

**FREQUENCY OF SENSORINEURAL HEARING LOSS IN CHRONIC SUPPURATIVE OTITIS MEDIA**<sup>1</sup>\*Dr. Minhale Saeed, <sup>2</sup>Dr. Abdul Basit and <sup>3</sup>Dr. Muhammad Usman Mateen<sup>1</sup>PMDC # 67378-S.<sup>2</sup>PMDC # 79706-P.<sup>3</sup>PMDC # 92714-P.

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**ABSTRACT**

**Introduction:** Chronic suppurative otitis media is persistent inflammation of the middle ear or mastoid air cells, clinically manifested with deafness and ear discharge. Hearing disability in adults and children also has its bearing on the individual and on the society. Chronic suppurative otitis media is fairly common disease especially in rural community. Chronic suppurative otitis media remains the most common cause of hearing impairment. The hearing loss is usually conductive resulting from tympanic membrane rupture and or changes in the ossicular chain due to fixation or erosion caused by chronic inflammatory process. The chronic inflammatory process can produce some circulatory disturbance such as vasodilation and vasoconstriction of the mucosal vessels of the round window membrane which could influence the inner ear. Toxins cross the round window membrane and cause irreversible cochlear hair cell loss mostly effecting the basal turn of cochlea. The relationship between chronic suppurative otitis media and sensorineural hearing loss remains a controversial issue. Sensorineural hearing loss due chronic otitis media has been reported as a definite pathologic entity, but its prevalence remains controversial. R Sharma and VK Sharma reported that in CSOM frequency of SNHL is 13% while Kamajit kaur reported 24% frequency of SNHL in CSOM. The Study also provides literature with magnitudes in local population. **Objective:** To determine the frequency of sensorineural hearing loss in chronic suppurative otitis media. **Study Design:** Cross-sectional study. **Settings:** ENT department Shaikh Zayed Hospital Lahore. **Duration With Date:** From Nov 01, 2017 to May 22, 2018. **Subjects And Methods: Sample Size:** The sample size of 180 was estimated by using 95% confidence level and 5% margin of error with expected frequency of sensorineural hearing loss 13%<sup>6</sup> among cases with chronic suppurative otitis media. **Sampling Technique:** Non probability purposive sampling. **RESULTS:** The age range was 10 to 50 years for both male and female. The male patient were 114 (63.3%) and 66 (36.7%) patient were female. Out of these patients 137 (76.1%) have tubotympanic CSOM and 43 (23.95%) have atticoantral CSOM. 23 (12.8%) patients have sensorineural hearing loss and 157 (87.2%) patients do not have sensorineural hearing loss. Out of 180 patients 99 (55%) have moderate hearing loss on pure tone audiometry. **Conclusions:** It is concluded from the study that majority of patient with CSOM have tubotympanic type and while a less percentage of patients have atticoantral type. Males are effected more than males. The incidence of sensorineural hearing loss (12.8%) in CSOM is much lower than the conductive hearing loss.

**KEYWORDS:** Chronic suppurative otitis media, sensorineural hearing loss, pure tone audiometry.**INTRODUCTION**

Chronic suppurative otitis media is persistent inflammation of the middle ear or mastoid air cells, clinically manifested with deafness and ear discharge. It may be insidious in onset, but is often capable of causing severe destruction and irreversible sequelae. Hearing loss associated with chronic suppurative otitis media is a matter of concern globally, particularly in children because of its long term effects on development of essential skills in speech, language and social interaction. Hearing disability in adults also has its bearing on the individual and on the society. Chronic suppurative otitis

media is fairly common disease especially in rural community.<sup>[1]</sup>

Chronic suppurative otitis media (CSOM) affects approximately 2% of the population.<sup>2</sup> WHO in 2004 mentioned worldwide prevalence of chronic suppurative otitis media in 65-330 million people and 39-200 million suffer from clinically significant hearing impairment.<sup>[1]</sup>

Chronic suppurative otitis media remains the most common cause of hearing impairment.<sup>3</sup> The hearing loss is usually conductive resulting from tympanic membrane

rupture and or changes in the ossicular chain due to fixation or erosion caused by chronic inflammatory process.<sup>4</sup> There are two types of CSOM, Tubotympanic and atticofacial type. Tubotympanic is safe or benign type; it involves antero-inferior part of middle ear cleft and is associated with a central perforation. There is no risk of serious complications. Atticofacial is called unsafe or dangerous type; it involves posterosuperior part of the middle ear cleft (i.e. attic, antrum and mastoid) and is associated with an attic or a

marginal perforation. Risk of complications is high in this type. The chronic inflammatory process can produce some circulatory disturbance such as vasodilation and vasoconstriction of the mucosal vessels of the round window membrane which could influence the inner ear.<sup>5</sup> Toxins cross the round window membrane and cause irreversible cochlear hair cell loss mostly affecting the basal turn of cochlea.<sup>[6]</sup>

