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Original Article

Study of Incidence of Sensorineural Hearing Loss in Allergic Rhinitis

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ABSTRACT

Background: Allergic rhinitis (AR) is a common inflammatory disorder of the nasal mucosa that may have systemic effects extending to the auditory system. Recent studies suggest that allergic inflammation may contribute to sensorineural hearing loss (SNHL), but its incidence among AR patients remains under-recognized. The present study was conducted to determine the incidence of sensorineural hearing loss in patients with allergic rhinitis and to assess its association with demographic and clinical variables.
Materials and Methods: A cross-sectional study was conducted on 210 patients with clinically and allergologically confirmed allergic rhinitis attending the ENT outpatient department. Detailed otological examination and pure tone audiometry were performed to assess hearing thresholds. Patients with middle ear disease, noise exposure, or systemic disorders affecting hearing were excluded. Statistical analysis was done using chi-square and t-tests, with $p < 0.05$ considered significant.
Results: Among the 210 patients, 19.5% had SNHL, mostly mild (13.3%), with no cases of severe loss. SNHL was slightly more frequent in perennial AR (21.1%) than in seasonal AR (17.1%), although the difference was not statistically significant ($p > 0.05$). No significant gender difference was observed ($p = 0.47$). The mean age of the study population was 29.1 ± 8.1 years, and a gradual increase in SNHL prevalence with age was noted. These findings indicate that subclinical SNHL can occur even in young adults with AR, possibly due to prolonged allergic inflammation affecting cochlear function
Conclusion: Nearly one-fifth of patients with allergic rhinitis exhibit subclinical or mild sensorineural hearing loss, indicating possible cochlear involvement due to allergic inflammation. Routine audiological evaluation should be considered in the management of allergic rhinitis to ensure early detection and intervention.

Keywords: *Allergic rhinitis, Sensorineural hearing loss, Audiometry, Perennial rhinitis, Cochlear dysfunction.*

INTRODUCTION

Allergic rhinitis (AR) is a common IgE-mediated inflammatory disorder of the nasal mucosa characterized by symptoms such as nasal congestion, rhinorrhea, sneezing, and itching. Globally, AR affects 10–30% of adults and up to 40% of children, and its prevalence has been rising over the past few decades due to environmental and lifestyle changes [1,2]. In India, the prevalence is estimated to be around 20–25%, with urban populations showing higher incidence due to increased allergen exposure [3].

AR can be classified into seasonal (intermittent) and perennial (persistent) types based on the pattern and duration of allergen exposure. While the main focus in AR management is relief of nasal and ocular symptoms, chronic inflammation associated with AR can lead to complications involving the ear, nose, and throat, such as Eustachian tube dysfunction, otitis media with effusion, and rarely, sensorineural hearing loss (SNHL) [4–6].

Sensorineural hearing loss in AR is not well documented, unlike conductive hearing loss which is commonly associated with middle ear effusions. The pathophysiology of SNHL in AR is believed to involve immune-mediated cochlear damage, chronic inflammatory cytokine activity, and prolonged Eustachian tube dysfunction, which may compromise inner ear homeostasis [7,8]. Several studies have suggested that mild or subclinical SNHL can occur even in young adults with AR, often remaining undetected unless audiological assessments are performed [9,10].

Early identification of SNHL in AR patients is important because untreated hearing loss can lead to communication difficulties, decreased quality of life, and delayed cognitive development in younger populations. Despite this, routine audiometric screening is rarely incorporated into standard AR management protocols. Identifying the incidence of SNHL among AR patients will help in raising awareness and may guide clinicians to include audiological evaluation as part of routine care.

Objective of the study: This study aims to determine the incidence of sensorineural hearing loss in patients with allergic rhinitis, and to assess its relationship with type of AR, age, and gender. Understanding these associations can contribute to early diagnosis and timely intervention to prevent long-term auditory impairment.

MATERIALS AND METHODS

This was a cross-sectional observational study conducted at the Department of ENT at a tertiary care hospital for a period of 6 months from January 2025 to June 2025. The study aimed to determine the incidence of sensorineural hearing loss (SNHL) in patients with allergic rhinitis (AR) and analyze its correlation with type of AR, age, and gender.
Study Population: A total of 210 patients diagnosed with allergic rhinitis were included in the study.

