



## Original Research Article

## To study the role of sputum cytology in patients with bronchial asthma and COPD

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## ABSTRACT

**Background:** COPD is the major cause of morbidity and mortality across the world. In addition to this, the major factor that is contributing in this disease is smoking. This kind of problem occurs due to airflow obstruction that influences the progressive and accompanied hyper-responsiveness. The patients with Asthma and COPD overlap (ACO) have a poor quality of life and more rapid decline in lung functions and high mortality. Also, they consume a disproportionate amount of health care resources. Moreover, sputum cell counts are extensively used in the treatment of asthma and COPD. The clinical application of sputum cell count in patients with both COPD and asthma remain elusive.

**Aim:** The study aims to study the role of sputum cytology in patients with Bronchial Asthma and COPD.

**Materials and Methods:** It was a prospective study carried out in the Department of Pulmonary Medicine, D Y Patil Medical College, Nerul, Navimumbai, Maharashtra, India. The period of the study was from January 2020 to June 2021. The number of healthy patients recruited for the current study was 20, along with 20 asthmatic patients and 30 COPD patients. Spirometry and body plethysmography was used to measure the capacity and volume of the lungs of all the patients. One-Way Analysis of Variance (ANOVA) test was conducted for counting the differences in counts of lung function variables and sputum cells.

**Results:** The mean age of healthy patients was  $62.78 \pm 6.1$  years, asthmatic patient was  $55.9 \pm 12.8$  years and COPD patients was  $65.8 \pm 5.2$  years. According to the analysis, the specific airway's conductance for aesthetic patients was  $[0.60 \pm 0.04 \text{ kPa} \cdot \text{Sec}^{-1}]$  and for the patient who was suffering from COPD, the score was  $[1.82 \pm 0.19 \text{ kPa} \cdot \text{Sec}^{-1}]$  and the outcome for healthy patients was  $[1.19 \pm 0.12 \text{ kPa} \cdot \text{Sec}^{-1}]$ .

**Conclusion:** The study has found a strong relationship between sGaw and neutrophil and the neutrophil-macrophage ratio of COPD patients. According to the analysis of the study outcome, eosinophils are important for the respiratory inflammatory infiltrates in asthma patients as well as in COPD.

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## 1. Introduction

The disruptive airway diseases are considered as disorder that influences the respiratory system of an individual. The issues related to airway are narrowing the bronchi and bronchioles. These kinds of conditions have a significant impact on the resultant dyspnea, wheeze and cough.<sup>1</sup> The most common and serious problems for an individual are Asthma and Chronic Obstructive Pulmonary Disease

(COPD). These diseases are analyzed and identified through specific physiological spermatic evaluation. According to analysis and observation of patients, COPD is found to be the major cause of morbidity and mortality across the world. In addition to this, the major factor that is contributing towards this disease is smoking.<sup>2</sup> This kind of problem occurs due to airflow obstruction that influences the progressive and accompanied hyper-responsiveness. According to the analysis, people who have difficulties and breathing are having higher chances of such disease. The chronic and productive coughs are diagnosed with COPD.

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The care professionals have suggested that regular smokers are having higher risk for such disease.<sup>3</sup> It is advised to the patients of airway disease to quit smoking and maintain the healthy diet and do regular exercise. However, the treatment for such disease is having limited and costly options and range of availability of such treatment is low.

Asthma was considered to be eosinophilic while COPD was considered as primary neutrophilic lower airway inflammation. There are different types of inflammations which have a significant impact on the health of the individual. Bronchial asthma is a major chronic airways disease that is responsible for the inflammation in the airways and leads towards several issues like chest tightness, cough and breathlessness. To overcome the issues in an individual, there are different types of approaches used to evaluate and offer treatment. The cellular composition of inflammatory infiltrate, namely, bronchial mucosa biopsy and bronchoalveolar lavage fluid are some well-known techniques.<sup>4</sup> There is important role played by the cytological and biological evaluation of induced sputum. The proper evaluation and knowledge of chronic inflammation in the airways is needed. These kinds of diseases are having a significant impact on Th-2 and the immune system of an individual that responds in asthma and related to the characteristics of Th-1 mediated immunity in COPD. The overlap of asthma and COPD is the term to describe patients who has some major problems and facing the critical issues.<sup>5</sup> The patients with ACO have a poor quality of life and more rapid decline in lung functions and high mortality. Also, they consume a disproportionate amount of health care resources.

The neutrophil count of COPD patients is varying as per the conditions of individual and measured by the cellular composition of inflammatory in people who are suffering from asthma. The noninvasive biomarkers to analyze the airway inflammation play a critical role in the planning and offering of the treatment.<sup>6</sup> Apart from this, sputum count is necessary for analyzing the health conditions of patients with asthma and COPD. The elusive application for identifying sputum count cell is helpful for understanding the health conditions of individual. However, the airway disease are difficult to identify through primary diagnose as specialist physician is required for managing the issues and identifying the symptoms of COPD.<sup>7</sup> Moreover, the patients with viral infection and wheeze are mostly diagnosed with asthma.

## 2. Aim and Objectives

1. To understand the cytology in bronchial ASTHMA and COPD.
2. To analyze and compare the differences in sputum cell count and lung function variables.

