

Prevalence of Asthma among Patients with Allergic Rhinitis - A Cross Sectional Study

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ABSTRACT

BACKGROUND

Approximately 10-30% of population suffers from allergic rhinitis during their lifetime. In India, more than 10% of the population is reported to have one or other type of allergic disorder. Nasal symptoms are often demeaned; however, their prevalence and effect on the quality of life justify an aggressive and rational approach. Rhinitis and asthma frequently co-exist [60-70%] with rhinitis appearing first in 45% of patients. We wanted to study prevalence of bronchial asthma in patients of allergic rhinitis with or without chest symptoms and its correlates.

METHODS

This is a cross sectional study conducted among 100 cases of allergic rhinitis who presented to our hospital from December 2010 to August 2012. Data was analysed by using SPSS and results were expressed in percentages.

RESULTS

Maximum number of patients belonged to the age group between 21 - 25 yrs. (34 patients), where males were 38.18% and females were 28.89%. Majority of the patients (74%) had significantly reversible small airways obstruction. Among the patients with allergic rhinitis, males had predominantly chest symptoms (58.33%) compared to females (41.67%). Spirometry revealed 63 (80.77%) patients had mild obstruction, 12 (15.38 %) had moderate obstruction and 3 (3.85 %) had severe obstruction. The prevalence of asthma among allergic rhinitis was found to be 78% in our study.

CONCLUSIONS

78% of patients with allergic rhinitis were found to have underlying asthma. Prevalence of severe, moderate, and mild asthma amongst patients of allergic rhinitis was found to be 3%, 12% and 63% respectively. Severe obstruction was observed in 3.85% of subjects.

KEY WORDS

Asthma, Allergic Rhinitis, Spirometry, Chest Symptoms, Obstruction

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BACKGROUND

The prevalence of allergic disorders is increasing worldwide. While genetic factors have probably not changed, environmental factors have altered markedly. On one hand, environmental pollution has increased with potentially adverse effects on the impact of environmental allergens. On the other hand, excess hygiene and limited exposure to microbial antigens may also be responsible for the higher rate of development of allergic disorders. Every day, millions of children wake up suffering from the symptoms of nasal/respiratory allergies. Likewise, many experiences the suffering of the vicious cycle of "scratch-itch scratch" due to allergic skin conditions. Now it is widely recognized that disease means more than just symptoms. The global impact on an individual's daily function and ability to enjoy life is also very important, sometimes more critical than the symptoms themselves.

Allergic disorders are associated with learning disabilities, fatigue, and lack of concentration, sleep disturbances and loss days from school. In utero, T cells of foetus are primed by common environmental allergens that cross placenta. Type 2 helper T cells dominate immune response of virtually all newborn infants. The normal non-atopic infant's immune system, during subsequent development shifts in favour of Type 1 helper T cell mediated responses to inhaled allergens (process termed "immune deviation"), whereas in the potentially atopic infant there is a further increase in Type 2 helper T cells that were primed in utero. The progressive development of allergy seen through childhood in the form of atopic dermatitis, food allergy, allergic rhinitis, childhood asthma, adult asthma is referred to as "The Allergy March". Total IgE, a marker of allergic diseases peaks in 2nd decade, after that it begins to decrease.^{1,2}

Atopy is the inherited tendency to develop IgE mediated immune responses, which places a person at greater risk for developing certain allergic diseases such as allergic rhinitis, asthma, atopic dermatitis.^{1,3} Histamine is a crucial mediator in the pathophysiology of early and late phase reactions of an allergic response, playing important roles in cytokine release and in the adhesion process.⁴ In India, more than 10% of the population is reported to have one or other type of allergic disorder.

Two studies conducted in Bombay, concluded that incidence of atopy in the Indian population is as high as 25.3%.^{5,6} The prevalence of allergic rhinitis is estimated to range from 10% to 20% in the USA and Europe.⁷ Allergic rhinitis [called *Asatmyaja Pratisyaya* in Indian medicine] with its attendant complications is a common condition today as the nasal passages are among the chief source of contact of man with allergens. Allergic rhinitis is defined as an allergen induced inflammation of the membranes lining the nose. It is characterized by nasal congestion, rhinorrhoea, sneezing, itching of nose and/or postnasal drainage.⁸

Based on the nature of symptoms ARIA (Allergic Rhinitis and its Impact on Asthma) working group has classified allergic rhinitis into intermittent, persistent, mild and moderate-severe types and recommended for assessment of asthma in patients with persistent rhinitis, assessment of

rhinitis in patients with persistent asthma and appropriate therapeutic strategy to combine safe and effective management of the upper and lower airway.⁹

