

## Original Article

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# Sensorineural hearing loss in tubotympanic variety of chronic suppurative otitis media

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### Abstract

**Objectives:** To determine whether chronic suppurative otitis media (CSOM) can cause Sensorineural hearing loss (SNHL) and to note its degree and its relation to duration of disease.

**Methods:** This was a cross sectional study which was carried out in the departments of Otolaryngology and Head-Neck Surgery of Dhaka Medical College Hospital during the period of October'2012 to March'2013. A total number of 76 patients having unilateral CSOM were included in this study age ranging from 6 to 59 years after exclusion of other possible causes of SNHL such as meningitis, head injury, previous ear surgery and chronic noise exposure. The use of unilateral CSOM cases provided a contralateral ear to serve as a control. Bone conduction threshold elevation between diseased and control ear was considered as the indicator of inner ear damage.

**Results:** In this series, CSOM was seen to be associated with sensorineural hearing loss. Significant threshold elevation was observed in relation to disease duration. Here bone conduction measurement in all frequencies (500Hz, 1000Hz, 2000Hz and 4000Hz) in diseased and uninvolved contralateral side showed elevation of bone conduction in diseased side and this elevation was significantly higher ( $p < 0.001$ ). The average bone conduction loss at 4kHz was higher than the average at the speech frequency range.

**Conclusion:** This study suggests that CSOM can cause significant bone conduction threshold elevation and it should be considered when managing this problem. Early detection and prompt treatment may limit this potential handicap.

**Key words:** Sensorineural hearing loss, Tubotympanic variety, Chronic suppurative otitis media.

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### Introduction

Chronic Suppurative otitis media (CSOM) is a disease where the persistent inflammatory reaction in the middle ear cleft mucosa leads to intermittent or persistent, mucoid or mucopurulent aural discharge from the middle ear through a persistent defect in the tympanic membrane (lasting >12 wks)<sup>1</sup>.

CSOM is considered a major health problem in our country. It was observed CSOM frequently affects children in developing countries<sup>2</sup>. In a study in our country it was found 16.95% of school going children had CSOM with mild to moderate hearing loss<sup>3,4</sup>.

Deafness in CSOM is initially conductive in nature due to pathology in the middle ear conductive pathway. But an issue that has recently gained attention is additional sensorineural hearing loss due to chronic otitis media. In a series of articles, with clinical and histopathological documentation, it was found that sensorineural hearing loss can occur concomitantly or as sequelae of CSOM<sup>5,6</sup>. The microorganisms e.g. *Pseudomonas aeruginosa* or *Streptococcus pneumoniae* in chronically inflamed middle ear mucosa liberate toxins<sup>7</sup> that enter the inner ear through round window<sup>8</sup> and biochemically alter the inner ear fluids<sup>9</sup> resulting in damage to sensory cells in inner ear and gradual end-organ dysfunction<sup>10</sup>. This may cause sensorineural hearing loss or mixed type of hearing impairment.

Hearing loss associated with CSOM is a matter of concern globally, particularly in children because of its long term effect on development of essential skill in speech, language and social interaction. Hearing disability in adults also has its bearing on the individuals and on the society. It thus behaves the ENT surgeon to implement early medical and surgical management for all varieties of CSOM. The results of this cross sectional study may reflect the importance of this diseases and its consequence in hearing, which may help both the ENT specialist as well as policy makers.

### Objectives

1. To evaluate the degree of sensorineural hearing loss in CSOM of Tubotympanic type.
2. To evaluate the degree of sensorineural hearing loss in CSOM of Tubotympanic type with duration of disease.

### Materials and Methods

**Study design:** Cross sectional study.

**Place of Study:** This study was carried out in the departments of Otolaryngology and Head-Neck Surgery of Dhaka Medical College Hospital.

**Duration of study:** October, 2012 to March, 2013.

**Study population:** All patients with unilateral CSOM of tubotympanic type in inactive stage.

**Sample size:** 76

**Sampling method:** Purposive, non-random sampling.

### Inclusion criteria:

1. All patients with unilateral CSOM, tubotympanic type, inactive stage.
2. Both the ear is free from other diseases (otitis externa, congenital anomalies)
3. Patients with age ranging from 6 to 59 years.

### Exclusion criteria:

1. Patient with active or discharging ear.
2. Patient with bilateral CSOM.
3. Patient with history of head injury, meningitis, previous ear surgery or chronic noise exposure.
4. Patient not giving consent for study.

### Methods:

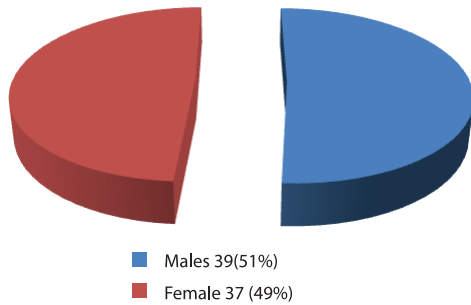
Purposive, consecutive all patients with tubotympanic type of CSOM according to inclusion criteria in the outpatient department of Otolaryngology and Head-Neck Surgery of DMCH within the study period were selected. All the selected patients were interviewed examined and investigated. Clinical hearing assessment was done along with otoscopic examination. Pure tone audiometry was done in all cases to compare the threshold of hearing between two ears. When the bone conduction threshold

difference between contra lateral normal ear is >15dB in the patient with unilateral CSOM tubo-tympanic type (inactive stage) was considered as significant difference. All the information and data were recorded and compiled in a structured data sheet.