Inclusion Criteria

1. Patients aged 18–50 years.
2. Clinically diagnosed allergic rhinitis based on ARIA (Allergic Rhinitis and its Impact on Asthma) guidelines.
3. Patients willing to undergo audiometric evaluation and provide informed consent.

Exclusion Criteria

1. History of chronic otitis media, tympanic membrane perforation, or ear surgery.
2. Known congenital or acquired hearing loss unrelated to AR.
3. Use of ototoxic drugs (e.g., aminoglycosides, loop diuretics).
4. Systemic illnesses affecting hearing (e.g., diabetes mellitus, hypertension, chronic kidney disease).
5. Inability to cooperate with audiometric testing.

Clinical Assessment

1. Detailed history-taking, including duration and type of AR symptoms, past medical history, family history of allergies, and occupational/environmental exposures.
2. Physical examination, including anterior rhinoscopy and otoscopic evaluation to rule out middle ear pathology.
3. Classification of AR:
   - Seasonal AR: Symptoms occurring during specific seasons.
   - Perennial AR: Symptoms persisting throughout the year.

Audiological Evaluation

1. Pure-tone audiometry (PTA): Conducted in a sound-treated room using a calibrated audiometer. Thresholds were measured at frequencies 250 Hz to 8 kHz for both ears.
2. Tympanometry: Performed to assess middle ear function and exclude conductive hearing loss. Only patients with normal tympanograms (Type A) were included in SNHL assessment.
3. Definition of SNHL: Hearing loss of >25 dB HL at any frequency, with air-bone gap ≤10 dB, classified as:
   - Mild: 26–40 dB HL
   - Moderate: 41–55 dB HL
   - Severe: >55 dB HL

Data Collection and Statistical Analysis: Data were recorded in a structured proforma. Continuous variables were expressed as mean ± standard deviation. Categorical variables were expressed as percentages. Chi-square test was used to analyze associations between SNHL and gender, type of AR, and age groups. p-value < 0.05 was considered statistically significant. Statistical analysis was performed using SPSS version 20.

RESULTS

A total of **210 patients** diagnosed with allergic rhinitis (AR) were included in the study. The study population comprised slightly more males (54.3%) than females (45.7%), with a **mean age of 29.1 years**. Perennial AR was more common than seasonal AR, reflecting continuous allergen exposure in the study region (Table 1).

Table 1. Demographic and Clinical Profile of Study Population

Variable	Number (%) / Mean ± SD
Total patients	210 (100%)
Gender (M:F)	114:96
Mean age (years)	29.1 ± 8.1
Perennial AR	128 (61.0%)
Seasonal AR	82 (39.0%)

Overall, **19.5% of patients with AR had SNHL**, predominantly mild in degree. **Moderate SNHL** was less common, and **no severe cases** were detected. This suggests that mild, subclinical SNHL may be an under-recognized complication among allergic rhinitis patients (Table 2).

Table 2. Incidence and Severity of Sensorineural Hearing Loss (SNHL)

Severity of SNHL	Number of Patients	Percentage (%)
Mild (26–40 dB HL)	28	13.3
Moderate (41–55 dB HL)	13	6.2
Severe (>55 dB HL)	0	0
Total with SNHL	**41**	**19.5**
Normal hearing	**169**	**80.5**

SNHL was slightly more prevalent in **perennial AR (21.1%)** compared to **seasonal AR (17.1%)**, possibly due to year-round allergen exposure and prolonged inflammatory effects on the Eustachian tube and cochlear pathways. Although this difference was not statistically significant ($p > 0.05$), it indicates that **disease chronicity** may influence auditory function (Table 3).

Table 3. Distribution of SNHL by Type of Allergic Rhinitis

Type of AR	Total Patients	SNHL Present	Percentage (%)
Perennial AR	128	27	21.1
Seasonal AR	82	14	17.1

There was **no significant gender difference** in the incidence of SNHL ($p = 0.47$), indicating that both males and females with AR are equally susceptible to sensorineural hearing loss (Table 4).

Table 4. Gender-wise Distribution of SNHL

Gender	Total Patients	SNHL Present	Percentage (%)
Male	114	20	17.5
Female	96	21	21.9

The incidence of SNHL showed a **gradual increase with age**, but differences were not statistically significant. Even younger adults (18–25 years) exhibited mild SNHL (14.7%), emphasizing the importance of **early audiological screening** in all AR patients (Table 5).

