast blood eosinophils counts are quite easy to be performed and the results correlate well with the sputum eosinophils values.[8]

Investigators have demonstrated different levels of eosinophilia prevalence in COPD patients. Some researchers from Brazil revealed 52.38%[9] prevalence of eosinophilia in COPD.[9] In another study done by Singh et al in United kingdom on 1483 patients, the prevalence of eosinophilia in COPD patients was 37.4%.[6]

The aim of this study was to estimate the frequency of eosinophilia in patients with COPD in our institution. The idea behind doing this study was taken while doing the literature search and found that although a lot of work was has been done on this problem in other parts of the world but we lack a considerable data on this subject. So this was direly needed to conduct research at local level regarding this issue. By identifying COPD exacerbation and initiating prompt treatment at its earliest stage we can help a lot to minimize the symptoms of the affected patients.

Methodology

This cross sectional study was conducted at Pulmonology Department Ayub Teaching Hospital Abbottabad Pakistan. The duration of study was 6 months from 26-03-2019 to 25-09-2019 and study included 118 patients. Samples were taken via consecutive non-probability sampling technique. Patients between 35 to 80 years of age, both males and females having COPD of more than 5 years duration admitted in Pulmonology Department Ayub Teaching Hospital Abbottabad were included in the study. All patients with Bronchial asthma, ABPA, Churg Strauss syndrome, eosinophilic pneumonias and those on oral corticosteroids were excluded from the study.

After obtaining ethical approval from hospital ethical committee all patients with COPD admitted in Pulmonology department were enrolled. The details of the study were explained to the patients and informed written consent was obtained. Demographic data was recorded for each patient. Clinical assessment and relevant investigations including serum eosinophils count were performed. Such observations were done under supervision of an expert pulmonologist fellow of College of Physicians and Surgeons Pakistan. The collected data from each patient was recorded on a predesigned proforma.

For data analysis SPSS version 24 was used. Quantitative variables like age were described as Mean±Standard deviation. Categorical variables like gender, spirometry values and eosinophils count were calculated as frequencies and percentages. Eosinophilia was stratified among age and gender. The collected data were presented in the form of

tables and charts.

Results

There were a total of 118 study participants consisting of 90 (76.27%) males and 28 (23.73%) females (Table 1). Mean age of study participants was 65.1 (±7.1SD) years. Minimum age of the participants was 36 years and maximum age 79 years. Among 118 patients of COPD 84 (71.2%) were smokers and 34 (28.8%) were nonsmokers. Among smokers the minimum duration of smoking was 2 years while maximum duration was 30 years. Minimum number of cigarettes smoked per day was 3 cigarettes and maximum number was 35. Severity of COPD was analyzed; 51(43.2%) of patients had moderate COPD (FEV1:50%-79%), 35 (29.7%) had severe COPD (FEV1:30%-49%) and 32 (27.1 %) had very severe COPD (FEV1 < 30%). (Table.2) Total 45(38.1%) patients were found to have eosinophilia while 73 (61.9%) had no eosinophilia. (Table 3)

Table 1. Gender distribution of participants of study participants

Gender	Frequency	Percent
Male	90	76.27
Female	28	23.73
Total	118	100.0

Table 2. Spirometry distribution in COPD subjects

Spirometry grade of COPD	Frequency	Percent
FEV1:50%-79%	51	43.2
FEV1:30%-49%	35	29.7
FEV1:< 30%	32	27.1
Total	118	100.0

Table 3. Presence of Eosinophilia among study cases

Blood eosinophilia Found	Frequency	Percent	P-value
Yes	45	38.1	0.03
No	73	61.9	
Total	118	100.0	

Discussion

Our study comprised patients of age 36-79 years with a mean age of 65.1(±7.1SD) years. It clearly demonstrates that COPD is a disease of older age. One reason behind this is physiological decrease in the lung function (FEV1) that usually starts after 30 year of age. Studies have been done all over the world on this subject which demonstrates that COPD is mostly a disease of older people.[4,10] As the life expectancy in some countries with good health care increases with the passage of time it is observed that the proportion of older patients with COPD is on the rise.[10]

We found that 76.27% were males and 23.73% were females which is significant. Studies are conducted worldwide on this subject showing male predominance regarding COPD prevalence. One important reason may be the increased share of smoking in male population compared to female population.[11] Now a days smoking trend is changing in the developed world and male smokers versus female smokers ratio has become nearly equal. This is resulting in a considerable rise of female COPD patients' numbers.[11]

Smoking is considered a major risk factor in the etiology and pathogenesis of COPD all over the world.[12] We demonstrated this fact that smoking is significantly related to COPD (71.2% were smokers and 28.8% were nonsmokers). A number of studies have revealed this fact in so many countries.[12-14] With the rise of numbers of tobacco smoking individuals there is rise in COPD incidence all over the world.[14] Studies have demonstrated direct relation of COPD severity to duration and number of cigarettes smoked per day.[14] Our study confirmed these findings that more is the duration and amount of cigarettes smoked the more severe will be the COPD. Based on these observations it is well established that attempts at quit smoking is considered one of the best strategies

to decrease the incidence of COPD and its progression.[8]

We demonstrated eosinophilia in 38.1% of COPD patients. Different results have been demonstrated in other studies. The prevalence of serum eosinophilia in COPD in a study done in Brazil was found to be 52.38%[9]. In another study done by Singh et al in United Kingdom, the prevalence of serum eosinophilia in COPD patients was 37.4%[6]. These values are in congruence with values reported elsewhere.[6,9]

In our study we found that 43.2% of patients had moderate COPD (FEV1:50%-79%), 29.7% had severe COPD (FEV1:30%-49%) and 27.1 % had very severe COPD (FEV1< 30%). We found that there was direct relationship between severity of airway obstruction detected by FEV1 and eosinophilia.

Several studies have demonstrated that blood eosinophil counts are useful markers for the prediction of the effects of inhaled corticosteroids on exacerbation rates in COPD patients.[15,16,17,18] Strategies to control eosinophilic inflammation should be considered for the prevention and best management of COPD exacerbation. This can lead to a significant improvement in the overall mortality and morbidity of COPD.[18]

Our study has several limitations. Firstly our study was a hospital based study. This may have led us to miss quite a large number of eosinophilia patients as these patients can present with only mild symptoms for which many patients do not report to the hospital. Secondly, sample size was small hence the results can't be generalized. Male patients dominated in number as compared to females hence the results about female patients are also not better applicable to a larger amount of female population. Patients were not categorized into stable and exacerbation groups hence no idea could be made about eosinophilia in patients with stable COPD and COPD exacerbations. We recommend that a large multi-center study should be performed in order to fully analyze the frequency of eosinophilia in COPD patients as it is a growing problem and a small single centre study is not sufficient to analyze the situation. Separate observations need to be done for both stable COPD patients and patients with COPD exacerbation and the results analyzed for both groups.

Conclusion

A considerable proportion of eosinophilia is present in COPD patients. Eosinophilia is more prevalent in severe COPD patients therefore by timely identifying the eosinophilia especially during exacerbatios we can take prompt action and thus help a lot to minimize the patients' symptoms. This will also lead to marked reduction in mortality and in cost associated with COPD.

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