

Original Research Article

Spirometric evaluation in patients with allergic rhinitis- emphasising need of early diagnosis: a tertiary care experience from Central India

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ABSTRACT

Background: Allergic rhinitis is predecessor of Bronchial asthma in most of the cases. Present study was aimed to understand the prevalence of the impaired spirometric changes in patients with allergic rhinitis and to find association with various demographic factors, sputum eosinophilia and eosinophil count in the blood with the impaired Spirometry of these patients.

Methods: Authors conducted a cross sectional study among the patients of allergic rhinitis presented to us in our outpatient department from January 2016 to July 2017. The patient's with allergic rhinitis either newly diagnosed or already on treatment were included in the study. Standard guidelines as given by ARIA were followed in defining a case of allergic rhinitis. The detailed clinical history was taken, and examination was performed of all the patients and documented. Spirometric evaluation was done using the standard guidelines by a desktop based Spirometry.

Results: The mean age of the study subjects was 30.22 ± 13.13 years with male: female ratio of 0.96. The mean duration of the allergic rhinitis in our study was 3.86 ± 3.34 years. The most common complaint was itching sensation of nose followed by paroxysmal sneezing and watering of eyes. About 22.15% of the study subjects have impaired Spirometry. Upon bronchodilator therapy 30% of the study subjects had significant reversibility in FEV1.

Conclusions: About ¼ of present study subjects had impaired Spirometry and about 30% of them had reversibility after bronchodilator therapy. Authors also found that the higher age study subjects had significantly higher impaired Spirometry; persistent allergic rhinitis patients had higher impairment of Spirometry and the patients with higher the sputum eosinophilia had higher impairment in Spirometry.

Keywords: Allergic rhinitis, FEV1, Spirometry

INTRODUCTION

According to the World Health Organization statistics, the prevalence of chronic obstructive lung disease is estimated to be 251 million cases across the world. One of such obstructive airway diseases are allergic asthma.¹ Allergic rhinitis is predecessor of Bronchial asthma in most of the cases.^{2,3} Allergic rhinitis is inflammation of nose due to IgE mediated inflammation of the

membranes.⁴ Spirometry is a tool to assess the pulmonary function of an individual and helps in quantifying the lung diseases. It provided important information about the large and small airways and the pulmonary parenchyma.^{5,6} Very few studies have been conducted in assessing the lung functions of the patients with allergic rhinitis. Present study was aimed to understand the prevalence of the impaired spirometric changes in patients with allergic rhinitis and to find association with

various demographic factors, sputum eosinophilia and eosinophil count in the blood with the impaired Spirometry of these patients.

METHODS

Authors’ tertiary care hospital caters the majority of the population in Nagpur and various neighboring districts. Some patients are being referred from the adjoining districts of Madhya Pradesh for the treatment at our centre. Authors conducted a cross sectional study among the patients of allergic rhinitis presented to us in our outpatient department from January 2016 to July 2017. A study conducted by Mohammadi K et al, reported that 33.5% of their subjects had abnormal pulmonary function tests.⁷ Using this prevalence, with 8% absolute error and 95% confidence interval, the minimum sample size was 134. The present study included 140 study subjects for our convenience.

A written and informed consent was taken before the start of the study. The necessary permission was taken from the institution ethics committee before the start of the study. The patient’s with allergic rhinitis either newly diagnosed or already on treatment were included in the study. Standard guidelines as given by ARIA were followed in defining a case of allergic rhinitis.⁴ Those patients who were not able to perform the Spirometry, those having infective rhinitis, those who were unfit for spirometry (recent myocardial infarction, hemoptysis, recent abdominal surgery) and those patients who were already having diagnosed or on treatment for asthma were excluded from the study.

Data was collected using a pretested and predesigned questionnaire which included demographic variables like age, gender; occupation, area of residence etc. The detailed clinical history was taken, and examination was performed of all the patients and documented. Spirometric evaluation was done using the standard guidelines by a desktop-based Spirometry. All the parameters like height, weight etc. were entered into the desktop. In present study, Spirometry was said to be Impaired when patient had impaired FEV1 values as per ATS guidelines. Diagnosis of Asthma in present study was based on ATS criteria. Asthma was diagnosed when post bronchodilator FEV1 reversibility was more than or equal to 12% and reversibility of more than 200ml. Sputum and blood eosinophil counts were done and documented.

