

A study of sensory neural hearing(SNHL) loss in patients with chronic suppurative otitis media(CSOM)

Dr.Anmol Kaur Gill¹,Dr.Apurva,Dr.Divya²,Dr.Amit Modwal³,Dr.Man Prakash Sharma⁴

(ENT DEPARTMENT,NATIONAL INSTITUTE OF MEDICAL SCIENCES AND RESEARCH ,INDIA)

ABSTRACT

BACKGROUND

Hearing loss in chronic suppurative otitis media(CSOM) is conductive in nature,but some patients present with an additive sensorineural hearing loss(SNHL) also,which has been attributed to damage of the inner ear. Thus,this study aims to evaluate the association between CSOM AND SNHL and to establish a relation of SNHL with CSOM duration,socioeconomic status and age of patient.

METHODS

It is a prospective study,conducted in our institute National Institute of Medical Sciences(NIMS), Jaipur from January 2021 to June 2022, for a duration of 18 months. A total of 173 patients attending ENT OPD in NIMS,Jaipur who were selected based on inclusion and exclusion criteria,underwent complete history taking and clinical examination.Pure tone audiometry was also done to determine type and degree of hearing loss

RESULT

Out of 173 patients of CSOM,23 were found to have an additional sensorineural hearing loss along with conductive hearing loss,making it a prevalence of 13%. A significant correlation was found between age of patient and degree of SNHL,but no significant correlation was in duration of disease and degree of SNHL and is more common in lower socio economic status populations .

CONCLUSION

CSOM has some association with degree of SNHL and cochlear damage.Aging could be a precipitating factor in this pathological process. Further poor living conditions in lower socio economic groups are a contributing factor not only in causation of CSOM,but has some contribution in causing sensorineural hearing loss in CSOM patients

Date of Submission: 08-01-2023

Date of Acceptance: 23-01-2023

I. INTRODUCTION

Chronic otitis media (COM) is equivalent to the classic terminology chronic 'suppurative' otitis media (CSOM) which is no longer advocated to be used since COM is not always necessarily resulting from 'the gathering of pus. Chronic otitis media is defined as a permanent abnormality of the pars tensa or flaccida, likely resulting from an earlier acute otitis media, negative middle ear pressure or otitis media with effusion¹. The earlier anatomical distinction between tubotympanic and atticofacial types of the disease has been made redundant by our present ability to accurately assess an individual's ear, especially with magnification. The terminology 'safe' and 'unsafe' is incorrect and misleading since complications can result from any ear with active COM irrespective of its pathology². Aetiology of chronic otitis media includes Acute otitis media and otitis media with effusion, Genetics and race, Environment, Eustachian tube dysfunction and upper respiratory tract infections, Gastro-oesophageal reflux disease (GORD), Craniofacial abnormalities, Autoimmune disease such as ankylosing spondylitis, and Immune deficiency. Both childhood AOM and OME can result in long-term changes of the tympanic membrane. The prevalence of COM is observed to be greater in lower socioeconomic groups³. The reason for this higher prevalence is multifactorial with factors like maternal smoking, general health scores, and day-care attendance. Subtypes of chronic otitis media are Inactive mucosal COM (dry perforation), Active mucosal COM (perforation with otorrhoea, CSOM), Inactive squamous epithelial COM (retraction, atelectasis and epidermisation), Active squamous epithelial COM (acquired cholesteatoma), and Healed chronic otitis media. Complications of chronic otitis media include Labyrinthine fistula, Labyrinthitis, Facial nerve paralysis, Otogenic intracranial complications including meningitis, otitic hydrocephalus, lateral sinus thrombosis, cavernous sinus thrombosis and intracranial sepsis (e.g. Extradural, epidural, subdural, perisigmoid sinus and cerebral abscess formation), and Hearing loss⁴. The most frequently isolated pathogen from ear swabs of patients with COM was *Proteus mirabilis* (found in 33.3% of cases).

AIM AND OBJECTIVES

AIM:

To evaluate the association between CSOM and SNHL.

