

Deranged Pulmonary Function Tests in Allergic Rhinitis in North Indian Patients

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ABSTRACT

INTRODUCTION: Significant associations between allergic rhinitis and bronchial asthma have been established and as a result of bronchial hyper-responsiveness, patients can have deranged pulmonary function tests. We aim to compare previous such studies with the result of our study done in India wherein we identify among allergic rhinitis patients who despite not having overt asthmatic symptoms, have pulmonary function derangements, quite possibly at a subclinical disease level.

MATERIALS AND METHODS: We studied 74 patients of allergic rhinitis and after meticulous clinical work up, they underwent blood tests including hemogram, absolute eosinophil count, and total serum IgE followed by pulmonary function tests.

RESULTS: Out of 74 patients 60 (81%) had *intermittent* allergic rhinitis whereas only 14 (19%) had *persistent* allergic rhinitis. Pulmonary function tests showed reversible obstruction, ie, >10% improvement in FEV₁ with inhaled bronchodilators (as seen in asthma) in 18 (24.3%), mild obstruction in 14, and moderate obstruction in 4 cases.

CONCLUSION: The study emphasizes the importance of pulmonary symptoms and the performance of pulmonary function tests in cases of allergic rhinitis patients to rule out latent asthma.

KEYWORDS: Allergic rhinitis, asthma, forced expiratory volume, bronchodilator agents

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Introduction

Allergic rhinitis (AR), a common inflammatory condition affecting upper airways mainly the nose and often eyes, is characterized by symptoms such as sneezing, rhinorrhea, pruritus, and congestion which usually occur on exposure to allergens such as pollen, mites, dust, and other stimuli. Allergic rhinitis patients often have comorbidities, asthma being one of the most common. At least as many as 80% of asthma patients have symptoms of AR and up to 40% of patients with AR have associated asthma.^{1,2} Current pathophysiological studies suggest both conditions as manifestations of chronic inflammatory syndrome of the common airway or 'united airway disease'.^{3,4} Both of these disorders affect between 25% and 50% of the population and mar the health and quality of life of individuals and societies leading to social and financial burdens at a global level.

The frequent co-occurrence of both these conditions and their proven close relationship in various studies led World Health Organization (WHO) and the ARIA (Allergic Rhinitis and its Impact on Asthma) initiative to issue documents in 2001 and in 2008, which provide a comprehensive overview of the etiopathogenesis, diagnosis, and treatment of AR. The update proposes that management as one condition one airway-one disease, may alleviate the other coexisting disorders.⁵

Patients having persistent AR should be checked for asthma. This also is one of the key goals in the Finish Allergy Programme 2008–2018, to reduce the load of allergic rhinitis and asthma in the community.⁶ Although few studies have been done in India to see the prevalence of asthma in patients of AR, results of our study compare previous studies and help further analyse, assess, and model to propose standards of evaluation, norms, and guidelines for AR patients.

We also aim to recognize elements which help better identify cases with AR who, despite having absent overt asthmatic symptoms, may have pulmonary function alterations, possibly at a subclinical disease level.

Materials and Methods

This is a prospective study done in the department of Otorhinolaryngology, Head and Neck Surgery, of a tertiary care hospital during a period of 2 years from January 2013 to December 2015. A total of 74 patients with features of AR who presented to our outpatient department were enrolled in the study. After obtaining written informed consent, the patients were given a structured questionnaire requesting demographic details (age, gender, and residence), data on smoking, personal history, family history, history of atopy, and clinical features of AR (frequency and severity). They were



further classified into intermittent AR, and persistent AR as per WHO-ARIA initiative. Recruited patients subsequently underwent hemogram with erythrocyte sedimentation rate (ESR), total serum IgE testing, absolute eosinophil count (AEC), chest X-ray, and pulmonary function tests. Presence of asthma was indicated by reversible airway obstruction with administration of a bronchodilator agent as shown by $\geq 10\%$ increase in FVC (forced vital capacity) or FEV₁ (forced expiratory volume in 1 second).

All cases were put on medical treatment as per ARIA guidelines and then examined for symptom relief on follow up.

