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**Original Research Article**

# An association of sensorineural hearing loss in mucosal type of chronic suppurative otitis media

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## ABSTRACT

**Background:** Chronic suppurative otitis media of mucosal variety is one of the most common cause of conductive hearing loss worldwide. Sensorinueral hearing loss is rare but well established complication of chronic suppurative otitis media of squamosal variety. We made an attempt to view the sensorineural hearing loss in mucosal type of chronic otitis media and keeping objectives and aims as follows occurrence of sensorinueral hearing loss in mucosal type of chronic suppurative otitis media; relation of sensorinueral component with age, gender and duration in mucosal type of chronic suppurative otitis media.
**Methods:** A total of 105 cases of mucosal type of CSOM were studied retrospectively for the pattern of hearing impairement on the basis of pure tone audiogram in a Tertiary care hospital. Relation 0f sensorinueral hearing loss with with age, gender and duration in mucosal type of CSOM is compared and tabulated with various studies.
**Results:** Out of total 105 cases of CSOM of mucosal variety 30 (28.57%) had sensorinueral hearing loss affecting 13 males and 17 females with males to females ratio of 1:1.3.Mean bone conduction thresholds in males at 1 kh, 2 kh and 4 kh is 30.38%, 38.46% and 46.15% respectively and Mean bone conduction thresholds in females at 1 kh, 2 kh and 4 kh is 30.88%, 35% and 44.41% respectively.
**Conclusions:** Significant sensorinueral hearing loss was seen in our study. Age, gender and duration didn't have any impact on degree of sensorinueral hearing loss.

**Keywords:** CSOM, Mucosal disease, Sensorinueral hearing loss

## INTRODUCTION

Chronic suppurative otitis media of tubotympanic variety (CSOM) is one of the most common conditions encountered by otologist in daily practice. The classic type of hearing loss described for this condition is conductive. However, several investigators have reported sensorineural hearing loss (SNHL) do occur concomitantly or as sequelae of CSOM, despite the absence of symptoms of labyrinthitis.[1] The SNHL has been ascribed due to contribution of the middle ear hearing mechanism by bone conduction and/or cochlear dysfunction resulting from extension of inflammation in the middle ear cleft through the round window membrane.[2] Sensorineural hearing loss in chronic suppurative otitis media is well documented. It is hypothesised that in CSOM toxins enter through semipermeable round window membrane causing damage to organ of Corti Paparella, Morizona.[3,4] Chronic suppurative otitis media is fairly common disease in our country especially in rural community.[5] WHO in 2004 mentioned, the worldwide prevalence of chronic suppurative otitis media is 65-330 million people and 39-200 million (60%) suffer from clinically significant

hearing impairment.[6] It is observed CSOM frequently affects children in developing countries.[7] In a study in our country, it was found 34.56% of school children had different grades of hearing impairment and 16.95% having chronic suppurative otitis media had mild to moderate hearing loss (41- 60 dB).[5] Research workers at the National Ear Care Centre, Kaduna, Nigeria, got a hearing impairment frequency of 26.2% (1435 out of 5485 patients), affecting 9 months to 90 years old individuals with a male preponderance of 56.5%.[8] Prevalence of sensorineural hearing loss has been significantly found even in mucosal type of chronic suppurative otitis media, so we studied the relationship of SNHL with mucosal type of chronic suppurative otitis media and which has not been studied extensively. The objectives of our study were to assess the association between SNHL and mucosal COM.

## METHODS

A retrospective descriptive case series study was conducted from July 2014 to June 2015 at Department of Otorhinolaryngology and Head Neck Surgery, SNMC and HSK hospital Bagalkot.

A total of 105 cases of unilateral mucosal type of CSOM were studied for the pattern of hearing impairement on the basis of pure tone audiogram. All the patients underwent audiometry tests. Audiometric evaluation of all the patients were done by Ampled 3100 dual channel diagnostic audiometer and by using TDH 39 headphones in a sound proof audiometric room which is built according to ANSI guidelines (American Natonal standards Institute). The same audiometer was used for all the cases. For each patient, bone conduction (BC) thresholds for the frequencies of 0.25, 0.5, 1.0, 2.0, and 4.0 kHz were considered for this study. SNHL was considered when an intensity of 25 dB or more was required for the BC threshold in two or more frequencies. Statistical analysis was done by 't' test.

### *Inclusion criteria*

Inclusion criteria were all patients of unilateral mucosal type of CSOM between ages 10-50 years.

### *Exclusion criteria*

Exclusion criteria were patients with CSOM of atticoantral type; patients with CSOM with complications; patients with previous history of ear surgery; patients with age less than 10 years; patients with bilateral CSOM of mucosa type.