Statistical analysis

All data was collected, compiled and analysed using (Epi Info version 7.2). The qualitative data was expressed in terms in percentages. The quantitative data was either expressed in terms of mean and standard deviations or categorized into groups and expressed in terms of percentages. The difference between the two proportions was tested using chi square or fisher’s exact test. All

analysis was 2 tailed and significance level was set at 0.05.

RESULTS

The present study included 140 study subjects in our study. The mean age of the study subjects was 30.22±13.13years with male: female ratio of 0.96. About 57.14 % were belonging to urban areas and majority of the subjects were student (37.14%) by occupation followed by homemaker (20.71%) and manual labourers (16.43%) (Table 1).

Table 1: Sociodemographic characteristics of the subjects.

| Sociodemographic characteristics | Frequency | Percentage |
|----------------------------------|-----------|------------|
| Age | | |
| 11 to 20 | 41 | 29.29% |
| 21 to 30 | 36 | 25.71% |
| 31 to 40 | 40 | 28.57% |
| 41 to 50 | 9 | 6.43% |
| >50 | 14 | 10.00% |
| Gender | | |
| Males | 69 | 29.29% |
| Females | 71 | 50.71% |
| Residence | | |
| Urban | 80 | 57.14% |
| Rural | 60 | 42.86% |
| Occupation | | |
| Student | 52 | 37.14% |
| Homemaker | 29 | 20.71% |
| Manual labourer | 23 | 16.43% |
| Office job | 17 | 12.14% |
| Others | 19 | 13.58% |

Table 2: Distribution of the study subjects based on the duration, symptoms and type of allergic rhinitis.

| Duration of allergic rhinitis (in years) | Frequency | Percentage |
|--|-----------|------------|
| 0 to 5 | 112 | 80.00% |
| 5 to 10 | 23 | 16.43% |
| >10 | 5 | 3.57% |
| Chief complaints (n=140) | | |
| Itching sensation of nose | 127 | 90.71% |
| Paroxysmal sneezing | 122 | 87.14% |
| Watering of eyes | 116 | 82.86% |
| Runny nose/ watery secretion from nose | 113 | 80.71% |
| Blocked nose | 27 | 19.29% |
| Type of allergic rhinitis | | |
| Mild intermittent | 53 | 37.86% |
| Moderate to severe persistent | 50 | 35.71% |
| Moderate to severe intermittent | 21 | 15.00% |
| Mild persistent | 16 | 11.43% |

The mean duration of the allergic rhinitis in present study was 3.86±3.34years. The most common complaint was itching sensation of nose followed by paroxysmal sneezing and watering of eyes. The most common type of allergic rhinitis was mild intermittent followed by moderate to severe persistent and moderate to severe intermittent types (Table 2).

Table 3: Distribution of the study subjects based on the Spirometry and reversibility in FEV1 with bronchodilator effect.

| Spirometry | Frequency | Percentage |
|--|-----------|------------|
| Mild | 6 | 4.28% |
| Moderate | 4 | 2.85% |
| Moderately severe | 7 | 5.00% |
| Severe | 8 | 5.71% |
| Very severe | 6 | 4.28% |
| Normal | 109 | 77.85% |
| Significant reversibility in FEV1 on post bronchodilator effect | | |
| Yes | 42 | 30% |
| No | 98 | 70% |

Table 4: Association of different factors with spirometric evaluation.

| Factors | Normal (n=109) | | Impaired (n=31) | | P value |
|----------------------------------|----------------|-------|-----------------|-------|---------|
| | No. | % | No. | % | |
| Age | | | | | |
| <40 years | 95 | 87.15 | 22 | 70.95 | 0.0318 |
| ≥40 years | 14 | 12.5 | 9 | 29.05 | |
| Gender | | | | | |
| Male | 60 | 55.05 | 11 | 35.50 | 0.0545 |
| Female | 49 | 44.95 | 20 | 64.50 | |
| Type of allergic rhinitis | | | | | |
| Intermittent* | 66 | 60.55 | 8 | 25.80 | 0.0061 |
| Persistent** | 43 | 39.45 | 23 | 74.20 | |
| Sputum eosinophilia*** | | | | | |
| Present | 40 | 36.70 | 19 | 61.30 | 0.0144 |
| Absent | 69 | 63.30 | 12 | 38.70 | |
| Absolute eosinophil count | | | | | |
| <500 | 51 | 46.80 | 12 | 38.70 | 0.4249 |
| ≥500 | 58 | 53.20 | 19 | 61.30 | |

*Intermittent AR (Mild intermittent and mod.-sev. intermittent AR); ** Persistent AR (Mild persistent and mod.-sev. persistent AR); *** >3% eosinophils in sputum

About 22.15% of the study subjects have impaired Spirometry among which 4.28% were mildly impaired, 2.85% were moderately impaired, 5.00% were moderately severe impaired, 5.71% were severely impaired and 4.28% were very severely impaired. Upon bronchodilator therapy 30% of the study subjects had significant reversibility in FEV1 (Table 3).