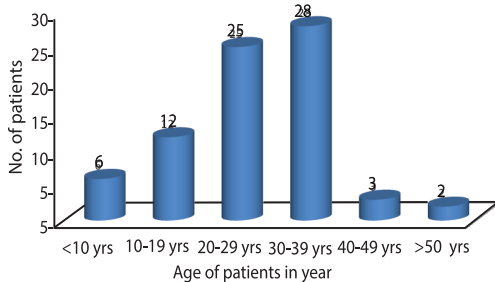
**Data analysis:** All collected data were checked and verified thoroughly to reduce inconsistency. The test statistics used for analysis of data were Z-test (for comparison of data presented in quantitative scale) and Chi square test or fisher's exact test (for comparison of data presented in categorical scale). P values <0.05 was considered as statistically significant.

**Observation and Results:**

All the results of the study were presented in different tables and figures.



**Fig.-1** Distribution of patients by Sex (n=76)  
Male: Female =1.05: 1



**Fig: 2** Distribution of patients by age(n=76)

Age ranged were 6-59 years (Mean30.1± 9.8years). 53(69.74%) patient were belonging to age ranged from 20 to 40 years.

**Table I**

*Comparison of bone conduction thresholds in diseased and normal ears. (n=76)*

Frequency	Normal Ear (dB)	CSOM Ear (dB)	P-Value
500Hz	5.92±4.60	17.04±4.63	<0.001
1000Hz	7.24±4.57	21.18±5.65	<0.001
2000Hz	9.47±5.45	25.00±6.27	<0.001
4000Hz	11.05±5.50	29.80±7.85	<0.001
Average	8.26±4.60	23.64±5.58	<0.001

The bone conduction thresholds in diseased and normal ears had significantly different in all frequencies. The bone conduction threshold difference was more (average >15dB) in 4000Hz.

**Table II**

*Co-relation of Sensorineural impairment with duration of disease.(n=76)*

Duration (Years)	Without Sensorineural impairment	With Sensorineural impairment	Total
5	12(80%)	3(20%)	15(100%)
6-10	21(60%)	14(40%)	35(100%)
11-15	11(61.11%)	7(38.89%)	18(100%)
>15	4(50%)	4(50%)	8(100%)
Total	48(63.16%)	28(36.84%)	76

**Table III**

*Duration of disease and average bone conduction threshold difference in diseased ear in different frequencies (n=76)*

Duration (Years)	500Hz	1000Hz	2000Hz	4000Hz
5	9.67	13.00	14.85	17.55
10	10.83	13.42	15.33	18.00
15	11.42	14.44	15.55	18.61
>15	11.88	15.00	17.50	23.13

**Discussion:**

Though conductive hearing impairment is the problem in tubo-tympanic type of CSOM, recently gained attention is additional sensorineural hearing loss concomitantly or as sequelae of chronic otitis media also. This study was carried out among 76 patients with male-female ratio of 1.05:1.

In this series, age range of patient was from 6 years to 59 years (mean  $30.1 \pm 9.8$ ). Average 69% of patients were in third and fourth decades. This age range matches the samples of other studies ( $31.2 \pm 16$  and  $35.3$ )<sup>11,12</sup>. As the more active persons in our society are within this age group, they have come to make notice their ear and hearing problem and attended to the otolaryngologist. Moreover when we analyzed the effect of the patient's age on the degree of SNHL in the diseased ears, there was still no significant correlation. On the contrary, other workers had found that increasing age was a risk factor in evolution of SNHL in patients with CSOM<sup>9,13</sup>.

In this study, it was found that bone conduction measurement in all frequencies in diseased and uninvolved contra lateral side showed elevation of bone conduction in diseased side and this elevation was significantly higher ( $p < 0.001$ ). In 500Hz, 1000Hz, 2000Hz, 4000Hz mean bone conduction threshold in diseased ear were 17.04, 21.18, 25.00 and 29.80 dB respectively and threshold difference is 11.12, 13.94, 15.53 and 18.75 dB respectively. This observation of greater SNHL at higher frequencies correlates with findings of other studies<sup>8,10</sup>.

As according to our operational definition where we considered the involvement of sensorineural component as  $>15$ dB bone conduction hearing threshold differences between the diseased and controlled normal ear, 36.84% patients had sensorineural involvement. Here the mean differences were

$17.77 \pm 1.64$  dB which is comparable to the findings (19.1dB) of another study<sup>14</sup>.

In general, it is shown that duration of disease causes progressive bone conduction threshold deterioration. Among 76 patients, 8 patients had disease more than 15 years and 50% of them had sensorineural impairment. In contrast 20% patients had sensorineural impairment having disease for 5 years or less. Significant correlation with duration of disease was found only in 4000Hz. Statistically significant increase in Sensorineural component in hearing loss related to duration of pathology was found in another studies<sup>11,12</sup>. In contrary some other studies did not find any significant correlation with duration of disease<sup>15,16</sup>.

**Conclusion:**

CSOM tubotympanic type have significant effect on cochlear function causing bone conduction threshold elevation in duration. Early detection and prompt treatment may limit this potential handicap.

**Limitation and recommendation:**

The limitations of this study were small number of cases and short period of study. Further studies should be required involving large number of cases with long duration of study and follow up for better conclusion.

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