## RESULTS

Out of total 105 cases of CSOM of mucosal variety 30 (28.57%) had sensorinueral hearing loss affecting 13 (12%) males and 17 (16%) females with males to females ratio of 1:1.3. The mean age was 31.2 years.

**Table 1: Age distribution (n=105) of unilateral CSOM of mucosal type.**

| Age group | Males | Females | Total |
|---|---|---|---|
| **10-20** | 15 | 16 | 31 |
| **21-30** | 13 | 13 | 26 |
| **31-40** | 16 | 13 | 29 |
| **41-50** | 13 | 06 | 19 |
| | 57 | 48 | 105 |

**Table 2: Age distribution of unilateral CSOM of mucosal type with sensorineural hearing loss.**

| Age groups | Males | Females | Total |
|---|---|---|---|
| **10-20** | 2 | 6 | 8 |
| **21-30** | 3 | 3 | 6 |
| **31-40** | 5 | 3 | 8 |
| **41-50** | 3 | 5 | 8 |
| | 13 | 17 | 30 |

**Table 3: Audiological profile of diseased ear in males.**

| Sl. No | Age in years | Duration In years | Bone conduction thresholds (dB)at | | | Air conduction thresholds (dB) at | | | Air Bone Gap (dB) at | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1KHz | 2KHz | 4KHz | 1KHz | 2KHz | 4KHz | 1KHz | 2KHz | 4KHz |
| **1** | 47 | 2 | 40 | 45 | 50 | 55 | 60 | 65 | 10 | 25 | 15 |
| **2** | 47 | 1 | 30 | 35 | 45 | 65 | 70 | 65 | 35 | 40 | 20 |
| **3** | 35 | 10 | 25 | 35 | 45 | 55 | 65 | 75 | 30 | 20 | 30 |
| **4** | 31 | 12 | 35 | 40 | 45 | 65 | 65 | 70 | 20 | 20 | 35 |
| **5** | 35 | 3 | 25 | 35 | 55 | 55 | 65 | 75 | 40 | 20 | 20 |
| **6** | 27 | 6 | 25 | 35 | 35 | 50 | 55 | 65 | 25 | 15 | 30 |
| **7** | 45 | 15 | 35 | 45 | 50 | 65 | 70 | 75 | 15 | 25 | 25 |
| **8** | 14 | 6 | 25 | 30 | 35 | 45 | 50 | 50 | 10 | 20 | 15 |
| **9** | 20 | 1 | 25 | 35 | 45 | 50 | 55 | 60 | 5 | 15 | 15 |
| **10** | 20 | 10 | 35 | 45 | 50 | 55 | 65 | 75 | 5 | 20 | 25 |
| **11** | 35 | 5 | 25 | 35 | 45 | 65 | 65 | 70 | 20 | 30 | 35 |
| **12** | 31 | 12 | 35 | 40 | 45 | 25 | 30 | 40 | 10 | 10 | 5 |
| **13** | 31 | 10 | 35 | 45 | 55 | 25 | 30 | 40 | 10 | 15 | 15 |

**Table 4: Audiological profile in diseased ear in females.**

| Sl. No. | Age In years | Duration In years | Bone conduction thresholds (dB)at | | | Air bone gap (dB) at | | | Air conduction thresholds (dB) at | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1KHz | 2KHz | 4KHz | 1KHz | 2KHz | 4KHz | 1KHz | 2KHz | 4KHz |
| **1** | 18 | 3 | 40 | 45 | 60 | 25 | 5 | 5 | 65 | 50 | 65 |
| **2** | 26 | 2 | 25 | 25 | 30 | 25 | 25 | 25 | 50 | 50 | 55 |
| **3** | 31 | 0.2 | 20 | 25 | 25 | 25 | 5 | 30 | 45 | 30 | 55 |
| **4** | 43 | 1 | 25 | 30 | 35 | 20 | 10 | 25 | 45 | 30 | 60 |
| **5** | 21 | 2 | 25 | 30 | 45 | 5 | 25 | 20 | 30 | 55 | 65 |
| **6** | 45 | 2 | 25 | 30 | 40 | 25 | 25 | 15 | 50 | 55 | 55 |
| **7** | 50 | 1 | 30 | 35 | 45 | 10 | 15 | 10 | 40 | 50 | 55 |
| **8** | 18 | 1 | 25 | 35 | 45 | 25 | 25 | 15 | 50 | 55 | 60 |
| **9** | 14 | 4 | 25 | 30 | 35 | 40 | 40 | 40 | 65 | 70 | 65 |
| **10** | 40 | 12 | 25 | 35 | 45 | 35 | 30 | 35 | 60 | 55 | 70 |
| **11** | 18 | 10 | 35 | 45 | 55 | 30 | 20 | 15 | 65 | 65 | 70 |
| **12** | 18 | 0.8 | 15 | 20 | 35 | 35 | 45 | 55 | 50 | 65 | 60 |
| **13** | 15 | 25 | 45 | 50 | 55 | 25 | 25 | 25 | 70 | 75 | 80 |
| **14** | 46 | 10 | 45 | 40 | 50 | 40 | 40 | 20 | 85 | 80 | 75 |
| **15** | 50 | 12 | 45 | 50 | 55 | 5 | 20 | 20 | 65 | 70 | 75 |
| **16** | 35 | 2 | 30 | 30 | 45 | 25 | 20 | 20 | 55 | 50 | 65 |
| **17** | 12 | 1 | 40 | 40 | 55 | 20 | 10 | 10 | 65 | 50 | 55 |

