ORIGINAL RESEARCH PAPER

ENT

KEY WORDS:

STUDY OF ALLERGIC RHINITIS AND ITS IMPACT ON PFT IN PRE-TEEN AND TEEN AGE GROUP:

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ABSTRACT

BACKGROUND: Because of this shared pathophysiology, World Health Organization has promoted the idea of 'one airway, one disease' —i.e., that allergic rhinitis and asthma are different manifestations of the same disease. Significant bronchial obstruction may be present in asymptomatic asthmatic adolescents and young adults. We aimed to assess the diagnostic value of two major PFTs individually and measure serum IgE to identify the patients with poor lung function with potential risk of asthma in known cases of allergic rhinitis in pre-teen(11 years and 12 years) and teen(13-19 years) age.

METHOD: Three thousand one hundred and five (3105) patients (age group 10 – 19 years) attending the out-patient department for AR were evaluated. They were further subdivided in 3 groups depending the duration of symtoms(0-12 months, 12-24 months and 24-36 months . According to GINA guideline the patients were subjected to spirometry to measure FEV1/FVC (ratio of forced expiratory volume in 1 s [FEV1] to forced vital capacity [FVC] <0.7) and bronchodilator reversibility(≥12%).Then serum IgE was measured. We considered serum IgE levels of 100 IU/mL as cutoff.

RESULT: In our study 63.2% patients had shown FEV1/FVC less than 0.7 and out of that 59.3%%patients had shown bronchodilator reversibility. 84.3% patients had elevated lavel of sIgE. In pre-teen age group(11-12 years) out of 882 patients,514(16.5%) patients had FEV1/FVC below 0.7 out of which 482 (15.5%)patients had shown bronchodilator reversibility. In teen aged patients, 13-15 years and 16-19 years, FEV1/FVC less than 0.7, were noted subsequenty in 817(26.3%) and 635(20.4%) patients. 776(24.9%) patients of 13-15 years out of 817 and 588(18.9%) patients of 16-19 years out of 635 patients have shown bronchodilator reversibility.

CONCLUSION: Our findings of FEV1/FVC, bronchodilator reversibility and serum IgE measurement show good approximation of the changes in in lung function observed over time and adequately describepulmonary function in growing subjects Pulmonary function tests (PFTs) are useful for diagnosing the cause of unexplained respiratory symptoms and monitoring patients with known respiratory hyperactive airway disease.

INTRODUCTION

Allergic rhinitis (AR) is a common health problem that significantly affects learing, performance, sleepand quality of life. It also leads to significant comorbidities and complic ations. Allergic rhinitis (AR) is a chronic inflammatory disease of the upper airways which results in nasal congestion, post nasal drip, rhinorrhea, sneezing, and pruritis. Symptoms can also extend to the eyes, ears, and throat. Studies narrate, 80% of patients develop symptoms of AR before 20 years of age. 12% of children with no family history of allergy, 30% to 50% of children with a single parental allergy and 60% to 80% of children with biparental allergies usually develop allergic spectrum disease commonly called as the ' allergic march' consisting of atopic dermatitis (AD), IgE-mediated food allergies, asthma and allergic rhinitis . They can coexist or as one condition improves, another can evolve. Rhinitis is classifed into one of the following categories according to etiology: IgE-mediated (allergic), autonomic, infectious and idiopathic (unknown). Traditionally, allergic rhinitis has been categorized as seasonal (occurs during a specifc season) or perennial (occurs throughout the year). However, not all patients fit into this classifcation scheme. For example, some allergic triggers, such as pollen, may be seasonal in cooler climates, but perennial in warmer climates, and patients with multiple "seasonal" allergies may have symptoms throughout most of the year . Therefore, allergic rhinitis is now classifed according to symptom duration (intermittent or persistent) and severity (mild, moderate or severe) .The Allergic Rhinitis and its Impact on Asthma (ARIA) guidelines have classifed "intermittent" allergic rhinitis as symptoms that are present less than 4 days per week or for less than 4 consecutive weeks, and "persistent" allergic rhinitis as symptoms that are present more than 4 days/week and for more than 4 consecutive weeks.

Atopic children have a genetic predisposition to develop imm unoglobulin E (IgE) antibodies to a variety of exposed dietary and inhalant allergens. Subsequent exposure to the produced IgE, that has fixed on mast cells results in a discharge of chemical mediators that causes both an immediate reaction and then a late inflammatory response in the target end organ. Because of this shared pathophysiology, World Health Organization has promoted the idea of 'one airway, one disease' —i.e., that allergic rhinitis and asthma are different manifestations of the same disease.

