

## Original Article

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# Hearing Loss In Chronic Suppurative Otitis Media (CSOM)

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### Abstract:

**Objectives:** To evaluate the type and degree of hearing loss in CSOM and also to find out any relationship between the hearing loss and disease duration.

**Methods:** This was a cross sectional study which was carried out in the departments of Otolaryngology and Head-Neck Surgery of BSMMU and Dhaka Medical College Hospital during the period of July'2011 to December'2011. A total 80 cases of CSOM were collected. Patient below the age of 5 years and patients above the age of 50 years were excluded from this study. The diagnosis of CSOM was established on the basis of clinical examination- otoscopy and tuning fork test. Pure tone audiogram (PTA) was done for hearing assessment. Thus, 80 cases of CSOM were collected with their PTA reports of 117 ears.

**Results:** The study included 80 patients of CSOM, of them 60 were with tubo-tympanic type and 20 were with attico-antral disease. Highest number of patients was in 2<sup>nd</sup> decade in both type of disease. 44.79% of ears of tubo-tympanic type were associated with mild (26-40 dB) hearing loss and 42.85% attico-antral variety was with moderate (41-55 dB) hearing loss. Conductive type of hearing loss was common in both types of disease. 98% of ears in tubo-tympanic and 81% of ears in attico-antral disease had conductive hearing loss. Mixed type (2.08%) of hearing loss was found in tubo-tympanic disease. Attico-antral disease was also associated with mixed (14.28%) and SNHL (4.76%).

**Conclusion:** The above study revealed that hearing loss in CSOM is mostly conductive in nature rarely sensorineural in type.

**Key words:** Hearing loss ,Chronic Suppurative Otitis Media.

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### Introduction

Chronic suppurative otitis media (CSOM) is a worldwide health problem and is still prevalent in the modern antibiotic era. The disease usually presents with hearing loss and aural discharge.

Hearing loss arising from chronic suppurative otitis media is a matter of serious concern globally, particularly in children, because of its long-term effects on early communication, language development, educational process and achievement. Hearing disability in adults is a burden to the individual and also to the family and entire society.

Considering the epidemiological prevalence of CSOM, a protocol was designed to conduct

a survey in Bangladesh to find out the effect of CSOM on hearing in the prevailing socio-economic and climatic condition of Bangladesh which showed that 16.95% of mild to moderate conductive hearing loss in children and young adult was due to CSOM.<sup>1,2</sup> The main possibilities of hearing loss in CSOM were impairment of tympano-ossicular impedance matching mechanism, reduction of baffle effect on round window and cochlear dysfunction. There was also a relationship between the thresholds of hearing and the duration of aural discharge.<sup>3</sup>

The degree of hearing loss varies with the size and position of tympanic membrane defect, impairment of ossicular chain and presence of middle ear pathology. It is more in attic antral disease associated with cholesteatoma.<sup>4</sup>

There was a significant quantitative correlation between the size and site of perforation and hearing loss. Non-marginal perforation with intact ossicular chain shows hearing loss approx. 10-30 dB; in postero-superior marginal perforation with disruption of ossicular chain hearing loss is 40-60 dB and in total or subtotal perforation with loss of malleus and incus, the stapes remaining mobile, hearing loss is 60-80 dB.<sup>5,6</sup>

The predominant hearing loss in chronic otitis media was conductive in nature. But a few cases of sensorineural hearing loss was also found.<sup>7</sup>

In another study, out of 897 patients with CSOM, sensorineural hearing loss was observed in 10% of patients and hearing loss was significantly more common in patients with cholesteatoma.<sup>8</sup>

The relationship of cochlear losses associated with otitis media or sensorineural hearing loss caused by otitis media has been documented and confirmed by a number of authors.<sup>9,10</sup>

The round window membrane was a site of pathological involvement especially in CSOM. The mechanism by which sensorineural loss (especially high tone loss) occurred in presence of CSOM appeared to involve chemical contamination, i.e. toxins being absorbed through round window membrane.<sup>9</sup>

In a retrospective study of 87 patients with uncomplicated and unilateral CSOM confirmed the evidence of increased bone conduction thresholds on the diseased side when compared with normal opposite ears. Furthermore, there was a greater loss of bone conduction with longer duration of the disease. They postulated, based on their findings, that abnormal bone conduction threshold in CSOM may well be due to changes in the mechanics of sound conduction.<sup>10</sup> Long standing use of locally instilled antibiotics was thought to be one of the important causes of sensorineural hearing loss.<sup>11</sup>

