

Sensorineural hearing loss in chronic suppurative otitis media

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ABSTRACT

INTRODUCTION: Chronic suppurative otitis media (CSOM) is defined as a persistent or intermittent infected discharge through a non-intact tympanic membrane (perforation or through tympanostomy tube).

OBJECTIVE: Is to find the percentage of sensorineural hearing loss (SNHL) in patients with chronic suppurative otitis media and detection the correlation pathologies that increase its occurrence.

METHODS: A descriptive study conducted at AL-Yarmouk Teaching Hospital & AL-Karkh General Hospital from August 2019 to April 2021. We included patients with unilateral chronic suppurative otitis media who are less than 40 years. we exclude any patients who has any medical history that potentially affect the results of this study. The outcome was presence of sensorineural hearing loss which is measure using a pure tone audiometry (PTA).

RESULTS: Sensorineural hearing loss detected in 24 patients (15%). The longer the duration of disease had the greater incidence of SNHL which occurred in 10 patients (6.25%), A p- value of 0.001, and the more active disease is associated with more SNHL incidence that reported in (20) patients, (12.5%) with P value = 0.05, and especially in (14) patients who had tympanic membrane (TM) perforation in attic site with percentage of (8.75%) and P value = 0.001. The incidence of occurrence of granulation tissue or polyp in patients with CSOM is more than cholesteatoma, but SNHL is more evidently seen in those who had cholesteatoma rather than granulation tissue or polyp. The present study notices that (15) patients with (9.375%) had severe SNHL (> 70 dB) which occurred with higher frequencies as shown in 4000 & 8000 Hz.

CONCLUSION: Sensorineural hearing loss occurs as a result of CSOM, especially with long duration of disease & in attic TM perforation and with active disease & presence of pathology like polyp, granulation tissue or Cholesteatoma. PTA is required regularly for patients with CSOM and should not be ignored to detect SNHL as early as possible.

Key words: Chronic suppurative otitis media, Sensorineural hearing loss, Cholesteatoma.

INTRODUCTION

Chronic suppurative otitis media (CSOM) is defined as a persistent or intermittent infected discharge through a non-intact tympanic membrane (TM), i.e. perforation or tympanostomy tube.¹

Organisms isolated in chronic otitis media vary considerably. The predominant organisms involved are gram-negative bacilli such as *Pseudomonas aeruginosa*, *proteus sp.*, and *escherichia coli*, anaerobes such as *bacteroides fragilis*, and gram-positive like *staphylococcus*.²

Chronic suppurative otitis media (CSOM) is pathologically classified into:³

- Inactive (mucosal) CSOM; perforation of the TM at Pars Tensa without inflammation.
- Active (mucosal) CSOM; perforation, edematous mucosa and ear discharge.
- Inactive squamous epithelium CSOM; retraction pockets at the Pars Flaccida.
- Active squamous epithelium CSOM (Cholesteatoma); active mucosa with derbies and squamous retraction.
- Healed chronic otitis media.

In patients with CSOM, some have virtually

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normal hearing, while others have conductive hearing loss. Conductive hearing loss is due to perforation of the TM, loss of the Round Window Baffle that occurs with posterior perforation exposing the Round Window Niche and losing the protection which is normally afforded by the TM, ossicles destructions (severe loss), tympanosclerosis, presence of cholesteatoma and shallow middle ear space with destructive or fibrosed ossicles decreasing the impedance transformer).⁴ In addition to conductive hearing loss, many patients have a degree of sensorineural hearing loss (SNHL). The pathology of SNHL in patients with CSOM depends on the role of the round window in transmitting inflammation from the middle ear, in which the round window membrane allows toxic materials to enter the inner ear and biochemically alter the inner ear fluids, leading to gradual end-organ dysfunction.^{4,5} A local toxic effect might accelerate atrophic changes in the cochlear duct's supporting tissue; these changes could alter the mass, stiffens and friction of the spiral ligament or the basilar membrane resulting in altered displacement of the cochlear partition in response to the sound wave.⁶

The objective of this study was find the percentage of sensorineural hearing loss (SNHL) in patients with chronic suppurative otitis media and to detect the correlation of specific pathologies on its occurrence.

METHODS

Setting and study design: A descriptive study was conducted on 160 patients attending the department of Otorhinolaryngology at Al-Yarmouk Teaching Hospital and Al-Karkh General Hospital from August 2019 to April 2021.

Ethical consideration: This study was conducted according to the ethical approval obtained from the hospitals. All participants were asked for written consent after explaining the aims and nature of the study.