Seasonal allergic rhinitis is typically poorly managed in pre teen and teen agers, in whom it is responsible for considerable morbidity identified as problems with schoolwork, poor academic performance, loss of sleep and reduced ability to concentrate. As a obvious result, allergic rhinitis imposes a substantial and increasing economic burden on health-care systems and the society. Because of the absence of gold standard tests to confirm or refute asthma, most guidelines concur that asthma is a clinical diagnosis based on a characteristic pattern of symptoms and signs in the absence of an alternative explanation. A large part of population at their academic important phase of life, in pre teens and teen age, suffer from concomitant upper and lower airway active allergic inflammatory response. Significant bronchial obstruction may be present in asymptomatic asthmatic adolescents and young adults . It has been shown that pre teen and teenagers with chronic airway obstruction are less likely to perceive dyspnoea compared with those with acute obstruction. Their poor perception of bronchial obstruction may place them at higher risk of developing severe asthma episodes and reduced lung function which is associated with poor asthma outcomes. Therefore, regular assessment of lung function is quite rational for monitoring asthma in known cases of allergic rhinitis.

AIM OF THE STUDY

1. To identify the patients with poor lung function with

potential risk of asthma in known cases of allergic rhinitis in pre-teen(11 years and 12 years) and teen(13-19 years) age group.
2. To evaluate the label of serum-IgE in known cases of allergic rhinitis and to find out the association the this value with poor lung function.

STUDY DESIGN
Prospective, observational and analytical.

MATERIALS AND METHODS
STUDY AREA:
Department of MEDICINE, Mursidabad Medical College, Berhampore.West Bengal. India.

STUDY PERIOD: November, 2016 – November, 2019.

ETHICAL CLEARANCE:
Institutional ethics committee clearance was taken prior to the commencement of the study.

STUDY SAMPLE:
Three thousand one hundred and five (3105) patients (age group 10 – 19 years) attending the out-patient department for AR were evaluated. They were further subdivided in 3 groups depending the duration of symtoms.

- Group A – 0 to 12 month(754 Patients)
- Group B- 12 month 1 day to 24 months (918 Patients)
- Group C – 24 months 1 day to 36 months(1433 Patients)

INCLUSION CRITERIA
1. All patients with current seasonal allergic rhinitis confirmed by the presence of a documented clinician diagnosis.
2. Patients with evidence of treatment(s) for allergic rhinitis in last 1year.

EXCLUSION CRITERIA
1. Patients of allergic rhinitis who are already receiving treatment for asthma, were excluded from the study.
2. Those having a history of nasal or craniofacial surgery within 30 days.
3. Those having active infections
4. Those with history of worm infestations
5. Those having underlying systemic chronic illness were excluded from the study.

STUDY METHOD
A thorough evaluation of the patient's home and work/ school environments was done with International Study of Asthma and Allergies in Childhood (ISAAC) questionnaire to determine potential triggers of allergic rhinitis and asthma. Environmental history was taken emphasising on common and potentially relevant allergens including pollens, furred animals, textile flooring/upholstery, tobacco smoke, humidity levels at home, as well as other potential noxious substances that the patient may be exposed to at school or at home.Te use of certain medications (e.g., betablockers, acetylsalicylic acid [ASA], non-steroidal antiinfammatory drugs [NSAIDs], angiotensin-converting enzyme [ACE] inhibitors, and hormone therapy) as well as the recreational use of cocaine which can lead to symptoms of rhinitis were asked in detail. History obtained regarding family history of atopic disease, the impact of symptoms on quality of life and the presence of comorbidities. Patients who suffered from persistent nasal symptoms reffering to "constant cold" documentation was done regarding the frequency and duration of"colds".

GINA (Global Initiative For Asthma)2019 guidelines were followed to evaluate the patients. These `patients of documented allergic rhinitis were subjected to PFT and bronchodilator reversibility. Pulmonary function tests (PFTs) are useful for diagnosing the cause of unexplained respiratory symptoms and monitoring patients with known respiratory disease.

FIRST -
Spirometry (forced expiratory volume in 1 s [FEV1] and forced vital capacity [FVC]) expressed as a ratio FEV1:FVC).