Multiple factors contribute to the wide range of reported prevalence rates. These include type of prevalence rate reported, study selection criteria, age of participants, differences in survey methods, varied geographic locations and socioeconomic status, any of which are significant enough to confound direct comparison between studies. There are no standard set of diagnostic criteria for allergic rhinitis. It constitutes approximately 55% of all allergies seen in India.¹⁰

A recent survey carried out in India shows that 20–30% of the population suffer from allergic rhinitis and that 15% develop asthma.^{11,12} Approximately 10-30% of population suffers from allergic rhinitis during their life time.^{13,14} Nasal symptoms are often demeaned; however, their prevalence and effect on the quality of life justify an aggressive and rational approach. Rhinitis and asthma frequently co-exist [60-70%] with rhinitis appearing first in 45% of patients.¹⁰ Although a cause of significant widespread morbidity, allergic rhinitis is often viewed rather erroneously as trivial disease.

In India, it is often treated as an 'orphan' disease as AR falls in the grey area between the otorhinolaryngologist and the pulmonologist resulting in lack of focus on research in allergic rhinitis by both the specialties. The prevalence of asthma in patients with rhinitis ranges from 15%-40% and is present in 10%-15% of the patients with seasonal rhinitis and in 25% 40% of those with persistent rhinitis. The severity of rhinitis is directly related to asthma severity and develops before age of 20 years in 80% of cases with mean age of onset of 10 years and peak incidence of 13-19 years.¹⁵

The Control of Allergic Rhinitis and Asthma Test has been proposed as the first tool to implement the Allergic Rhinitis and its Impact on Asthma initiative guidelines in clinical practice. The "Control of Allergic Rhinitis and Asthma Test" (CARAT) is a brief self-administered questionnaire to quantify the degree of control of Allergic Rhinitis and Asthma. CARAT can be used both in clinical studies and in clinical practice, to compare groups and to evaluate individual patients over time.¹⁶ Reports from India shows that 1 out of every 6 person has allergic rhinitis.¹⁷ Raichur is one of the backward districts of Karnataka and highly polluted. So, the current study intended to determine the prevalence of bronchial asthma in patients with allergic rhinitis with or without chest symptoms.

In our study we intent to determine the prevalence of bronchial asthma in patients with allergic rhinitis with or without chest symptoms by degree of bronchodilator response and to correlate clinical and spirometric parameters of these patients in our clinical setting under Indian scenario.

METHODS

It was a cross sectional study conducted in our department from December 2010 to August 2012. Only those patients with history suggestive of allergic rhinitis and who were able to successfully complete spirometry along with other inclusion criteria were enrolled in our study. Those who did not meet inclusion criteria and patients who did not give consent were not included in the study. A total of hundred allergic rhinitis

patients fitted into our inclusion criteria. Clinical diagnosis of allergic rhinitis was made after a detailed clinical history and physical examination. Symptoms of paroxysms of sneezing, nasal pruritus, rhinorrhoea and nasal blockage daily for the last two weeks were considered to have allergic rhinitis. Patients with history of fever, purulent nasal discharge or sputum, respiratory infection in the month prior to study, Patients with other ENT problems like DNS, polyps, smokers, patients with known heart disease, patients on treatment with steroids (intranasal/oral), patients on leukotriene modifiers were excluded from the study.

All the patients included in the study underwent the following Investigations

- a. Complete haemogram.
- b. Absolute Eosinophil Count.
- c. X ray – Chest.
- d. X ray - PNS.
- e. Serum total IgE level.
- f. Spirometry.

Ethics

Permission was obtained from the institutional ethical committee regarding conducting this study. Informed written consent was taken from patients fulfilling the eligibility criteria and been informed about type of study and assurance was given for maintenance of confidentiality of the patient.

Statistical Analysis

It was a cross sectional study. Chi square test was used to find the association. A p value <0.05 was taken as significant. Data analysis was done using software SPSS v16.0 and results were expressed in percentages.

RESULTS

Age (Yrs.)	Sex		Total
	Female	Male	
16-20	7 (15.5%)	5 (9%)	12 (12%)
21-25	13 (28.8%)	21 (38.1%)	34 (34%)
26-30	11 (24.4%)	15 (27.2%)	26 (26%)
31-35	7 (15.5%)	11 (20%)	18 (18%)
36-40	7 (15.5%)	3 (5.4%)	10
Total	45	55	100

Table 1. Distribution of Subjects According to Age and Sex

Among the total 100 Allergic rhinitis patients studied, the age group varied from 16 to 40 years. The maximum number of patients belonged to the age group between 21-25 yrs. (34) where males were 38.18% and females were 28.89%. Minimum number of patients belonged to the age group between 36-40 yrs., (10) where males were 15.56% and females were 5.45%. Males were predominant than females in all the age groups. Mean age of study subjects was 27.78 ± 6.01 years.

