

SPUTUM EOSINOPHILIA AS A MARKER OF BRONCHIAL ASTHMA SEVERITY AND ITS ASSOCIATION WITH ALLERGIC RHINITISRamachandra Prabhu H. D¹, Tirthankar Mukherjee², Mahendra M³, Vishwanath K⁴, Vinayaka G. P⁵**HOW TO CITE THIS ARTICLE:**

Ramachandra Prabhu H. D, Tirthankar Mukherjee, Mahendra M, Vishwanath K, Vinayaka G. P. "Sputum Eosinophilia as a Marker of Bronchial Asthma Severity and its Association with Allergic Rhinitis ". Journal of Evolution of Medical and Dental Sciences 2014; Vol. 3, Issue 18, May 05; Page: 5042-5047, DOI: 10.14260/jemds/2014/2551

ABSTRACT: Asthma is an inflammatory, reversible and progressive disease with episodes of exacerbations. Both the Nasal and Bronchial mucosa are the elements of united airway disease and Eosinophils measured from this mucosa can be an indirect marker of Airway inflammation (AI) in asthma and Allergic Rhinitis (AR). Eosinophil infiltration is hallmark feature of pathogenesis of airway inflammation and is raised in acute and chronic variants. Sputum Smear cytology for Eosinophils (SSE), marker of AI is used as research tool in specialized Institutions to measure AI. In this study 100 patients were enrolled. 52% had Bronchial Asthma (BA) whereas 48% of them had associated Allergic Rhinitis (BAAR). The severity of asthma was assessed as per FEV1 classification. There was no statistically significant difference between sputum eosinophils in both groups (P=0.298). There was no statistically significant association between SSE and severity of Asthma in both groups (P=0.298 and P=0.129)

KEYWORDS: Asthma: Severity of Asthma: Sputum Smear Eosinophilia,

INTRODUCTION: Epidemiology Study Group of the Indian Council of Medical Research found the prevalence of bronchial asthma in Indian adults to be 2.38%. Three-fourths of children and 55% of adults with asthma and associated AR had simultaneous onset of both diseases.¹ It was thus observed that AR occurred commonly with asthma and could be an independent risk factor for the development of asthma. AR and asthma, rather than being considered two distinct diseases, can be unified by the concept of a "united airway," where allergic symptoms of the upper and lower airways can be thought of as manifestations of a common atopic entity.²

Blood eosinophils are known to be an indirect marker of airway inflammation in asthma. It is known since long that the total eosinophil count reflects asthmatic activity and is useful for regulating steroid dosage and for early detection of exacerbations.³ The eosinophil mediates damage to the respiratory epithelium and is the prime effector cell in the pathophysiology of asthma. Eosinophils play a major role in the onset and maintenance of bronchial inflammation and tissue injury in asthma.

It has been determined that the degree of eosinophilia is proportional to the severity of asthma, as measured by clinical grading or pulmonary function.⁴ Studies have reported a correlation between the number of blood eosinophils and the severity of asthma.⁵

Eosinophils are increased in broncho alveolar lavage fluid from asthmatics compared to non-asthmatics. In biopsy specimens from patients with symptomatic asthma, eosinophils are found in high numbers in the airway epithelium and in deeper bronchial tissues.

Analysis of the cell differential of induced sputum is a useful noninvasive method for evaluating airway inflammation in asthma.⁶ In the clinical management of patients with bronchial asthma blood eosinophilia is considered a risk factor, indicating deterioration and exacerbation.

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However, patients with asthma may have a normal number of eosinophils in their blood. Based on these results and the inconsistent findings of other investigators, we cannot depend on the blood eosinophilic count to monitor disease activity⁷. AR was associated with an increased risk of poorly controlled asthma.⁸ AR is a significant factor affecting the recovery time of PFTs and therefore may impact asthma management.⁹

This study attempts to investigate the relation between sputum eosinophils in patients with Bronchial Asthma as a marker of disease severity and also a predictor of coexisting allergic rhinitis.

MATERIAL & METHODS: This observational study was carried out on 100 patients attending outpatient department of Kempegowda Institute of Medical Sciences and Research Hospital between 2011-2013. Subjects undertook a single visit to laboratory and underwent following procedures- Clinical assessment Questionnaire, Spirometry, Sputum smear.

Inclusion Criteria: Bronchial Asthma Cases proven by Spirometric evidence of airflow reversibility (2007 NHLBI Guidelines).

Exclusion Criteria:

1. Patients having current or past history of tuberculosis and COPD, ILD, Pneumonias.
2. Any history of hemoptysis.
3. Those on oral corticosteroids within 3 months prior to the study.
4. All cases blood eosinophilia.
5. Exclude cases with Ischemic Heart Disease and Pulmonary ThromboEmbolicism.
6. Evidence of infective exacerbation e.g., fever, purulent expectoration, raised leukocyte counts, specific growth of micro-organisms in sputum culture.
7. CXR demonstrating other causes of chronic cough. COPD, Consolidation, TB etc.

