

Research Article

Study of reversible airway disease in patients with allergic rhinitis

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ABSTRACT

Background: Allergy is a condition with wide spectrum of manifestations; it ranges from individuals with positive skin prick test without clinical features to allergic rhinitis, Atopic dermatitis, Asthma, Urticaria, Conjunctivitis, Enteritis and its most severe clinical manifestation Anaphylactic shock. This study aims to determine the baseline Spirometry in patients with allergic rhinitis using a computerized Spirometer. Assess the pulmonary function after inhalation of a bronchodilator to determine the degree of bronchodilator response. Correlate the clinical and laboratory parameters with the pulmonary functions.

Methods: This study was conducted on 50 cases of allergic rhinitis presenting to our hospital from July 2006 to December 2007. Clinical diagnosis was made after a detailed clinical history and physical examination. All the patients included in the study underwent the following investigations: Complete hemogram, Absolute eosinophil count, X ray – chest and PNS, Serum total IgE level, spirometry.

Results: Males constituted majority of population (62%) with mean age of 24±11.4 years. The most common symptom among allergic rhinitis patients was sneezing. Peripheral blood AEC levels were directly proportional to the severity of AR. Serum total IgE levels were also directly proportional to the severity of AR and severity of lower airway obstruction. PEF, FEF-25, FEF-50, FEV1% were significantly lower among AR patients with lower airway obstruction compared to patients with AR alone (p<0.05).

Conclusions: Allergic rhinitis is a common disorder among general population predominantly involving the younger age group. Multicentric prospective studies are required to evaluate further, the role of spirometry among AR patients.

Keywords: Allergic rhinitis, Spirometry, Sneezing, Bronchodilator, Absolute eosinophil count

INTRODUCTION

The prevalence of allergic disorders is increasing worldwide. While genetic factors have probably not changed, environmental factors have altered markedly. On the 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. Allergy is a condition with wide spectrum of manifestations; it ranges from individuals

with positive skin prick test without clinical features, to individuals affected by different forms of disease such as allergic rhinitis, Atopic dermatitis, Asthma, Urticaria, Conjunctivitis, Enteritis and its most severe clinical manifestation Anaphylactic shock. 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} 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.^{3,4}

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.⁵ It constitutes approximately 55% of all allergies seen in India.⁶ Approximately 10-30% of population suffers from allergic rhinitis during their life time.^{7,8} 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.⁶ In present study we intent to determine the baseline Spirometry in patients with allergic rhinitis and assess the incidence of reversible airway disease with degree of bronchodilator response and to correlate clinical and spirometric parameters of these patients in our clinical setting under Indian scenario.

METHODS

This study was conducted on 50 cases of allergic rhinitis presenting to the hospital from July 2006 to December 2007. The institutional ethical committee approved our study. Clinical diagnosis 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, Smokers, Patients with congenital heart disease, rheumatic heart disease, hypertension, ischemic heart disease, Patients on treatment with oral contraceptives were excluded from the study. All the patients included in the study underwent the following investigations: Complete hemogram, Absolute eosinophil count, X ray – chest and PNS, Serum total IgE level, Spirometry.

Spirometer

All selected patients were subjected to pulmonary function tests using a computerized spirometer MORGAN HYP'AIR COMPACT+. Patients were symptomatic at the time of test and were off medication

for 24 hrs. The data regarding age, sex, height, weight, races was entered in computerized format. Machine was calibrated before each test. Patients were properly instructed regarding the test prior to its performance and assured that it is a safe and non-invasive procedure. They were instructed to remove any dental prosthetics.

Proper fitting mouthpiece and nose clips were provided. They were made to sit in a comfortable position. After one minute of normal breathing, subjects were asked to expire maximum and take maximum inspiration, immediately keep the mouthpiece and to expire out all the air with maximum effort. They were told to be in expiration phase for six seconds, at the end of which were instructed to make maximum inspiratory effort. Subjects were asked not to cough or stop in between the procedure. The parameters were recorded through computerized appliances and flow volume loop, volume time curve created. The procedure was repeated twice and the best test was selected for study. Reproducibility was assured ensuring FVC of acceptable tracings did not vary by more than 5%. A β_2 -agonist bronchodilator, salbutamol in pressure aerosol form available commercially as

“Metered dose inhaler”, delivering 100 micrograms per puff was used [Asthalin – Cipla]. Each patient received 200mg and spirometric test were repeated. After completion of test – A graphical record with results were obtained – Forced vital capacity, Forced expiratory volume in 1st second, Forced expiratory flow 25,50, Peak flow rate.

A significant reversibility of airflow obstruction is defined as increase of 12% or more and 200ml in FEV1 and/or FVC or of 15% in FEF25, FEF50 or of 20% in PEF above the baseline. Statistical analysis was done using Microsoft excel, MEDCALC version 9.6.1.0 software. P- value calculated with one way analysis of variance (ANOVA) and p- value taken as significant if <0.05. Sensitivity, specificity and predictive values were calculated from ROC curve analysis.