Table 5. Age-wise Distribution of SNHL

Age Group (years)	Total Patients	SNHL Present	Percentage (%)
18–25	68	10	14.7
26–35	94	19	20.2
36–45	48	12	25.0

DISCUSSION

The present cross-sectional study was conducted to determine the incidence of **sensorineural hearing loss (SNHL)** among patients with **allergic rhinitis (AR)** and to evaluate its association with the type of AR, age, and gender. Out of 210 patients

evaluated, **41 (19.5%)** were found to have SNHL, predominantly **mild in degree**. This finding reinforces that allergic rhinitis, beyond being a nasal disorder, can influence **inner ear function** through inflammatory and immunologic mechanisms.

Comparison with Previous Studies

The observed incidence of SNHL (19.5%) in the present study closely parallels previous reports in literature. Kim et al. (2019) found SNHL in **18%** of AR patients, suggesting that inner ear involvement is not uncommon in allergic conditions [11]. Similarly, Chen et al. (2018) reported **20% subclinical SNHL** among AR patients, particularly those with perennial symptoms [12]. Jeong et al. (2017) demonstrated cochlear dysfunction using otoacoustic emissions in **16%** of AR patients, even when audiometric thresholds were normal [13].

These findings collectively indicate that **allergic inflammation** can subtly affect cochlear structures, often without overt symptoms, highlighting the need for audiological screening in AR.

Possible Pathophysiological Mechanisms

Several mechanisms have been proposed to explain the association between **AR and SNHL**. Chronic nasal and nasopharyngeal inflammation may cause **Eustachian tube dysfunction**, resulting in altered middle ear pressure and impaired cochlear homeostasis [14]. Furthermore, **immune-mediated cochlear injury** may occur due to systemic allergic responses and cytokine release.

Increased levels of inflammatory mediators such as **interleukin-4, interleukin-5, tumor necrosis factor-α**, and **histamine** may extend beyond the nasal mucosa, leading to microcirculatory disturbances and damage to **outer hair cells** within the cochlea [15,16]. Experimental models have shown eosinophilic infiltration in the cochlear region in allergic conditions, supporting the concept of allergy-induced cochlear inflammation [17].

The findings of this study, with nearly one-fifth of patients demonstrating SNHL, lend further clinical support to these pathophysiological mechanisms.

Association with Type of Allergic Rhinitis

In the current study, SNHL was slightly more prevalent in **perennial AR (21.1%)** compared to **seasonal AR (17.1%)**, although the difference was not statistically significant ($p > 0.05$). This trend mirrors findings by DiBerardino et al. (2006), who reported higher rates of hearing impairment among patients with **persistent allergic rhinitis** due to continuous allergen exposure and sustained mucosal inflammation [18]. The chronicity of inflammation in perennial AR may lead to prolonged **cytokine activation** and **immune cell infiltration**, predisposing these patients to subtle cochlear damage. Thus, **duration and persistence of symptoms** may be important risk factors for hearing changes in allergic individuals.

Age and Gender Correlation

No significant gender difference was observed in the incidence of SNHL, consistent with Kim SH et al. (2012), who reported a similar absence of sex predilection in auditory threshold changes among AR patients [19]. The **age-related increase** in SNHL observed in this study, although not statistically significant, aligns with previous evidence suggesting that **chronic allergic inflammation** may exacerbate cochlear aging or metabolic stress over time [20].

Interestingly, mild SNHL was also noted among younger adults (18–25 years), reinforcing that **hearing loss in AR is not restricted to older age groups** and can develop early if allergic inflammation is uncontrolled.

Clinical Implications

The findings of this study have important clinical implications. Allergic rhinitis is often managed with a focus on nasal and ocular symptoms, while auditory manifestations are frequently overlooked. The detection of mild SNHL in nearly one-fifth of AR patients underscores the need for routine audiometric evaluation, even in those without ear complaints.

Early diagnosis allows timely intervention through allergen avoidance, antihistamines, and intranasal corticosteroids, which may help reduce inner ear inflammation and prevent progression of hearing loss [21]. Integrating audiological screening into ARIA (Allergic Rhinitis and its Impact on Asthma) guidelines could enhance comprehensive management of allergic rhinitis [22].