A study showed in individuals with CSOM, mixed hearing impairments were common. But it was unclear whether the raised bone conduction thresholds were a reflection of the pathologic process affecting the inner ear or a combination of high prevalence of sensorineural hearing impairments in the population along with artificial elevation of bone conduction thresholds associated with a conductive defect.<sup>12</sup>

Bone conduction losses increasing in severity with the increasing duration of the disease was reported on 404 patients with CSOM.<sup>13</sup>

A significant bone conduction reduction was seen in 195 patients with CSOM. It was also documented that the changes were not related to the patient's age at the onset of CSOM but were related to the disease duration. An average increase of 5.5 dB for every 10 year duration was noticed.<sup>14</sup>

Early diagnosis and treatment of CSOM have a great role in prevention of further hearing impairment and in the improvement of hearing. Since only few studies have been done in our country to assess the effect of CSOM on hearing, this study will be of great help in identifying the type and degree of hearing loss and also in planning the modern micro surgical treatment for preservation and improvement of hearing and also rehabilitation in some cases.

#### Objectives:

1. To observe the type and degree of hearing loss in CSOM
2. To correlate the degree of hearing loss with duration of disease.
3. To compare the hearing loss in tubo-tympanic and attico-antral types of CSOM.

#### Materials and Methods:

**Study design :** Cross-sectional study.

**Place of study :** Department of Otolaryngology-Head & Neck Surgery, Dhaka Medical College Hospital & Bangabandhu Sheikh Mujib Medical University, Dhaka.

**Period of study:** 1<sup>st</sup> July 2011 to 31<sup>st</sup> December 2011.

**Study sample :** All case who fulfilled the inclusion and exclusion criteria had been selected as purposive sampling in this study.

#### Inclusion Criteria:

- a. All cases with tubo-tympanic type of CSOM irrespective of wet and dry ear.
- b. CSOM - Attico - Antral type with Cholesteatoma.

#### Exclusion Criteria:

- a. CSOM with intracranial & extracranial complications.
- b. Patients below 5 years and above 50 years of age.

#### Methods:

A total 80 cases of CSOM were collected from inpatient wings of Department of Otolaryngology- Head & Neck Surgery, BSMMU and DMCH with their descriptive history and clinical findings, during the period of 1<sup>st</sup> July 2011 to 31<sup>st</sup> December 2011.

Patient below the age of 5 years were excluded from this study because those patients cannot produce reliable response during pure tone audiogram, which was essential for quantitative measurement of hearing loss. Patients above the age of 50 years were excluded because there is some degree age related hearing loss present after 50 yrs of age.

Pure tone audiogram (PTA) was done for those patients who had tubo-tympanic type of ear disease irrespective of wet and dry ear and cholesteatoma in attico-antral types of CSOM.

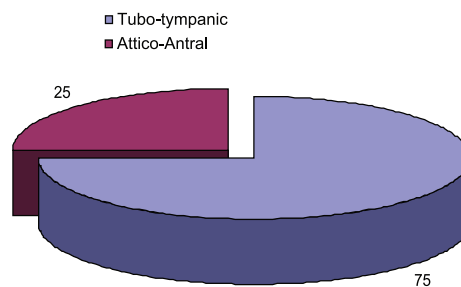
Thus, 80 cases of CSOM were collected with their PTA reports of 117 ears.

The diagnosis of CSOM was established on the basis of-

- Clinical examination- otoscopy and tuning fork test
- Hearing test: Pure tone audiometry

#### Observation and Results:

In the 80 patients, out of their total 160 ears, 117 ears satisfied the criterion for having CSOM, 96 being tubo-tympanic and 21 attico-antral.



**Fig-1:** Distribution of types of CSOM

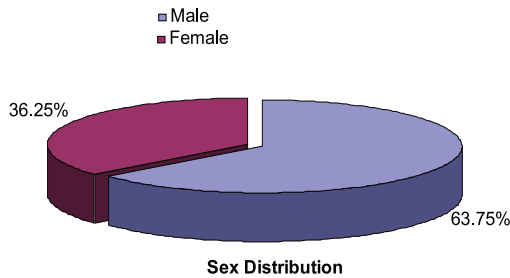
The distribution of CSOM (n= 80) shows that tubo-tympanic variety was in 60 patients (75%) and attico-antral variety in 20 patients (25%).

