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Sensorineural Hearing Loss in Patients with Chronic Suppurative Otitis Media

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ABSTRACT

Background: Chronic suppurative otitis media is a common long-standing middle ear problem. It presents with persistent otorrhea through a perforated tympanic membrane for at least six to twelve weeks. Most patients develop conductive hearing loss. If the infection continues, inflammatory products can reach the cochlea and injure inner ear structures. This may lead to sensorineural loss that can become irreversible if ignored. **Objective:** To determine how often patients with chronic suppurative otitis media develop sensorineural hearing loss. **Methods:** A descriptive cross-sectional study was completed in the ENT unit of Mayo Hospital, King Edward Medical University, Lahore. The study ran from 16 May to 16 November 2024. One hundred fifty patients who fulfilled the inclusion criteria were selected. Age, gender, comorbid illness, and symptom duration were documented. Pure tone audiometry was done in all cases, and results were reported by an ENT consultant. Bone conduction thresholds at 500, 1000, 2000, and 4000 Hz were calculated in the diseased and opposite ear. Standard definitions were used to label sensorineural loss. All findings were entered on a structured proforma and analyzed with routine statistical tests. **Results:** The mean age was 36.9 ± 7.5 years. Symptoms continued for an average of 15.3 ± 3.3 weeks. There were 82 males, making up 54.7 percent of the group, and 68 females, making up 45.3 percent. Hypertension was present in 27 patients, while 24 had diabetes. Sensorineural loss appeared in 22 patients, which represented 14.7 percent of the total sample. **Conclusion:** A considerable number of patients with CSOM had sensorineural hearing loss in addition to conductive loss. Early diagnosis and complete hearing assessment are important to prevent permanent inner ear damage. Patient counseling and further research on prevention are recommended.

INTRODUCTION

CSOM (Chronic suppurative otitis media) is one of the most common ear diseases seen in ENT clinics, especially in low to middle income countries. Its global prevalence ranges from 0.5 percent to 30 percent, influenced by geography and socioeconomic status. The burden is highest in South Asia, sub-Saharan Africa, and parts of Latin America, where many children have repeated infections and poor access to early treatment[1].

CSOM is a inflammatory condition of the middle ear cleft, mastoid air cells, and Eustachian tube. It is usually caused by mixed aerobic and anaerobic bacteria. Most patients present with long-standing or recurrent ear discharge through a permanent tympanic membrane perforation[2]. The disease has two main clinical types. The mucosal or safe type has a central perforation. The squamosal or unsafe type is linked with cholesteatoma, which may lead to bone erosion and serious complications[3].

The effects of CSOM are not limited to the middle ear. Ongoing inflammation can spread to the inner ear, causing permanent auditory damage. Persistent infection and chronic inflammation can result in ossicular chain erosion, tympanosclerosis, and mastoid cavity involvement. These processes are responsible for conductive hearing loss, the well-recognized sequel[4]. However, there is increasing evidence that inner ear structures may also be affected.

Sensorineural hearing loss (SNHL) in CSOM is thought to occur due to the passage of inflammatory mediators, bacterial toxins, and enzymes across the round window membrane into the cochlea. Animal studies confirm that chronic inflammation can induce macrophage-mediated inner ear injury leading to irreversible loss of hair cells and spiral ganglion neurons[5]. This suggests that CSOM should not be considered only a disease of the middle ear, but one with potential inner ear consequences as well.

Clinically, the prevalence of SNHL in CSOM patients varies considerably across studies. Subramaniam et al. found cochlear dysfunction in a significant proportion of chronic otitis media patients, with high-frequency thresholds affected earlier[6]. Tang et al. demonstrated that both

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mucosal and cholesteatomatous CSOM can impair bone conduction thresholds, though the risk is greater in squamosal disease[7]. Philipose et al. recently highlighted disease duration as a major determinant of cochlear dysfunction, suggesting that longer-standing cases have higher risk of SNHL[8]. These findings are consistent with the hypothesis that persistent inflammation increases cumulative cochlear damage.

Systematic evidence further supports this association. A 2021 systematic review by Elzinga et al. concluded that patients with otitis media are at increased risk of SNHL, although study heterogeneity and methodological limitations restrict definitive conclusions[9]. Several studies point toward a link between CSOM and sensorineural hearing loss, but stronger prospective data and standardized audiological methods are still lacking.