OBJECTIVES:

1. To assess the proportion of patients with SNHL in CSOM patients
2. To establish a relation of SNHL with CSOM duration, socio economic status and age of patient

II. REVIEW OF LITERATURE

Kaur K et al (2003) conducted a study to find out whether a sensorineural component exists in hearing loss associated with CSOM. A sample of 100 patients of unilateral CSOM was selected for the study and their bone conduction thresholds were analysed in relation to the duration of disease using audiometric data. A 24 per cent incidence of sensorineural hearing loss was found in the series, particularly involving the higher frequencies. Moreover, the incidence of sensorineural hearing loss progressively increased with the increase in duration of CSOM.⁵

Papp Z et al (2003) undertook a retrospective study reviewing files of 121 patients with unilateral chronic suppurative otitis media to determine whether chronic suppurative otitis media could cause sensorineural hearing loss. Chronic suppurative otitis media was seen to be associated with sensorineural hearing loss. When age and normal side were corrected for, pure-tone threshold and bone conduction threshold at either the speech frequencies or at 4 kHz increased gradually according to the duration of the chronic suppurative otitis media⁶

Kasliwal N et al (2004) carried out a study on SNHL in CSOM. The study determined the average SNHL in relation to the age of onset, duration of disease, examining it in relation to other eventual aural complications such as cholesteatoma, ossicular chain erosion and otorrhea. On the basis of data obtained it was observed consistent co-relation between severity of SNHL and duration of the disease, presence of cholesteatoma, ossicular erosion, attic and subtotal perforations.⁷

Azevedo AF et al (2007) conducted a study to evaluate SNHL related to CSOM and its association with cholesteatomas, disease duration and age of patients. It was Retrospective analysis of 115 patients with CSOM with and without cholesteatoma submitted for surgical treatment

. In Conclusion SNHL occurred in 13% of the patients with CSOM, and was correlated with older age, but not with the presence of cholesteatoma or longer duration of ear disease.⁸

Lasisi AO et al (2007) undertook a prospective study of hearing loss in CSOM at University College Hospital, Ibadan, two general hospitals and two primary health care centres, to report the prevalence, type and severity of hearing loss in CSOM and to identify risk factors. There were 189 CSOM subjects and 100 controls aged between 4 and 150 months. There was significant correlation between socio-economic status and hearing loss ($r=0.138$, $p=0.02$) while no correlation was found with upper respiratory infection ($r=0.054$, $p=0.36$), age of onset ($r=0.037$, $p=0.62$) or frequency of attacks ($r=-0.068$, $p=0.35$).⁹

Kolo E. S. et al (2008) conducted a retrospective analysis of the clinical records and pure tone audiograms of patients with chronic suppurative otitis media in a Nigerian Tertiary Health Institution to assess the association between sensorineural hearing loss and chronic suppurative otitis media, and to investigate some clinical factors that might affect the sensorineural component in patients with this disease. Patients with chronic suppurative otitis media had a significant degree of sensorineural hearing loss in this study. The higher frequencies were more affected; however, the patient's age and duration of otorrhea seem not to have any correlation with the degree of sensorineural hearing loss.¹⁰

III. MATERIALS AND METHODOLOGY

STUDY DESIGN: Prospective study

STUDY AREA: Department of Otorhinolaryngology, National Institute of Medical Science Research and Hospital, Jaipur.

STUDY PERIOD: 1st January 2021 to 30th June 2022

SAMPLE SIZE : 173

TIME FRAME : 18 months

SELECTION CRITERIA OF PATIENTS

INCLUSION CRITERIA

1. All CSOM patients between age group 10-50 years.
2. Unilateral CSOM patients with contralateral normal ear on otoscopy

EXCLUSION CRITERIA

1. Patients with history of previous ear surgery.
2. Patients with history of systemic disease like Diabetes mellitus, Meningoencephalitis, familial hearing loss.
3. Patients with history of prolonged exposure to noise.
4. Patients with history of head injury

IV. METHODOLOGY

Subjects were selected based upon the inclusion and exclusion criteria. All the patients underwent complete history taking and clinical examination. Pure tone audiometry was performed and a clinical proforma was filled incorporating details regarding particulars of patient, detailed clinical examination and investigations.

Investigations – Routine Investigations CBC, ESR, Viral markers.

Specific investigations–

- Pure tone audiometry was performed by a calibrated audiometer in a sound proof room and masking was used when appropriate

Radiological Investigations– Conventional X-Ray of Both Mastoid (X-ray bilateral mastoid –law’s lateral view)

Statistical analysis – Descriptive statistics were performed on all the study variables. Chi squared test and student t test were employed to determine the statistical significance of the differences observed among the variables.