**Table 5: Audiological profile of normal ear in males.**

| Sl. No | Age in years | Bone conduction thresholds (dB) at | | | Air conduction thresholds (dB) at | | | Air bone gap (dB) at | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1KHz | 2KHz | 4KHz | 1KHz | 2KHz | 4KHz | 1KHz | 2KHz | 4KHz |
| **1** | 47 | 15 | 25 | 20 | 20 | 25 | 25 | 5 | 0 | 5 |
| **2** | 47 | 15 | 10 | 15 | 25 | 25 | 25 | 10 | 15 | 10 |
| **3** | 35 | 15 | 5 | 15 | 20 | 25 | 20 | 10 | 10 | 5 |
| **4** | 31 | 15 | 15 | 10 | 20 | 25 | 25 | 5 | 10 | 15 |
| **5** | 35 | 10 | 15 | 10 | 10 | 25 | 25 | 0 | 15 | 15 |
| **6** | 27 | 5 | 10 | 10 | 20 | 25 | 20 | 10 | 15 | 0 |
| **7** | 45 | 10 | 5 | 15 | 20 | 25 | 25 | 10 | 20 | 10 |
| **8** | 14 | 10 | 10 | 15 | 25 | 25 | 20 | 15 | 15 | 5 |
| **9** | 20 | 10 | 10 | 10 | 25 | 25 | 20 | 15 | 15 | 10 |
| **10** | 20 | 10 | 15 | 10 | 25 | 10 | 20 | 15 | 5 | 5 |
| **11** | 35 | 10 | 5 | 15 | 20 | 10 | 20 | 0 | 15 | 20 |
| **12** | 31 | 15 | 5 | 15 | 25 | 15 | 20 | 10 | 0 | 15 |

**Table 6: Audiological profile of normal ear in females.**

| Sl. No. | Age in years | Bone conduction thresholds (dB) at | | | Air conduction thresholds (dB) at | | | Air bone gap (dB) at | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1KHz | 2KHz | 4KHz | 1KHz | 2KHz | 4KHz | 1KHz | 2KHz | 4KHz |
| **1** | 18 | 15 | 25 | 20 | 20 | 25 | 20 | 5 | 0 | 0 |
| **2** | 25 | 15 | 10 | 10 | 25 | 25 | 10 | 10 | 15 | 15 |
| **3** | 31 | 5 | 10 | 10 | 20 | 25 | 20 | 15 | 15 | 10 |
| **4** | 43 | 5 | 5 | 0 | 15 | 10 | 10 | 10 | 5 | 15 |
| **5** | 21 | 15 | 10 | 15 | 25 | 15 | 20 | 10 | 5 | 5 |
| **6** | 45 | 10 | 0 | 0 | 15 | 10 | 10 | 5 | 10 | 10 |
| **7** | 50 | 5 | 10 | 15 | 20 | 10 | 15 | 15 | 0 | 0 |
| **8** | 18 | 10 | 15 | 10 | 25 | 20 | 25 | 15 | 5 | 0 |
| **9** | 14 | 20 | 10 | 15 | 25 | 25 | 20 | 15 | 10 | 5 |
| **10** | 40 | 15 | 15 | 20 | 25 | 25 | 20 | 10 | 5 | 0 |

Continued.