SNHL adds a considerable clinical burden in CSOM. Mixed hearing loss makes treatment more difficult and limits the degree of improvement expected after tympanic membrane repair. Many patients eventually require hearing aids for acceptable rehabilitation. Detecting cochlear involvement early helps clinicians plan management and counsel patients about realistic outcomes. Yuan et al. noted that preoperative SNHL is associated with poorer postoperative hearing results in CSOM patients undergoing tympanoplasty[10]. Their findings support timely surgical treatment to avoid permanent inner ear injury.

Although evidence is increasing, several gaps remain, especially in South Asia. Many publications are single-centre studies with small cohorts. Information on regional disease patterns, prevalence, and risk factors for SNHL in CSOM is still limited. Local research is needed to develop practical guidelines and counselling strategies.

The present study aimed to determine the frequency of sensorineural hearing loss in patients with chronic suppurative otitis media seen in our setup. Generating local data will help define the actual disease burden and guide clinicians toward early, appropriate interventions that protect hearing and improve long-term results

METHODOLOGY

A cross sectional (descriptive) study was carried out in the Department of Otorhinolaryngology, Mayo Hospital, Lahore, between 16 May and 16 November 2024. Ethical approval was granted by the Institutional Review Board of King Edward Medical University (approval number 777/RC/KEMU). Written informed consent was taken from every participant before enrollment. Consent forms and study information were available in English and Urdu. Participants were assured of confidentiality, voluntary participation, and could withdraw anytime.

A total of 150 patients were included. The sample size was calculated with a 95 percent confidence level and a 5.5 percent margin of error, using an expected 13 percent prevalence of SNHL in CSOM. Participants were recruited through non-probability consecutive sampling.

Adults aged 18 to 60 years, of either sex, who met the operational definition of CSOM were eligible. Patients who had a history of head trauma or traumatic perforation of the tympanic membrane, previous ear surgery, and noise induced hearing loss, exposure to ototoxic medications, a family history of congenital or acquired hearing loss, or any central nervous system infections such as meningoencephalitis were excluded from the study.

Demographic details such as age, sex, and duration of illness were noted on a structured form. Pure tone audiometry was carried out by an ENT specialist. Bone conduction thresholds at 500, 1000, 2000, and 4000 Hz were taken from the affected ear and the opposite ear. Standard criteria were used to label cases of sensorineural hearing loss.

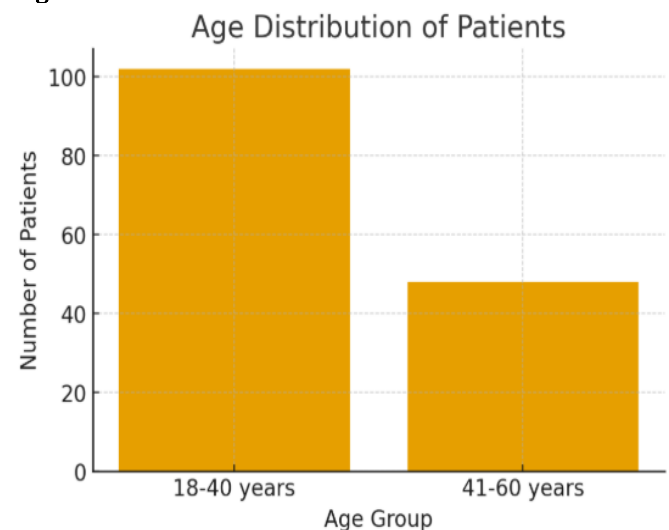
Data were processed in SPSS version 26. Age and duration were expressed as mean and standard deviation. Sex, hypertension, diabetes, and the presence of sensorineural loss were described as numbers and percentages. Stratification was done for age, sex, disease duration, hypertension, and diabetes to limit confounding. The chi square test was used to check associations between categorical variables. A p value below 0.05 was considered significant.

A cross-sectional design was selected to estimate the burden of sensorineural loss in patients with chronic suppurative otitis media attending a tertiary hospital. This design does not establish cause and effect. It offers baseline information for later multicenter or follow up studies.

RESULTS

A total of 82 patients with CSOM (chronic suppurative otitis media) were evaluated. Two age brackets were used, 18 to 40 years and 41 to 60 years. Most patients belonged to the younger bracket. There were 53 patients in the 18 to 40 year group. The remaining 29 patients were between 41 and 60 years of age. This shows that chronic ear discharge was more common in younger adults in this sample. The same pattern appeared when hospital attendance records for the study period were reviewed, with more visits from patients below 40 years. Figure 1 shows the age split in detail.

