



Original Research Article

To study of sputum cytology in COPD and bronchial asthma

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ABSTRACT

Introduction: It has been observed that airflow obstruction is permanent and progressive and accompanied by hyper-responsiveness which may be partially reversible. There are three main types of disorders in COPD. It includes emphysema, peripheral airways disease and chronic bronchitis. Aim of this study was to study of sputum cytology in COPD and bronchial asthma.

Materials and Methods: It was a prospective study carried out in the Department of Respiratory Medicine, Gujarat Adani Institute of Medical Science, Bhuj, Gujarat, India. The study period was from January 2019 to December 2019. 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: It was identified that the mean age of healthy patients was 62.81 ± 6.2 years, of asthmatic patients was 55.4 ± 12.5 years, and that of the COPD patients was 65.3 ± 5.6 years. During the study, it was further determined the Specific airway conductance (sGAW) for asthmatic patients to be $[0.40 \pm 0.02 \text{ kPa} \cdot \text{Sec}^{-1}]$, while for the COPD patients it came out to be $[1.72 \pm 0.16 \text{ kPa} \cdot \text{Sec}^{-1}]$. Similarly, for the healthy patients, it was $[1.15 \pm 0.19 \text{ kPa} \cdot \text{Sec}^{-1}]$. sGaw was positively associated with sputum macrophages. However, it was found that sGaw was inversely associated with neutrophil and neutrophil-macrophage ratio in COPD.

Conclusions: In light of the current results, it was identified that one of the important pathophysiological conditions among the COPD patients is poor airway conductance. It increases significantly when the penetration of neutrophils increases in the airways.

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1. Introduction

COPD is found to be a major cause of morbidity and mortality around the world. Smoking is the major contributing factor to the disease. In medical terms, COPD is a disease identified by the subsistence of airflow obstruction associated with chronic bronchitis or emphysema.¹ It has been observed that airflow obstruction is permanent and progressive and accompanied by hyper-responsiveness which may be partially reversible. Three types of disorders are considered to be part of COPD - emphysema, peripheral airways disease and chronic bronchitis.²

Bronchial asthma is another major chronic airway disease responsible for the inflammation in the airways. Among the vulnerable people, the inflammation causes recurrent episodes of wheezing, breathlessness, chest tightness and cough.³ Therefore, it has been identified that the airflow obstruction is responsible for increasing the airway responsiveness towards the different stimulus.⁴

There are various techniques to evaluate the cellular composition of inflammatory infiltrate, namely, bronchial mucosa biopsy, bronchoalveolar lavage fluid (BALF), and induced sputum. It is considered to be a procedure which is non-invasive in nature and therefore can be easily performed frequently. There is an important role played by the cytological and biochemical evaluation of induced sputum while assessing and monitoring chronic inflammation in the

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airways.⁵

Neutrophils are the predominant cells, occurring both in the stable period of the disease and during exacerbations which have been confirmed through Cytologic examinations of induced sputum conducted on the COPD patients.⁶ The neutrophil count in the airways of COPD patients differs according to the severity of the disease. There is relevancy in the specificity of the cellular composition of inflammatory infiltrates in patients with asthma and COPD. Among the patients who have asthma with COPD, a mixed type of inflammatory infiltrates has been pragmatic in accordance with the presence of both eosinophils and neutrophils.⁷ The aim of the paper was the Study of sputum cytology in COPD and bronchial asthma.

2. Aims and objectives

The present study were to study sputum cytology in COPD and bronchial asthma, and to compare the differences in lung function variables and sputum cell counts.

3. Materials and Methods

It was a prospective study carried out in the Department of Respiratory Medicine, Gujarat Adani Institute of Medical Science, Bhuj, Gujarat. The study period of the study was from January 2019 to December 2019. The current study involved a total of 20 healthy patients along with 20 asthmatic and 30 COPD patients. An ethical committee approval and consent of study subjects was obtained. 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. In order to examine the relationship among sputum leukocyte profiles and lung function variables Pearson Correlation test was performed.

4. Results

Table 1:

Group	Mean age
Healthy	62.81±6.2
Asthmatics	55.4±12.5
COPD	65.3±5.6

From the above table, it was identified that the mean age of healthy patients was 62.81±6.2 years, of asthmatic patients was 55.4±12.5 years and that of the COPD patients was 65.3±5.6 years.

From the above table, the Specific airway conductance (sGaw) for patients with asthma was [0.40±0.02 kPa.Sec⁻¹], while for patients with COPD, it was [1.72±0.16 kPa.Sec⁻¹], and for healthy patients, it came out to be

Table 2:

Group	Specific airway conductance(kPa.Sec ⁻¹)	P-value
Healthy	1.15±0.19	<0.05
Asthmatics	0.40±0.02	
COPD	1.72±0.16	

[1.15±0.19 kPa.Sec⁻¹]. Thus, the difference in the sGAW among the asthmatic and COPD patients and healthy participants was statistically significant.

A positive association was observed between sGaw and sputum macrophages. Herein an inverse relationship between sGaw and neutrophil and neutrophil-macrophage ratio in the COPD patients was also determined. During the study, it was also observed that FRC or Functional Residual Capacity was strongly associated with macrophages and neutrophils. However, no such relationship between the asthmatic and healthy individuals was found during the current study.

5. Discussion

The average age of the asthmatic patients was 55.4±12.5 years, while the mean age of the COPD patients came out to be 65.3±5.6 years. In contrast to the current study, the mean age of the asthmatics was 36.1±14.5 years, and that among the COPD patients was 56.8 ±11.2 according to the study of Gorska et al., (2008).⁵ Furthermore, as per the study of Gao et al., (2017),⁸ the mean age of asthmatic patients was 46.2±16.45 years and that of the patients with COPD was 71.8±8.50 years. An inverse relationship of sGaw with neutrophil and neutrophil-macrophage ratio in COPD was found in the current study. In addition, FRC had a strong relationship with the macrophages and neutrophils. Similar results were obtained by Peleman et al., (1999).⁹

In contrast, according to Gorska et al., (2008)⁵ Cytology of the sputum showed no significant differences between both groups in the total cell count and the absolute and relative count of individual cell types (macrophages, lymphocytes, neutrophils, and eosinophil). Moreover, this study also revealed sGaw to be higher among COPD patients as compared to the healthy participants and also in comparison to asthmatic patients. But the difference herein came out to be statistically significant. However, Topalovic et al., (2015) stated sGAW value was found to be lower in the group of obstructive patients compared to both the healthy controls and the group of non-obstructive respiratory diseases.¹⁰

6. Conclusion

In light of the current results, it was identified that for COPD patients, the poor airway conductance is a very important pathophysiological condition. It becomes an even more prominent issue as the infiltration of neutrophils increases

in the airway. The current study it was also found that Macrophages, accounted for 60-70% of all cells. Among the healthy participants, they were found to be associated with the predominant sputum cells. Further, the neutrophils were also identified as the second most common of all the cells. Furthermore, it was also observed that eosinophil may be important for the respiratory inflammatory infiltrates in asthma patients as well as the patients diagnosed with COPD.

7. Source of Funding

None.

8. Conflict of Interest

None.

9. Acknowledgment

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