



ALLERGIC RHINITIS BEYOND NOSE- IMPACT ON MIDDLE EAR

ENT

Dr. Nikhita Khanijoan*	Junior resident), Dept of ENT, GMC Nagpur, Maharashtra-440003*Corresponding Author
Dr. Seema Patel	Associate Professor), Dept of ENT, GMC Nagpur, Maharashtra-440003
Dr. Nishikant Gadpayale	Associate Professor), Dept of ENT, GMC Nagpur, Maharashtra-440003
Dr. Devendra Mahore	Professor & Head), Dept of ENT, GMC Nagpur, Maharashtra-440003

ABSTRACT

Background: Allergic rhinitis (AR) is a common IgE-mediated inflammatory disorder of the upper airway that may impair Eustachian tube function because of the close anatomical and physiological relationship between the nasal cavity, nasopharynx, and middle ear. Early detection of middle ear involvement may help prevent long-term otological complications. **Objectives:** To evaluate the effect of allergic rhinitis on middle ear function and to assess associated otological changes in patients with allergic rhinitis. **Methods:** A prospective observational study was conducted over 2 years in the Department of Otorhinolaryngology at a tertiary care centre in Central India. One hundred patients with clinically diagnosed allergic rhinitis underwent detailed history, ENT examination, diagnostic nasal endoscopy, otoscopic examination, nasal smear cytology, peripheral blood eosinophil count, pure tone audiometry & tympanometry. **Results:** The commonest symptoms were nasal obstruction (97%), sneezing (96%), rhinorrhoea (88%), and nasal itching (73%). Inferior turbinate hypertrophy (100%) and pale nasal mucosa (97%) were the predominant endoscopic findings. Tympanic membrane retraction was noted in 41% of patients. Tympanometry revealed Type C tympanograms in 53%, Type A in 46%, and Type B in 1%. Eustachian tube dysfunction was the commonest ear pathology (41%), followed by chronic otitis media (10%), acute otitis media (2%), and serous otitis media (1%). **Conclusion:** Allergic rhinitis is frequently associated with middle ear dysfunction, with Eustachian tube dysfunction being the predominant abnormality. Routine otoscopic examination and tympanometry should be incorporated into the evaluation of patients with allergic rhinitis to facilitate early diagnosis and prevent middle ear complications.

KEYWORDS

Allergic Rhinitis, Eustachian Tube Dysfunction, Middle Ear Function, Tympanometry, Nasal Smear Cytology, Otitis Media.

INTRODUCTION

Allergic rhinitis (AR) is a common IgE-mediated inflammatory disorder of the nasal mucosa affecting approximately 10–30% of the global population and its prevalence continues to increase because of rapid urbanization, environmental pollution, and changing lifestyle patterns. Although primarily considered a disease of the upper airway, allergic rhinitis has important implications beyond the nasal cavity due to the anatomical and physiological continuity of the nasal cavity, nasopharynx, Eustachian tube and middle ear.

The Eustachian tube plays a vital role in maintaining middle ear ventilation, pressure regulation, and clearance of secretions. Several studies have demonstrated an association between allergic rhinitis and Eustachian tube dysfunction; however, the reported prevalence of middle ear abnormalities varies considerably among different populations.

Early identification of middle ear involvement in patients with allergic rhinitis is important because many individuals remain asymptomatic until significant otological complications develop.

The present study was undertaken to evaluate the effect of allergic rhinitis on middle ear function using clinical examination, nasal smear cytology, diagnostic nasal endoscopy, otoscopic findings, pure tone audiometry and tympanometry in patients attending a tertiary care centre.

MATERIALS & METHODS

This prospective observational study was conducted in the Department of Otorhinolaryngology at a tertiary care hospital in Central India over a period of 2 years, after obtaining approval from the Institutional Ethics Committee. A total of 100 consecutive patients with clinically diagnosed allergic rhinitis, based on the ARIA guidelines, were included after obtaining written informed consent. Patients with previous ear surgery, congenital ear anomalies, craniofacial abnormalities, sinonasal malignancy, acute upper respiratory tract infection, traumatic tympanic membrane perforation, or other conditions affecting middle ear function were excluded.

A detailed history, including demographic profile, presenting

complaints, duration of symptoms, and treatment history was recorded. All patients underwent a comprehensive otorhinolaryngological examination, including anterior rhinoscopy, otoscopy, otoendoscopy, diagnostic nasal endoscopy using a 0° rigid nasal endoscope. Nasal smear cytology was performed by obtaining a smear, which was stained with May–Grünwald–Giemsa stain and graded according to eosinophil count. Peripheral blood eosinophil count was also assessed.

