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## STUDY OF PULMONARY FUNCTION PARAMETERS IN PATIENTS WITH ALLERGIC RHINITIS BEFORE AND AFTER TREATMENT WITH TOPICAL NASAL STEROIDS

Shivakumar Senniappan\*

Department of ENT, Vinayaka Missions Kirupananda Variyar Medical College and Hospitals,  
Vinayaka Mission's Research Foundation (DU), Salem, Tamil Nadu, India

\* Corresponding author

### ABSTRACT

**Background:** Allergic Rhinitis is a common disorder, reports for at least 2.5% of all physicians' visits, at the minimum of 2.1 million lost schools per year, roughly 6 million lost working days and 28 million restricted working days a year. Allergic rhinitis if left untreated can affect the upper and lower airways which in turn may alter the pulmonary functions .which readily can be investigated by performing Pulmonary Function Tests. (5. This study aims to understand the impaired spirometric changes in patients with Allergic Rhinitis and the efficacy of Topical Nasal Steroids on the treatment of Allergic Rhinitis in terms of improvement in Pulmonary Function Test parameters.

**Methods:** The study was conducted between February 2020 to December 2020 on 60 patients attending ENT OPD in Vinayaka Missions Kirupanandha Variyar Medical College and Hospital, Salem. All patients with Allergic Rhinitis fulfilling inclusion and exclusion criteria were seen at the otorhinolaryngology OPD and underwent a complete otorhinolaryngological examination, AEC and Spirometry.. Patients were then treated with topical nasal steroids for a period of 3 months. At the end of 3 months, patients were assessed and subjected to AEC and PFT. Pulmonary function parameters are compared before and after treatment with topical nasal steroids.

**Results:** 60 Patients; 28 male and 32 female were investigated with AEC and PFT before and After treatment with nasal Steroids. AEC values declined significantly after Treatment. FVC, FEV1 and FEV1/FVC ratio and MVV all Significantly improved after treatment.

**Conclusions:** Early identification of allergic rhinitis patient and efficient treatment prevents further progression of disease and its related morbidity. By using a simple, non-invasive spirometry we can identify obstruction of the smaller and the larger airways at an earlier stage in patients with allergic rhinitis. Thus proper and meticulous administration of intranasal steroids is highly recommended for the treatment of allergic rhinitis.

**Keywords:** Allergic Rhinitis, Topical Nasal Steroids, Spirometry

### INTRODUCTION

Allergic Rhinitis is contemplated to be a common disorder, affecting almost everyone at least once in their lifetime sporadically. It is considered to be highly widespread, allergen mediated, inflammatory disease of the upper respiratory tract. It is defined as a Hypersensitivity Type 1 reaction which is an inflammatory response induced by an immunoglobulin IgE. This response is caused due to inhalation of an allergen which gets sensitized leading to nasal mucosal inflammation which results in recurrent or chronic symptoms. (1)

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About the authors : Shivakumar Senniappan

Corresponding author- Email:

Allergic rhinitis affects nearly 20% of population. It is not known to be a life frightening condition, but is a notable source of global morbidity. 30-35% of Indian population is known to be suffering from Allergic Rhinitis. (2) It paves way to annoying symptoms which remarkably influence the patient's quality of life. The primary symptoms which the patients present are sneezing, nasal obstruction, rhinorrhea, itching of the nose, eyes and palate and impaired smell. (3) Allergic Rhinitis may also be habitually associated with post nasal drip, irritability, cough and fatigue. Allergic rhinitis reports for at least 2.5% of all physicians' visits, at the minimum of 2.1 million lost schools per year, roughly 6 million lost working days and 28 million restricted working days a year. This is how Allergic Rhinitis impacts the quality of living. (2) The treatment options for allergic rhinitis are considered to be plenty. However, anti-histamines and intranasal steroids are broadly advocated. The most effective, first line therapy for patients with moderate to severe disease is considered to be the administration of intranasal corticosteroids.(4) The route of administration of intranasal steroids makes is more convenient for consumption as it transports the drug straight to the target organ, thereby cutting down the probability for systemic adverse effects. Allergic rhinitis if left untreated can affect the upper and lower airways which in turn may alter the pulmonary functions which readily can be investigated by performing Pulmonary Function Tests. (5) Assessment of pulmonary functions is considered vital in many clinical circumstances, both when the patient gives history or shows symptoms indicative of lung disease and when complications or possible factors for lung disease are evident. Different methods of pulmonary functions tests are available among which Spirometry is most readily available, non-invasive, cost efficient, useful, less time consuming and carries no risk. (6) The main crucial parameter which was evaluated in our study was FEV1, FVC and MVV. (7) This study aims to understand the prevalence of impaired spirometric changes in patients with Allergic Rhinitis and the efficacy of Topical Nasal Steroids on the treatment of Allergic Rhinitis in terms of improvement in Pulmonary Function Test parameters.

