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Assessment of otological and audiological status in patients of allergic rhinitis

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ABSTRACT

Background: Allergic rhinitis (AR) is a type-I hypersensitivity reaction of the nasal mucosa to the airborne allergens, primarily mediated by immunoglobulin E (IgE) characterized by nasal obstruction, watery rhinorrhea, sneezing and itching at the nose, palate and nasopharyngeal region. Various studies have been done to study the relationship between middle ear afflictions and allergic rhinitis and majority of them incriminate nasal allergies as a probable factor to the development of otitis media.
Methods: A total of 70 patients, affected by allergic rhinitis, were recruited for the study after fulfilling the inclusion and exclusion criteria. Complete audiological work up including tympanometry studies was performed. Patients' data was then compiled and analyzed using statistical analyses.
Results: It was observed that disease is more common in age group of 21 to 30 years. 63% patient had perennial allergic rhinitis and rest 37% had seasonal allergic rhinitis. Otoscopic examination of the participants revealed that abnormal tympanic membrane findings such as retracted, congested, bulged and dull TM is more common in PAR than SAR. Hearing impairment is more common in PAR than SAR. Tympanometry study showed that in PAR 'B' type of tympanogram was found in 20% cases and 'C' type curve was found in 19% cases while in SAR these value were 4% and 8% respectively.
Conclusions: Allergic rhinitis whether seasonal or perennial adversely affect the eustachian tube functions which in turn may lead to increased incidence of middle ear effusion and otitis media. Diagnosis and proper management of allergic rhinitis is the key to avoid these middle ear diseases.

Keywords: Allergic rhinitis, Tympanogram, Eustachian tube functions, Otitis media with effusion

INTRODUCTION

Allergic rhinitis (AR) is a type-I hypersensitivity reaction of the nasal mucosa, primarily mediated by immunoglobulin E (IgE) with complex etiological factors. The clinical symptoms of allergic rhinitis are nasal obstruction, watery rhinorrhea, sneezing and itching at the nose, palate and nasopharyngeal region. Perennial allergic inflammation is mainly expressed as nasal obstruction, hyperactivity and often concomitant poor sense of smell while rhinorrhea and conjunctivitis is more common in seasonal allergic rhinitis.

Various authors have studied the relationship between otitis media and allergic rhinitis. Most of them agree that allergies probably contribute to the development of OME, with other major risk factors being bacterial infection and Eustachian tube obstruction (ETO).[1,2]

Epidemiologic studies consistently identify allergy as a risk factor for otitis media. Also, higher than expected

frequencies of allergy are reported for patients with otitis media.[3] This possibility is exemplified by the results of two review papers where prevalence of allergy in otitis media patients ranged from 25%-89%.[4,5] Several other authors proved a definitive role of allergy of upper airway in causation of middle ear dysfunction.[6] It is also suggested that the observed relationship between allergy and otitis media with effusion is caused by mediators of inflammation and cytokines and colony-stimulating factors released by mucosal mast cells and other inflammatory and epithelial cells in the nose and nasopharynx. These mediators produce blockage of the Eustachian tube through a number of mechanisms.[2] Both viral upper respiratory infection and nasal allergic reaction provoke nasal inflammation, which in turn causes Eustachian tube dysfunction leading to increased negative pressure in the middle ear and improper ventilation. This causes the retraction of tympanic membrane and conductive hearing loss.[7,8] Many studies confirm the association of allergy with MEE and support the hypothesis that the middle ear may be an integral part of the United Airway Concept.[9]

In a study, done to assess audiological manifestations of allergic rhinitis, it was concluded that Allergic rhinitis patients had a higher prevalence of hearing loss and otoacoustic emission abnormalities than controls.[10] Another study concluded that nasal allergy can affect Eustachian tube function, leading to the changes in the middle ear pressure and resulted in hearing impairment. Authors state that nasal challenges with allergen performed using rhinomanometry combined with tympanometry and PTA may be a useful diagnostic supplement in chronic OME patients.[11]

Association of ET dysfunction (ETD) and a decrease in MEP, which are key findings in otitis media with effusion were also demonstrated by several studies.[12,13] In contrast to the above studies, another study stated that the patients with allergic rhinitis had better hearing than the control group at 8000 Hz.[14]

As can be noted from literature review given above the allergy may affect the outer, the middle or the inner ear. Therefore, this study was done to assess otological and audiological status in patient of allergic rhinitis.