V. OBSERVATIONS AND RESULTS

The age of patients in our study ranged from 10-50 years with a mean age of 35.23 years with standard deviation of 13.95 years.

Age Group (in years)	Number of Cases	Percentage (%)
10-14	3	1.734104
15-19	10	5.780347
20-24	32	18.49711
25-29	26	15.0289
30-34	34	19.65318
35-39	22	12.71676
40-44	9	5.202312
45-50	37	21.38728

Table 1. Age distribution

Descriptive Variable	Age (in years)
Mean	32.821
Std. Deviation	10.016
Minimum	10
Maximum	50

Table 2. Descriptive statistics of age

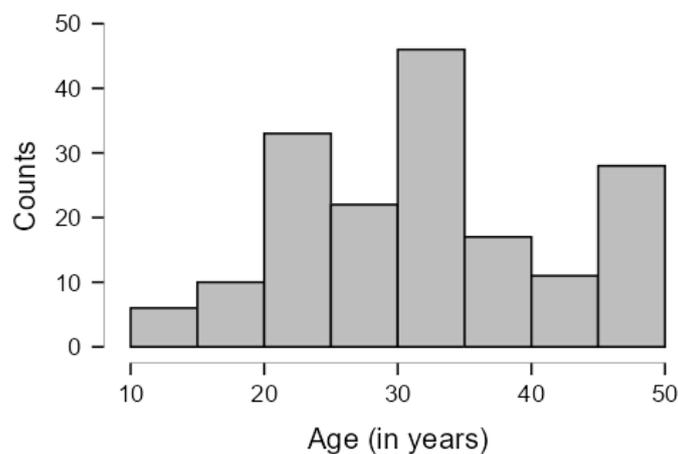


Figure 1. Age distribution

The study population comprised of 78 (45%) females and 95 (54.9%) males.

Table 3. Frequencies for SEX

SEX	Frequency	Percent	Valid Percent	Cumulative Percent
Female	78	45.087	45.087	45.087
Male	95	54.913	54.913	100.000

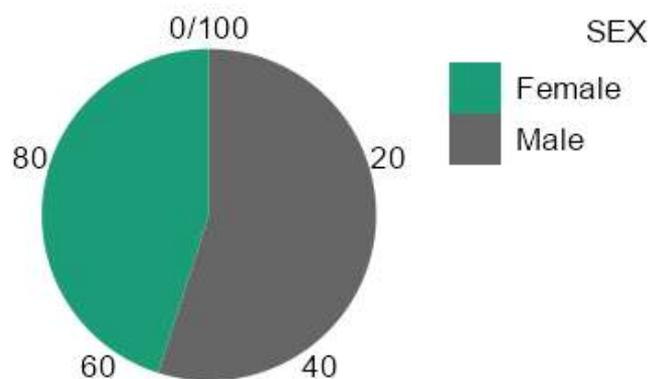


Figure 2. Sex distribution

All the patients in our study group belonged to poor socioeconomic class.

Table 4. Frequencies for Socioeconomic status

Socioeconomic status	Frequency	Percent	Valid Percent	Cumulative Percent
Poor	173	100.000	100.000	100.000

Table 4. Frequencies for Socioeconomic status

Socioeconomic status	Frequency	Percent	Valid Percent	Cumulative Percent
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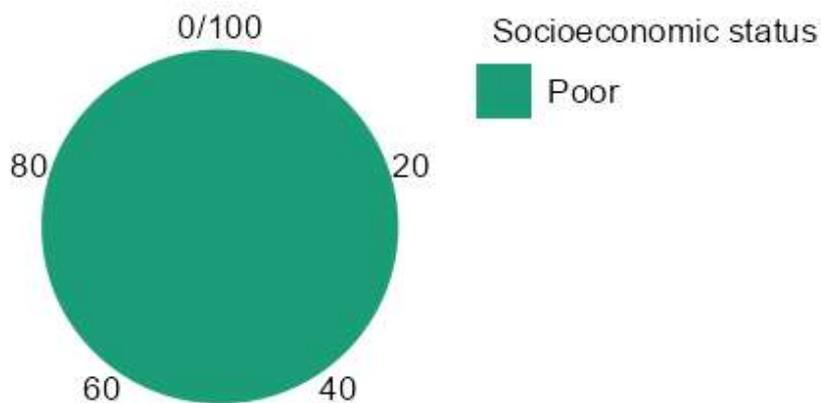


Figure 3. Socioeconomic status distribution

In our study population 148 (85.6%) patients belonged to rural background and 25 (14.4%) patients belonged to urban background.