### **AIM**

To study the pulmonary function parameters in patients with allergic rhinitis before and after treatment with topical nasal steroids.

### **OBJECTIVES**

1. To study the effect of allergic rhinitis on pulmonary function test.
2. To study the changes in pulmonary function test before and after treatment of allergic rhinitis.
3. To study the efficacy of Topical Nasal Steroids on the treatment of Allergic Rhinitis in terms of improvement in Pulmonary Function Test parameters.

### **MATERIALS AND METHODS**

The study was conducted in the year between February 2020 – December 2020 on 60 patients attending ENT OPD in Vinayaka Mission's Kirupananda Variyar Medical College and Hospital, Salem.

### **INCLUSION CRITERIA**

Patients between the age group 12 years to 60 years

### **EXCLUSION CRITERIA**

1. Patients below 12 years and above 60 years of age
2. Patients with Bronchial Asthma

### 3. Patients with other allergic conditions.

60 patients between the age group 12-60 years fulfilling Inclusion/Exclusion criteria who gave informed consent presenting with symptoms of Allergic Rhinitis were subjected to detailed history taking, physical, systemic and ENT examinations. Investigations include blood examination (Total Blood Count, Differential Leucocyte Count, and Absolute Eosinophil Count) and Pulmonary Function Test. Patients were then treated with topical nasal steroids. The nasal steroid used in our study was Fluticasone Propionate which comes in the form of 12ml nasal spray with 120 metered doses; each metered dose gives out 100µl of the drug. The dosage is 1 puff (100µl) twice daily. It was administered for a period of 3 months. At the end of 3 months, patients were assessed and subjected to pulmonary function tests. Pulmonary function parameters are compared before and after treatment with topical nasal steroids.

## STATISTICAL ANALYSIS

1. Using unpaired t test the mean variables of allergic rhinitis were found. SPSS version 17 was used for data analysis.
2. Pearson's coefficient was done to find out the correlation between Allergic rhinitis and FVC, FEV1, and MVV.

## RESULTS

Table 1 (Sex distribution)

In our study, 28 patients were found to be male and 32 patients were female.

| Sex distribution | No. of Patients |
|------------------|-----------------|
| Male             | 28              |
| Female           | 32              |

Chart 1 (Gender distribution)

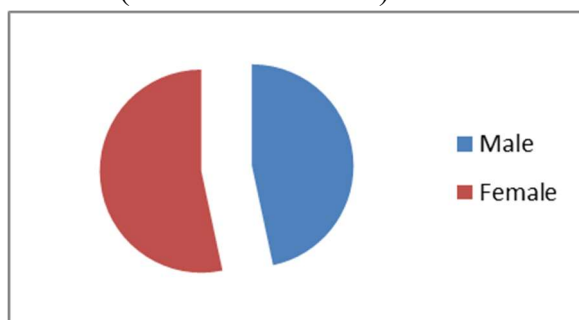
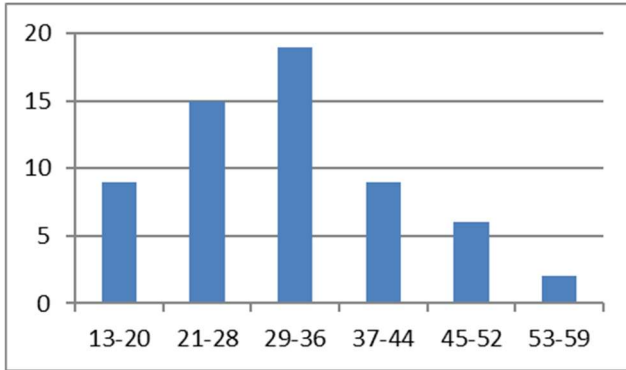