Authors found a significant association between the spirometric impairment and age, type of allergic rhinitis

and sputum eosinophilia. The subjects who were age more than 40years had higher proportion of impaired Spirometry when compared to subjects less than 40 years. The subjects with persistent allergic rhinitis were having significantly higher impaired Spirometry when compared with those with intermittent allergic rhinitis. The proportion of sputum eosinophilia was higher in patients with impaired Spirometry and the proportion of eosinophil count was also significantly higher in cases with impaired spirometry (Table 4).

DISCUSSION

Allergic rhinitis is a symptomatic disorder of the nose induced after allergen exposure by an IgE-mediated inflammation of the membranes lining the nose.⁴ This can further escalate the problems to the lower respiratory tract and predispose allergic asthma. With this background we conducted a cross sectional study to find the proportion of the impaired Spirometry among the patients with allergic rhinitis. The most common complaint was itching sensation of nose followed by paroxysmal sneezing and watering of eyes in our study. Studies done by Rao B et al, Agarwal VH et al, and Dahilo EA et al, reported similar results when compared to our study.⁸⁻¹⁰

Authors found that 22.15% of the study subjects had impaired Spirometry. A study conducted by Leskela R et al, among the school children found 50.4% of the subjects had at least one parameter of pulmonary function test as abnormal and this was higher than present study.¹¹ Some studies conducted by Ciprandi et al, and Ciprandi et al, showed that the impairment in FEV1 and FEF25-75 to be 6%, 28%, 8.4% and 24.7% respectively.¹²⁻¹⁴ Another study done by Jafari M et al, reported that the impairment of FEV1, FEF25-75 and FVC were 13.50%, 30.95% and 17.46% respectively.¹⁵ A study done by Kessel A et al, inferred that the FEF25-75 was significantly lower in case of allergic rhinitis patients when compared to controls.¹⁶ Bavbek S et al, reported that the FEV1/FVC and FEF25-75 was lower in the patients having allergic rhinitis with asthma when compared to patients having only allergic rhinitis.¹⁷ Similar findings were reported by Rao B et al, Tantilipikorn P et al, and Anand KS et al.^{18,19} A study done by Mohammadi K et al, inferred similar results when compared to our study.⁷

In present study, with bronchodilator therapy 30% of the study subjects had significant reversibility in FEV1. Studies done by Ciprandi et al, Cirillo I et al, Marra SMG et al, Bavbek S et al, Tantilipikorn P et al, Medina L et al, Billo SR et al, and Ajiya A et al. inferred similar results.^{12,17,18,20,21,23,24} Authors found a significant association between the spirometric impairment and age, type of allergic rhinitis and sputum eosinophilia. A study conducted by El Helaly N et al, studied the IgE levels and found to be higher in cases with allergic rhinitis with asthma followed by without asthma and controls.²⁵ Another inflammatory marker IL-5 was studied by Marra

SM et al, and found to be high in case of asthma followed by allergic rhinitis and controls.²¹ A study done by Jafari M et al, inferred that higher the age more the chances of impairment in Spirometry which was similar with the present study results.¹⁵

Present study had some limitations. One of them was that it was a hospital based cross sectional study. Analytical studies would substantiate the impairment of the lung function and the presence of allergic rhinitis. Second limitation is that it is a single centre study which will not reflect the overall burden of the population. Nonetheless it is one of few studies conducted over allergic rhinitis and its association with spirometric impairment among Indian setup.

CONCLUSION

About ¼ of present study subjects had impaired spirometry and about 30% of them had reversibility after bronchodilator therapy. Authors also found that the higher age study subjects had significantly higher impaired spirometry; persistent allergic rhinitis patients had higher impairment of Spirometry and the patients with higher the sputum eosinophilia had higher impairment in spirometry. So, authors recommend that spirometry should be performed at earliest so as to detect decrease in airway function earlier and its management instituted, so that further deterioration of lung function can be prevented.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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