CONCLUSION

This study found that **19.5% of patients with allergic rhinitis** had **sensorineural hearing loss**, mostly mild in degree. The findings suggest that allergic inflammation may extend to the inner ear, even in patients without ear symptoms. Regular **audiological evaluation** should be included in the management of allergic rhinitis to enable early detection and treatment. Larger prospective studies are needed to confirm these observations and clarify underlying mechanisms.

REFERENCES

1. Bousquet J, Khaltaev N, Cruz AA, et al. Allergic Rhinitis and its Impact on Asthma (ARIA) 2008 update. Allergy. 2008;63 Suppl 86:8–160.
2. Settipane RA. Epidemiology of allergic rhinitis: update. Curr Opin Allergy Clin Immunol. 2001;1:7–16.
3. Kumar A, et al. Prevalence of allergic rhinitis in Indian urban population: A cross-sectional study. Indian J Otolaryngol Head Neck Surg. 2016;68:123–129.
4. Naclerio RM. Pathophysiology of allergic rhinitis. J Allergy Clin Immunol. 1991;88:231–237.
5. Kim SW, et al. Sensorineural hearing loss in patients with allergic rhinitis: A cross-sectional study. Laryngoscope. 2019;129:1232–1238.
6. Chen YS, et al. Auditory dysfunction in patients with allergic rhinitis. Int J Pediatr Otorhinolaryngol. 2018;108:37–41.
7. Snow JB Jr. Mechanisms of inner ear injury in allergic diseases. Otolaryngol Clin North Am. 1993;26:811–825.
8. DiBerardino DJ, et al. Allergic rhinitis and inner ear function: A review. Otolaryngol Head Neck Surg. 2006;135:753–759.
9. Kim SH, et al. Auditory threshold changes in patients with chronic allergic rhinitis. Clin Exp Otorhinolaryngol. 2012;5:159–164.
10. Jeong SW, et al. Cochlear involvement in allergic rhinitis: A case-control study. Eur Arch Otorhinolaryngol. 2017;274:1261–1267.
11. Kim SW, et al. *Sensorineural hearing loss in patients with allergic rhinitis: A cross-sectional study.* Laryngoscope. 2019;129(6):1232–1238.
12. Chen YS, et al. *Auditory dysfunction in patients with allergic rhinitis.* Int J Pediatr Otorhinolaryngol. 2018;108:37–41.
13. Jeong SW, et al. *Cochlear involvement in allergic rhinitis: A case-control study.* Eur Arch Otorhinolaryngol. 2017;274:1261–1267.
14. Naclerio RM. *Pathophysiology of allergic rhinitis.* J Allergy Clin Immunol. 1991;88(2):231–237.
15. Khalid AN, et al. *Cytokine expression in allergic rhinitis and its implications for auditory function.* Ann Allergy Asthma Immunol. 2007;98(6):546–551.
16. Snow JB Jr. *Mechanisms of inner ear injury in allergic diseases.* Otolaryngol Clin North Am. 1993;26(5):811–825.
17. DiBerardino DJ, et al. *Allergic rhinitis and inner ear function: A review.* Otolaryngol Head Neck Surg. 2006;135(5):753–759.
18. DiBerardino DJ, et al. *Allergic rhinitis and inner ear function: A review.* Otolaryngol Head Neck Surg. 2006;135(5):753–759.
19. Kim SH, et al. *Auditory threshold changes in patients with chronic allergic rhinitis.* Clin Exp Otorhinolaryngol. 2012;5(3):159–164.
20. Bousquet J, et al. *ARIA 2020: Revision and update.* Allergy. 2020;75(10):2313–2327.
21. Settipane RA. *Epidemiology of allergic rhinitis: update.* Curr Opin Allergy Clin Immunol. 2001;1(1):7–16.
22. Bousquet J, Khaltaev N, et al. *ARIA guidelines.* Allergy. 2008;63 Suppl 86:8–160.
23. Agrawal Y, et al. *Prevalence of hearing loss and balance disorders in the US population.* JAMA Otolaryngol Head Neck Surg. 2008;134(10):1071–1079.