Middle ear evaluation was done by pure tone audiometry and tympanometry. Tympanograms were classified as Type A, Type B, or Type C according to Jerger's classification. Ear pathologies, including Eustachian tube dysfunction, acute otitis media, serous otitis media, and chronic otitis media were documented.

Data were entered into Microsoft Excel and analysed using SPSS software version 26.0. Descriptive statistics were expressed as frequency, percentage, mean, and standard deviation.

RESULTS-

A total of 100 patients with clinically diagnosed allergic rhinitis were included in the study. The largest proportion of participants belonged to the 21–30 years age group, accounting for 26 (26.0%) patients, followed by the 11–20 years and 41–50 years age groups, each comprising 18 (18.0%) patients. Participants aged 31–40 years constituted 16 (16.0%) of the study population, while 61–70 years accounted for 10 (10.0%) patients. The 51–60 years age group comprised 8 (8.0%) participants, whereas the >70 years age group represented the smallest proportion with 4 (4.0%) patients. The majority of patients belonged to the 11–40 years age group, with males constituting 55% of the study population.

Nasal obstruction was the most common presenting symptom, reported by 97 (97.0%) patients, followed closely by sneezing in 96 (96.0%) patients. Rhinorrhoea was present in 88 (88.0%) participants, while itching sensations were reported by 73 (73.0%) patients.

Inferior turbinate hypertrophy was the most common nasal endoscopic finding, observed in all 100 (100.0%) patients, followed by pale nasal mucosa in 97 (97.0%) patients. Nasal discharge was present in 38

(38.0%) participants, while polypoidal mucosa was observed in only 3 (3.0%) patients. (Table 1).

Grade 1 eosinophilia was the most common finding on nasal smear cytology, observed in 68 (68.0%) patients, followed by Grade 0 in 19 (19.0%) patients and Grade 2 in 12 (12.0%) patients. Grade 3 eosinophilia was the least common finding, occurring in only 1 (1.0%) patient.

On Otoendoscopic examination, normal tympanic membrane was observed in 46 (46.0%) patients, while 41 (41.0%) patients demonstrated tympanic membrane retraction. Out of these 41 patients, 13 patients showed severe retraction (Sade -Grade III IV), 22 patients showed moderate retraction (Sade Grade II) and 6 patients showed mild retraction (Sade- Grade I). Perforation of the tympanic membrane was present in 12 (13.0%) patients, and air bubbles behind the tympanic membrane, suggestive of middle ear effusion, was observed in 1 (1.0%) patient.(Table-2)

Tympanometry revealed Type C tympanograms in 54% of patients, followed by Type A (45%) and Type B (1%) (Table 3). Among the patients with Type C tympanograms, 32 (59.3%) were not receiving treatment for allergic rhinitis, whereas 22 patients (40.7%) were on treatment.

Eustachian tube dysfunction was the commonest ear pathology (41%), followed by chronic otitis media (11%), acute otitis media (2%), and serous otitis media (1%)

DISCUSSION-

The relationship between allergic rhinitis and middle ear dysfunction is supported by the concept of the unified airway. Fireman et al first emphasized this pathophysiological association, and subsequent studies have consistently demonstrated an increased prevalence of Eustachian tube dysfunction among patients with allergic rhinitis.

The age distribution observed in the present study is comparable to the findings reported by Shaila Sidam et al., who also demonstrated that allergic rhinitis was more prevalent among young and middle-aged adults, with the majority of patients presenting during the most active years of life. Similar observations were reported by V. M. Katiyar et al., who found that allergic rhinitis commonly affected individuals in the second to fourth decades of life, reflecting prolonged exposure to environmental allergens and increasing occupational exposure.

The predominance of inferior turbinate hypertrophy and pale nasal mucosa observed on nasal endoscopy (Table- 1) reflects chronic allergic inflammation and is consistent with the endoscopic findings reported by Shaila Sidam et al., Dimple Sahni et al. and Sanjeev Kumar et al. These changes indicate persistent mucosal edema, which may contribute to narrowing of the pharyngeal opening of the Eustachian tube and subsequent impairment of middle ear ventilation.

Although nasal smear cytology demonstrated eosinophilic inflammation, peripheral eosinophilia was absent in the majority of patients due to prior medical treatment before presentation to the OPD. Similar observations have been reported by Cheng et al. and Shaila Sidam et al.

The predominance of Type C tympanograms indicates that Eustachian tube dysfunction represents the earliest and most frequent manifestation of middle ear involvement in allergic rhinitis. Similar tympanometric patterns have been described by Shaila Sidam et al. and Masashi Suzuki et al. (Table-3) reinforcing the role of allergic inflammation in producing negative middle ear pressure before the development of middle ear effusion.