Table 5. Frequencies for Urban/Rural

Urban/Rural	Frequency	Percent	Valid Percent	Cumulative Percent
Rural	148	85.549	85.549	85.549
Urban	25	14.451	14.451	100.000

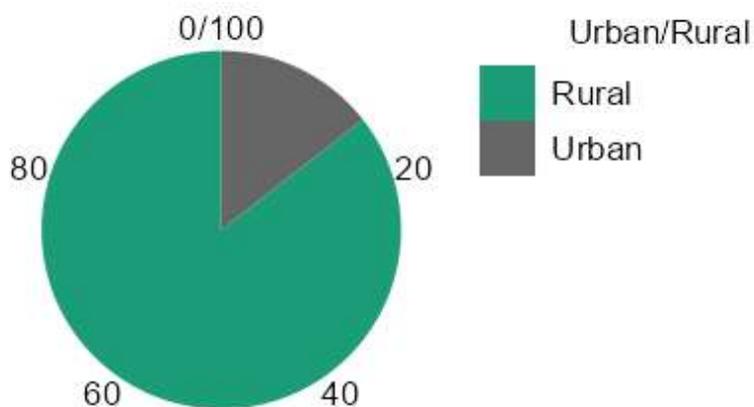


Figure 4. Urban/Rural distribution

.Out of 173 patients, 63 (36.4%) had squamosal type of CSOM and 110 (63.6%) had mucosal type of CSOM

Table 6. Frequencies for Type of CSOM

Type of CSOM	Frequency	Percent	Valid Percent	Cumulative Percent
Mucosal	110	63.584	63.584	63.584
Squamosal	63	36.416	36.416	100.000

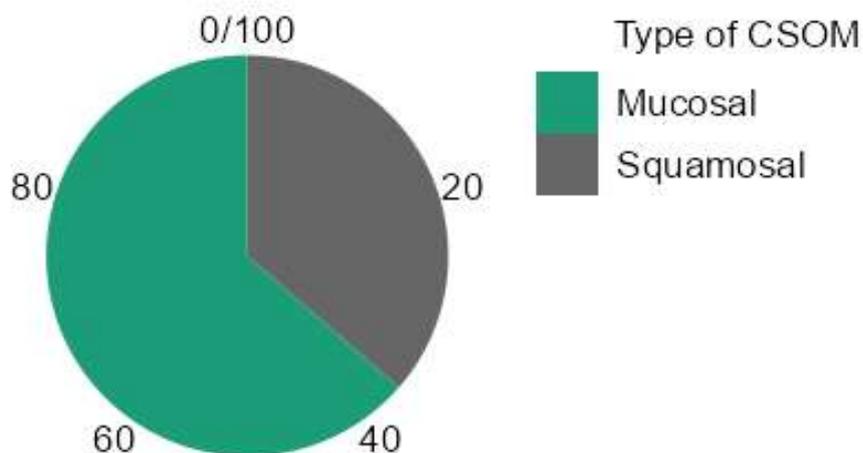


Figure 6. Type of CSOM distribution

Out of 173 patients included in the study, 146 (84.4%) had conductive type of hearing loss and 27 (15.6%) had mixed (conductive + sensorineural) type of hearing loss.

Table 7.Frequencies for Type of Hearing Loss

Type of Hearing Loss	Frequency	Percent	Valid Percent	Cumulative Percent
Conductive	146	84.393	84.393	84.393
Mixed	27	15.607	15.607	100.000