Figure 1



There were 45 male patients, which accounted for 54.9 percent of the sample. The remaining 37 patients were female, making up 45.1 percent. Although males were slightly more common, the difference between genders was not statistically significant (Figure 2).

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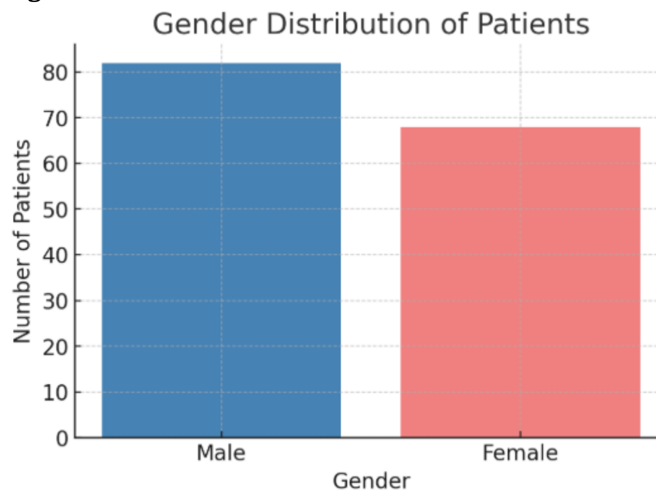
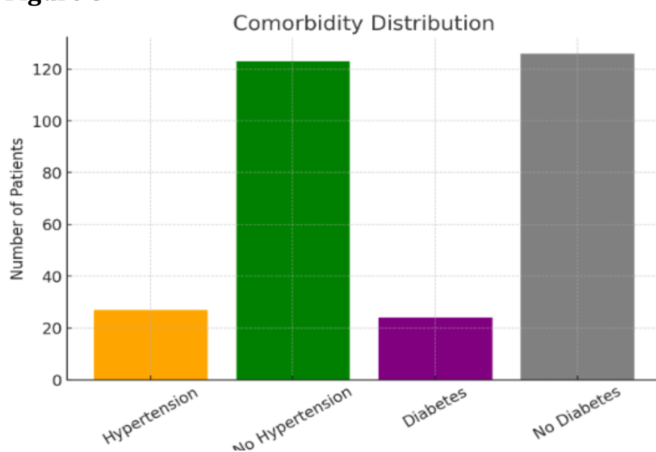
Figure 2



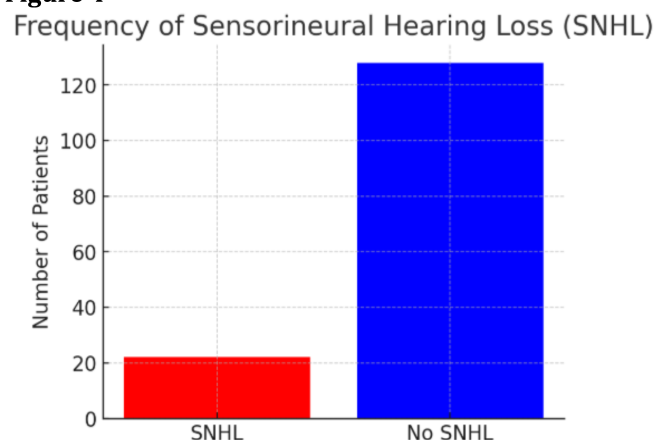
The mean duration of symptoms was 21.4 ± 9.2 weeks. When categorized, 20 patients (24.4 percent) had symptoms for less than 13 weeks, 27 patients (32.9 percent) reported symptoms lasting 13 to 24 weeks, and 35 patients (42.7 percent) had symptoms for more than 24 weeks. Figure 3 displays this distribution, showing that a large proportion of patients presented late in the course of disease.

Figure 3



SNHL was noted in 26 out of 82 patients, giving a frequency of 31.7 percent. It was reported in 15 males (57.7 percent) and 11 females (42.3 percent). Although SNHL was more common in males, the association was not statistically significant ($p > 0.05$).

Figure 4



When analyzed by age, sensorineural hearing loss was observed in 14 of 46 patients (30.4 percent) aged 19–30 years, 8 of 24 patients (33.3 percent) aged 31–45 years, and 4 of 12 patients (33.3 percent) aged 46–60 years. The chi square test showed that age did not affect the chances of developing sensorineural loss. The p value was above 0.05, so the difference was not meaningful.

