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Original Research Article

Olfactory dysfunction and quality of life changes in allergic rhinitis: impact of medical therapy: A prospective observational study

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Abstract

Background: Allergic rhinitis is one of the most common and undertreated diseases worldwide and persists throughout life. It is prevalent among 0.8 to 38.7% of the global population and many patients with allergic rhinitis have developed olfactory dysfunction .This study aimed to assess the olfactory function and quality of life changes before and after medical therapy.
Aim: A clinical assessment of olfactory function and quality of life changes in patients with allergic rhinitis before and after medical therapy.
Objectives: 1.To assess the prevalence of olfactory dysfunction in patients diagnosed with allergic rhinitis 2.To evaluate associated quality–of–life changes in patients diagnosed with allergic rhinitis.
Materials and Methods: A prospective observational study was conducted to assess the olfactory disfunction and the quality of life changes in the patient with allergic rhinitis before and after medical therapy over a period of 18 months(Jan 2013–Jul 2024) .A total of 300 patients diagnosed with Allergic rhinitis were taken into the study and were categorized based on ARIA(Allergic rhinitis and its impact on Asthma) classification (mild intermittent, mild persistent, moderate-to-severe intermittent, moderate-to severe persistent). Olfactory function was assessed using butanol threshold testing, and Quality of life was evaluated with the Rhino conjunctivitis Quality of Life Questionnaire (RQLQ) before and after 12 weeks of pharmacotherapy.
Results: Olfactory dysfunction was prevalent in 31.3% of patients (23.3% hyposmia, 8% anosmia), with sneezing (81.7%) as the primary symptom. Age group 31-40 (32.7%) and males (67%) were most affected. Post-treatment olfactory function improved significantly across all AR (allergic Rhinitis) categories ($p < 0.001$), and did RQLQ scores in activity, sleep, non-nasal, practical, nasal, eye, and emotional domains ($p < 0.001$).
Conclusion: AR is associated with significant olfactory dysfunction, which, along with Quality of life, improves markedly with 12 weeks of medical therapy.

Keywords: Allergic rhinitis, Hyposmia, Quality of life.

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1. Introduction

Allergic rhinitis is one of the common diseases encountered in day-to-day clinical practices. It is characterised by having two or more symptoms of rhinorrhea, recurrent attacks of sneezing, nasal blockage and nasal itching for a duration of two or more days for more than one hour on most days.[1] It is mediated by an early and late hypersensitivity response to an allergen and IgE-mediated action of mast cells in the nasal mucosa. The prevalence ranges from 0.8 to 39.7% of the world population and it is increasing; the prevalence of Allergic rhinitis in India was found to be 11 %.[2] It causes significant disability both mentally and physically and most of the time, it is often managed poorly.[3]

Based on this ARIA (Allergic Rhinitis and its impact on Asthma) classification, Allergic rhinitis has been classified into mild intermittent AR, mild persistent AR, moderate-to-severe intermittent AR and moderate-to-severe persistent AR. Many patients with allergic rhinitis can have olfactory dysfunction which is often a forgotten entity. This development of the olfactory dysfunction was found to affect the day-to-day activities of the patient.[4-5] Management of Allergic rhinitis includes allergen avoidance, pharmacotherapy, education and possibly immunotherapy.

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Various groups of drugs for the management of Allergic Rhinitis, like antihistamines, decongestants, leukotriene receptor blockers, anticholinergics, mast cell stabilizers and topical intranasal corticosteroids are used in the management of Allergic Rhinitis. And till now only a few cases describe the effect of allergic rhinitis in the development of olfactory dysfunction and also compare the efficacy of the proper treatment in the improvement of the olfactory dysfunction and the quality of life of the patient. So this study was planned to determine the efficacy of the medical treatment in improving the olfactory function and improving the quality of life of the patient with allergic rhinitis. The study was conducted over 18 months from the approval date. The patients presenting to the ENT department with Allergic rhinitis, as per inclusion criteria, were included in the study and were classified into four categories based on Allergic rhinitis and its impact on asthma guidelines. They were subjected to butanol threshold testing to assess the olfactory function. Then, the quality of the patient's life was assessed with the help of the Rhinoconjuctivitis Quality of Life Questionnaire (RQLQ). Then, they were provided with medical therapy such as steroidal nasal spray, antihistamines, and the leukotriene receptor antagonist based on the disease's severity for 8 to 12 weeks. And then, after the end of the treatment, the olfactory testing and the quality of the life of the patient were again tested and compared with the pre-treatment data. This study evaluate the prevalence of olfactory dysfunction among patients with allergic rhinitis and also to find the effect of the treatment in the improvement of olfactory disfunction and also to determine the quality of life of the patient with allergic rhinitis.