Definition of cases, inclusion and exclusion criteria: We included adults under 40 years diagnosed as chronic suppurative otitis media according to a history of aural discharge more

than three months with perforation of the TM, retraction pockets or cholesteatoma. We included only unilateral cases; the normal ear served as a control to detect impaired hearing by the patient himself.

In our inclusion or exclusion criteria, we aimed to prevent confounders from affecting our results' accuracy. Ages over 40 were excluded to avoid presbycusis as a cause of sensorineural hearing loss. Patients with a history of otological surgery, head injury, chronic medical diseases like diabetes mellitus and hypertension, exposure to systemic or local ototoxic drugs, exposure to hazardous noise, family history of SNHL at age under 40 years, and congenital cholesteatoma were excluded from this study.

Sampling: We conveniently chose our sample by including only patients who fulfilled the inclusion criteria and visited the outpatient clinic on Mondays and Thursdays of the study duration.

Procedure and outcomes: All enrolled patients were subjected to a thorough history taking and comprehensive otological examination, including using a microscope, tuning fork, and audiological assessment by pure tone audiometry.

We used diagnostic audiometer model TA155, interacoustic AC3, DA65 for performing pure tone audiometry. We measured hearing at five frequencies 500, 1000, 2000, 4000 and 8000 Hz. Audiometrically, SNHL is diagnosed when bone conduction and air conduction are impaired with a difference of less than 10 dB. If only air conduction is impaired, we diagnosed conductive hearing loss. Mixed hearing loss is diagnosed when air and bone conduction are impaired with a difference of more than 10 dB. We always masked the opposite ear on measuring bone conduction.

Hearing Loss (HL) is mild when the hearing level is 26-40 dB, moderate when it is 41-55 dB, moderately severe when it is 56-70 dB, severe when it is 71-90 dB and profound when it is > 90 dB.

According to the duration of CSOM, we divided

Table 1 | Distribution of patients according to the duration of the disease.

Duration in years	Patients without SNHL		Patient with SNHL		Total	
	No.	%	No.	%	No.	%
I 0–5	78	48.75	2	1.25	80	50
II 6–10	40	25	4	2.5	44	27.5
III 11–15	12	7.5	8	5	20	12.5
IV 16–20	6	3.75	10	6.25	16	10
Total	136	85	24	15	160	100

P value = 0.001, SNHL: sensorineural hearing loss

the patients into four groups. Group I with a period of 5 years and less, Group II of 6-10 years, Group III of 11-15 years, and Group IV of 16-20 years. According to disease activity, we labelled the patient as active if he had ear discharge and inactive if he did not. According to the perforation site, patients had a central, marginal, or attic perforation. According to pathological sequelae, patients either have simple uncomplicated perforation (dry) or have a polyp and granulation tissue or cholesteatoma. Correlation between having SNHL and disease activity, duration of symptoms, site of perforation and pathological sequelae were tested statistically.

Statistics: The collected data were analyzed using statistical packages for social sciences version 22. The statistical significance of the association between two categorical variables was assessed by the Chi-squared test and was considered statistically significant when the P value was < 0.05.

RESULTS

This study enrolled 160 patients with CSOM; 84 (52.8%) were males, while 76 (47.2%) were females. SNHL occurred in 24 patients (15%); 14 (8.8%) were males, and 10 (6.2%) were females. Fifteen patients (9.375%) had severe SNHL (> 70 dB) that occurred at higher frequencies, like 4000 and 8000 Hz.

The longer the disease duration, the higher the rate of SNHL. **Table 1** shows that 10 out of 24 with SNHL had CSOM for 16-20 years while only 6 out of 136 without SNHL had the illness for 16-20 years, P value of 0.001.

Table 2 | Distribution of patients according to disease activity.

Disease activity	Without SNHL		With SNHL		Total	
	No.	%	No.	%	No.	%
Active	96	60	20	12.5	116	72.5
Inactive	40	25	4	2.5	44	27.5
Total	136	85	24	15	160	100

P value = 0.05, SNHL: sensorineural hearing loss

Table 3 | Distribution of patients according to site of perforation

Site of perforation	Without SNHL		With SNHL		Total	
	No.	%	No.	%	No.	%
Central	118	73.75	4	2.5	122	76.25
Marginal	12	7.5	6	3.75	18	11.25
* Attic	6	3.75	14	8.75	20	12.5
Total	136	85	24	15	160	100

* P value = 0.001, SNHL: sensorineural hearing loss

Disease activity was associated with the development of SNHL. CSOM was active in 20/24 patients (83.33%) with SNHL and 96/136 (70.58%) in patients without SNHL, with a p-value of 0.05. See **table 2**

Table 3 shows that perforation of the TM at the attic area is more common in patients with SNHL than in those without, 14/24 (58.33%) and 6/136 (4.4%), respectively, and this difference was statistically significant with a p-value of 0.001.