METHODS

This study has been done in Department of ENT, King George's Medical University, Lucknow, UP, India, for a period of 12 months. Patients were first judged for following inclusion and exclusion criteria

Inclusion criteria

Patients of 10-55 years with clinical diagnosis of allergic rhinitis on the basis of signs and symptoms were included in the study.

Exclusion criteria

Exclusion criteria were use of ototoxic agents; metabolic and systemic disease causing hearing loss; otoscopic evidence of a perforated tympanic membrane; serum IgE <200 IU/ml; negative skin prick test; H/o ear surgery; mentally retarded patients; patients reluctant to undergo complete otological assessment.

Procedure

A total of 70 patients were recruited for the study after fulfilling the inclusion and exclusion criteria. Out of these 70 patients, 44 patients had perennial allergic rhinitis and 26 patients were having seasonal allergic rhinitis. A detailed history and clinical examination of the patients was done. These patients were interrogated in detail for the incidence of allergic rhinitis in relation to effect on patient's hearing. Complete audiological work up including tympanometry studies was performed. Patients were also investigated for serum IgE and skin prick test.

Tools for measurement of outcomes

This was done to objectively confirm the presence of allergic rhinitis and to assess the hearing threshold and middle ear function. The tests, which were carried out are listed below:

- Skin prick test
- Serum Ig level
- Otoscopy
- Tuning fork test
- Pure tone audiometry
- Tympanogram

Patients' data was then compiled and analyzed using statistical analyses.

Statistical analysis

Continuous data were summarized as Mean±SD (standard deviation) while discrete (categorical) in number and percentage. The categorical groups were compared by chi-square (χ^2) test. Pearson correlation analysis was used to assess association between the variables. A two-tailed (α=2) p value less than 0.05 ($p<0.05$) was considered statistically significant. All analyses were performed on SPSS software (Windows version 17.0).

RESULTS

Demographic characteristics

The frequency distribution of demographic characteristics (age and sex) of patients was studied with respect to incidence of allergic rhinitis (Table 1). It was observed

that disease is more common in age group of 21 to 30 years in both genders.

Patients were further classified in two groups. First is seasonal allergic rhinitis group and second is perennial allergic rhinitis group. In this study 63% patient had perennial allergic rhinitis and rest 37% had seasonal allergic rhinitis (Figure 1).

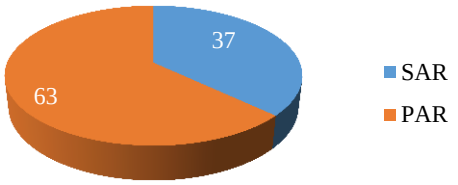

Figure 1: Distribution of patients in SAR and PAR groups.

Table 1: Age and sex distribution of patients (N=70).

Age group (years)	Male	Percentage (%)	Female	Percentage (%)	Total	Percentage (%)
10-20	14	32.55	8	29.62	22	31.42
21-30	15	34.88	8	20.62	23	32.85
31-40	6	13.95	7	25.92	13	18.57
41-55	8	18.60	4	14.81	16	22.85
Total	43	100	27	100	70	100.

Table 2: Comparison of otoscopic findings in SAR and PAR.

Otoscopy	SAR Group No. of ears (52)	Percentage (%)	PAR Group No. of ears (88)	Percentage (%)
Normal tympanic membrane	41	78.85	49	55.68
Bulged tympanic membrane	1	1.92	8	9.09
Retracted tympanic membrane	7	13.46	14	15.91
Congested tympanic membrane	3	5.77	8	9.09
Dull tympanic membrane	0	0	7	7.95

Table 3: Tympanometry in SAR and PAR.

Types of tympanogram	SAR No. of ears (N=52)	Percentage (%)	PAR No. of ears (N=88)	Percentage (%)
A type curve	41	78.85	40	45.45
As type curve	2	3.85	8	9.09
Ad type curve	3	5.77	5	5.68
B type curve	2	3.85	18	20.45
C type curve	4	7.68	17	19.32

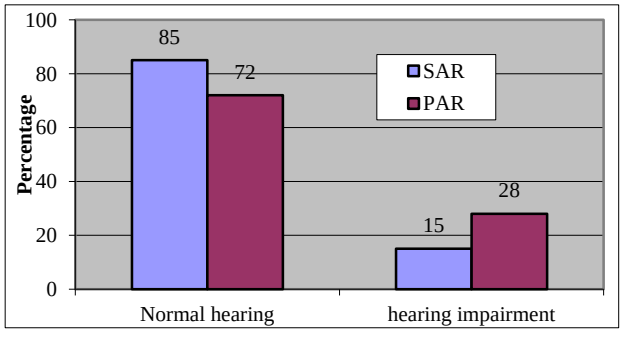

Figure 2: Hearing status in SAR and PAR.

