Association between allergic rhinitis and bronchial asthma in adults

- a cross-sectional study

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ABSTRACT: Introduction: The relationship between bronchial asthma and allergic rhinitis has been recognized clinically. The main pathophysiological role is leukotriene inflammation in both upper and lower airways. Patients with persistent and severe rhinitis have the highest risk for asthma and it is an independent risk factor for asthma onset. The prevalence of bronchial asthma in allergic rhinitis is around 40 % in South India. Allergic asthma is the most easily recognizable asthma phenotype that often commences in childhood and is often associated with past and family history of allergic diseases like eczema, allergic rhinitis, and food/drug allergy.

Aim: The study's main aim was to study the prevalence of the co-existence of allergic rhinitis and bronchial asthma in the adult population Using a respiratory allergy prediction tool.

Materials and Method: Analytical cross-sectional study done on 280 subjects from June 2021 to June 2023.

Inclusion criteria: 1) patients >18 years of age of both genders. 2) patients with chronic rhinitis and any symptoms of asthma (dyspnoea, cough, wheezing, chest tightness)

Exclusion criteria: 1) severely ill patients who cannot perform Spirometry. 2) to exclude the patients with other causes of dyspnoea

Methodology: The study was conducted in the outpatient department of the Pulmonary Medicine department, where all the patients with chronic rhinitis and any symptoms of asthma were recruited and subjected to detailed history and Spirometry tests to confirm the diagnosis of bronchial asthma.

Results: Data was obtained from 280 allergic rhinitis patients with a mean age of 27.78 ± 6.01 years. The prevalence of coexisting bronchial asthma was found to be 78% with the highest in the age group of 26 to 35 years. For qualitative variables, the Chi-square test is applied, and Reprogram 4.3.1 for statistical references.

Conclusion: Genetic, epidemiologic, pathophysiologic, and clinical evidence strongly support the relationship between AR and asthma. The majority of asthmatic Patients have AR. Both diseases are Ige-mediated leading to the release of inflammatory mediators into nasal and bronchial systems. A positive link was found between allergic rhinitis and asthma, suggesting that allergic rhinitis is an important risk factor to develop asthma and it is also an important cause of suboptimal control of asthma. Our study revealed that 78% of patients with allergic rhinitis were found to have asthma as an underlying disease. Lung function test abnormalities are detected even in patients who do not have chest symptoms. In accordance, all allergic rhinitis patients should be screened with spirometry as a baseline investigation to Detect hidden asthma.

INTRODUCTION:

Allergic rhinitis and bronchial asthma are often co-existing conditions. Many allergic asthma patients also have allergic rhinitis. The type of inflammation in AR and asthma involves T-Helper type 2 lymphocytes, mast cells, and eosinophils. Both allergic rhinitis and bronchial asthma share common environmental and genetic risk factors. The prevalence of allergic rhinitis ranges from 15 to 40%. Bronchial asthma is a heterogeneous disease, characterized by chronic airway inflammation. Asthma is characterized by variable symptoms of wheezing, shortness of breath, chest tightness, and cough and by variable expiratory flow limitation. 1 to 18% of the world's population are impacted[1]. About 10 to 50 percent of the world's population suffers from allergic rhinitis (AR), a condition whose prevalence has grown over time along with urbanization and pollution levels. AR is associated with asthma in 40 % of patients, whereas 80 to 95 % of patients with allergic asthma also have rhinitis. 80% of AR symptoms appear before the age of 20 and peak between the ages of 20 and 40 before gradually fading[2].

Genetic and environmental variables are thought to play a role in the development of asthma. Environmental factors may also affect the progression of disease to the lower airways in patients with AR. In a study of patients with allergic rhinitis, smoking increased the risk of developing asthma by approximately threefold(polosa,2008). family history has also been shown to play an important predictive role in the development of asthma and AR history of maternal asthma and or maternal smoking were strongly associated with the development of allergic rhinitis and asthma. Exposure to allergies and air pollution are considered environmental factors. Beta-blockers and aspirin are other probable triggers. Djukanovic and colleagues compared biopsies from atopic asthmatics and atopic nonasthmatics and found that atopic nonasthmatics had basement membrane thickening and eosinophilic inflammation resembling asthma. The pattern of symptoms, treatment response over time, and spirometry are typically used to make the diagnosis.

Both nasal and non-nasal symptoms are present in allergic rhinitis. After an allergic reaction to an allergen that causes mucosal inflammation, nasal symptoms such as rhinorrhoea, sneezing, nasal obstruction, and itching may last for hours.