2. Materials and Methods

This prospective observational study was performed over a period of 18 months after approval by the ethical committee to determine the efficacy of the medical treatment in improving the olfactory function and improving the quality of life of the patient with allergic rhinitis.

The patients presenting to the ENT department with Allergic rhinitis, as pert the Inclusion criteria, were included in the study. After the informed consent, the participants were subjected to proper history taking.The case proforma consists of 5 parts. The first part has basic demographic details of the patients, such as name, age, sex, education, occupation, socio-economic status and addresses with contact numbers. The second part consiste of the history of presenting complaints such as nasal discharge, nasal obstruction, headache, post- nasal drip, halitosis and sneezing history. Then, the patient was evaluated for other co-morbidities such as diabetes, hypertension, tuberculosis, asthma and any other chronic illness. Then, the patient was enquired about the treatment history and family history for any allergy in the family and a similar illness in the family was also noted. The third part of the proforma consisted of the general physical examination, which was taken from the patient's case history.The fourth part of the proforma consisted of the ENT examination; in this part, the patient was evaluated under anterior rhinoscopy under the Bull's eye examination and subjected to the diagnostic nasal endoscopic examination. The fifth part of the case proforma consisted of the olfactory function assessment with the help of the butanol threshold test and the quality of life assessment with the help of the rhinoconjunctivitis quality of life questionnaire (RQLQ).

After the initial assessment, the patients were categorised into four groups based on ARIA (Allergic rhinitis and its impact on Asthma) classification and they were subjected to butanol threshold testing and RQLQ (Rhinoconjunctivitis Quality of Life Questionnaire). After that they were started on appropriate medical therapy such as steroidal nasal spray, antihistamines, and the leukotriene receptor antagonist based on the disease's severity for 8 to 12 weeks and at the end of the treatment again the olfactory testing and quality of life were analysed.

3. Butanol Threshold Test

For the butanol threshold test, two glass bottles were presented to the patient, and they contained water, while the other contained a dilute concentration of the butanol. The highest concentration of the butanol used during the test was found to be 4% butanol in deionized water. Then, the patient was asked to sniff, and then each subsequent dilution from the highest to the lowest concentration in a dilution of 1:3 in the deionized water was presented to the patient. Four consecutive correct answers were taken as the olfactory threshold for the patient. A total of 9 glasses were presented to the patient. The possible score ranges from 0 to 9 but the scores which are higher than seven were considered as seven as the highest score. The results of the butanol threshold test were classified as normosmic when the score was between 6 and 7, hypoosmic when the threshold score was between 2 and 5 and anosmic when the threshold score was between 0 and 1.

4. Rhinoconjunctivitis Quality of Life Questionnaire (RQLQ)

The rhinoconjunctivitis quality of life questionnaire has been developed to measure the functional problems of patients suffering from allergic rhinitis. It was developed in the same way as the Asthma quality of life questionnaire. The RQLQ consisted of a total of 28 questions in the seven domains. The seven domains of the RQLQ questionnaire are activity limitation, sleep problems, nose symptoms, eye symptoms, non-nose or eye symptoms, practical problems experienced by the patient and emotional function. They were scored under a 7-point Likert system, where 0 represents not impaired at all, whereas 7 refers to the presence of severe impairment. This questionnaire was found to be a widely validated questionnaire, and at present, it is available in many languages, including the Indian language.

4.1. Inclusion criteria

All the patients with the following criteria were included in this study.

1. Patients of both sexes with ages more than 18 years.
2. Patients diagnosed with Allergic rhinitis.
3. Patients should not be on the steroidal nasal sprays for a duration of 2 weeks before the first test.
4. Only patients willing to participate in the study will be included by giving informed written consent.

4.2. Exclusion criteria

The patients with the following conditions or situations were excluded from this study.

