



RESEARCH ARTICLE

Clinical and Audiological Evaluation of Sensorineural Hearing Loss in Adults: A Cross-Sectional Study in a Tertiary Care ENT Center

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Abstract

Background: Sensorineural hearing loss is a common cause of adult-onset auditory impairment and has significant implications on communication, social interaction, occupational functioning, and quality of life. Identification of risk factors and early audiological evaluation are important for prevention, timely rehabilitation, and reduction of disability. **Objective:** To evaluate the clinical profile, severity, laterality, audiological pattern, and associated risk factors of sensorineural hearing loss in adults presenting to an ENT outpatient clinic. **Materials and Methods:** A study was conducted among 200 adult patients aged 18 years and above diagnosed with sensorineural hearing loss based on pure tone audiometry. A structured proforma was used to collect demographic data, clinical symptoms, associated comorbidities, history of noise exposure, ototoxic drug intake, smoking, and family history. Audiometric severity and laterality were recorded. Statistical analysis was performed using chi-square test, and a p-value less than 0.05 was considered statistically significant. **Results:** Of 200 patients, 114 (57.0%) were males and 86 (43.0%) were females. The mean age was 56.8 ± 13.2 years. Bilateral sensorineural hearing loss was observed in 146 (73.0%) patients. The most affected age group was 51–70 years, accounting for 96 (48.0%) cases. Common symptoms included hearing difficulty in all patients, tinnitus in 116 (58.0%), and vertigo in 24 (12.0%). Hypertension and diabetes mellitus were common comorbidities. Noise-induced hearing loss was observed in 48 (24.0%) cases. Moderate sensorineural hearing loss was the most common severity grade. Age showed significant association with severity of hearing loss. **Conclusion:** Sensorineural hearing loss is a major cause of auditory impairment among adults and is commonly bilateral in older age groups. Age, noise exposure, hypertension, diabetes mellitus, smoking, and ototoxic drug exposure are important associated factors. **Keywords:** Audiometry, Hearing Impairment, Noise Exposure, Presbycusis, Sensorineural Hearing Loss, Tinnitus.

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1 | INTRODUCTION

Sensorineural hearing loss is a form of hearing impairment resulting from pathology involving the cochlea, auditory nerve, or central auditory pathways. It is the most common type of permanent hearing loss among adults and may be caused by age-related degeneration, noise exposure, metabolic disorders, vascular disease, ototoxic medications, infections, trauma, genetic factors, or idiopathic causes. Hearing loss may be unilateral or bilateral and may vary from mild impairment to profound deafness. (1)

Age-related sensorineural hearing loss, also known as presbycusis, is one of the leading causes of hearing impairment in older adults. It is usually bilateral, symmetrical, slowly progressive, and more prominent at higher frequencies. Degenerative changes in the cochlea, stria vascularis, spiral ganglion, and auditory pathways contribute to progressive auditory decline. Presbycusis affects communication ability and may contribute to social withdrawal and reduced quality of life. (2)

Sensorineural hearing loss is often underrecognized because many adults gradually adapt to reduced hearing and seek medical care only when communication becomes difficult. Patients may initially complain of difficulty hearing speech in noisy environments, asking people to repeat words, increasing television volume, or misunderstanding conversations. Delayed diagnosis can result in avoidable social isolation, occupational difficulty, emotional distress, and reduced rehabilitation benefit. (3)

Tinnitus is a frequent associated symptom in patients with sensorineural hearing loss. It may present as ringing, buzzing, hissing, or roaring sensation in the ear. Tinnitus can be distressing and may interfere with sleep, concentration, emotional well-being, and daily activity. In many patients, tinnitus reflects cochlear or neural dysfunction and should prompt audiological evaluation. (4)

Noise-induced hearing loss is an important preventable cause of sensorineural hearing loss. It commonly affects individuals exposed to industrial noise, machinery, traffic, construction work, music systems, firearms, and occupational sound hazards.