Asthma and AR are frequently found in the same patient. Both disorders are IgE-mediated allergies produced by identical allergens and share common inflammatory and pathophysiological pathways [5]. As a result, allergic rhinitis is regarded as a risk factor for both the occurrence and severity of asthma. Bronchial hyper-responsiveness is common in people with AR, even if they have no asthma symptoms and asymptomatic airway hyper-responsiveness is Associated with an increased risk of developing asthma.

AR has been found to have a significant impact on asthma morbidity in adults, and therapy of AR helps to improve asthma control6. The coexistence of asthma and AR can cause a delay in appropriate therapy, as the focus of treatment is primarily on asthma, with less attention paid to the accompanying rhinitis, which often goes unnoticed.

METHODOLOGY:

This cross-sectional study was held in the Pulmonary Medicine department from June 2021 to June 2023. Only those patients with a history suggestive of AR and bronchial asthma who were able to complete Spirometry along with other inclusion criteria were enrolled in our study.

INCLUSION CRITERIA:

1) patients >18 years of both genders. 2) Patients with chronic Allergic rhinitis and any asthma symptoms (dyspnoea, cough, wheezing, chest tightness).

EXCLUSION CRITERIA:

1) severely ill patients who cannot perform Spirometry. 2) Dyspnoea due to pathology other than asthma. 3) Patient not giving consent to be included in the study.

STUDY TOOLS:

The RAP (Respiratory Allergy Prediction test) questionnaire is a self-administered easy-to-use tool, that consists of 9 questions for screening allergic rhinitis. The tool was developed by Galimberti et al., in 2015.[7] The investigators used an interview technique to collect responses from each patient.

A spirometry test was done on all patients. FEV1/ FVC ratio <70% and with post-bronchodilator reversibility of >12% or 200ml were diagnosed as bronchial asthma.

All patients in the study underwent investigations like complete hemogram, Absolute eosinophil count, chest X-ray, X-ray PNS, and Spirometry.

STATISTICAL ANALYSIS:

The data was analyzed using Reprogram 4.3.1. Descriptive data were analyzed in percentages. Mean and standard deviation will be calculated for numerical variables. For inferential statistics, we used the Chi-square test. P value less than 0.05 was taken as significant.

RESULTS:

The present study has a total of 280 patients who have met our inclusion criteria and their ages varied from 18 to 40 years with a maximum number of patients belonging to the 26-30 yrs age group. The study had a female predominance, with 160 females and 120 males. Females were predominant in all the age groups. The mean age of the study subjects was 27.78±6.01 years. (Table 1)

Table 1. Distribution according to age and sex

AGE	SEX		
YEARS	MALE	FEMALE	TOTAL
18-20	16(15.5%)	20(9%)	36(12.85%)
21-25	14(28.8%)	24(38.1%)	38(13.57%)
26-30	40(24.4%)	52(27.2%)	92(32.85%)
31-35	36(15.5%)	46(20%)	78(27.85%)
36-40	14(15.5%)	18(5.4%)	34(12.14%)
TOTAL	**120**	**160**	**280**

The subjects were all requested to take part in the Respiratory Allergy Prediction test (RAP questionnaire). Table 2 shows the response of participants to the questionnaire. 7.8% had nasal symptoms that worsen in a dusty environment, 17.5% suffered from itchy/watery/red eye during the year, and 7.5% experienced cough/shortness of breath, even during exercise, 8.2% had parents/ relatives suffering from AR and/or Bronchial asthma and experienced running nose/ nasal obstruction or itching nose for many consecutive days. 11.4% of them had wheezed, in 15% of patients nasal/ ocular complaints started or worsened during the spring, 6.4% had evidenced nocturnal awakenings due to SOB or cough and 5.7% of participants frequently used nasal spray.