R Sharma and VK Sharma et al in their study reported that in Chronic suppurative otitis media frequency of sensorineural hearing loss is 13%.<sup>6</sup> Kamaljit Kaur et al (2003) in their study reported 24% incidence of sensorineural hearing loss in patients with chronic suppurative otitis media. The relationship between chronic suppurative otitis media and sensorineural hearing loss remains a controversial issue.<sup>[8]</sup>

It is likely that sensorineural hearing loss associated with chronic suppurative otitis media is higher in population of lower socioeconomic status. This may be corroborated by the hypothesis that there is difficulty to access treatment with antibiotics, inadequate follow up and poor hygiene and education in low socioeconomic group.<sup>[6]</sup>

Sensorineural hearing loss due chronic otitis media has been reported as a definite pathologic entity, but its prevalence remains controversial.<sup>7</sup> In patients having chronic suppurative otitis media higher frequencies were more affected than the lower frequencies, however the patient's age and duration of otorrhea seems not to have any correlation with the degree of sensorineural hearing loss.<sup>8</sup> In a study it was found that 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).

The rationale of my study is to determine frequency of sensorineural hearing loss in chronic suppurative otitis media whether it is present or not as it is still controversial in previous literature as shown by the above mentioned studies by R Sharma, VK Sharma and Kamaljit Kaur.

## OBJECTIVE

To determine the frequency of sensorineural hearing loss in chronic suppurative otitis media.

## Operational Definitions

**Chronic Suppurative Otitis Media:** It is persistent inflammation of the middle ear or mastoid air cells, clinically manifested with discharge through a persistent defect in tympanic membrane and is diagnosed by otoscopy and microscopy.

**Sensorineural Hearing Loss:** It is type of hearing loss in which the root cause lies in vestibulocochlear nerve, inner ear or central processing centers of brain, it is measured in dB and by pure tone audiometric testing as Hearing loss of more than 16 dB and is presented graphically on pure tone audiogram.

## MATERIALS AND METHODS

**Setting:** ENT Department Shaikh Zayed Hospital, Lahore.

**Duration:** From Nov 01, 2017 to May 22, 2018

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

**Sample size:** The sample size of 180 was estimated by using 95% confidence level and 5% margin of error with expected frequency of sensorineural hearing loss 13%<sup>6</sup> among cases with chronic suppurative otitis media.

**Sampling technique:** Non probability purposive sampling

## Inclusion Criteria

1. **Age:** 10 to 50 years
2. **Gender:** Both.
3. Patients with continuous otorrhea through a perforated tympanic membrane for at least three months. (As per operational definitions)

## Exclusion Criteria

1. Traumatic head injury assessed by history.
2. Meningitis assessed by CSF examination.
3. Previous ear surgery assessed by history.
4. Chronic noise exposure assessed by history. (working in a factory /commercial drivers).
5. Systemic ototoxic drug therapy assessed by history.

## Data Collection and Procedure

180 patients fulfilling the inclusion criteria were enrolled after informed consent through the OPD and indoor of ENT department Shaikh Zaid Hospital, FPGMI, Lahore. Demographic history like name, age, gender and address will be recorded. All patients with chronic suppurative otitis media were examined by pure tone audiometric testing. All this information was collected by Performa (attached). Pure tone audiometry was standardized and performed by one audiologist. Patients included in this study did not suffer any extra financial burden as we routinely perform pure tone audiometry in every patient who presents with chronic suppurative otitis media. Sensorineural hearing loss was labelled (as per operational definition).

**Data Analysis**

All the data was entered and analyzed by using SPSS Version 10. Descriptive statistics were calculated. Qualitative variables like Gender and frequency of sensorineural hearing loss in chronic suppurative otitis media were presented by using percentages and frequency. Quantitative variable like age of the patient were presented by mean and standard deviation. Data was stratified for age and gender, type of CSOM. Chi square test will be used post-stratification with *P*-value less than or equal to 0.05 considered as significant.