Duration of illness showed a clear trend. When symptoms continued for more than 24 weeks, 14 of 35 patients had sensorineural loss. This equals 40 percent. In the 13 to 24 week group, 8 of 27 patients were affected. When symptoms were present for less than 13 weeks, only 4 of 20 patients had inner ear involvement. The p value was below 0.05, so this finding was statistically significant.

In simple terms, age and sex did not change the risk of sensorineural loss. Patients who lived with the disease for a longer time were more likely to develop it. This shows how ongoing infection can harm the inner ear if treatment is delayed.

DISCUSSION

Chronic suppurative otitis media remains a common problem across the world. Recent reviews place its global prevalence close to 3.8 percent. The disease is seen more often in low and middle income countries. Many patients in these settings reach hospitals late because medical care is harder to access on time[11]. Ongoing perforation and infection in CSOM can extend beyond the middle ear and harm the inner ear through the passage of toxins and inflammatory mediators across the round window membrane[12]. Experimental studies have shown that chronic middle ear inflammation causes macrophage activity and loss of outer hair cells, particularly in the basal cochlear turns, which supports the biological mechanism of sensorineural injury[13].

In this study of 150 CSOM patients, sensorineural hearing loss (SNHL) was detected in 14.7 percent. The mean age was 36.9 ± 7.5 years, and the average symptom duration was 15.3 ± 3.3 weeks. Males made up 54.7 percent of participants. Hypertension and diabetes were recorded in 18.0 percent and 16.0 percent, respectively. These demographic trends are comparable to other published data, suggesting that CSOM mainly affects middle-aged adults and may coexist with systemic comorbidities.

The frequency of SNHL found here was lower than that reported in some regional studies but remains clinically important. Jha and Singh observed SNHL in 25.5 percent of CSOM patients in India[14], while another tertiary care study reported rates approaching 37 percent in chronic cases[15]. The differences in reported frequencies may be due to variation in disease chronicity, severity, patient selection, and diagnostic methods.

In our analysis, factors such as age, sex, symptom duration, hypertension, and diabetes did not show significant correlation with SNHL ($p > 0.05$). The absence of association may reflect relatively short disease duration or limited sample size for subgroup analysis. Other authors have shown opposite trends. Elzinga et al. found that chronic otitis media generally caused greater bone conduction deficits, though variability between studies limited strong conclusions[16]. Subramaniam et al. reported SNHL in up to 71.4 percent of patients with CSOM lasting

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more than five years, indicating that longer-standing inflammation leads to greater cochlear damage[17].

The link between cholesteatoma and SNHL remains uncertain. Our data included too few cases to draw conclusions, and no significant association was identified. Some researchers suggest that cholesteatoma-related disease may cause more extensive cochlear injury because of its erosive and inflammatory nature. Jha et al. found in their prospective analysis that cholesteatoma and ossicular erosion were independent predictors of SNHL[18]. These results, however, need validation in larger and more diverse cohorts.

This study has some limitations. Many patients had relatively short durations of disease, which may underestimate the true risk of long-term cochlear damage. It was not possible to completely exclude prior use of ototoxic ear drops. Middle ear disease can temporarily lower bone conduction thresholds, a known issue called the Carhart effect. This may have influenced how sensorineural loss was measured in some patients. The sample size was also modest, which reduced the strength of subgroup comparisons.

Even with these limits, the findings show that many patients with chronic suppurative otitis media develop sensorineural loss. This underlines the importance of proper treatment and requirement of a follow -up. Once inner ear damage occurs, hearing often does not recover. Early surgery and regular audiological checks can reduce long-term disability.

Future work should follow patients over time. High frequency audiometry and otoacoustic emissions would allow earlier detection of cochlear injury. Studies that include molecular or imaging tests may also add value. Large multicenter projects from South Asia and other regions can improve prediction tools and guide better management of CSOM related hearing loss.

CONCLUSION

About 15 percent of patients with chronic suppurative otitis media experienced sensorineural hearing loss, showing that the disease can affect the inner ear as well as the middle ear. This type of damage can be permanent, adding to the overall burden of hearing loss.

No significant link was seen between sensorineural loss and factors such as age, sex, or common medical conditions. This indicates that even younger or otherwise healthy patients are at risk if the disease persists. The damage to the cochlea is likely caused by inflammatory mediators and toxins originating in the middle ear.

Patients with CSOM should have regular hearing assessments. Early repair of the tympanic membrane can help protect the inner ear from further injury. CSOM is not a minor condition, and a considerable number of patients may develop permanent sensorineural hearing loss. Prompt treatment, proper intervention, and continued follow-up are essential to prevent long-term hearing impairment.