Table 2. Responses of Participants to the RAP Questionnaire

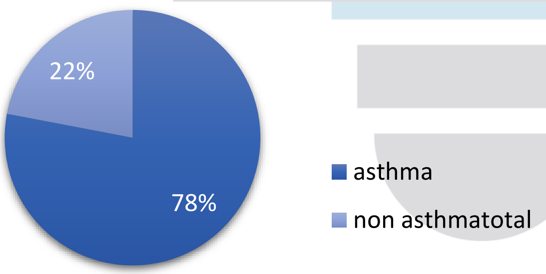
RAP Questions	Number (n=280)	Percentage
1. Do you have parents or relatives suffering from rhinitis and/or asthma?	23	8.2%
2. Do you suffer from itchy/ watery/ red eyes during the Year?	49	17.5%
3. Do you experience running nose/ nasal obstruction or nasal itching for many consecutive days?	57	20.3%
4. Do your nasal or ocular complaints usually start or worsen during the spring?	42	15%
5. Have you ever had a wheeze?	32	11.4%
6. Did you ever have a cough or shortness of breath, even during exercise?	21	7.5%
7. Do you have nocturnal awakenings due to shortness of breath or cough?	18	6.4%
8. Do you use nasal spray frequently?	16	5.7%
9. Do you feel that your nasal symptoms worsen in dusty environment?	22	7.8%

Among the study group, 167 patients with AR had chest symptoms like cough, chest tightness, wheezing, and SOB. 113 patients have not given a history of chest symptoms. Of the 280 patients, Females experience more chest symptoms than males %). (Table 3)

Table 3. Association with chest symptoms

Chest symptoms among allergic rhinitis			
Sex	**Present**	**Absent**	**Total**
Female	96	64	160
Male	71	49	120
Total	**167(59.6%)**	**113(40.3%)**	**280**

It was discovered that 78% (n=78) of patients had bronchial asthma and 22% (n=22) did not. The mean FEV1 was 69.5%, with a post FEV1 of 78.5%, and a 14% difference between the two was observed.



Prevalence of Asthma

The prevalence of asthma in AR patients with and without chest symptoms was reported to be 64% (n=141) and 36% (n=77). AR patients had a relative risk of developing asthma of 1.26 (95% CI- 0.99-1.60). A significant relationship was found using a chi-square test of 11.8 with df=1 ($p < 0.05$). (Table 4)

Table 4. Prevalence of bronchial asthma about chest symptoms

Allergic rhinitis And Chest symptoms	Asthma		Total
	Yes	**No**	
Present	141	25	166

Absent	77	37	114
Total	**218(78%)**	**62(22%)**	**280**

DISCUSSION:

Several theories have been proposed to explain the relationship between the upper and lower airways, as well as the concept of united airway illness. The development of combined upper and lower airway disease is significantly associated with genetic variables, anatomical relationship between upper and lower airways, neuronal contact between the nose and lower airway, and circulating inflammatory mediators. Inflammatory mediators can reach the lower airway from the upper airway through the airway passage and also through blood [8].

According to the findings of this study, allergic rhinitis is more common in younger people. This is consistent with the available literature, which indicates that allergy diseases are more common among young people [9]. Our study found a slight female majority, which is consistent with prior studies.

In a dusty atmosphere, the majority of patients noticed an increase in nose symptoms, followed by itchy and watery red eyes. Only a few members have utilized nasal spray to relieve their symptoms. This is comparable to the findings of Yadav SPS et al., who discovered that nasal obstruction is common, followed by itching and ocular problems[10].

47% of patients from the questionnaire have experienced wheeze, cough, and shortness of breath at the time of illness. Females had more chest symptoms than males. In J. M. Phadtare et al[11] studies, they had female predominance similar to our study. These patients had more severe AR and airway obstruction than those who did not have these symptoms.

AR sufferers are more prone than normal persons to have aberrant Spirometry readings. Spirometry anomalies were common in people aged 26 to 35. Bronchial asthma was diagnosed in 78% of the patients. As a result, it is critical to do Spirometry on individuals who have been diagnosed with allergic rhinitis.

The prevalence of asthma in allergic rhinitis patients with and without chest symptoms was 64% and 36%, respectively. Our study found a greater prevalence of asthma than the literature (15% to 40%). The cause could be that Spirometry tests were performed on people who did not have any chest symptoms. Another cause could be differences in social and geographic variables.

CONCLUSION:

A positive correlation was discovered between allergic rhinitis and asthma, implying that allergic rhinitis is a significant risk factor for developing asthma and a major cause of asthma control failure. According to our findings, asthma was shown to be the underlying condition in 78% of individuals with allergic rhinitis.

Pulmonary function test abnormalities are detected even in patients who do not have chest symptoms. As a baseline inquiry, all AR patients should be examined with Spirometry to detect concealed asthma.

ABBREVIATIONS:

AR- Allergic Rhinitis, Ig E- Immunoglobulin E, RAP- Respiratory Allergy Prediction test, FEV1- Forced Expiratory Volume at 1st sec, FVC- Forced Vital Capacity, PNS- Para Nasal Sinus

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