SECOND -
Bronchodilator reversibility.

PFTs take approximately 15 minutes for 13-19 years old patients, 15 to 30 minutes for 11 and 12 year olds, 45 minutes for pre- and post bronchodilator testing.

Evidence of variable expiratory airflow limitation measured as per GINA guideline which is

At least once during the diagnostic process, e.g. when FEV1 is low, documention is done if the FEV1/FVC ratio is below the lower limit of normal.

The FEV1/FVC ratio is normally more than 0.75–0.80 in adults, and more than 0.85 in children.

Documention done when the variation in lung function is greater than in healthy people. Excess variability is recorded if FEV1 increased by >200mL and >12% of the baseline value (or in children, increases by >12% of the predicted value) after inhaling a bronchodilator. This is called 'bronchodilator reversibility'.

We calculated bronchodilator reversibility as a percentage change after administration of 400 μg of salbutamol with the following equation:

$$\frac{(\text{post-bronchodilator FEV1} - \text{baseline FEV1}) \times 100}{\text{Baseline FEV1}}$$

Bronchodilator reversibility was deemed positive if FEV1 increased by 12% or more.

The greater was the variation, or the more times excess variation was seen, asthma was stamped more confidently.

After PFT ,all patients were subjected to serum IgE measurement. Serum allergen specific immunoglobulin E (IgE) assessment allows characterization of the relevant sensitizing allergens. Total serum IgE levels were measured at hospital laboratory by chemiluminescent assay using ADVIA Centaur XP immunoassay system. In this study, we considered serum IgE levels of 100 IU/mL as cutoff level. Several other studies have reported serum IgE levels of 73-160 IU/mL as a marker for the presence of atopy with varying sensitivity and specificity.

RESULT &ANALYSIS
CHART-1

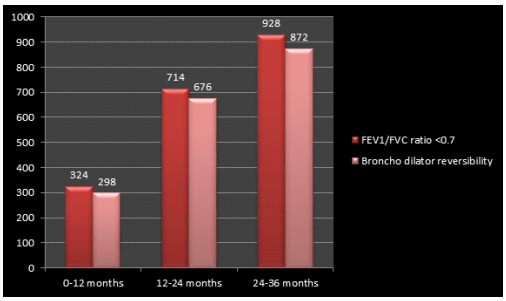
PATIENT DISTRIBUTION			
Age In Years	**Number of patients**	**FEV1/FVC less than 0.7**	**Bronchodilator reversibility**
11-12	**882**	**514**	**482**
13-15	**1218**	**817**	**776**
16-19	**1005**	**635**	**588**

This chart shows the distribution of patients in different age groups. In pre-teen age group(11-12 years) out of 882 patients,514(16.5%) patients had FEV1/FVC below 0.7 out of which 482 (15.5%)patients had shown bronchodilator reversibility. In teen aged patients, 13-15 years and 16-19 years, FEV1/FVC less than 0.7, were noted subsequenty in 817(26.3%) and 635(20.4%) patients. 776(24.9%) patients of 13-15 years out of 817 and 588(18.9%) patients of 16-19 years out of 635 patients have shown bronchodilator reversibility. So in our study **63.2%** patients and teenagers had shown FEV1/FVC less than 0.7 and out of that **59.3%**%patients had

shown bronchodilator reversibility.

DIAGRAM-2

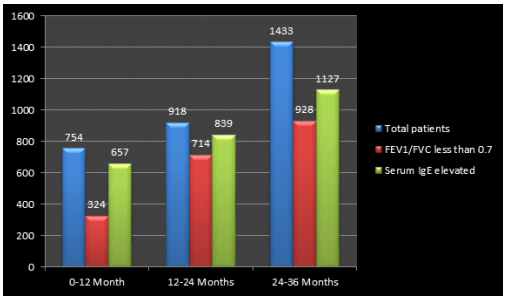
Result of FEV1/FVC ratio and bronchodilator revers ibility according to duration of symtoms of AR



It was noted that from Group A, 324(10.4%) patients had low FEV1/FVC ratio less than 0.7. out of which bronchodilator reversibility was noted in 298(9.5%)patients. In Group B , 714(22.9%) patients had FEV1/FVC ratio less than 0.7 and of them 676(21.7%) responded to bronchodilator reversibility. In Group C, 928(29.8%) patients had low FEV1/FVC ratio and out of them 872(28.08%) patients showed bronchodilator reversibility.

