

**Study of Sputum Cytology in COPD and Bronchial Asthma**Laxmi Niwas Tiwari<sup>1</sup>, Prakash Sinha<sup>2</sup>, Ritesh Kamal<sup>3</sup><sup>1</sup>Assistant Professor, Department of Pulmonary Medicine, Katihar Medical College and Hospital, Katihar, Bihar<sup>2</sup>Associate Professor, Department of Pulmonary Medicine, Katihar Medical College and Hospital, Katihar, Bihar<sup>3</sup>Professor and Head of Department, Department of Pulmonary Medicine, Katihar Medical College and Hospital, Katihar, Bihar

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**Abstract:**

**Background:** Globally, COPD is the leading cause of illness and mortality. Additionally, smoking is a major contributing factor to this condition. Airflow restriction is the cause of this type of issue, which affects the progressive and concomitant hyper responsiveness. The quality of life is lower, lung function declines more quickly, and mortality is higher in people with asthma and COPD overlap (ACO). They also use a disproportionate amount of resources for medical care. Furthermore, sputum cell counts are widely employed in the management of COPD and asthma. Sputum cell count has not yet been successfully applied clinically in COPD and asthma patients. The purpose of the study is to investigate the function of sputum cytology in COPD and bronchial asthma patients.

**Methods:** From January 2021 to December 2021, a prospective study was conducted in the pulmonary medicine department of Katihar Medical College and Hospital in Katihar, Bihar. Twenty healthy participants, twenty asthmatic participants, and thirty COPD participants were enrolled in the current study. All patients' lungs were measured for volume and capacity using body plethysmography and spirometry. Sputum cell and lung function variable counts were compared using the One-Way Analysis of Variance (ANOVA) technique.

**Results:** The mean age of patients with COPD was 65.8±5.2 years, patients with asthma was 55.9±12.8, and patients in good health was 62.78±6.1 years. The analysis showed that the specific airway conductance for patients with aesthetic concerns was [0.60±0.04 kPa.Sec<sup>-1</sup>], for COPD patients it was [1.82±0.19 kPa.Sec<sup>-1</sup>], and for healthy individuals it was [1.19±0.12 kPa.Sec<sup>-1</sup>].

**Conclusion:** The neutrophil-macrophage ratio of COPD patients and sGaw had been found to be strongly correlated in the study. Eosinophils have a significant role in the pulmonary inflammatory infiltrates in both COPD and asthma patients, according to the interpretation of the study's results.

**Keywords:** Sputum, COPD, Asthma.

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**Introduction**

Disruptive airway illnesses are regarded as conditions that affect a person's breathing system. The bronchi and bronchioles are becoming narrower due to airway-related problems. The ensuing dyspnea, wheeze, and cough are significantly impacted by these kinds of conditions. [1] The two most prevalent and dangerous conditions for an individual are chronic obstructive pulmonary disease (COPD) and asthma. Particular physiological spermatic examination is used to analyze and identify these illnesses. Analysis and patient observation indicate that COPD is the leading cause of illness and death worldwide. Additionally, smoking is a major contributing factor to this condition. [2] Airflow restriction is the cause of this type of issue, which affects the

progressive and concomitant hyper responsiveness. The data indicates that respiratory problems are associated with an increased risk of this type of disease. COPD is identified as the cause of the persistent and productive cough. According to medical authorities, individuals who smoke often may be more susceptible to this type of illness. [3] Patients with airway illness are recommended to give up smoking, keep a healthy diet, and engage in regular exercise. Unfortunately, there are few, expensive a therapeutic choice available for this kind of illness, and their availability is restricted. It was once thought that COPD had a primary neutrophilic lower airway inflammation, whereas asthma was thought to be eosinophilic. Many kinds of inflammations exist, and they all significantly

affect a person's health. One of the main chronic airway diseases, bronchial asthma causes inflammation in the airways, which in turn causes a number of problems, including coughing, dyspnea, and tightness in the chest. There are various methods used to assess and treat a person in order to help them overcome their problems. Some well-known methods for determining the cellular makeup of an inflammatory infiltration are bronchial mucosa biopsy and bronchoalveolar lavage fluid. [4]

The biological and cytological analysis of generated sputum plays a significant role. It is necessary to properly assess and understand chronic inflammation of the airways. These illnesses are significantly affecting Th-2 and an individual's immune system, which is linked to the features of Th-1 mediated immunity in COPD and asthma. The phrase "overlapping asthma and COPD" refers to those who have both asthma and COPD and are dealing with serious complications. [5] ACO patients have a lower quality of life, a faster rate of lung function deterioration, and a higher death rate. They also use a disproportionate amount of resources for medical care.

Individual variables influence the neutrophil count of COPD patients, which is determined by the inflammatory cellular composition of asthmatic patients. The analysis of airway inflammation using noninvasive biomarkers is an essential part of treatment planning and delivery. [6] In addition, sputum counts are required to assess the health

status of individuals suffering from COPD and asthma. The tricky application for sputum count cell identification is useful for comprehending an individual's health issues. However, since a specialized physician is needed to manage the conditions and recognize COPD symptoms, it can be challenging to diagnose airway diseases by a primary diagnosis. [7] Furthermore, the majority of people diagnosed with asthma also have viral infections and wheeze.