Comparison of otoscopic findings in SAR and PAR

Otoscopic examination of the participants revealed that patients of SAR have more normal tympanic membrane findings than patients of PAR. Abnormal tympanic membrane findings such as retracted, congested, bulged and dull TM is more common in PAR than SAR (Table 2).

Hearing status of the patients

Most of the patient had normal hearing thresholds. Chart 2 shows that hearing impairment in PAR is more common than SAR (28.41% versus 15.4%). None of the patient had profound hearing impairment.

Tympanometry findings

Tympanometry study of the patients showed that 'A' type curve is more common in SAR than PAR which implies normal middle ear impedance. In PAR patients 'B' type of tympanogram was found in 20% cases and 'C' type

curve was found in 19% cases while in SAR these value were 4% & 8% respectively (Table 3).

DISCUSSION

In the study, allergic rhinitis was more common in young males between 10 to 30 yrs, constituting more than sixty seven percent, which corroborated with the findings of most researchers.[3] In the study, allergic rhinitis is more common in males in younger age group, after that the prevalence becomes almost similar among both sex. This fact has been supported by other studies.[4] Perennial allergic rhinitis was found in 44 patient (62.86%) is more common than seasonal allergic rhinitis, which was found in 26 patients (37.14%). Similar findings were stated by another study.[6]

In seasonal allergic rhinitis, otoscopy revealed a normal TM in 41 ears while TM congestion seen in 3 ears and negative middle ear pressure was apparent by retracted TM in 7 ears i.e. 13.46% cases. Normal TM was observed in 78.30% ears and 8.30% had retracted TM. In perennial allergic rhinitis, otoscopy revealed normal TM in 49 ears while TM congestion seen in 8 cases and negative middle ear pressure was apparent by retracted TM in 14 ears i.e. 15.91% cases.

In the study 28.41% patient of PAR having conductive hearing impairment while in SAR it is 15.4%. Similarly other studies showed that allergic rhinitis patients had a higher prevalence of hearing loss more so in cases of perennial allergic rhinitis, but another study concluded that the patients with allergic rhinitis had better hearing than the control group at 8000 Hz.[12,13]

The changes in impedance of ear drum are indicative of changes in middle ear pressure caused by tubal air pressure. Tympanogram revealed insignificant middle ear changes in PAR showing type 'B' tympanogram in 20% patients and type 'C' tympanogram in 19% patients. In cases of SAR type 'B' tympanogram was seen in 4% cases and type 'C' tympanogram was seen in 8% cases. Other studies also report similar findings to signify the presence of eustachian tube dysfunction like fluid in middle ear and negative middle ear pressure; which was found more frequently in patients affected by allergic rhinitis.[14,15]

CONCLUSION

Allergic rhinitis is more common in young and adults age group of 10 to 30 years, constituting 67.43% of total cases. In this age group, it is more common in male population. Perennial allergic rhinitis constituted 62.86% of the total patient population studied while Seasonal allergic rhinitis accounted for 37.14%, concluding that former is more common than later. Patients of perennial allergic rhinitis are have more hearing impairment (28.41%) than seasonal allergic rhinitis (15.4%), which is mostly conductive type. In patients of seasonal allergic otoscopy revealed abnormal TM findings in 21.15% patients whereas in perennial allergic rhinitis, abnormal TM was observed in 44.32% cases. Type B tympanogram were found in 20% of the patients with perennial rhinitis and in 4% of the patients with seasonal rhinitis. Type C tympanogram were found in 19% of the patients with perennial and in 8% with seasonal rhinitis. On the basis of the above study authors would like to conclude that allergic rhinitis whether seasonal or perennial adversely affect the eustachian tube functions which in turn may lead to increased incidence of middle ear effusion and otitis media. Diagnosis and proper management of allergic rhinitis is the key to avoid these middle ear diseases.

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