Table 2 (Age distribution)

| Age distribution | No. of. patients |
|------------------|------------------|
| 13-20            | 9                |
| 21-28            | 15               |
| 29-36            | 19               |
| 37-44            | 9                |
| 45-52            | 6                |

|       |   |
|-------|---|
| 53-59 | 2 |
|-------|---|

**Chart 2 (Age distribution)**



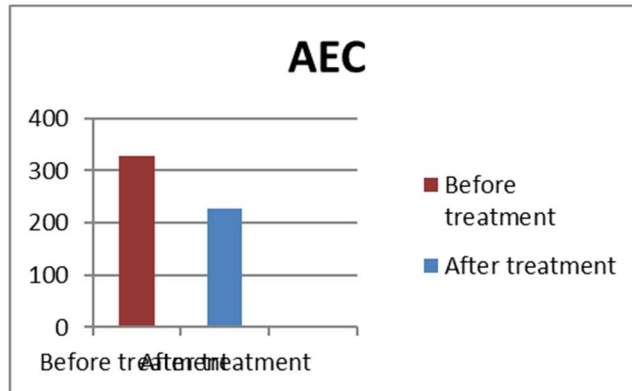
In our study, which includes 60 patients, 9 patients belonged to the age group 13-20 years, 15 patients belonged to the age group 21-28 years, 19 patients belonged to the age group 29-36 years, 9 patients belonged to the age group 37-44 years, 6 patients belonged to the age group 45-52 years and 2 patients belonged to the age group 53-59 years.

**Table 3 (Comparison of AEC before and after treatment with Topical Nasal steroids)**

| Parameter studied | Before treatment | After treatment | P value |
|-------------------|------------------|-----------------|---------|
|                   | n = 60           | n = 60          |         |
| AEC               | 329 ± 89         | 227 ± 21        | 0.017   |

\*\* p value ≤ 0.05 is significant

**Chart 3 (Comparison of AEC before and after treatment with Topical Nasal steroids)**



In our study, the absolute eosinophil count was evaluated for all the patients before and after treatment with topical nasal steroids which showed a mean value of 329 ± 89/µL of AEC before treatment and a mean value of 227 ± 21/µL of AEC after treatment.

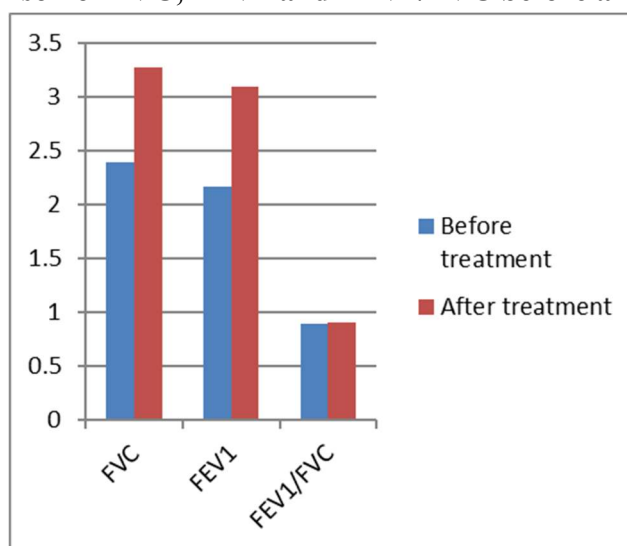
**Table 4 Comparison of FVC, FEV1 and FEV1/FVC before and after treatment**

| Parameters studied    | PFT values before treatment<br>n = 60 | PFT values after treatment<br>n = 60 | P value |
|-----------------------|---------------------------------------|--------------------------------------|---------|
| FVC                   | 2.39 ± 0.26                           | 3.27 ± 0.25                          | 0.001   |
| FEV <sub>1</sub>      | 2.17 ± 0.32                           | 3.10 ± 0.30                          | 0.001   |
| FEV <sub>1</sub> /FVC | 0.89 ± 0.07                           | 0.91 ± 0.04                          | 0.011   |