Spirometry Pattern	Number	Percent (%)
Normal	22	22%
Restriction	24	24%
Obstruction	54	54%
Small airways obstruction	74	74%

Table 2. Distribution of Subjects According to Spirometry Pattern

Among the 78 (78%) patients who had asthma, the majority of the patients (74%) had significantly reversible small airways obstruction. 54 patients (54%) had obstructive flow pattern on spirometry whereas 24 (24%) had restrictive flow pattern in combination with obstruction on spirometry. Of the 100 patients who underwent spirometric assessment of the pulmonary function, 22% (n=22) had normal baseline study, 24% (n=24) had restrictive pattern and 54% (n=54) had obstructive pattern. Among the patients with obstructive pattern, small airway obstruction was seen in majority (74%, n=74).

Sex	Allergic Rhinitis and Chest Symptoms		Total
	Without	With	
Female	20	25	45
Male	20	35	55
Total	40(40%)	60(60%)	100

Table 3. Association of Study Group Based on Chest Symptoms

Among the study group, 60 patients with allergic rhinitis had chest symptoms in the form of cough, chest tightness and wheeze whereas 40 patients did not give history of chest symptoms. Among the patients with allergic rhinitis males had predominant chest symptoms (58.33%) compared to females (41.67%).

Severity of Asthma	Sex		Total
	Female	Male	
Mild	26	37	63
Moderate	4	8	12
Severe	2	1	3
Total	32 (41.02%)	46 (58.97%)	78

Table 4. Distribution According to Severity of Asthma and Gender

Among the 78 patients who were diagnosed as asthmatics on the basis of spirometry, 63 (80.77%) patients had mild obstruction, 12, (15.38 %) had moderate obstruction and 3 (3.85 %) had severe obstruction. Of the total 78 patients diagnosed of asthma, males accounted for 46 (58.97%) whereas females were 32 (41.02).

Severity	AR	Asthma severity		
		Mild (%)	Moderate (%)	Severe (%)
Mild	31	19 (61.3)	-	-
Moderate	35	23 (65.7)	4 (11.4)	-
Severe	34	21 (61.7)	8 (23.5)	3 (8.8)
Total	100	63	12	3

Table 5. Relationship between Severity of Allergic Rhinitis (AR) and Severity of Bronchial Asthma

In 31% (n=31) of mild allergic rhinitis patients 19 patients (61.3 %) had mild asthma whereas, 35% cases (n=35) of moderate allergic rhinitis patients 23 patients (65.7 %) had mild asthma and 4 patients (11.4 %) had moderate asthma. In 34 % (n=34) cases of severe allergic rhinitis patients, 21 patients (61.7 %) had mild asthma, 8 patients (23.5 %) patients had moderate asthma and 3 patients (8.8 %) had severe asthma.

Allergic Rhinitis and Chest Symptoms	Asthma		Total
	Yes	No	
With	51	9	60
Without	27	13	40
Total	78 (78%)	22 (22%)	100

Table 6. Prevalence of Bronchial Asthma in Relation to Chest Symptoms

In our study, 78% (n=78) had bronchial asthma where as 22 % (n=22) did not have asthma, according to the methods

adopted. The prevalence of asthma in AR patients with chest symptoms were found to be 65.4% (n=51) and without chest symptoms is 34.6 % (n=27). There was a Relative risk of 1.26 (95 % CI = 0.99-1.60) among the AR patients to develop asthma calculated with a chi square test showing a significant association of 3.33 with df=1 (p<0.05).

DISCUSSION

In the present study, Allergic rhinitis was more common in the younger age group. This is in accordance with the published literature that allergic disorders predominate in the younger people with 0-40 year group and particularly the most productive years of life, constituting 80% of patients, resulting in a huge loss to the society.^{10,18,19} Among AR patients, studies show that there is an equal sex distribution or male predominance among children and equal sex distribution or slight female predominance among adults. The male predominance in our study is probably due to sampling induced by the social status of women in our society. Females tend to endure their suffering while males may seek medical attention.