RESULTS

Males constituted majority of our study population (62%) with mean age of 24±11.4 years. The most common symptom among allergic rhinitis patients was sneezing followed by nasal discharge and cough.

Table 1: Severity wise split up-age and sex.

	5-14	15-24	25-34	>34	Male	Female
Mild AR	4	3	5	1	9	4
Mod AR	4	7	5	4	15	5
Sev AR	2	9	5	1	7	10

Peripheral blood AEC levels were directly proportional to the severity of AR and lower airway obstruction, though the difference was not statistically significant. Among patients with AR alone and AR+airway obstruction, peripheral blood AEC levels were higher in AR patients with airway obstruction. AEC>530/cu.mm has a sensitivity and specificity of 63% and 58% respectively. It has a positive predictive value of 48% and negative predictive value of 72% ($p > 0.05$).

Table 2: Distribution of cases by symptoms.

Symptom	No.
Sneezing	47
N. block	32
Discharge	40
Itching	23
Cough	32
Chest tight	21
Wheeze	10
Eye symptoms	21
Skin symptoms	6

Serum total IgE levels were also directly proportional to the severity of AR and severity of lower airway obstruction. The difference was statistically significant for both ($p < 0.05$). Among patients with AR alone and AR+lower airway obstruction, serum total IgE levels were higher in AR patients with lower airway obstruction. Serum total IgE>580 IU/ml has sensitivity and specificity of 68.4% and 67.7% respectively with a positive predictive value of 57% and negative predictive value of 78% ($p = 0.05$).

Table 3: Severity of AR - AEC levels.

	Mean AEC
Total cases	674.5
Mild AR	604
Mod AR	718.6
Sev AR	747.1

Incidence of lower airway obstruction (asthma) among AR patients was 38%. Among them small airway obstruction was the predominant observation (53%). PEF, FEF-25, FEF-50, FEV1% were significantly lower among AR patients with lower airway obstruction compared to patients with AR alone ($p < 0.05$). There was no significant difference in FVC and FEV1 values between the two groups. AR patients with lower airway obstruction have a greater response to bronchodilator (reversibility) than patients with AR alone which was statistically significant for reversibility in FEV1, PEF, FEF-25, FEF-50.

DISCUSSION

Allergic rhinitis was more common in the younger age group in our study. 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.^[6] With advancing age people tend to outgrow atopic diathesis and only those with more severe disease will have symptoms.

This explains the relative paucity of older patients in present study. 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.⁹ We had more males than females in our study both among children and adults but the proportion of males were less among adults than in children.

It is thus observed that most male children presenting with allergic rhinitis tend to outgrow their disease during the passage through adolescence and into adulthood, whereas a large number of female children who were asymptomatic or may have had subclinical disease, tend to manifest allergic rhinitis when entering adulthood. Most of our patients presented with classical symptoms of allergic rhinitis viz. 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.¹⁰

50% 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. In our study 60% of patients of AR had above normal AEC levels, 40% patients with AR had normal AEC levels. AEC did not reflect severity of allergic rhinitis. Neither does a high AEC confirm atopy nor does a normal AEC rule it out.

Allergic rhinitis patients are more likely to have abnormal spirometry than normal subjects. Small airway dysfunction is the most common abnormality. FEV1 (% predicted), FEV1%, PEF, FEF-25 and FEF-50 are sensitive indicators. 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 broncho constriction 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.

From literature, the incidence of asthma among allergic rhinitis patients was ranging from 28-43%. Present study also had a similar incidence of asthma (reversible airway

disease) among the patients with allergic rhinitis. Significant percentage (36%) of present patients had predominant restrictive abnormality at baseline, though 72% 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 the pre bronchodilator spirometric results, degree of bronchodilator response was higher in allergic rhinitis patients. The response was intermediate to that of normal and asthmatic subjects. Thus the airway obstruction in allergic rhinitis is largely reversible and patients may benefit with a) Optimal control of allergic rhinitis b) Additional use of bronchodilator in those with severe allergic rhinitis or chest symptoms.

CONCLUSION

Allergic rhinitis is a common disorder among general population predominantly involving the younger age group. Serum total IgE and AEC levels were higher in AR patients with obstructive airway disease highlighting the link between upper airway and lower airway, thus supporting the concept of “unified airway disease”.

There was significant difference in spirometric parameters like % predicted values of PEF pre, FEV1%, FEF-25 and FEF-50, and reversibility in FEV1, PEF, FEF-25 and FEF-50 among AR patients with obstructive airway disease and patients with AR only. Multicentric prospective studies are required to evaluate further, the role of spirometry among AR patients.

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