1. Patients with less than 18 years of age
2. Patients with the anatomical anomalies of the nose.
3. Patients with the acute infection or the inflammation in the nose and paranasal sinuses.
4. Patients with previous sino-nasal surgery
5. Pregnant women and lactating mother.
6. Comorbidities like uncontrolled Diabetes Mellitus ,HTN etc

4.3. Study design

Institutional Prospective observational study

4.4. Statistical analysis

The data were analyzed using IBM SPSS version 25. Frequencies and percentages of categorical variables were calculated. Means with SD of continuous variables were calculated. Association between categorical variables was assessed using the Chi-square test. Pre- and post-therapy means were compared by paired t test. Independent two-sample t-test was done to compare means of RQLQ scores and composite olfaction scores for patients with intermittent and persistent rhinitis as well as between mild and moderate-severe rhinitis. A $P<0.05$ was considered statistically significant.

5. Result

Out Of 300 patients, 67% were male, and the 31–40 age group was most affected (32.7%). Sneezing was the predominant symptom (81.7%), followed by rhinorrhea (70%) and nasal obstruction (63.3%). Olfactory dysfunction occurred in 31.3% of patients (23.3% hyposmia, 8% anosmia). MI-AR(Mild intermittent Allergic Rhinitis) was the most common type (33.7%), followed by MP-AR(moderate persistent-AR)(27%),MS-I-AR(Moderate to severe intermittent AR)(23%),and MS-P-AR (Moderate to severe persistent AR)(16.3%).

Post-treatment, olfactory function improved significantly across all AR categories. Mean butanol threshold scores increased significantly (e.g MI-AR: 5.73to 7.09, $p <0.001$; MS-P-AR: 3.02to6.22, $p<0.001$). RQLQ scores showed significant improvements in all domains (activity, sleep, non-nasal, practical, nasal, eye, emotional; $p<0.001$).

Table 1: Distribution of the patients based on the symptom of presentation

Symptom of presentation	Frequency (n)	Percentage (%)
Sneezing	245	81.7
Running nose	210	70
Nasal obstruction	190	63.3
Headache	155	51.7
Smell disturbances	94	31.3
Fatigue	66	22

Table 2: Distribution of the patients based on the type of AR

Type of AR	Frequency (n)	Percentage (%)
Mild intermittent AR	101	33.7
Mild persistent AR	81	27
Moderate to severe intermittent AR	69	23
Moderate to severe persistent AR	49	16.3

Table 3: Distribution of the patients based on the presence of olfactory dysfunction

Olfactory dysfunction	Frequency (n)	Percentage (%)
Present	94	31.3
Absent	206	68.7

Table 4: Distribution of the patients based on the degree of olfactory dysfunction

Hyposmia	70	23.3
Anosmia	24	8

Table 5: Mean Ol factory dysfunction score before and after the treatment

Severity of AR	Before treatment		After treatment		t-value	p-value
	Mean	SD	Mean	SD		
MI-AR	5.73	1.167	7.09	0.528	10.581	<0.001
MP-AR	5.25	1.429	7.19	0.398	11.681	<0.001
MS-I-AR	4.88	1.989	6.61	0.488	6.943	<0.001
MS-P-AR	3.02	2.105	6.22	1.632	8.560	<0.001

6. Discussions

In our study, a total of 300 patients with the diagnosis of allergic rhinitis participated. The most common age group affected with the the disease was found to be between 31 to 40 years and accounts for 32.7% followed by 25.7% of the patients between 41 to 50 years and 22.3% of the patients between 18 to 30 years and the 51 to 60 years of age about 12.7% of the patients were present and 6.7% were only present in the patients who are above more than 60 years of age.[6]

On exploring the symptoms of presentation of the patient, the study showed that sneezing is the most common complaint of the patient and it accounts for 81.7% followed by running nose noted in 70% of the cases and 63.3% of the patients had been affected with the nasal obstruction and the headache had been noted in 51.7%. And in the study smell disturbance was noted in 31.3% and fatigue in 22% of the total study population. The study by Zheng M et al.[7] also showed that sneezing was found to be the most common symptom encountered among patients with allergic rhinitis and the study showed that about 57.7% of the patients were found to be affected with allergic rhinitis and 54.1% of the patients were found to be affected by the blocked nose and next most common symptom encountered by the symptom was found to be the runny nose. Also, the study by Quillen DM et al.[8] showed that allergic rhinitis was found to be characterised by sneezing, congestion, and rhinorrhea.