DIAGRAM-3

Diagnostic values of Elevated serum IgE(sIgE) and FEV1/FVC ratio



In groupA out of 754 ,657 (21.15%)patients had elevated serum IgE and 324(10.4%) had FEV1/FVC ratio less than 0.7. These values in group B(out of 918) and group C (1433 patients) were respectively 839(27%) and 1127 (36.2%)for serum IgE and 714(22.9%) and 928(29.8%) for FEV1/FVC ratio <0.7.

So out total 3105, 63.2% patients FEV1/FVC ratio less than 0.7 and 84.3% patients had elevated lavel of sIgE.

DISCUSSION

In the past, allergic rhinitis was considered to be a disorder localized to the nose and nasal passages, but current evidence indicates that it may represent a component of a systemic airway disease involving the entire respiratory tract. There are a number of physiological, functional and immunological relationships between the upper (nose, nasal cavity, paranasal sinuses, Eustachian tube, pharynx and larynx) and lower (trachea, bronchial tubes, bronchioles and lungs) respiratory tracts. For example, both tracts contain a ciliated epithelium consisting of goblet cells that secrete mucous, which serves to filter the incoming air and protect structures within the airways. Furthermore, the submucosa of both the upper and lower airways includes a collection of blood vessels, mucous glands, supporting cells, nerves and inflammatory cells. Evidence has shown that allergen provocation of the upper airways not only leads to a local inflammatory response, but may also lead to inflammatory processes in the lower airways, and this is supported by the fact that rhinitis and asthma frequently coexist.

In allergic rhinitis, numerous inflammatory cells, including mast cells, CD4-positive T cells, B cells, macrophages, and eosinophils, infiltrate the nasal lining upon exposure to an inciting allergen (most commonly airborne dust mite fecal particles, cockroach residues, animal dander, moulds, and pollens). In allergic individuals, the T cells infiltrating the nasal mucosa are predominantly T helper 2 (T2) in nature and release cytokines (e.g., interleukin [IL]-3, IL-4, IL-5, and IL-13) that promote immunoglobulin E (IgE) production by plasma cells. Crosslinking of IgE bound to mast cells by allergens, in turn, triggers the release of mediators, such as histamine and leukotrienes, that are responsible.

The interpretation of functional parameters in the transition from childhood to adolescence was highlighted in this study . Our results suggest that, at least for the age and time range examined in this study, the predictions FEV1/FVC and bronchodilator reversibility reference equations are a good approximation of the changes in in lung function observed over time and adequately describe pulmonary function in growing subjects. Numerous follow-up studies in children with asthma have consistently shown that more severe respiratory symptoms in childhood predict reduced lung function in early adulthood.

Among symptomatic patients who had completed two tests as per GINA guideline, we were able to securely diagnose asthma in **63.1%** cases and out of these **59.2%** cases had shown bronchodilator reversibility. Serum IgE was elevated in **84.3%** cases of AR.

A number of epidemiological studies on childhood asthma are there highlighting the relation between asthma and deficits in lung function, but the characteristics of growth in pulmonary function from childhood to adulthood are not completely defines in them. The present study addresses this to some extent. To detect whether the loss of lung function and asthma are the cause or the effect of each other, is crucial for the prevention of asthma and for our understanding of the origins of this hyperactive airway disease. The contradictory results can be due to differences in the frequency of assessment, cohort retention rates and the use of quantitative measurements . It is of note that all subjects with an asthma diagnosis were on prescribed inhaled asthma medication.

While treating AR, measurement of serum IgE and deliberate search for presence of asthma, promotes physically active lifestyle which is strongly associated with life satisfaction .The present study has led to substantial and persistent improvements in this pre-teen and teen age group patients reflected as increased self-reported confidence and better understanding of the management of allergic rhinitis and concomitant asthma. Future research are needed to bridge the gap between knowledge and day-to-day practice.

CONCLUSION

Allergic rhinitis (AR) is a common disease that significantly affects sleep, learning, performance and quality of life in preteen and teenagers and results in significant co morbidities .Coexistence of underlying asthma further hinders their psychosocial development and lowers self as well as peer acceptance. Thus endangering their academic and sports performance in this vulnerable transition of life. So every possible strategy should be undertaken to indentify and manage this allergic concomitant airway hyperactivity.