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Original Research Article

A prospective cross-sectional study of prevalence of sensorineural hearing loss in patients with chronic otitis media

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ABSTRACT

Background: Chronic otitis media (COM) accounts for one of the major causes of acquired hearing loss, especially in developing countries. The hearing loss is mostly conductive, but many cases show mixed hearing loss of varying degrees, suggesting involvement of the sensorineural component as well. This study aims to estimate the prevalence of sensorineural hearing loss (SNHL) in patients of chronic otitis media and assess the clinical factors playing a role in sensorineural hearing.
Methods: Prospective analysis of clinical and surgical data of 80 patients with COM was studied. The bone conduction thresholds measured in both normal and affected ears were compiled. Disease duration, presence of cholesteatoma and its association with degree of SNHL were evaluated.
Results: In this study, COM was more common in the younger age group with a female preponderance. Prevalence of SNHL in COM was found to be 31%, out of which 21% had squamosal and 10% had mucosal disease. Mean bone conduction thresholds were significantly higher in the affected ear compared to the normal ear ($p<0.05$). No significant difference was found concerning the duration of disease. Although the incidence of sensorineural hearing loss was more in patients with squamosal disease, the degree of hearing loss did not vary with the presence or absence of cholesteatoma.
Conclusions: COM can lead to significant sensorineural hearing loss, and prompt evaluation for better management and hearing outcomes.

Keywords: Chronic otitis media, Sensorineural hearing loss, Audiometry, Cholesteatoma

INTRODUCTION

Chronic otitis media (COM) is a chronic inflammatory condition of the middle ear space with long-term and sometimes permanent tympanic membrane changes. It presents as hearing loss, otorrhea, otalgia or tinnitus.[1] It is common in developing countries, attributed as one of the common causes of acquired hearing loss, which is mostly conductive hearing loss due to loss of tympanic membrane and ossicular dysfunction. Sensorineural hearing loss (SNHL) is either due to failure in the cochlear transduction of sound or neural impulses of the vestibulocochlear nerve. Recently, there have been studies showing the association of sensorineural hearing loss in patients of COM, as well as the correlation of degree of SNHL with the patient's age, disease duration, presence of ossicular dysfunction and cholesteatoma.[2] Inner ear damage leading to sensorineural hearing loss in COM patients may be due to the spread of inflammation to the inner ear, or direct spread of pathogens or ototoxic drugs.[3]

The goal of this study is to assess the incidence of sensorineural hearing loss in patients with COM and evaluate its association with the type and duration of COM. This will help with the evaluation, treatment and counselling of the patient regarding treatment outcomes and prevention of complications.

METHODS

Study design

It was a hospital based prospective observational study.

Study place

The study was conducted at the Department of Otorhinolaryngology, Assam Medical College and Hospital.

Study duration

The duration of the study was 1 year (September 2023 to August 2024).

Inclusion criteria

Patients with unilateral COM undergoing otologic surgeries for the same were included.

Exclusion criteria

Patients below the age of 12 years, and those with a previous history of ear surgeries, head injuries or any organic neurological disorders were excluded.

Sample size calculated using Cochran's formula, taking 95% confidence interval with margin of error of 10% and the prevalence of SNHL in 71.4% patients of COM (from a previous study), the sample size was calculated to be 78.414, rounded up to 80.[4]

$$n = z^2 \times pq/d^2$$

Demographic data, clinical history and otological examination and pure tone audiometry were evaluated. Bone conduction thresholds for normal and diseased ears were tabulated to assess SNHL. High-resolution computed tomography (HRCT) temporomastoid as well as surgical records were used to assess the presence or absence of cholesteatoma.

Prevalence of senorineural hearing loss as well its correlation with disease duration and cholesteatoma was assessed.

The data was recorded in tabulated form in Microsoft Excel, and computerised analysis was done.

RESULTS

A total of 80 patients of COM were included in this study, and a female preponderance was found, with 66 percent of the patients being females. The younger age group was mostly affected, with the mean age being 28 years with SD±12.49, ages ranging from 12 years old to 64 years. The average disease duration was 9.6 years with SD±7.2.