**Materials and Methods**

From January 2021 to December 2021, a prospective study was conducted in the pulmonary medicine department of Katihar Medical College and Hospital in Katihar, Bihar. In total, 20 healthy patients, 20 asthmatic patients, and 30 COPD patients were included in the current study. Lung volume and capacity were measured using plethysmography and spirometry. In addition, the researcher measured the leukocytes that were generated from each patient's sputum. In addition, sputum cell counts and the variations in the lung function variables were assessed using the ANOVA test. A Pearson Correlation test was used to look at the relationship between lung function factors and sputum leukocyte profiles.

**Results**

The average age of asthmatic patients was 55.9±12.8 years, that of COPD patients were 65.8±5.2 years, and that of healthy patients was 62.78±6.1 years, according to Table 1.

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

Groups	Mean Age in years
Healthy	62.78±6.1
Asthmatics	55.9±12.8
COPD	65.8±5.2

Data on the specific airways conductance (sGaw) are included in Table 2, which has aided in the analysis of the effect on the person's health. The analysis showed that the specific airways conductance for patients with aesthetic conditions was [0.60±0.04 kPa.Sec-1], for COPD patients it was [1.82±0.19 kPa.Sec-1], and for healthy individuals it was [1.19±0.12 kPa.Sec-1]. Based on the result analysis, it can be concluded that there

was a statistically significant difference in specific airway conductance between the patients with asthma, COPD, and those in good health, and that there was a positive correlation between sGaw and sputum macrophage.

Furthermore, the investigation revealed a high correlation between neutrophils and macrophages and FRC, or functional residual capacity.

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

Group	Specific airway conductance (kPa.Sec-1)	p-value
Healthy	1.19±0.12	<0.05
Asthmatics	0.60±0.04	
COPD	1.82±0.9	

In addition, it was found that in COPD patients, there was an inverse association between sGaw and neutrophil and neutrophil-macrophage ratio.

Furthermore, no connection between asthmatic and healthy people was discovered by the study.

## Discussion

It may be concluded from an analysis of the current study's results and comparison with earlier research that sGaw and neutrophils and the neutrophil-macrophage ratio in COPD patients are inversely correlated. The main correlation was discovered in FRC, which effectively associates with neutrophils and macrophages. Patients with COPD and asthma had mean ages of  $65.8 \pm 5.2$  and  $55.9 \pm 12.8$ , respectively, for the current study. According to Gao et al (2017) [8] study, the mean age of COPD and asthmatic patients was  $71.8 \pm 8.50$  years and  $46.2 \pm 16.45$  years, respectively. Research has revealed that there is no discernible difference in the total cell count between the two groups (asthmatic and COPD) in terms of sputum cytology. Furthermore, the analysis of the absolute and relative counts of distinct cell types, including neutrophils, eosinophils, lymphocytes, and macrophages, revealed a high correlation between macrophages and Functional Residual Capacity. [9] In addition, it was shown that sGaw was higher in COPD patients compared to healthy and asthmatic individuals. Additionally, the study found that patients with obstructive respiratory disease had lower values of sGaw than both the healthy controls and the group with non-obstructive respiratory disease. According to George and Brightling's (2016) study, the investigators' confidence in the cell count was excellent ( $r=0.99$  for neutrophils and  $r=0.99$  for macrophages). [10] The study found that both groups had a high percentage of activated macrophages, and it concluded that sputum for COPD is safe and consistent. Analyzing the health status of patients with COPD and asthma requires careful examination of the cellular composition of inflammatory infiltrates in patients. [11]

According to the study, people who have both asthma and COPD have significant challenges and risky health outcomes. Analysis indicates that asthma is an inflammatory airway condition, and research has linked the severity of the condition to COPD. The airway hyper responsiveness indicates that the mechanisms responsible for IgE sensitization are directly influencing the spread of high total serum IgE and nonatopic asthma patients. [12] To gauge the problems and decide the course of treatment for these individuals, the sputum cell count is examined. These metrics are crucial and challenging to diagnose, but taking particular treatment measures into account can benefit patients and assist manage respiratory problems. In addition, the patients' physiological data analysis and helpful confirmation are helpful for treatment planning and providing the necessary support. [13]

## Conclusion

According to the current study, people with asthma and COPD have poor airway conductivity, which makes breathing difficult for them. The amount of neutrophils and infiltration, as well as the sputum cell count, are all greatly impacted by respiratory system problems.

The present investigation examined the quantity and state of macrophages, which comprise 60–70% of total cells. The neutrophil-macrophage ratio of COPD patients and sGaw had been found to be strongly correlated in the study. The examination of the study's results indicates that eosinophils play a significant role in both COPD and asthma patients' respiratory inflammatory infiltrates.

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