**RESULTS**

- The age range was 10 to 50 years for both male and female with a mean of 33.16 and standard deviation of 10.7.
- The male patient were 114 (63.3%) and 66 (36.7%) patient were female.
- Out of the total 180 Patients 11 (6.1%) had Slight, 29 (16.1%) Mild, 99 (55%) Moderate, 17 (9.4%) Moderately Severe, 12 (6.7%) severe and 12 (6.7%) Profound degree of hearing loss.
- 23 (12.8%) patients have sensorineural hearing loss and 157(87.2%) patients do not have sensorineural hearing loss.
- Out of these patients 137 (76.1%) have tubotympanic CSOM and 43 (23.95%) have atticoantral CSOM.
- 23 Patients with Tubotympanis CSOM had sensorineural hearing loss with *P Value* of 0.004
- Sensorineural hearing loss was not age specific as statistical analysis gave *P Value* of 0.023.
- Sensorineural hearing loss was more in patients (23) with Moderate degree of hearing loss with *P Value* of 0.001.

**Table 1: Frequency of patients According to Sex (n=180).**

	Frequency	Percent
Male	114	63.3
Female	66	36.7
Total (n)	180	100.0

**Table 7: Cross Table of Sensorineural Loss and Type Of CSOM (n=180).**

		Type Of CSOM		Total	P Value
		Tubotympanic	Atticontral		
Sensorineural Loss	Yes	23	0	23	
	No	114	43	157	
Total		137	43	180	0.004

**Table 8: Cross Table of Sensorineural Loss in Age Groups (n=180).**

		Sensorineural loss		Total	P Value
		Yes	No		
Age Groups	Age 10-19	2	26	28	
	Age 20-29	12	35	47	
	Age 30-39	3	40	43	

**Table 2: Frequency of Degree of Hearing Loss (n=180).**

	Frequency	Percent
Slight	11	6.1
Mild	29	16.1
Moderate	99	55.0
Moderately Severe	17	9.4
Severe	12	6.7
Profound	12	6.7
Total (n)	180	100.0

**Table 3: Descriptive Statistics of Age (n = 180).**

Mean	33.16
Std. Deviation	10.697
Range	35
Minimum	14
Maximum	49

**Table 4: Frequency of Sensorineural Loss (n=180).**

	Frequency	Percent
Yes	23	12.8
No	157	87.2
Total (n)	180	100.0

**Table 5: Frequency of Type Of CSOM (n=180).**

	Frequency	Percent
Tubotympanic	137	76.1
Atticontral	43	23.9
Total (n)	180	100.0

Age 40-49	6	56	62	
Total	23	157	180	0.023

**Table 9: Sensorineural Loss according to Degree of Hearing Loss (n=180).**

		Sensorineural loss		Total	P Value
		Yes	No		
Degree of Hearing Loss	Slight	0	11	11	
	Mild	0	29	29	
Moderate		23	76	99	
Moderately Severe		0	17	17	
Severe		0	12	12	
Profound		0	12	12	
Total		23	157	180	0.001

**Table 10 Sensorineural Loss according to Gender (n=180).**

		Sensorineural loss		Total	P Value
		Yes	No		
Gender	Male	23	91	114	
	Female	0	66	66	
Total		23	157	180	0.001

## DISCUSSION

Chronic suppurative otitis media is found more in males than females. Most of the patient with chronic suppurative otitis media have conductive hearing loss but less percentage of patients have sensorineural hearing loss. Majority of patients have tubotympanic type of CSOM (76.1%) rather than atticofurrow type of CSOM (23.9%). Sensorineural hearing loss was present in 12.8% of patients and was absent in 87.2% patients. Patients having tubotympanic type of CSOM has mild to moderate hearing loss while patients having atticofurrow type of CSOM have severe to profound hearing loss in majority of cases. Lower socioeconomic status also affects the outcome of sensorineural hearing loss in CSOM as incidence increases in patients with low socioeconomic status. In patients having chronic suppurative otitis media higher frequencies are affected more than the lower frequencies. Majority of patients with CSOM had moderate hearing loss.

In this study I included 180 patients with diagnosed chronic suppurative otitis media, 137 (76.1%) patients had tubotympanic type of CSOM and 43 (23.9%) had atticofurrow type of CSOM. The age distribution was 10 to 50 years. Male patients were 114 (63.3%) and female patients were 66 (36.7%). Out of 180 patients with CSOM 23 (12.8%) patients had sensorineural hearing loss while 157 (87.2%) patients did not have sensorineural hearing loss. 11 (6.1%) patients had slight hearing loss, 29 (16.1%) patients had mild hearing loss, 99 (55%) patients had moderate hearing loss, 17 (9.4%) had moderately severe hearing loss, 12 (6.7%) had severe hearing loss and 12 (6.7%) had profound hearing loss.