Results

Out of 74 patients diagnosed with AR, 41 were males and 33 females (1.24:1 male-to-female ratio). Age ranged from 8 years to 51 years with maximum patients in 21-30 age group. History of smoking was present in 19 (25.6%) of patients out of which 7 (9.4%) were active and 12 (16.2%) passive smokers whereas 55 (74.4%) were nonsmokers. In total, 11 (14.8%) had positive family history of 'united airway' disease (asthma or AR) whereas 63 (85.2%) had no such family history. Maximum patients 44 (59.4%) belonged to *lower socioeconomic* group. Absolute eosinophil count was raised in 28 (37.8%) of patients whereas it was normal in the rest. Total serum IgE was raised in 55 (74.3%) of patients. Table 1 shows the clinical profile of the study group.

Watering nose and sneezing were the most common symptoms seen in 65 cases (87%) followed by nasal blockage in 58 (78.3%) cases. They were classified into *intermittent AR* and *persistent AR* as per WHO initiative ARIA. Out of 74 patients 60 (81%) had *intermittent AR* whereas only 14 (19%) had *persistent AR*. Mild AR symptoms were present in 35 (47.2%) and moderate-severe symptoms of AR were seen in 39 (52.8%) patients. Pulmonary function test (PFT) showed *reversible obstruction*, ie, $>10\%$ improvement in FEV₁ with inhaled bronchodilators in 18 (24.3%), mild obstruction in 14 and moderate obstruction in 4 cases – Table 2. Comorbid latent asthma was more commonly detected in *persistent AR* group (35.7%) as compared with *intermittent AR* cases (21.6%) – Table 3.

Discussion

The percentage of males (53.8%) was seen marginally higher than females (46.1%) in our study. This is similar to a study done by Patel et al⁷ wherein out of 70 AR patients 52.8% were males and 47.1% females. Many of our AR cases were within agegroup of 21-30 years and the mean age of patients in our study was 33.12 years although one patient (1.3%) was elderly. This inference that elder patients had lesser risk of asthma, AR, and their association is in accordance with various studies⁸ although many authors have validated the opposite pattern as well.^{9,10}

In our study, *watering nose* and *sneezing* were the most common presenting symptoms in 65 (87.8%) patients. This is

Table 1. Clinical profile of patients with allergic rhinitis.

Gender			
Female	33		
Male	41		
Age (years)	Female	Male	Total
0-10	0	1	1
11-20	5	8	13
21-30	16	20	36
31-40	7	10	17
41-50	4	2	6
51-60	1	0	1
AR symptoms			
Watering nose	65 (87.8%)		
Sneezing	65 (87.8%)		
Nasal blockage	58 (78.3%)		
Nasal itching	41 (55.4%)		
Sleep disturbances	28 (37.8%)		
Symptoms severe enough to impair with daily life	21 (28.3%)		
Red/itchy eyes	44 (59.4%)		
Laboratory findings			
Raised AEC in blood	28 (37.8%)		
Raised serum IgE levels	55 (74.3%)		
Family history			
Allergic rhinitis	11 (14.8%)		
History of smoke exposure			
Active	7 (9.4%)	Total 19 (25.6%)	
Passive	12 (16.2%)		

Abbreviations: AEC, absolute eosinophil count; AR, allergic rhinitis.

Table 2. Status of pulmonary function in patients with allergic rhinitis.

PULMONARY FUNCTION TESTS	N/74 (%)		
Normal	56 (75.6%)		
Obstructive disease (reversible ^a)	Mild	Moderate	Severe
	14 (18.9%)	4 (5.4%)	0
Restrictive disease	None		

^aReversible obstruction $>10\%$ improvement in FEV₁ with inhaled bronchodilators.

Table 3. Break up of allergic rhinitis cases and presence of associated latent asthma.

TYPE OF AR	NO. OF CASES	COMORBID LATENT ASTHMA	PERCENTAGE
Persistent AR	14	5	35.7
Intermittent AR	60	13	21.6
Total	74	18	24.3

Abbreviation: AR, allergic rhinitis.

similar to the study done by Patel et al⁷ in which most common symptom was rhinorrhea (100%) followed by sneezing present in 95.7% patients and nasal blockage in 22.8% patients. Only 25.6% of AR patients in our study were smokers (9.4% active and 16.2% passive). This is also in agreement with study done by Bugiani et al¹¹ who also found lower prevalence of AR in smokers. Bugiani gave a possible explanation that AR patients either do not start smoking or they stop sooner.