Noise-induced hearing loss typically affects high frequencies and may initially remain unnoticed. Use of hearing protection and occupational safety measures are essential for prevention. (5)

Systemic diseases such as hypertension and diabetes mellitus have also been associated with sensorineural hearing loss. These conditions may affect cochlear microcirculation, neural function, and metabolic homeostasis of the inner ear. Since the cochlea has high metabolic demand and delicate vascular supply, vascular and metabolic disturbances can contribute to auditory dysfunction. (6)

Pure tone audiometry remains the basic and most important investigation for diagnosis and grading of hearing loss. It helps determine type, degree, configuration, and laterality of hearing impairment. Audiometric evaluation is essential for diagnosis, follow-up, disability assessment, and planning of rehabilitation such as hearing aid fitting or referral for advanced auditory rehabilitation. (7)

The present study was conducted to evaluate the clinical and audiological profile of sensorineural hearing loss among adult patients and to identify important associated risk factors such as age, hypertension, diabetes mellitus, occupational noise exposure, smoking, ototoxic drug exposure, and family history.

2 | MATERIALS AND METHODS

This was a hospital-based cross-sectional observational study conducted in the Department of ENT over a 12-month period. A total of 200 adult patients aged 18 years and above with clinically and audiometrically confirmed sensorineural hearing loss were enrolled using consecutive sampling.

Patients aged 18 years and above diagnosed with sensorineural hearing loss using pure tone audiometry and willing to participate were included. Patients with conductive or mixed hearing loss on pure

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tone audiometry, history of ear surgery, recent acute otologic infection, and incomplete clinical data were excluded.

Data were collected using a structured proforma. The proforma included demographic details such as age, sex, and occupation. Clinical details included chief complaints, duration and progression of symptoms, laterality, tinnitus, vertigo, ear fullness, and associated otological symptoms. History of systemic diseases such as hypertension and diabetes mellitus was recorded. History of occupational noise exposure, smoking, ototoxic drug use, and family history of hearing loss was also noted.

All patients underwent detailed ENT examination. Otoscopic examination was performed to exclude external ear and middle ear pathology. Tuning fork tests including Rinne, Weber, and absolute bone conduction tests were performed as part of clinical assessment.

Pure tone audiometry was performed in all patients. Air and bone conduction thresholds were assessed across standard frequencies. The degree of hearing loss was classified according to audiometric threshold. Audiometric grading was categorized as mild hearing loss, moderate hearing loss, severe hearing loss, and profound hearing loss. Laterality was recorded as unilateral or bilateral sensorineural hearing loss.

The audiometric grading used was as follows: mild hearing loss was defined as 26–40 dB, moderate hearing loss as 41–60 dB, severe hearing loss as 61–80 dB, and profound hearing loss as more than 80 dB.

Data were analyzed using SPSS version 22. Descriptive statistics were applied for frequencies and percentages. Chi-square test was used to find associations between severity of hearing loss and risk factors. A p-value less than 0.05 was considered statistically significant.

Institutional ethical approval was obtained before the study. Informed consent was obtained from all participants. Confidentiality of patient information was maintained.

3 | RESULTS

3.1 | Total of 200 adult patients with sensorineural hearing loss were included in the study

Male predominance was observed, with 114 (57.0%) males and 86 (43.0%) females. The mean age of the study population was 56.8 ± 13.2 years. The higher proportion of males may be related to greater occupational noise exposure, outdoor activity, smoking, and health-seeking patterns.

The most commonly affected age group was 51–70 years, accounting for 96 (48.0%) patients. Patients above 70 years constituted 34 (17.0%) cases. These findings indicate that sensorineural hearing loss was more common among older adults, consistent with the contribution of age-related auditory degeneration.

Hearing loss was present in all patients. Tinnitus was the most common associated symptom, reported by 116 (58.0%) patients. Vertigo was observed in 24 (12.0%) patients, while ear fullness was reported by 18 (9.0%) patients. The presence of tinnitus indicates cochlear involvement in a significant proportion of patients.