REFERENCES

1. Khairkar M, Mishra AK, Lakhotia P, Lakhotia M. Chronic Suppurative Otitis Media: A Comprehensive Review. Cureus. 2023 Aug 31;15(8):e44153. https://doi.org/10.7759/cureus.43729
2. Rajput MSA, Ansari F, Shoeb M, Shakeel M. Mucosal type of Chronic-suppurative otitis-media and the long-term impact on hearing loss. Indian J Otol. 2020;26(4):218-22. https://doi.org/10.7759/cureus.10176
3. Silva MN, Muller JS, Selaimen FA, et al. Tomographic evaluation of the contralateral ear in patients with severe chronic otitis media. Braz J Otorhinolaryngol. 2020;86(5):563-8. https://doi.org/10.5935/1808-8694.20130085
4. Mostafa BE, El Fiky LM, El Sharnouby MM. Complications of suppurative otitis media: still a problem in the 21st century. ORL J Otorhinolaryngol Relat Spec. 2019;81(2-3):87-92. https://doi.org/10.1159/000191472
5. Xia A, Thai A, Cao Z, et al. Chronic-suppurative otitis-media causes macrophage-associated sensorineural hearing loss. J Neuroinflammation. 2022 Jul 12;19(1):224. https://doi.org/10.1186/s12974-022-02585-w
6. Subramaniam V, Ashkar A, Rai S. Cochlear dysfunction in chronic otitis media and its determinants. Iran J Otorhinolaryngol. 2020 Jan;32(109):79-84.
7. Tang Y, Lian B, Zhang M, et al. Sensorineural damage in Chronic-suppurative otitis-media with and without cholesteatoma: a comparative study. Ann Transl Med. 2022 Jul;10(14):778. https://doi.org/10.21037/atm-22-2606
8. Philipose R, Varghese A, Kumar N, Varghese SS. Determinants of cochlear dysfunction in chronic otitis media: mucosal disease. Indian J Otolaryngol Head Neck Surg. 2023 Nov;75(Suppl 2):3733-8. https://doi.org/10.1007/s12070-023-04093-6
9. Elzinga HBE, van Oorschot HD, Stegeman I, Smit AL. Relation between otitis media and sensorineural hearing loss: a systematic review. BMJ Open. 2021 Aug;11(8):e050108. https://doi.org/10.1136/bmjopen-2021-050108.
10. Yuan Y, et al. Prognostic factors of hearing outcome in patients with Chronic-suppurative otitis-media following tympanoplasty. Ann Transl Med. 2022 Nov;10(21):1163. https://doi.org/10.21037/atm-22-5306.
11. Onifade A, Katolo HW, Mookerjee S, Bhutta MF. Epidemiology of Chronic Suppurative Otitis Media: Systematic Review to Estimate Global Prevalence. J Epidemiol Glob Health. 2025;15:55. https://doi.org/10.1007/s44197-025-00396-9
12. Bhutta MF, et al. Chronic suppurative otitis media: beyond the middle ear. Lancet. 2024. https://doi.org/10.1016/S0140-6736(24)00259-9
13. Xia A, Thai A, Cao Z, et al. Chronic-suppurative otitis-media causes macrophage-associated sensorineural hearing loss. J Neuroinflammation. 2022;19(1):224. https://doi.org/10.1186/s12974-022-02585-w
14. Jha S, Singh RK. The evaluation of the incidence of sensorineural component of hearing loss in chronic suppurative otitis media. IJRMS. 2022;10(12):2898–2903. https://doi.org/10.18203/2320-6012.ijrms20223095
15. “Sensorineural Hearing Loss and its Severity in Patients Suffering from Longstanding Aural Suppuration.” (Bolan Medical College, Quetta); 2023. https://doi.org/10.53350/pjmhs020231712538
16. Elzinga HBE, van Oorschot HD, Stegeman I, Smit AL. Relation between otitis media and sensorineural hearing loss: a systematic review. BMJ Open. 2021;11(8):e050108. https://doi.org/10.1136/bmjopen-2021-050108

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17. Subramaniam V, Ashkar A, Rai S. Cochlear Dysfunction in Chronic Otitis Media and Its Determinants. Iran J Otorhinolaryngol. 2020;32(109):79–84. https://doi.org/10.22038/ijorl.2019.35045
18. Jha S, et al. Determinant of Chronic-suppurative otitis-media and its association with sensorineural hearing loss. JIGM. 2024;10. https://doi.org/10.18203/issn.2454-5929.ijohns20252245

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