Most of our patients presented with classical symptoms of allergic rhinitis like paroxysms of sneezing, nasal discharge, nasal block, itching and eye symptoms. Similarly Yadav SPS et al. in their study among 1075 patients of AR reported sneezing, nasal discharge and nasal block as the commonest symptoms followed by itching and eye symptoms.²⁰ In a study done by Seedat RY et al. among 100 patients of AR, nasal block was the commonest symptom (80%) followed by nasal discharge, sneezing, pruritus and postnasal drip.²¹ Cough was also common symptom among our patients. Cough in allergic rhinitis patients could be due to postnasal drip, pharyngitis or lower airway obstruction. Postnasal drip is the commonest cause of cough in allergic rhinitis. Since it is difficult to ascertain that cough was due to upper or lower airway involvement, we considered only chest tightness and wheeze to evaluate chest symptoms in our study. 41% of our patients gave history of chest tightness and/or wheeze sometime during the illness though it may not be their presenting complaints. These patients had more severe rhinitis and airway obstruction than those who did not complain, and it can be considered as a risk factor for development of asthma. There are more patients who rated their symptoms as moderate to severe. This is probably due to the patients with milder symptoms may not be seeking medical help or are not being recognized or are being treated by general practitioners.

Allergic rhinitis patients are more likely to have abnormal spirometry than normal subjects. Small airway dysfunction is the most common abnormality. FEF-25-75, FEF 25 and FEF-50 are sensitive indicators. Patients with more severe AR have more severe airway dysfunction. Spirometric abnormalities were highest in the third decade when rhinitis symptoms were also peaking. Therefore, it is important to perform the test when the patient is having rhinitis symptoms. The bronchoconstriction may be mediated by neuro-humoral mechanisms (nasobronchial reflex through vagus), postnasal drainage of inflammatory material into lower airways, loss of air conditioning and aeroallergen trapping due to mouth breathing as result of nasal obstruction. Grossman and Putnam

performed pulmonary function tests on 32 patients with allergic rhinitis and found that, at baseline 13% of patients had obstruction at low lung volumes (maximum mid expiratory flow and maximum terminal flow). This was lower than that in our study, however their sample size was smaller and they have not specified the severity of allergic rhinitis.²² Morgan and Hall studied Dynamic compliance at varying respiratory frequencies, closing capacity, residual volume and maximum expiratory flow volume curves in subjects with symptoms of hay fever. Frequency dependence of compliance was found in 40% of patients even when expiratory flow rates at mid vital capacity were within the predicted range of all subjects. Subclinical airway obstruction is present even when spirometric tests are in normal limits.²³

The prevalence of asthma in AR patients with chest symptoms were found to be 65.4% (n=51) and without chest symptoms is 34.6 % (n=27). From literature, the prevalence of asthma in patients with rhinitis ranges from 15% to 40%.¹⁵ Our study had a higher prevalence (78%) of asthma (reversible airway disease) among the patients with allergic rhinitis. This could be due to the fact that small airways reversibility was considered as a parameter to diagnose asthma in the present study and the majority of our patients had small airways obstruction. Recent research suggests that FEF 25-75% or FEF 25-50% may be a more sensitive parameter than FEV1 in the detection of obstructive small airway disease.^{24,25} Present being a prevalence study, the patients who initially present with chest symptoms with history of allergic rhinitis were taken into the study could be another possible explanation. Previous studies tell us that the severity of rhinitis is directly related to severity of asthma¹⁵ which was also observed in our study. 24% of our patients had restrictive abnormality at baseline, though 74% of them also had concomitant small airway involvement. There were no studies regarding restrictive abnormality among AR patients. We hypothesized this restriction could be due to FVC limitation either secondary to poor effort due to severity of nasal symptoms or secondary to underlying small airway dysfunction present in these patients. However, these patients need further evaluation with appropriate investigations to know the cause of restriction. Irrespective of pre bronchodilator spirometry results, degree of bronchodilator response was higher in allergic rhinitis. The response was intermediate to that of normal and asthmatic patients. Thus, the airway obstruction in allergic rhinitis is largely reversible and patients will benefit with,

- a. Optimal control of allergic rhinitis.
- b. Additional use of bronchodilator and inhaled corticosteroids in those with severe allergic rhinitis with chest symptoms.

CONCLUSIONS

Patients with allergic rhinitis are at risk of developing asthma. Both allergic rhinitis, and asthma cause significant morbidity and loss of quality of life. It is therefore essential to diagnose early because it is possible to modify the course of the disease with adequate therapy. 78% of patients with allergic rhinitis were found to have underlying asthma. Prevalence of severe, moderate, and mild asthma amongst patients of allergic rhinitis was found to be 3%, 12% and 63% respectively.

Severe obstruction was observed in 3.85% of subjects. Among the patients with allergic rhinitis, males had predominantly chest symptoms compared to females.

Pulmonary function test abnormalities are present even when patients do not complain of chest symptoms. Therefore, in allergic rhinitis patients, asthma should be carefully investigated, and they should undergo pulmonary function tests as a baseline investigation to detect occult asthma, more so in allergic rhinitis patients who have chest symptomatology.

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