Having granulation tissue or polyp is more common than cholesteatoma in patients with CSOM; however, cholesteatoma is statistically significantly correlated with SNHL than granulation tissue and polyp. Granulation tissue and polyp were found in 92/136 (67.64%) patients without SNHL and 12/24 (50%) of those with SNHL. In contrast, cholesteatoma was found in 4/136 (2.9%) patients without SNHL and 8/24 (33.33%) of those with SNHL, with a p-value of 0.001. See **table 4**.

Table 4 | Distribution of patients according to pathology of disease.

Site of perforation	Without SNHL		With SNHL		Total	
	No.	%	No.	%	No.	%
Polyp, granulation tissue	92	57.5	12	7.5	104	65
Cholesteatoma	4	2.5	8	5	12	7.5
Dry	40	25	4	2.5	44	27.5
Total	136	85	24	15	160	100

P value = 0.001, SNHL: sensorineural hearing loss

DISCUSSION

In this study, we included 160 patients with CSOM, sensorineural hearing loss was diagnosed in 24 (15%). Presence of SNHL was significantly associated with the duration of the disease, perforation at the attic area of the TM, presence of active disease, and presence of cholesteatoma. Gender has statistically non significant association with the SNHL.

In his study at Al-Basrah Hospital, south of Iraq on 100 patients, Salman reported that about 12% of patients with CSOM have SNHL; a percentage comparable to ours.⁷ Shehab in his study at Al-Mosul Hospital, north of Iraq reported a higher percentage of SNHL among patient with CSOM, 21 %.⁸

A prospective study was carried out at the department of Otolaryngology in Dhaka, Bangladesh, which included 150 cases suffering from CSOM; found that about (20.1%) of patients had sensorineural hearing loss.⁹

Blakly et al.¹⁰ studied 123 cases with unilateral CSOM and reported that there is a strong association between CSOM and SNHL.

Cusimano et al.¹¹ reviewed 595 patients with chronic suppurative otitis media (195 with unilateral disease); stated a definite and significant correlation between the duration of the disease and the sensorineural hearing loss (like the present study).

Papp et al.¹² in a retrospective study reviewing the files of 121 patients with unilateral CSOM and found that there is a significant association with SNHL and the threshold shift was more accentuated as duration and age increased and seemed to be higher at 4 KHz than that at the speech frequencies, that is similar to this study.

Kaur et al.¹³ studied a sample of 100 patients with unilateral CSOM; stated that (24%) of them have SNHL particularly affecting the higher frequencies and progressively increased with the increase of the duration of the disease, which is going with the results of present study.

Kasliwal et al.¹⁴ carried out a statistical study on 510 patients with unilateral CSOM; observed the consistent correlation between the severity of SNHL and the duration of the disease & presence of more complicated pathology (matching with current study).

Feng et al.¹⁵ in a retrospective study on 147 patients with unilateral CSOM; noticed that the difference in bone conduction threshold between diseased and controlled ear were statistically significant and associated with the duration and the higher frequencies are easier affected than the lower frequencies, that is agree with this study results .

De Azevedo et al.¹⁶ in a retrospective analysis of 115 patients with CSOM; found that SNHL occurred in (13%) of the patients with chronic suppurative otitis media was correlated with older age but not with presence of pathology or longer duration of ear disease.

The difference of some other studies results, possibly due to variations in sample size of their studied cases, or may be depend on geographical factors and perhaps because of status of populations as the researchers took more patients from rural areas in their studies because the disease (CSOM) was more among them that could be due to low socioeconomic status & poor compliance with drugs and neglected follow up.

CONCLUSION

Sensorineural hearing loss may complicate CSOM, especially with long duration of disease, perforation at attic area of the TM, active disease, and presence of pathology like polyp, granulation tissue or Cholesteatoma.

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Abbreviations list: Chronic suppurative otitis media (CSOM), Hearing Loss (HL), Pure tone audiometry (PTA), Sensorineural hearing loss (SNHL), Tympanic membrane (TM).

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