**Table-I**  
*Age distribution (n=80)*

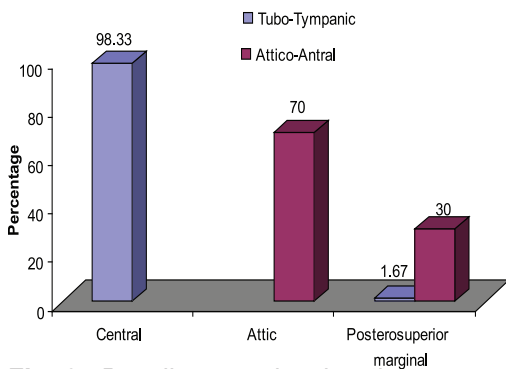
Age Group	Tubo-Tympanic (n=60)		Attico-Antral (n=20)	
	No.	%	No.	%
< 10	13	21.66	3	14.09
11-20	20	33.34	11	54.93
21-30	16	26.67	5	25.91
31-40	08	13.35	1	5.07
> 40	03	5.0	-	-

Maximum tubo-tympanic type of CSOM was noted in 2<sup>nd</sup> and 3<sup>rd</sup> decades and attico-antral type was in 2<sup>nd</sup> decade.

Male and female ratio was 1.75:1 irrespective of type of CSOM.



**Fig.-2: Distribution of Sex**



**Fig.-3: Bar diagram showing the types of perforation**

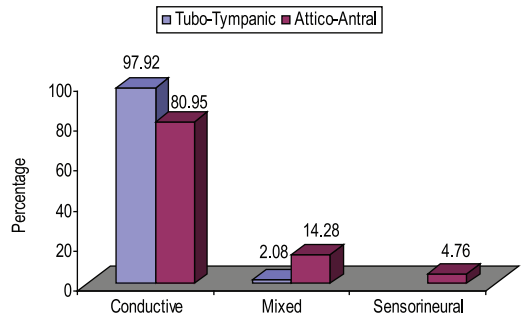
Central perforation was most common in tubo-tympanic cases (98.33%). In attico-antral type where attic perforation was common (70%).

**Table-II**

*Degree of hearing impairment in dB (No. of ears- 117)*

Hearing level (dB)	No. of Ears (%)		Total (n= 117)
	Tubo-tympanic (n= 96)	Attico-antral (n= 21)	
0-25	20(20.83%)	-	20(17.09%)
26-40	43(44.74%)	4(19.05%)	47(40.17%)
41-55	31(32.29%)	9(42.85%)	40(34.18%)
56-70	2(2.83%)	7(33.33%)	9(7.69%)
71-90	-	1(4.77%)	1(0.86%)
> 91	-	-	-

About 44.79% of ears of tubo-tympanic variety were associated with mild (26-40 dB) hearing loss and 42.85% of ears of attico-antral variety were associated with moderate (41-55 dB) hearing loss. Maximum number of ears shows mild to moderate degree of hearing loss.



**Fig-4: Distribution of type of hearing loss**

Most of the ears of tubo-tympanic (97.92%) and attico-antral type (80.95%) were associated with conductive type of hearing loss. Few ears (14.28%) were associated with mixed hearing loss in attico-antral disease.

**Table-III**

*Distribution of ears in different hearing loss groups in relation to disease duration (No of ears- 117).*

Disease Duration in years	0-25 dB		26-40 dB		41-55 dB		56-70 dB		71-90 dB		No. of ears (%)
	T.T	A.A	T.T	A.A	T.T	A.A	T.T	A.A	T.T	A.A	
< 1	02	-	-	01	-	-	-	-	-	-	03 (2.57)
1-5	06	-	15	03	05	06	-	02	-	-	37 (31.62)
6-10	12	-	28	-	09	03	-	04	-	01	57 (48.71)
11-15	-	-	03	-	14	-	02	01	-	-	20 (17.09)
No of ears	20	-	46	04	28	09	02	07	-	01	117 (100)

Maximum ears (48.71%) were presented with 6-10 years disease duration and minimum ears (2.57%) were presented with less than 1 year disease duration.

**Table-IV**

*Degree of hearing impairment with disease duration (n=80).*

Duration (years)	Average hearing loss (dB)	
	Tubo-tympanic (n=60)	Attico-antral (n=20)
< 1 year	25 (n=5)	40 (n=2)
1-5	35 (n=15)	50 (n=10)
6-10	40 (n=20)	60 (n=6)
11-15	50 (n=15)	60 (n=2)
> 15	55 (n=5)	-

In between 6-10 years of duration of disease most of the ears show average 40 dB hearing loss in tubo-tympanic type and average 60 dB hearing loss in attico-antral type of CSOM.