Table 7.Frequencies for Type of Hearing Loss

Type of Hearing Loss	Frequency	Percent	Valid Percent	Cumulative Percent
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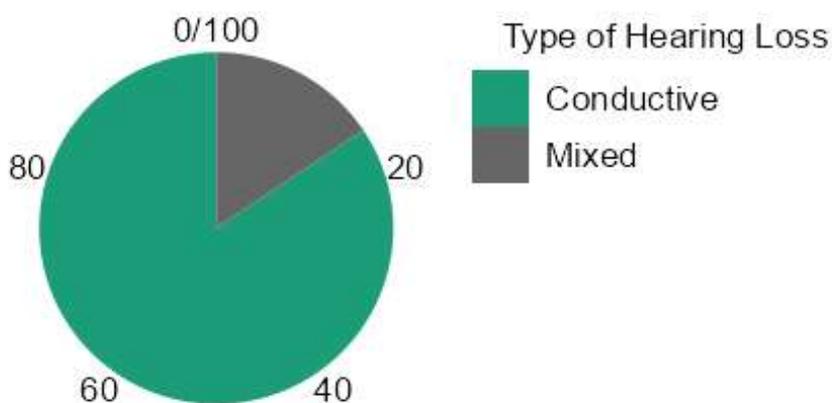


Figure 9. Type of hearing loss distribution

Out of 27 patients with sensorineural hearing loss in addition to conductive hearing loss, 18 (66.7%) had loss of high frequencies, whereas 9 (33.3%) had loss of low frequencies.

Table 8. Frequencies for Frequency Loss

Frequency Loss	Frequency	Percent	Valid Percent	Cumulative Percent
High	18	10.405	66.667	66.667
Low	9	5.202	33.333	100.000
Missing	146	84.393		
Total	173	100.000		

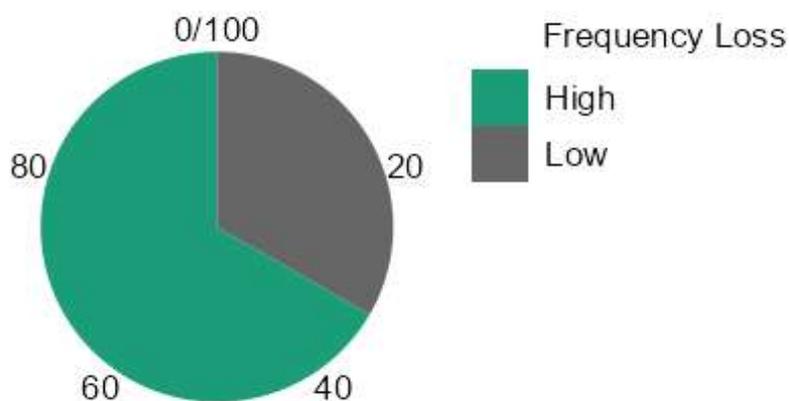


Figure 11. Frequency Loss distribution

The duration of CSOM in our study population ranged from 2 months to 20 years with a mean duration of 4.8 years \pm 4.2 years.

	Duration (in months)
Mean	57.243
Std. Deviation	50.272
Minimum	2
Maximum	240
Duration of CSOM (in months)	Number of Cases
3-12	27
13-24	10
25-36	12
37-48	10
49-60	54
61-72	27
73-84	11
85-96	6
97-108	9
109-120	8
133-144	7
169-180	3
229-240	3

Table 13. Descriptive statistics of duration of CSOM

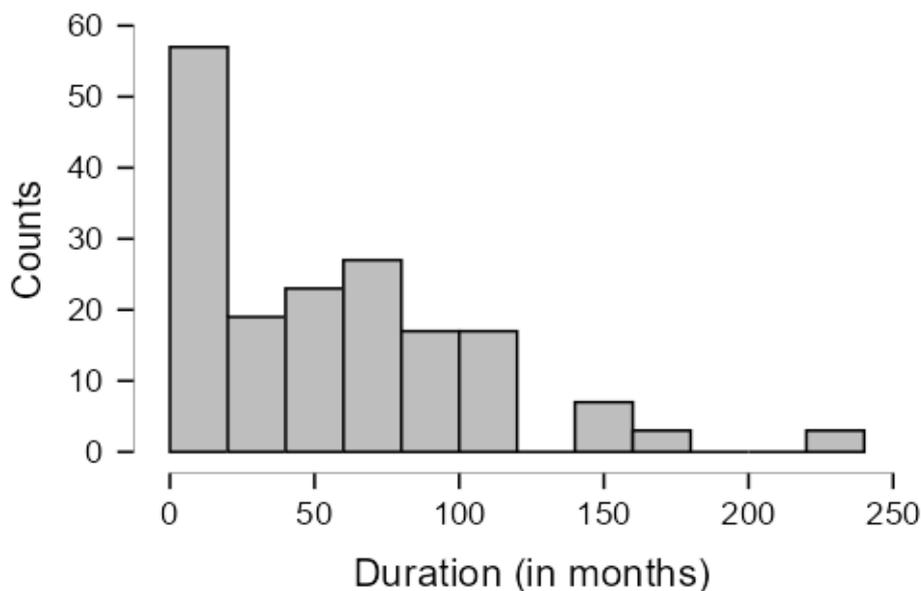


Figure 12. Duration of CSOM distribution

χ^2 test was employed to see the association between type of hearing loss and sex. It had a p value of 0.36 and did not show any statistically significant difference between the two sexes.