P value ≤ 0.001 is highly significant

P value ≤ 0.05 is significant

**Chart 4 Comparison of FVC, FEV<sub>1</sub> and FEV<sub>1</sub>/FVC before and after treatment**



In our study, FVC, FEV<sub>1</sub> and FEV<sub>1</sub>/FVC values were calculated before and after treatment. The mean values of FVC before treatment was found to be 2.39 ± 0.26L and after treatment was 3.27 ± 0.25L. The mean values of FEV<sub>1</sub> were 2.17 ± 0.32L before treatment and 3.10 ± 0.30L after treatment. The mean values of FEV<sub>1</sub>/FVC before and after treatment were 0.89 ± 0.07 and 0.91 ± 0.04 respectively.

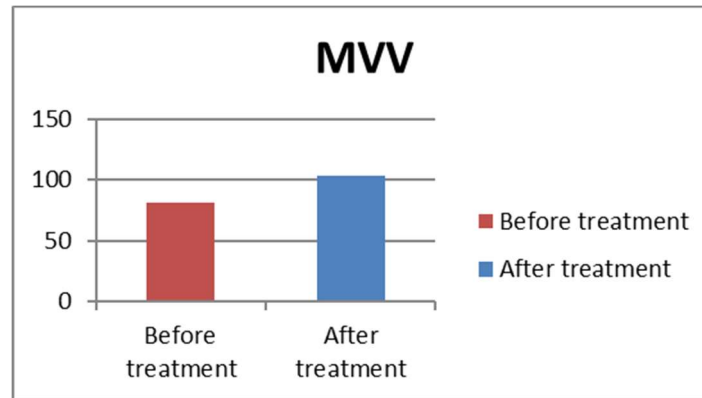
**Table 5 Comparison of MVV before and after treatment**

| Parameter studied | Before treatment<br>n = 60 | After treatment<br>n = 60 | P value |
|-------------------|----------------------------|---------------------------|---------|
| MVV               | 81.25 ± 19.06              | 103.45 ± 26.10            | 0.001   |

P value ≤ 0.001 is highly significant

P value ≤ 0.05 is significant

Chart 5 Comparison of MVV before and after treatment



In our study, the Maximum voluntary ventilation was calculated for all the patients before and after treatment with topical nasal steroids which showed a mean value of  $81.25 \pm 19.06$  L/min before treatment and  $103.45 \pm 26.10$  L/min after treatment.

## DISCUSSION

Allergic Rhinitis is a universal health issue and is growing in prevalence. It is connected to aggravation of various inflammatory airway diseases like asthma, chronic obstructive pulmonary disease and also leads to certain complications such as sinusitis, chronic otitis media, nasal polyposis etc if left untreated.

Numerous kinds of drugs are available for the management of allergic rhinitis. The physician must customize the regimen in consonance with the patient's symptoms and circumstances.

Outshining all the other treatment options Glucocorticosteroids remain as the mainstay treatment for allergic rhinitis as stated by several studies. Holm AF et al, Adriaan Holm et al. (8) (9)

Dykewicz MS et al (10) observed that intranasal steroids are the most potent remedy available. Fluticasone propionate and mometasone furoate are the most repeatedly used intranasal steroids. In our study we have administered Fluticasone propionate for the patients. We have made an attempt to find out the efficacy of this topical nasal steroid in our study. Michael Mandl et al, (11) Berlin JM et al, (12) Golden SJ et al, (13) in their studies stated that Fluticasone propionate was found to be efficient in the treatment of allergic rhinitis.

In our study, out of the 60 patients' majority of the allergic rhinitis patients belonged to the age group 20 – 35 years. Charles Freche et al (14) stated that allergic rhinitis most likely occurs in adulthood which supported our study.