Most of the patients gave a history of otorrhea of duration 6 to 10 years, and squamosal COM was associated with increasing duration of otorrhea, whereas patients with otorrhea less than 5 years mostly had mucosal disease.

Table 1: Age and sex distribution.

Age (years)	Male	Female	Percentage
12-20	10	16	32.5
21-30	6	20	32.5
31-40	6	10	20
41-50	2	5	8.7
51-60	2	1	3.7
>60	1	1	2.5
Total	27	53	

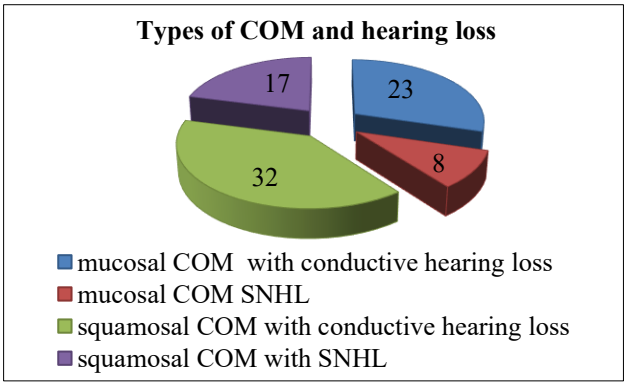

Figure 1: Types of chronic otitis media and hearing loss.

Bone conduction thresholds at the frequencies of 500 Hz, 1000 Hz, 2000 Hz and 4000 Hz were compared between the diseased and the non-diseased ears of the patients. Mean bone conduction thresholds were higher in the affected ear than normal ear, and all were significant ($p<0.05$). The mean bone conduction threshold difference between the normal and diseased ear was found to be increasing from lower frequencies to higher frequencies.

Cholesteatoma was found in 32 patients of squamosal COM. Among the patients with sensorineural hearing loss, 15 patients had cholesteatoma in the middle ear, and 10 patients did not.

In patients having sensorineural hearing loss, the bone conduction thresholds of the diseased ear in the absence and presence of cholesteatoma were similar, and hence, this study found that the presence of cholesteatoma did not have a statistically significant impact on the degree of sensorineural hearing loss (SNHL) ($p>0.05$).

Table 2: Duration of disease and its association with mixed hearing loss.

Duration of otorrhea (years)	No. of patients with mucosal COM	No. of patients with mucosal COM with SNHL	No. of patients with squamosal COM	No. of patients with squamosal COM with SNHL	Total	Percentage of patients with SNHL
<5	19	7	5	1	24	10
6-10	12	1	19	9	31	12.5
>10	0	0	25	7	25	8.75
Total	31	8	49	17	80	

Table 3: Bone conduction thresholds in normal and diseased ear.

Frequency (in Hz)	Mean bone conduction threshold in the normal ear	Mean bone conduction threshold in the affected ear	P value	Mean bone conduction threshold difference
500	16.87±3.21	23.87±11.13	<0.0001	7
1000	18.37±5.72	26.68±12.93	<0.0001	8.31
2000	20±4.28	29.62±13.04	<0.0001	9.62
4000	20.81±3.12	31.06±14.68	<0.0001	10.25

Table 4: Comparison of mean bone conduction threshold in patients of mixed hearing loss in absence and presence of cholesteatoma.

Frequency (in Hz)	Mean bone conduction threshold of the diseased ear in the absence of cholesteatoma	Mean bone conduction threshold of the diseased ear in the presence of cholesteatoma	P value
500	36.36±11.63	38.21±10.48	0.6801
1000	40.45±13.68	42.14±12.51	0.7505
2000	44.09±15.30	45.37±12.16	0.8176
4000	48.63±16.89	47.5±12.82	0.8507