## CONCLUSIONS

It is concluded from the study that majority of patient with CSOM have tubotympanic type and while a less percentage of patients have atticofurrow type. Males are affected more than females. The incidence of sensorineural hearing loss (12.8%) in CSOM is much lower than the conductive hearing loss. Lower socioeconomic status increases the incidence of sensorineural hearing loss in CSOM.

## REFERENCES

1. Raquib A, Taous A, Rojibul Haque. Sensorineural component in chronic suppurative otitis media. *Bangladesh J Otorhinolaryngol*, 2009; 15(2): 69-74.
2. Baumann I, Gerendas B, Plinkert PK, Praetorius M. General and disease-specific quality of life in patients with chronic suppurative otitis media--a prospective study. *Health Qual Life Outcomes*, 2011; 29(9): 48.
3. Musani MA, Rauf A, Ahsan M, Khan FA. Frequency and causes of hearing impairment in tertiary care center. *J Pak Med Assoc*, 2011; 61(2): 141-4.
4. da Costa SS, Rosito LP, Dornelles C. Sensorineural hearing loss in patients with chronic otitis media. *Eur Arch Otorhinolaryngol*, 2009; 266(2): 221-4.
5. Razooki AN, Yasin SH, Khefi RS. Sensorineural hearing loss in chronic suppurative otitis media Iraqi *J Med Sci*, 2012; 10(1): 93-7.
6. Sharma R, Sharma VK. Analysis of sensorineural hearing loss in chronic suppurative otitis media with or without cholesteatoma. *Indian J Otol*, 2012; 18(2): 65-8.
7. Yoshida H, Miyamoto I, Takahashi H. Is sensorineural hearing loss with chronic otitis media due to infection or aging in older patients? *Auris Nasus Larynx*, 2009; 36(3): 269-73.
8. Kolo ES, Salisu AD, Yaro AM, Nwaorgu OG. Sensorineural hearing loss in patients with chronic suppurative otitis media. *Indian J Otolaryngol Head Neck Surg*, 2012; 64(1): 59-62.
9. Stone M, Fulghum R. Bactericidal activity of wet cerumen. *Annals of Otolaryngology, Rhinology, and Laryngology*, 1984; 93: 183-6.