#### **Discussion:**

Eighty (80) patients of different age groups were included in the series, after taking relevant history, clinical examination and investigations. Out of 160 ears, 117 ears were included in this series.

In the present study, tubo-tympanic type of CSOM was found in 75% of patients and attico-antral type in 25% of patients. The

majority was young adults in their 2<sup>nd</sup> and 3<sup>rd</sup> decade. In tubo-tympanic disease 33.34% was in 2<sup>nd</sup> decade and 26.67% was in 3<sup>rd</sup> decade. In attico-antral disease incidence was highest 54.93% in the 2<sup>nd</sup> decade which exactly corresponded with many workers<sup>15</sup>. Patients below the age of 5 years were excluded from this study because pure tone audiogram (PTA) could not be done due to difficulty and non co-operation of the patients. Patients above the age of 50 years were excluded from the study because patient about 50 years might have some degree of age related hearing loss.

There was no difference in the incidence between men and women.<sup>15</sup> But a considerable male predominance was found in another study.<sup>16</sup> In this series, males (63.75%) were more affected than female (36.25%) with a male female ratio of 1.75:1. This might be due to increase prevalence of CSOM among the male or it might be simple reflection of overall high male attendance in hospital outpatient department. Female are also reluctant to come forward for treatment in our country.

Regarding the type of perforation in this series, central perforation (98.33%) was more

common in tubo-tympanic disease. There was a single case of marginal perforation (1.67%). This is similar to the author, where marginal perforations were considered to be more sinister, because they may be associated with the formation of cholesteatoma.<sup>17</sup> In attico-antral disease, 70% of patients had attic perforation and 30% had marginal perforation. These findings are more or less similar to other series where attic perforation was more than the marginal perforation.<sup>18</sup>

In case of CSOM of tubo-tympanic type, out of 96 ears hearing loss was mild (26-40 dB) in 43 (44.79%) ears, moderate (41-55 dB) in 31 (32.29%) ears and moderately severe (56-70 dB) in 2 (2.83%) ears. No cases had profound hearing loss. Similar hearing losses have been reported by author were out of 156 ears hearing loss was < 30 dB in 57.7% of ears, 30-60 dB in 35.9% of ears and > 60 dB in 6.4% of ears.<sup>19</sup> More or less similar findings were also shown by others.<sup>1,3.</sup>

In the present study, in case of CSOM of attico-antral type, out of 21 ears 9 (42.85%) had moderate and 7 (33.33%) had moderately severe (56-70 dB) hearing loss. This is supported by the author where hearing loss was 10-60 dB, according to the condition of ossicular chain in attico-antral disease.<sup>7</sup> Hearing impairment is more in attico-antral type than tubo-tympanic disease.<sup>3,4,8.</sup>

Hearing thresholds vary considerably in case of CSOM. Some patients have normal hearing, while others have a severe mixed hearing loss or even a dead ear.<sup>34</sup> In this series, in tubo-tympanic disease (97.92%) ears had conductive hearing loss and (2.08%) ears had mixed type of hearing loss. Mixed type of hearing loss in tubo-tympanic disease was also reported by others.<sup>10,12.</sup> A study was done on 300 patients with CSOM and found normal bone conduction in 62.20%, 10 to 15 dB loss in 12.40% and greater than 30 dB loss in 6% of patients.<sup>20</sup>

In attico-antral disease, 80.95% of ears showed conductive deafness, 14.28% of ears with mixed deafness and 4.76% of ears with sensorineural hearing loss. Sensorineural hearing loss related to cholesteatoma and to the presence of discharge.<sup>21</sup>

This series studied the distribution of ears in different hearing loss groups in relation to duration of disease. Highest numbers of ears (48.71%) were presented with 6-10 years of disease duration. Hearing loss was mild (26-40 dB) in tubo-tympanic and moderate (41-55 dB) in attico-antral disease at that duration of disease.

This series studied the degree of hearing loss with duration of disease. It was seen that in tubo-tympanic disease, average hearing loss was 25 dB, 35 dB, 40 dB, 50 dB in <1 year, 6-10 years, 11-15 years disease duration respectively. In attico-antral disease, average hearing loss was 40 dB, 50 dB, 60 dB, 70 dB in <1 year, 1-5 years, 6-10 year, 11-15 year disease duration respectively. This gradual increase in hearing loss with disease duration was more or less similar to the author who studied with 218 patients with uncomplicated CSOM. That study showed that hearing loss was increased by 8-7 dB in patients with less than 10 years disease duration and 12.2 dB increased in 10-20 years duration.<sup>22</sup>