| Sl. No. | Age in years | Bone conduction thresholds (dB) at | | | Air conduction thresholds (dB) at | | | Air bone gap (dB) at | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1KHz | 2KHz | 4KHz | 1KHz | 2KHz | 4KHz | 1KHz | 2KHz | 4KHz |
| **11** | 18 | 10 | 15 | 25 | 10 | 20 | 25 | 0 | 5 | 0 |
| **12** | 18 | 15 | 10 | 15 | 10 | 25 | 25 | 5 | 15 | 10 |
| **13** | 15 | 5 | 10 | 15 | 15 | 25 | 20 | 10 | 10 | 5 |
| **14** | 46 | 0 | 50 | 5 | 15 | 15 | 20 | 15 | 10 | 5 |
| **15** | 50 | 5 | 10 | 15 | 20 | 15 | 10 | 15 | 5 | 0 |
| **16** | 35 | 5 | 10 | 20 | 25 | 15 | 25 | 20 | 5 | 5 |
| **17** | 12 | 10 | 15 | 10 | 25 | 25 | 20 | 10 | 10 | 15 |

**Table 7: Comparison audiolgical profile indiseased and nondiseased ear in males.**

| | | 1KHz | | 2KHz | | 4KHz | |
|---|---|---|---|---|---|---|---|
| | | Diseased | Non diseased | Diseased | Non diseased | Diseased | Non diseased |
| **Mean air conduction** | Mean | 51.62 | 21.54 | 57.31 | 21.15 | 63.46 | 21.92 |
| | SD | 13.62 | 4.27 | 13.48 | 6.18 | 12.65 | 2.53 |
| | t | 7.67404 | | 8.12767 | | 16.9921 | |
| | p | <0.0000001 | | <0.0000001 | | <0.0000001 | |
| **Mean Air bone gap** | Mean | 18.08 | 9.23 | 21.15 | 11.15 | 46.15 | 13.46 |
| | SD | 11.46 | 5.34 | 7.68 | 6.18 | 6.18 | 3.15 |
| | t | 10.4156 | | 8.121767 | | 16.9921 | |
| | p | <0.0000001 | | <0.0000001 | | <0.0000001 | |
| **Mean bone Conduction** | Mean | 30.38 | 11.15 | 38.46 | 10.77 | 46.15 | 13.46 |
| | SD | 5.58 | 3.63 | 5.16 | 5.72 | 6.18 | 3.15 |
| | t | 10.4156 | | 8.12767 | | 16.9921 | |
| | p | <0.0000001 | | <0.0000001 | | <0.0000001 | |

**Table 8: Comparison audiolgical profile in diseased and non-diseased ear in females.**

| | | 1KHz | | 2KHz | | 4KHz | |
|---|---|---|---|---|---|---|---|
| | | Diseased | Non diseased | Diseased | Non diseased | Diseased | Non diseased |
| **Mean air conduction** | Mean | 56.18 | 10.88 | 56.18 | 7.65 | 63.82 | 5.88 |
| | SD | 13.17 | 5.07 | 13.75 | 4.72 | 8.01 | 5.66 |
| | t | 13.2351 | | 13.7639 | | 24.3571 | |
| | p | <0.0000001 | | <0.0000001 | | <0.0000001 | |
| **Mean Air bone gap** | Mean | 24.41 | 19.71 | 20.88 | 19.41 | 22.06 | 19.12 |
| | SD | 10.44 | 5.44 | 12.78 | 6.09 | 13.12 | 5.07 |
| | t | 9.61491 | | 10.7143 | | 0.861818 | |
| | p | <0.0000001 | | <0.0000001 | | <0.3952 NS | |
| **Mean bone Conduction** | Mean | 30.38 | 9.71 | 35.00 | 10.88 | 44.41 | 12.94 |
| | SD | 9.72 | 5.44 | 8.44 | 05.37 | 09.98 | 06.86 |
| | t | 3.65759 | | 4.18126 | | 7.83625 | |
| | p | <0.0000001 | | <0.0000001 | | <0.0000001 | |

**Table 9: Comparison of SNHL in different studies.**

| Percentage | Paperella et al[10] | Levine[11] | Kaur et al[12] | Sharona[13] | Presnt study |
|---|---|---|---|---|---|
| **SNHL** | 43% | 12% | 24% | 9.4% | 28.57% |

Mean bone conduction thresholds in males at 1 kh, 2 kh and 4 kh is 30.38%,38.46% and 41.92% respectively and Mean bone conduction thresholds in females at 1 kh, 2 kh and 4 kh is 30.88%,35% and 44.41% respectively. The mean air conduction threshold in males at 1 kh, 2 kh and 4 kh is 51.9dB, 57.3dB and 63.4dB. and Mean air conduction thresholds in females at 1 kh, 2 kh and 4 kh is56.17dB, 56.17dB and 63.8 dB. The mean air-bone gap (A-B gap) in males at 1 kh, 2 kh and 4 kh is 23.23dB, 26.17dB and 22.0dBand the mean air-bone gap (A-B gap) in females at 1 kh, 2 kh and 4 kh is 24.4dB, 20.85dB, 22.03dB diseased ears respectively. There was no

significant correlation between the age and degree of sensorineural hearing loss.