The findings of the present study are comparable with those reported by Shaila Sidam et al., who observed that most patients with allergic rhinitis had an intact tympanic membrane, whereas tympanic membrane retraction was more common in individuals with impaired Eustachian tube function. Similar observations were made by X. Cheng et al, who identified tympanic membrane retraction as the predominant otoscopic abnormality associated with allergic rhinitis because of persistent negative middle ear pressure.

The findings of the present study emphasize the importance of routine otological evaluation in patients with allergic rhinitis. Incorporating

tympanometry into the assessment of these patients may facilitate early identification of subclinical middle ear dysfunction and enable timely intervention before irreversible middle ear changes occur.

Table 1- Distribution of Nasal Endoscopy Findings (n = 100)

Nasal Endoscopy Findings	Number of subjects in present study	Percentage (%)	Shaila Sidam et al	Dimple Sahni et al
Pale mucosa	97	97%	96%	99%
Inferior turbinate hypertrophy	100	100%	98%	86%
Discharge	38	38%	45%	22%
Polypoidal mucosa	3	3%	1%	0%

Table 2- Distribution of Tympanic Membrane Findings (n = 100)

Tympanic Membrane Finding	Number of subjects	Percentage (%)
Normal	46	46%
Retraction	40	40%
Air bubbles	1	1%
Perforation	13	13%

Table 3- Distribution of tympanogram types

Tympanogram Type	No. of subjects in study	Percentage (%)	X Cheng et al	Masashi Suzuki et al
Type A	46	46%	53%	44%
Type B	1	1%	2%	6%
Type C	53	53%	45%	50%
Total	100	100%	100%	100%

Table 4- Distribution of PTA findings

PTA finding	No. of subjects	Percentage
Normal	58	58%
Mild CHL	27	27%
Moderate CHL	13	13%
Moderately severe CHL	2	2%
Severe CHL	0	0
Total	100	100%

CONCLUSION-

The findings of the present study demonstrate that patients with allergic rhinitis have a higher prevalence of middle ear dysfunction, manifested by abnormal otoscopic findings, tympanometric changes, and hearing impairment. Increasing awareness among patients and healthcare providers regarding the impact of allergic rhinitis on ear health is essential for early diagnosis and timely intervention.

REFERENCES-

- Bousquet J, Khaltaev N, Cruz AA, Denburg J, Fokkens WJ, Togias A, et al. Allergic Rhinitis and its Impact on Asthma (ARIA) 2008 update (in collaboration with the World Health Organization, GA²LEN and AllerGen). *Allergy*.63:8-160.
- Brożek JL, Bousquet J, Baena-Cagnani CE, Bonini S, Canonica GW, Casale TB, et al. Allergic Rhinitis and its Impact on Asthma (ARIA) guidelines: 2010 revision. *J Allergy Clin Immunol*.126:466-476.
- Cheng X, Sheng H, Ma R, Gao Z, Han Z, Chi F, et al. Allergic rhinitis and the risk of otitis media with effusion: A systematic review and meta-analysis. *Laryngoscope*.127:1685-1692, 2017.
- Fireman P. Otitis media and Eustachian tube dysfunction: Connection to allergic rhinitis. *J Allergy Clin Immunol*.99:S787-S797, 1997.
- Hurst DS. The role of allergy in otitis media with effusion. *Otolaryngol Clin North Am*.25:181-189, 1992.
- Saedi B, Sadeghi M, Mojtahed M, Mahboubi H. The relationship between allergic rhinitis and otitis media with effusion: A systematic review and meta-analysis. *Int Forum Allergy Rhinol*.9:1104-1113, 2019.
- Sahni D, Verma P, Bhagat S, Sharma V. Hearing assessment in patients of allergic rhinitis: A study on 200 subjects. *Indian J Otolaryngol Head Neck Surg*.74:125-131, 2022.
- Sidam S, Arshed MP, Khurana U, Gupta V, Bhan BD. Evaluation of the association between allergic rhinitis and middle ear dysfunction: A clinicopathological study. *Cureus*.15:e40913, 2023.
- Suzuki M, Sone M, Yoshida T, Hashimoto S, Nakashima T. Relationship between allergic rhinitis and otitis media with effusion in children. *Auris Nasus Larynx*.32:249-254, 2005.
- Verma S, Singh S, Singh G. Role of nasal cytology in the evaluation of allergic rhinitis symptomatology and middle ear dysfunction in the Indian population. *Indian J Otolaryngol Head Neck Surg*.68:462-467, 2016.