Robinson et al (15) demonstrated that allergic rhinitis is more common in age group 20-30 years. Our results were found to be in accordance with the studies conducted by Bunnag et al (16) The reasons suggested by these researchers were that individuals belonging to this age group were comparatively more active compared to older age group; which gives them an increased chance of coming in contact with a wide spectrum of allergens.

Females were more in number in our study. Gender distribution showed not much significance. However, Bachert et al (4) from his study said that females were more affected than males. The correlation of age and gender is directly proportional to the incidence of allergic rhinitis.

In our study, the absolute eosinophil count was evaluated for all the patients before and after treatment with topical nasal steroids which showed a mean value of  $329 \pm 89/\mu\text{L}$  of AEC before treatment and a mean value of  $227 \pm 21/\mu\text{L}$  of AEC after treatment. Shreepad et al (17) also observed similar results in their study.

Pulmonary function testing is stipulated for assessment of respiratory symptoms. It is performed to assess the ventilation, perfusion, diffusion and mechanics of respiration. (18) On the other hand it is also used to estimate the severity and development of lung diseases, such as asthma, COPD and various other lung diseases. Forced expiratory volume and forced vital capacity are the principal measurements acquired by spirometry. Their ratio is vital for distinguishing restrictive airway disease and obstructive disease. The depletion of lung volumes in smaller airways was denoted in these patients. MVV is another parameter which is said to be important as far as Allergic rhinitis is concerned as it evaluates airway obstruction probably through immunological mechanism or poor respiratory muscle strength as stated by Gian LM et al (19) and Giorgio C et al (20) in their studies. Keeping this in mind, pulmonary function test was carried out in all patients before and after treatment with Fluticasone propionate.

It was found that the mean value of FVC before treatment was found to be  $2.39 \pm 0.26\text{L}$  and after treatment was  $3.27 \pm 0.25\text{L}$ . There was high significant increase in the values of Forced vital capacity after treatment. The findings in our study were supported by the studies performed by Kessel at al. (21) Similar findings were also established by Lohia et al (22) in his study.

The mean value of FEV1 before and after treatment was found to be  $2.17 \pm 0.32\text{L}$  and  $3.10 \pm 0.30\text{L}$  respectively. There was found to be high significant increase in the values of Forced expiratory volume after treatment. Ji XQ et al (23) showed similar studies in their study.

The mean values of FEV1/FVC before and after treatment were  $0.89 \pm 0.07$  and  $0.91 \pm 0.04$  respectively. The results showed a positive correlation. The above finding in our study was supported by Riikka et al. (24)

In our study, the Maximum voluntary ventilation was calculated for all the patients before and after treatment with topical nasal steroids which showed a mean value of  $81.25 \pm 19.06 \text{ L/min}$  before treatment and  $103.45 \pm 26.10\text{L/min}$  after treatment. There was significant increase in the MVV values after treatment.

Giorgio C et al (19) established similar results in his study.

## CONCLUSION

Allergic rhinitis is the commonest immunologic disease and is the commonest chronic disease experienced by humans.

In our study it was found that females were affected than males. Adulthood was the most commonly affected age group. It was noticed that there was drastic difference in the values of absolute eosinophil count before and after administration of nasal steroids. It was observed that the values of FVC, FEV1,

and MVV were reduced before treatment but whereas the values of the above mentioned parameters increased suggesting high significance. From this study it shows that intranasal steroids are highly efficient, superior and effective in the treatment of allergic rhinitis. A study suggested that intranasal steroids are well tolerated, has no detectable hypothalamic-pituitary adrenal axis. (25)It improves patient compliance and its rapid onset of action helps in patient and physician acceptance.

## **SUMMARY**

Early identification of allergic rhinitis patient and efficient treatment prevents further progression of disease and its related morbidity. By using a simple, non-invasive spirometry we can identify obstruction of the smaller and the larger airways at an earlier stage in patients with allergic rhinitis. Thus proper and meticulous administration of intranasal steroids is highly recommended for the treatment of allergic rhinitis.

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**CONFLICT OF INTEREST:** None

**ETHICAL APPROVAL:** The study was approved by Institutional Ethical Committee

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