## 3. Materials and Methods

It was a prospective study carried out in the Department of Respiratory Medicine, Department of Pulmonary Medicine, D Y Patil Medical College, Nerul, Navimumbai, Maharashtra, India. The period of the study was from January 2020 to June 2021. The current study involved a total of 20 healthy patients along with 20 asthmatic and 30 COPD patients. Spirometry and body plethysmography was used to measure the volume and capacities of the lungs. Apart from this, the researcher also quantified the leukocytes that were induced from the sputum of all the patients. Further, the ANOVA test was used to determine the differences in the lung function variables along with sputum cell counts. To examine the relationship among sputum leukocyte profiles and lung function variables Pearson Correlation test was performed.

## 4. Results

**Table 1:** Mean age of participants from different groups

Group	Mean Age (Years)
Healthy	62.78±6.1
Asthmatics	55.9±12.8
COPD	65.8±5.2

Table 1 shows that the mean age of healthy patients was 62.78±6.1 years, asthmatic patient was 55.9±12.8 years and COPD patients was 65.8±5.2 years.

**Table 2:** Specific airway conductance of participants from different groups

Group	Specific airway conductance (kPa.Sec <sup>-1</sup> )	P-value
Healthy	1.19±0.12	<0.05
Asthmatics	0.60±0.04	
COPD	1.82±0.19	

Table 2 provides information related to the specific airways conductance (sGaw) that has helped to analyze the impact on the health of the individual. According to the analysis, the specific airways conductance for aesthetic patients was [0.60±0.04 kPa.Sec<sup>-1</sup>] and for the patients who were suffering from COPD, the score was [1.82±0.19 kPa.Sec<sup>-1</sup>] and the outcome for healthy patients was [1.19±0.12 kPa.Sec<sup>-1</sup>]. From the analysis of the outcome, it can be considered that the difference in specific airway conductance among the asthmatic, COPD and healthy patients was statistically significant and a positive association was observed between sGaw and sputum macrophage. In addition to this, from the analysis, it is also identified that FRC or Functional Residual Capacity was strongly associated with macrophages and neutrophils. Apart from this, the inverse relationship was identified among sGaw and neutrophil and neutrophil-macrophage

ratio in COPD patients. Moreover, the study has found no relationship between asthmatic and healthy individuals.

## 5. Discussion

According to the analysis of the outcome of the current study and comparison with the past studies, it can be considered that sGaw have an inverse relationship with the neutrophils and neutrophils-macrophage ratio in the COPD patients. The major relationship was found in FRC that is showing effective association with macrophages and neutrophils. For the current study, the mean age of asthmatic and COPD patients was  $55.9 \pm 12.8$  and  $65.8 \pm 5.2$  years. The study of Gao et al., (2017)<sup>8</sup> shows that the mean age of asthmatic and COPD patients was  $46.2 \pm 16.45$  and  $71.8 \pm 8.50$  years respectively. The analysis of studies has shown that Cytology of sputum has no significant difference between both groups such as COPD and asthmatic in the total cell count. In addition to this, the absolute and relative count of an individual cell type that involves the macrophages, lymphocytes, neutrophils and eosinophils was analyzed and found that Functional Residual Capacity was strongly associated with macrophages.<sup>9</sup> Apart from this, it is also identified that sGaw was higher among the patients with COPD as compared to healthy and asthmatic patients. The study has also identified a lower value of sGaw in obstructive patients compared to both the healthy controls and group of non-obstructive respiratory disease. As per the study of George and Brightling (2016), the reliability of the cell count was high within investigators ( $r=0.99$  neutrophils,  $r=0.99$  macrophages).<sup>10</sup> The study has identified the large proportion of activated macrophages in both groups and suggested that sputum is safe and reproducible for COPD.

The effective consideration of cellular composition of inflammatory infiltrates in patients is essential for analyzing the health condition of asthmatic and COPD patients.<sup>11</sup> The study has identified that patients with mixed issues of COPD and asthma have major issues and face serious health problems. According to analysis, the asthma is airway inflammatory and study has shown the correlation with the severity with COPD disease. The airway hyper responsiveness suggest that, the factors that involve for IgE sensitization are having direct impact on the propagation of nonatopic and high total serum IgE among the asthma patients.<sup>12</sup> The sputum cell count is analyzed for measuring the issues and planning of the treatment process of such patients. However, these measurements are critical and difficult to diagnose but consideration of specific treatment actions can be helpful for the patients and managing the respiratory issues. Apart from this, the useful confirmation and physiological data analysis of the patients is beneficial for the planning of treatment and offering the required support.<sup>13</sup>

## 6. Conclusion

From the current study, it has been analyzed that COPD and Asthmatic patients are having poor airway conductance and having issues in breathing. The issues related to the respiratory system have a significant impact on the sputum cell count and affect the level of neutrophils and infiltration. The current study has analyzed the level and conditions of macrophages and accounted for 60-70% of all cells. The study has found a strong relationship between sGaw and neutrophil and the neutrophil-macrophage ratio of COPD patients. According to the analysis of the study outcome, the eosinophils are important for the respiratory inflammatory infiltrates in asthma patients as well as in COPD.

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## 8. Conflict of Interest

The authors declare they have no conflict of interest.

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