But an increase of 5.5 dB for every 10 years duration in bone conduction threshold was found by another author<sup>19</sup> which is less than this series. It was found that sensorineural hearing loss increased as the duration of CSOM had increased.<sup>13</sup>

Sensorineural hearing loss might be due to either prolong use of topical antibiotics or absorption of chemicals or toxins of CSOM through round window membrane.<sup>9,11</sup>

#### **Conclusion:**

From the study, it can be concluded that CSOM is the major cause of hearing



impairment in our society. Findings of the present study suggest that early diagnosis and audiological assessment are needed for the patients with CSOM. This will help in the treatment of this disorder especially in bilateral cases and cases of young individual for restoration of hearing either by medical treatment or by surgery or by hearing aids and subsequent rehabilitation. For prevention more attention should be given for epidemiological survey and public awareness.

#### References:

1. Amin MN, Chowdhury WA, Sheikh MS, Abdullah M. Pattern of ENT diseases in rural Bangladesh. *Journal of BCPS*, 1989; 7(1): 23-27.
2. Amin MN, Datt PG, Amin ASA. Incidence of hearing impairment amongst the school going children. *J. of BCPS*, 1992;10:23-25.
3. Prasansuk S and Hinchelffe R. Tympanic membrane perforation: Descriptors and hearing levels in otitis media. *Audiology* 1982;21:43-51.
4. Youngs R. Chronic suppurative otitis media-mucosal disease. In: Ludman H, Wright T, eds. *Diseases of the Ear*, 6<sup>th</sup> edn. London: Arnold, 1998: 381.
5. Gray IF, Hawthorne M. In: *Synopsis of Otolaryngology*, 5<sup>th</sup> edn. London: Butterworth-Heinemann, 1992:3-117.
6. Anthony WP, Harrison CM. Tympanic membrane perforation: Effect on audiogram. *Arch Otolaryngol*, 1972; 95:506-10.
7. Blaldehy BW. Does chronic otitis media cause sensorineural hearing loss? *The J. of Otolaryngol*, 1998,27:17-20.
8. Vartiainen E. Age and hearing function in patients with chronic otitis media. *The J of laryngol*, 1995;24:336-39.
9. Paparella MM et al. Sensorineural hearing loss in otitis media. *Ann otol Rhino laryngol* 1984;93:623-9.
10. Walby AP, Barrera A, Scbuknecht HF. Cochlear Pathology in chronic suppurative otitis media. *Ann. Otol Rhinolo laryngot* 1983; 92 (Suppl 103): 3-19.
11. Pal J, Bhakia MI. Deafness among the urban community- an epidemiological survey at Lucknow. *Indian J Med Res.* 1974;62:857-68.
12. Browning GG, Gatehouse S. Hearing in chronic otitis media. *Ann otol Rhinol laryngol* 1989; 98:245-50.
13. English GM, Northern AL. Chronic otitis media as a cause of sensorineural hearing loss. *Arch laryngol head neck surgery* 1973;19:18-22.
14. Cusimano F, Cocita VC, D'Arnico A. Sensorineural hearing loss in chronic otitis media. *J. Laryngol Otol* 1989;103:158-163.
15. Browning GG and Gatehouse S. The prevalence of middle ear disease in the adult British population. *Clinical otolaryngology.* 1992;17:317-321.
16. Vartiainen E. Changes in the clinical presentation of chronic otitis media from 1970<sub>s</sub>, to 1990<sub>s</sub>, *The J. of Laryngol and Otol.* 1998;112:1034-1037.
17. Mills RP. Management of chronic suppurative otitis media. In: Booth KB, ed. *Scott-Brown's Otolaryngology (Otology)* 6<sup>th</sup> edn. Oxford: Butterworth-Heinemann, 1997:3(10):1-9.
18. Savic LD and Deleric DR. Facial paralysis in chronic suppurative otitis media. *Clip. Otolaryngol* 1989;14: 515-17.

19. Ferlito A. A review of definition, terminology and pathology of aural cholesteatom. *The Journal of Laryngology and Otology* 1993;107: 483-88.
20. Bluvshstein GM. The audiological characteristics of chronic suppurative otitis media. *Vesta otolaryngol* 1963; 25:64-72.
21. Vartiainen E, Karjalainen S. Factors influencing sensorineural hearing loss in chronic otitis media. *Am J. otolaryngol* 1987;8:13-15.
22. Sayed YEL. Bone conduction impairment in uncomplicated chronic suppurative otitis media. *American J of otolaryngol*, 1998;19:149-53.