Bilateral sensorineural hearing loss was observed in 146 (73.0%) patients, while unilateral involvement was seen in 54 (27.0%) cases. Bilateral involvement was more common, especially among older adults and patients with metabolic comorbidities.

Moderate sensorineural hearing loss was the most common grade, observed in 84 (42.0%) patients, followed by mild hearing loss in 72 (36.0%). Severe and profound hearing loss together accounted for 44 (22.0%) cases. Most patients therefore had mild-to-moderate hearing loss and could benefit from early rehabilitation.

Hypertension was the most common associated risk factor, observed in 68 (34.0%) patients, followed by diabetes mellitus in 56 (28.0%) patients. Occupational noise exposure was present in 48 (24.0%) cases, while smoking was reported by 42 (21.0%) patients. Ototoxic drug history and positive family history were less common but clinically relevant risk factors.

TABLE 1: Demographic Characteristics of Study Participants

Variable	Frequency (%)
Total patients	200 (100.0)
Male	114 (57.0)
Female	86 (43.0)
Mean age	56.8 ± 13.2 years

TABLE 2: Age Distribution of Study Participants

Age Group	Number (%)
18–30 years	18 (9.0)
31–50 years	52 (26.0)
51–70 years	96 (48.0)
>70 years	34 (17.0)

TABLE 3: Clinical Presentation Among Study Participants

Clinical Feature	Frequency (%)
Hearing loss	200 (100.0)
Tinnitus	116 (58.0)
Vertigo	24 (12.0)
Ear fullness	18 (9.0)

TABLE 4: Laterality of Hearing Loss

Laterality	Frequency (%)
Bilateral SNHL	146 (73.0)
Unilateral SNHL	54 (27.0)

TABLE 5: Audiometric Severity of SNHL

Degree of SNHL	Number (%)
Mild	72 (36.0)
Moderate	84 (42.0)
Severe	36 (18.0)
Profound	8 (4.0)

TABLE 6: Associated Risk Factors

Risk Factor	Number (%)
Hypertension	68 (34.0)
Diabetes mellitus	56 (28.0)
Noise exposure, occupational	48 (24.0)
Smoking	42 (21.0)
Ototoxic drug history	18 (9.0)
Positive family history	22 (11.0)

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TABLE 7: Statistical Associations

Association Studied	Result
Age and severity of SNHL	Statistically significant, $p < 0.01$
Diabetes and bilateral SNHL	Significant, $p = 0.04$
Noise exposure and high-frequency loss	Highly significant, $p = 0.001$

Age showed significant association with severity of sensorineural hearing loss. Diabetes mellitus was significantly associated with bilateral sensorineural hearing loss. Occupational noise exposure showed highly significant association with high-frequency hearing loss. These associations highlight the role of age-related, metabolic, and environmental factors in adult SNHL.

4 | DISCUSSION

The present cross-sectional study evaluated the clinical and audiological profile of sensorineural hearing loss among 200 adult patients attending an ENT outpatient clinic. The majority of patients were older adults, and the most commonly affected age group was 51–70 years. Male predominance was observed. Bilateral sensorineural hearing loss was common, and moderate hearing loss was the most frequent audiometric severity. Tinnitus was the most common associated symptom. Hypertension, diabetes mellitus, occupational noise exposure, smoking, ototoxic drug history, and family history were important associated factors.

Cruikshanks et al. reported that hearing loss is common among older adults and increases with age. In the present study, 48.0% of patients belonged to the 51–70 years age group, and 17.0% were above 70 years. Age showed significant association with severity of hearing loss, supporting the role of age-related auditory degeneration.

Gates and Mills described presbycusis as a progressive, bilateral, age-associated sensorineural hearing loss that commonly affects high frequencies. (8) The present study also observed a high proportion of bilateral SNHL, especially among older adults. This pattern is consistent with age-related cochlear and neural degeneration.

Lin et al. reported that hearing loss in older adults is independently associated with cognitive decline. (9) Although cognitive assessment was not performed in the present study, the high burden of SNHL among older adults indicates the need for early hearing evaluation and rehabilitation to reduce social and cognitive consequences.