The bone conduction was observed to be significantly higher in the diseased ears than those in the contralateral healthy ears with p value being less than 0.001 at all frequencies except for air bone gap (dB) in females at 4 kh.

Following tables shows the comparison of bone conduction thresholds diseased males and females ears separately with respect to age and duration of disease.

## DISCUSSION

Csom is one of the most common condition encontered by ENT Surgeons in day to day practice. Chronic Suppuratattive Otittis media of mucosal variety usually causes conductive type of hearing loss. Papparella et al 1972 believed that SNHL Commonly occurs in patients with this disease.[9]

The SNHL in CSOM has been variously been calculated to be upto 43% by Paperella et al, 12% by Levine, 24% by Kaur et al and 9.4% by Sharona.[10-13]

In our study the SNHL was 28.57& similar to above study with range from 9.4% to 43% with male to female ratio. 1:1.3.

Relevance of SNHL with relation to age was studied.

Papparella et al found SNHL in patients of all age ranges similar to our studies.[9]

We found that SNHL was 28.57% in affected ear and also SNHL was found to be significant at higher frequencies compared lower frequencies. These results correlates with studies by Papparella et al and Lundaman (that toxins cross the round window membrane to cause irreversible cochlear hair cell damage mostly affecting the basal turn of cochlea.[9,14]

## CONCLUSION

Audiometric evaluation of 105 cases of unilateral mucosal variety of CSOM done and compared with normal control ear. SNHL was found to be associated even with CSOM of mucosal variety also. We emphasis that that it's very important to council regarding chance of SNHL in CSOM and consequences that causes if patient is treated properly surgically.

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## REFERENCES

1. Linstrom CJ, Silverman CA, Rosen A, Meiteles LZ. Boneconduction impairment in chronic ear disease. Ann Otol Rhinol Laryngol. 2001;110:437-41.
2. Paparella MM, Oda M, Hiraide F, Brady D. Pathology ofsensorineural hearing loss in otitis media. Ann Otol. 1972;81:632-45.
3. Paparella MM, Brady DR. SNH loss in CSOM and mastoiditis. Trans. Am. Acad. Ophthalmol Otol. 1970;74:108-15.
4. Morizona T, Giebink GS, Paparella MM, Sikora MA, Shea D. Sensorineural hearing loss in experimental purulent otitis media due to streptococcus pneumoniae. Arch Otolaryngol. 1985;111:794–8.
5. Amin MN, Datta PG, Amin AS. Incidence of hearing impairment amongst the school going children. J Bangladesh Coll Physicians Surgeons. 1992;10(1):23-5.
6. WHO. Chronic suppurative otitis media. Burden of illness and anagement options. 2004. Available at: http://www.who.int/-child-adolescent-health/New_Publications/. Accessed on 8 November 2015.
7. Rupa V, Jacob A, Josheph A.Chronic suppurative otitis media: prevalence and practice among rural south Indian children. International Journal of Pediatric Otorhinolaryngology. 1999;48(3):17- 221.
8. Kodiya AM, Afolabi OA, Ahmad BM. The burden of hearing loss at Kaduna, Nigeria: A 4-year study at the National Ear Care Centre. Ear Nose Throat J. 2012;91:156-63.
9. Paparella MM, Oda M, Hiraide F. Pathology of sensorineural hearing loss in otitis media. Annotol. 1972;81:632-45.
10. Paparella MM, Morizono T, Le CT. Sensorineural hearing loss in otitis media. An-notol. 1984;93:623-9.
11. Levine BA, Shelton C, Sheehy JL. Sensorineural hearing loss in otitis media. Is it clinically signifi-cant? Arch otolaryngol Head Neck Surg. 1989;115:814-6.
12. Kaur K, Sonkhya N, Bapna AS. Chronic suppurative otitis media and sensorineural hearing loss: Is there a correlation?.Ind J Otolaryngol Head Neck Surg 2003;55:21-4.
13. Sharma K, Gulari SK, Kaur R. Sensorineural hearing loss in Chronic suppurative otitis media-safe type. Ind J Otol. 2006;11:22-6.
14. Lundman L, Santi PA, Morizono T, Harada T, JuhnSK, Bagger, Sjoback D. Inner ear damage and passage through the round window memberane of Pseodomonas aeruginosa exotoxin A in a chinchilla model. Ann Otol Rhinol Laryngol. 1992:101:437-44.

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