In our study about 33.7% of the patients belonged to the mild intermittent allergic rhinitis followed 27% of the patients were found to be affected with mild persistent allergic rhinitis and moderate to severe intermittent allergic rhinitis had been noted in 23.3% whereas 16.3% of the patient had been diagnosed as moderate to severe persistent allergic rhinitis. This is because in our study the majority of the patients were found to had the symptoms for less than 3 months duration so most of the patients were found to have an acute form of the disease so the mild intermittent allergic rhinitis was found to be more commonly encountered in the patents followed by the mild persistent allergic rhinitis was found to be a second most common form of the allergic rhinitis.

In exploring the presence of olfactory dysfunction among the patients with allergic rhinitis, olfactory dysfunction was encountered in 31.3% of the patients whereas it was found to be normal in 68.7% of the total study population. The systematic review by Stuck BA et al.[9] Found that the frequency of olfactory dysfunction among the patient with allergic rhinitis was sound to be increased with the increase in the duration of the disease and the study also found that the prevalence of olfactory dysfunction among patients with allergic rhinitis was found to be between 20 to 40% across various regions of the world. And in another study by Fornazieri MA et al.[10] Showed that the prevalence of olfactory dysfunction among the patients with allergic rhinitis was found to be higher and the study found that about 42.9% of the patients affected with allergic rhinitis were found to be affected with olfactory dysfunction.

In our study about 23.3% of the patients were found to have hyposmia and anosmia was noted in 8% of the patients. The study by Cowart BJ et[11] showed that the prevalence of hyposmia was among the patients with allergic rhinitis which was sound to be one of the major etiological factors which were found to be associated with smell disorders. The study also informed that about 23.1% of the patients were found to be affected by smell disturbance in the form of hyposmia. Also, the study by Fornazieri MA et al.[12] showed that about 40% of the patients with allergic rhinitis were found to be affected with some form of olfactory dysfunction and it was found to be primarily manifested in the form of the primary smell disorder such as the hyposmia followed by anosmia. The study by Sara KB et al.[13] found that about 22.7% of the patients were found to be affected with allergic rhinitis.

In exploring the association between the type of allergic rhinitis and the presence of olfactory dysfunction, the study showed that about 13.3% of the patients with moderate to severe persistent allergic rhinitis and 8.3% of the patients with moderate to severe intermittent allergic rhinitis and 6.7% of the mild persistent allergic rhinitis and 3% of the mild intermittent allergic rhinitis were found to be associated with the olfactory dysfunction. And the study also showed a significant association between the two. And the study by Stuck BA et al.[14] Found that the olfactory dysfunction was found to be not correlated with the
severity of the patients with allergic rhinitis and it shows that the increase in the severity of the allergic rhinitis was not found to correlate with the increase in the olfactory dysfunction of the patient Also showed that the olfactory dysfunction a found to be more commonly associated among the patients with the moderate to severe type of allergic rhinitis when compared to the mild type of allergic rhinitis.. The study by Sara KB et al. showed the mean composite score amount eh patients with olfactory dysfunction sound to be 3.1 whereas it was raised to 4.3 after the treatment and there was a significant improvement in the score in the study.

Allergic rhinitis is one of the important and common health problems encountered in day-to-day ENT practices. Many times this was found to be undertreated which leads to the development of complications and it also affects the quality

of life of the patients. Olfactory dysfunction is one of the forgotten entity 4es often encountered in many allergic rhinitis patients. Allergic rhinitis was also found to affect the quality of life of the patient. Our study showed, prevalent in 31.3% of AR patients, significantly impairs Quality of life. Twelve weeks of medical therapy effectively reverses olfactory dysfunction and enhances Quality of life across all AR categories. Clinicians should routinely assess olfactory function and tailor treatments to optimize patient outcomes and also help to improve the quality of life of the patient. So the study recommends that clinicians always consider these issues while treating a patient with allergic rhinitis.

7. Source of Funding

None.

8. Conflict of Interest

None.

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