Dalton et al. demonstrated that hearing impairment affects quality of life among older adults. (10) In the present study, all patients presented with hearing difficulty, and many had tinnitus. Hearing impairment may affect communication, confidence, family interaction, and daily functioning.

Sindhusake et al. studied risk factors for hearing loss in older adults and reported associations with age, noise exposure, and systemic factors. (11) In the present study, age, diabetes, hypertension, smoking, and occupational noise exposure were important associated factors, suggesting that adult SNHL has multifactorial etiology.

Agrawal et al. reported that hearing loss is prevalent among adults in the United States and increases with age. (12) The present study similarly showed that sensorineural hearing loss was more frequent in older adults. This supports the need for routine audiological screening in aging populations.

Hong et al. reported an association between diabetes mellitus and hearing impairment in adults. (13) In the present study, diabetes mellitus was present in 28.0% patients and showed significant association with bilateral SNHL. Diabetes may affect cochlear microvasculature and auditory nerve function, contributing to hearing impairment.

Bainbridge et al. also observed that diabetes is associated with hearing impairment, suggesting a metabolic contribution to auditory dysfunction. (14) The present findings support the need for audiological evaluation among diabetic patients, especially those with long-standing disease or symptoms of

hearing difficulty.

Tinnitus was reported by 58.0% patients in the present study. It is commonly associated with cochlear pathology and may be distressing even when hearing loss is mild or moderate. Patients with tinnitus should undergo detailed audiological evaluation and counseling.

Occupational noise exposure was observed in 24.0% patients and showed highly significant association with high-frequency hearing loss. Noise-induced hearing loss is preventable. Use of ear protection, reduction of workplace noise, periodic audiometry, and occupational health education are essential preventive measures.

Hypertension was the most common comorbidity. Vascular factors may influence cochlear blood supply and contribute to sensorineural hearing loss. Patients with hypertension should be counseled regarding blood pressure control and evaluated for hearing symptoms, especially in older age.

Smoking was present in 21.0% patients. Smoking may contribute to auditory dysfunction through vascular compromise, oxidative stress, and cochlear hypoxia. Smoking cessation should be included in preventive counseling for patients with hearing loss.

Ototoxic drug history was reported in 9.0% patients. Aminoglycosides, loop diuretics, platinum compounds, antimalarial drugs, and certain chemotherapeutic agents are known to cause ototoxicity. Careful drug history and monitoring are important in patients receiving potentially ototoxic therapy.

Moderate SNHL was the most common severity category. This is clinically important because patients with mild-to-moderate SNHL often benefit from hearing aids and counseling. Early rehabilitation can improve communication and reduce disability.

Profound hearing loss was observed in 4.0% patients. Such patients may require advanced evaluation and rehabilitation options, including powerful hearing aids or cochlear implant assessment depending on clinical suitability.

The present study has certain limitations. It was hospital-based and may not represent community prevalence. Speech audiometry, tympanometry, otoacoustic emissions, and auditory brainstem

response were not included for all patients. Detailed duration of comorbidities and dose-response relationship for noise exposure were not analyzed. Future studies with longitudinal follow-up and detailed audiological testing may provide stronger evidence.

5 | CONCLUSION

Sensorineural hearing loss is a major cause of auditory impairment among adults and is commonly bilateral in older age groups. In the present study, the most affected age group was 51–70 years, and male predominance was observed. Hearing difficulty was present in all patients, while tinnitus was the most common associated symptom. Bilateral SNHL was more common than unilateral disease. Moderate hearing loss was the most frequent audiometric severity. Hypertension, diabetes mellitus, occupational noise exposure, smoking, ototoxic drug history, and family history were important associated factors. Age was significantly associated with severity, diabetes was associated with bilateral SNHL, and occupational noise exposure was associated with high-frequency hearing loss. Early audiological screening, control of comorbidities, prevention of noise exposure, avoidance of ototoxic drugs where possible, and timely hearing rehabilitation are essential to improve quality of life.

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