10. Campos A, Betancor L, Arias A, Rodriguez C, Hernandez AM, Lopez Aquado D et al. Influence of human wet cerumen on the growth of common and pathogenic bacteria of the ear. *Journal of Laryngology and Otolaryngology*, 2000; 114: 925-9.
11. Sirigu P, Perra MT, Ferreli C, Maxia C, Turno F. Local immune response in the skin of the external auditory meatus: an immunohistochemical study. *Microscopy Research and Technique*, 1997; 38: 329-34.
12. Chouard CH. Wrisberg intermediary nerve. In: Fisch U (ed.). *Facial nerve surgery*. Birmingham, AL: Aesculapius Pub Co, 1977; 24-39.
13. Anson BJ, Donaldson JA. *Surgical anatomy of the temporal bone*, 3rd edn. Philadelphia: WB Saunders, 1981.
14. Sade J. Middle ear mucosa. *Archives of Otolaryngology*, 1966; 84: 137-43.
15. Gleeson M, Felix H, Neivergelt J. Quantitative and qualitative analysis of the human middle ear mucosa. In: Sade J (ed.). *The Eustachian tube, basic aspects*. Amsterdam: Kugler and Ghedini, 1991; 125-31.
16. Proctor B. The development of the middle ear spaces and their surgical significance. *Journal of Otolaryngology*, 1964; 78: 631-49.
17. Michaels L, Soucek S. Development of the stratified squamous epithelium of the human tympanic membrane and external canal: the origin of auditory epithelial migration. *American Journal of Anatomy*, 1989; 184: 334-44.
18. Browning GG. Chapter 3. Aetiopathology of inflammatory conditions of the external and middle ear. In: Kerr AG (ed.). *Scott-Brown's Otolaryngology*. 6th edn. Vol 3. London: Arnold, 1997.
19. Da Costa SS, Paparella MM, Schachern PA, Yoon TH, Kimberley BP. Temporal bone histopathology in chronically infected ears with intact and perforated tympanic membranes. *Laryngoscope*, 1992; 102: 1229-36.
20. Schuknecht HF. *Pathology of the ear*; 2nd edn. Philadelphia: Lea and Febiger, 1993: 191-253. *An excellent chapter on the pathology of otitis media, extensively illustrated with beautiful photomicrographs; it is also an excellent source of references to earlier work in the field dating back many decades.*
21. Thomsen J, Jorgensen MB, Bretlau P, Kristensen HK. Bone resorption in COM. A histological and ultrastructural study. I. Ossicular necrosis. *Journal of Laryngology and Otolaryngology*, 1974; 88: 975-92.
22. Lung JY, Chole RA. Bone resorption in COM: The role of the osteoclast. *ORL*, 2002; 64: 95-107.
23. Friedmann I. Epidermoid cholesteatoma and cholesterol granuloma. Experimental and human. *Annals of Otolaryngology, Rhinology and Laryngology*, 1959; 68: 57-79.
24. Sade J, Teitz A. Cholesterol and cholesteatoma. *Acta Otolaryngologica*, 1983; 95: 547-53.
25. Chang W. Tympanosclerosis. Electron microscopic study. *Acta Oto-laryngologica*, 1969; 68: 62-72.
26. Sorensen H, True O. Histology of tympanosclerosis. *Acta Oto-laryngologica*, 1972; 73: 18-26.
27. Schiff M, Catanzaro A, Poliquin JF, Ryan AF. Tympanosclerosis. A theory of pathogenesis. *Annals of Otolaryngology, Rhinology and Laryngology*, 1980; 89: 1-16.
28. Mattsson C, Magnuson K, Hellstrom S. Myringosclerosis caused by increased oxygen concentration in traumatized tympanic membranes. Experimental study. *Annals of Otolaryngology, Rhinology and Laryngology*, 1995; 104: 625-32.
29. Flodin MF, Hultcrantz M. Possible inflammatory mediators in tympanosclerosis development. *International Journal of Pediatric Otorhinolaryngology*, 2002; 63: 149-54.
30. Gacek RR. Evaluation and management of temporal bone arachnoid granulations. *Archives of Otolaryngology - Head and Neck Surgery*, 1992; 118: 327-32.
31. Jang CH, Merchant SN. Histopathology of labyrinthine fistulae in COM with clinical implications. *American Journal of Otolaryngology*, 1997; 18: 15-25.
32. Merchant SN, Gopen Q. A human temporal bone study of acute bacterial meningogenic labyrinthitis. *American Journal of Otolaryngology*, 1996; 17: 375-85.
33. Adams JC. Clinical implications of inflammatory cytokines in the cochlea: A technical note. *Otolaryngology and Neurotology*, 2002; 23: 316-22.
34. Rappaport JM, Bhatt SM, Berkard RF, Merchant SN, Nadol Jr. JB. Prevention of hearing loss in experimental pneumococcal meningitis by administration of dexamethasone and ketorolac. *Journal of Infectious Diseases*, 1999; 179: 264-8.
35. Harris JP, Darrow DH. Complications of COM. In: Nadol JB, Schuknecht HF (eds). *Surgery of the ear and temporal bone*. New York: Raven Press, 1993: 171-91.
36. Yetiser S, Tosun F, Kazkayasi M. Facial nerve paralysis due to COM. *Otolaryngology and Neurotology*, 2002; 23: 580-8.
37. Merchant SN, Nadol Jr. JB. Histopathology of ossicular implants. *Otolaryngologic Clinics of North America*, 1994; 27: 813-33.
38. Vartiainen E. The results of chronic ear surgery in a training programme. *Clinical Otolaryngology and Allied Sciences*, 1998; 23: 177-80.
39. Halik JJ, Smyth GD. Long-term results of tympanic membrane repair. *Otolaryngology - Head and Neck Surgery*, 1988; 98: 162-9.
40. Gates GA, Mills JH. Presbycusis. *Lancet*, 2005; 366(9491): 1111. [PMID: 16182900] (An excellent review of presbycusis.).
41. Kricos PB. Audiologic management of older adults with hearing loss and compromised cognitive/psychoacoustic auditory processing capabilities. *Trends Amplif*, 2006; 10(1): 1. [PMID: 16528428] (Overview of clinical management of

older individuals who often have limitations in cognitive and psychoacoustic auditory processing capabilities.).

42. Purcell DD, Fischbein NJ, Patel A, Johnson J, Lalwani AK. Two temporal bone CT measurements increase recognition of malformations and predict SNHL. *Laryngoscope*, 2006; 116(8): 1439. [PMID: 16885750] (Inner ear measurements combined with visual inspection improves detection of temporal bone abnormalities.
43. Shoup AG, Roeser RJ. Audiologic evaluation of special populations. In: Roeser RJ, Valente M, Hosford-Dunn H, eds. *Audiology: Diagnosis*. New York: Thieme Medical Publishers, 2000. (Review of diagnostic procedures for possible functional hearing loss.).