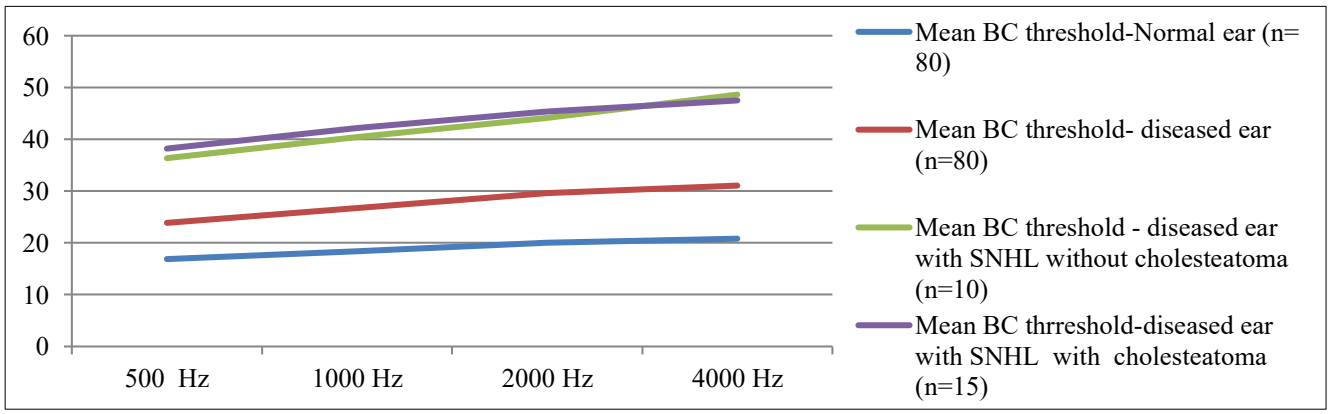

Figure 2: Comparison of mean bone conduction thresholds of normal ear, diseased ear, diseased ear with and without cholesteatoma.

DISCUSSION

COM is a common ENT disease, with long-term and sometimes permanent tympanic membrane changes, leading to hearing loss, which is of the conductive type conventionally. Mixed hearing loss is found in a lot of COM cases, implying that sensorineural hearing loss may be associated with COM. In this study, we found that the bone conduction thresholds of the diseased ear were significantly higher. Sensorineural hearing loss was found in 25 (31%) of COM patients in our study, out of which 17 (21%) had squamosal disease and 8 (10%) patients had mucosal disease. The prevalence of SNHL in our study aligns with the findings reported by Kaur et al (24%) and Thakur et al (23%), suggesting consistent rates across similar populations or study conditions.[5,6]

Although sensorineural hearing loss was found more in squamosal COM, there was no significant association between the degree of hearing loss in the affected ears with

the presence or absence of cholesteatoma. This is consistent with findings of Amali et al, Azevedi et al, and Kasliwal et al, who also found no significant correlation between SNHL and cholesteatoma.[2,7,8] While our findings suggest no significant impact of cholesteatoma on SNHL severity, they contrast with studies such as those by Rosito et al, who reported a notable elevation in bone conduction thresholds among cholesteatoma patients.[9]

Duration of disease was also not associated with a significant increase in sensorineural hearing loss in this study. Although, majority of patients gave a history of usage of topical ear drops, the association of ototoxic drugs could not be assessed as patients were unable to recall which drug they had been using.

Limitations

Limitations include lack of consideration to the other possible medical and physical factors that may affect cochlear function, for e.g., diabetes mellitus, smoking, noise trauma, lack of further assessment to find the exact pathology of SNHL- cochlear/retrocochlear, lack of documented data on the usage of ototoxic medications, and lack of long-term follow-up to find the improvement/ changes in SNHL post-surgery.

CONCLUSION

This study finds a significant correlation between sensorineural hearing loss in patients with COM. SNHL was found more in squamosal diseases as compared to mucosal disease. The cause could be due to toxins, ototoxic drugs or inflammation entering the inner ear and needs to be evaluated further. SNHL was more common in squamosal COM, but the degree of hearing loss did not significantly differ between ears with or without cholesteatoma. SNHL in COM patients needs to be evaluated early for proper management and the outcome of the patient.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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