The association between allergic diseases and socioeconomic status is contentious. Most of our patients belonged to *lower socio-economic class* 44 (59.4%) and this is in accordance with studies which have suggested AR and asthma to be more frequent in families with low socioeconomic status, whereas sensitization to aerial allergens appears to be more common in persons with higher socioeconomic status during childhood.¹² However, this might also be linked to other uncontrolled variances in life style and environmental exposures among the groups, and demands for further studies.

The basic investigations required in the evaluation of a patient with suspected AR include complete blood picture with peripheral eosinophil percentage, AEC, total IgE levels, nasal smear examination for eosinophils. A normal eosinophil count is less than 350 cells/ μ L of blood. The relationship between eosinophilia and allergic conditions has been well established in various studies.¹³ In our study, AEC was raised only in 37.6% of patients of AR which is similar to studies done by Venkateswarlu and Murali Mohan¹⁴ and Sonawane et al.¹⁵ IgE facilitated allergic sensitization is the cause of allergic diseases and raised total IgE. Despite wellknown limitations it is frequently included diagnostic criterion for allergic diseases. In 1985, Bousquet et al in a study reported the mean total serum IgE levels was 38 ± 43 KU/L-180 KU/L in normal people and 94 ± 93 KU/L in allergic individuals. Moreover asthmatics had higher mean IgE levels than those suffering from AR.¹⁶ In our study, serum IgE was raised in 74.3% of patients.

Routinely carrying out skin prick tests or radio-allergosorbent test (RAST), enzyme linked immunosorbent assay (ELISA) tests to evaluate the atopic skin status of all these cases is not feasible in most of the outpatient clinics of developing countries. Similar to other authors we too made an attempt to determine the patients who could be given treatment related to allergic symptoms based on the findings acquired from correlation of specific symptoms with the blood markers (total IgE levels and peripheral eosinophils).¹⁷

Allergic Rhinitis and its Impact on Asthma (ARIA) classification has been endorsed by numerous studies. In total, 81% of our patients had *intermittent* AR, whereas only 19% had *persistent* AR, and *mild* AR was present in 35 (47.2%) and *moderate-severe* symptoms of AR were seen in 39 (52.8%) patients. This is similar to study done by Bachert et al¹⁸ who found that 59% of his subjects had *intermittent*, 41% *persistent* rhinitis, 25% *mild*, and 75% moderate-severe AR whereas in a study done by Navarro et al¹⁹ 46% were *intermittent*, 54% *persistent*, 43% *mild*, and 57% *moderate-severe* AR.

There is evidence showing that patients with AR may have an increased prevalence of bronchial hyper-responsiveness and alterations in the functional testing of breathing.²⁰ In a study done by Jeffery et al²¹ on 107 patients of AR deranged pulmonary function tests were observed in 39.1% of cases and 26.1% of patients were diagnosed with asthma. Our study showed 18 (24.3%) of AR patients had PFT similar to asthma. Pulmonary function test showed mild obstruction in 14 (18.9%) whereas moderate obstruction in 4 (5.4%). This is in accordance with studies done by Simons⁴ and Patel et al⁷ wherein associated asthma was present in 15.3% patients. These results point to the presence of substantial variations in the prevalence of the different types of AR as per characteristics of study population and in context to health care.

Conclusion

The study highlights the significance of PFT in AR for recognizing the upper and lower airway disease as a continuum of single disease process and thus importance be given to history of chest symptoms in AR patients to check for latent asthma.

Author Contributions

SM: Protocol design

JM: Data collection and analysis, manuscript review

APS Technical assistance

SJ and NN: Study execution and Data collection

SB: Manuscript editing and Final approval.


Protection of human subjects and animals in research

Protection of human and animal subjects: The authors declare that no experiments were performed on humans or animals for this investigation.

Right to privacy and informed consent: The authors declare that no patient data appears in this article and all the

patients included in the study have received sufficient information and have given their informed consent in writing to participate in the study.

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