Informed consent was taken from all patients after recruitment. History of exposure to risk factors for the disease, such as smoking, fumes, irritants, and dust exposure will be noted. Detailed occupation was enquired to check for any exposure. Spirometry (Vitalograph 6800) was done as per ATS criteria.¹⁰ Asthma severity was classified as mild, moderate & severe as per NHLBI guidelines 2007. A diagnosis of AR was made clinically as per ARIA guidelines 2008¹¹.

Sputum Collection and Processing: After baseline investigations Sputum samples were collected. Sputum Induction with saline nebulisations was performed in selected patients.

After demonstration of sputum production Sputum is collected (at least 1ml) in a cup. Gross physical examination on Petri dish is undertaken before Slide is made with 0.1ml material taken with Forceps, Compress & spread after crushing cells. The slide is Fixed with 95% alcohol (for 10-20 min) and 2 slides are made and stained with Pap and H & E stain, Examined with 40X (high Power) for DC and smear graded by differential count. Sputum eosinophil counts was performed manually.¹²

Normal cut off value in Sputum Smear Cytology - Sputum Eosinophilis- Cut off value- $\geq 3\%$, eosinophilia-positive and $< 3\%$, eosinophilia-negative groups.

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STUDY DESIGN:

METHODOLOGY: Initially assessment, clinical history and examination and Performa filled. Subjects were classified into 2 groups - Bronchial Asthma without Allergic Rhinitis (BA), & Bronchial Asthma with Allergic Rhinitis (BAAR)

Reversibility Testing- At the screening visit after completion of three acceptable pre-bronchodilator forced expiratory manoeuvres, all patients will be asked to inhale salbutamol (100µg) so as to document the degree of reversibility. Reversibility of airway obstruction is defined as FEV1 >12% and 200ml after Salbutamol 100 mcg inhalation.¹¹

The severity of Bronchial Asthma was based on FEV1 into Mild, Moderate and persistent based on GINA Guidelines.¹³

Statistical Analysis: Proportions were compared between groups using Chi Square test using SPSS version 11.5. A P value less than 0.05 was considered statistically significant.

RESULTS:

	BA (n=52)	BAAR (n=48)	P Value
Age (yrs.)	36.6±8.1	36.2±6.4	0.8
Male Subjects	30	22	0.9
Female Subjects	28	20	0.9

Table1: Baseline characteristics of both groups

Group		Eosinophil Count		Total
		<3%	>=3%	
BA	Mild	17	5	22
		77.3%	22.7%	100.0%
	Moderate	16	12	28
		57.1%	42.9%	100.0%
	Severe	1	1	2
		50.0%	50.0%	100.0%
Total	34	18	52	
		65.4%	34.6%	100.0%
BAAR	Mild	20	8	28
		71.4%	28.6%	100.0%
	Moderate	8	11	19
		42.1%	57.9%	100.0%
	Severe	0	1	1
		.0%	100.0%	100.0%
	Total	28	20	48
			58.3%	41.7%

Table 2: Association of Severity of Asthma with Sputum Eosinophil Count in both groups

Severity		Eosinophil Count		Total
		<3%	>=3%	
Mild	BA	17	5	22
		77.3%	22.7%	100.0%
	BAAR	20	8	28
		71.4%	28.6%	100.0%
	Total	37	13	50
		74.0%	26.0%	100.0%
Moderate	BA	16	12	28
		57.1%	42.9%	100.0%
	BAAR	8	11	19
		42.1%	57.9%	100.0%
	Total	24	23	47
		51.1%	48.9%	100.0%
Severe	BA	1	1	2
		50.0%	50.0%	100.0%
	BAAR	0	1	1
		.0%	100.0%	100.0%
	Total	1	2	3
		33.3%	66.7%	100.0%

Table 3: Association of Sputum Eosinophils with Bronchial Asthma & Bronchial Asthma with Allergic Rhinitis

RESULTS: In this study there was no statistically significant difference in sputum eosinophil counts between the 2 groups ($P=0.468$). In both the groups there was no association between sputum eosinophilia and the severity of asthma ($P=0.298$ & $P=0.129$). However a higher number of patients with moderate severity had sputum eosinophilia. Only a small number of patients with severe airflow limitation presented to the OPD.

DISCUSSION: In this study we made an attempt to study sputum eosinophil count as a predictor of severity of asthma. We also explored whether an increased sputum eosinophil count was associated with coexisting allergic rhinitis (BAAR). However we did not find any statistically significant association. The findings could be limited by a fewer number of severe asthmatics presenting to the OPD. Another limitation could be a small study group. Therefore the role of sputum eosinophils in assessing disease severity is limited. Conventional spirometry & newer modalities like fractional nitric oxide concentration in exhaled breath (FeNO) provides further information in distinguishing different phenotypes in asthma, allowing a much more appropriate control of the disease¹⁴.

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