Table 9. Contingency table for type of hearing loss and age

Type of Hearing Loss	SEX		Total
	Female	Male	

Table 9. Contingency table for type of hearing loss and age

Type of Hearing Loss	SEX		Total
	Female	Male	
Conductive	68	78	146
Mixed	10	17	27
Total	78	95	173

Independent sample t test was performed to see the association between type of hearing loss and age of the patient. It had a p value of 0.04 and showed that sensorineural hearing loss was more commonly associated with old age.

Table 10. Independent Samples T-Test between type of hearing loss and age

	t	df	p
Age (in years)	-2.073	171	0.040

Independent sample t test was performed to see the association between type of hearing loss and duration of CSOM. It had a p value of 0.06 and did not show any statistically significant association between type of hearing loss and duration of CSOM.

Table 11. Independent Samples T-Test between type of hearing loss and duration of CSOM

	t	df	p
Duration (in months)	0.501	171	0.617

Independent sample t test was performed to see the association between type of CSOM and age of the patient. It had a p value of 0.09 did not show any statistically significant association between type of CSOM and age.

Table 12. Independent Samples T-Test between type of CSOM and age

	t	df	p
Age (in years)	0.153	171	0.878

Table 13. ANOVA between type of perforation and duration of CSOM

Cases	Sum of Squares	df	Mean Square	F	p
Type of perforation	23491.534	6	3915.256	1.581	0.156
Residuals	411192.269	166	2477.062		

ANOVA test performed to see the association between type of perforation and duration of CSOM found a p value of 0.03 and showed a significant association between type of perforation and duration of CSOM.

VI. Discussion

We undertook this study at ENT Department OF NIMS Medical College, Jaipur for a duration of 18 months to evaluate the association, progression and pattern of sensorineural hearing loss in CSOM, to assess the proportion of patients with SNHL in CSOM patients, and to establish a relation of SNHL with CSOM duration, socio economic status and age of patient. The age of patients in our study ranged from 10-50 years with a mean age of 35.23 years with standard deviation of 13.95 years. The study population comprised of 78 (45%) females and 95 (54.9%) males. All the patients in our study group belonged to poor socioeconomic class. In our study population 148 (85.6%) patients belonged to rural background and 25 (14.4%) patients belonged to urban

background. Out of the 173 patients included in our study, 7 had discharge in left ear, 82 had ear discharge and hearing loss in left ear, 16 had right ear discharge, and 68 had right ear discharge and hearing loss. Independent sample t test was performed to see the association between type of hearing loss and age of the patient. It had a p value of 0.04 and showed that sensorineural hearing loss was more commonly associated with old age. Independent sample t test was performed to see the association between type of hearing loss and duration of CSOM. It had a p value of 0.06 and did not show any statistically significant association between type of hearing loss and duration of CSOM. Independent sample t test was performed to see the association between type of CSOM and age of the patient. It had a p value of 0.09 did not show any statistically significant association between type of CSOM and age. CSOM was strongly associated with low socio-economic status. This is in concordance with the findings of our study. The duration of CSOM in our study population ranged from 2 months to 20 years with a mean duration of 6.8 years \pm 2.2 years. 146 patients had purely conductive hearing loss while 27 patients had mixed hearing loss. Out of 27 patients, 9 patients had disease duration of 4-6 years and 18 patients had the disease for more than 6 years. As the duration of the disease increased, the degree of hearing loss also increased. Patients with 4- 6 years of disease duration had maximum 60 dB mixed hearing loss, while the patients with more than 6 years of CSOM had maximum 65dB mixed hearing loss. χ^2 test was employed to see the association between type of hearing loss and type of CSOM. It had a p value of 0.002 and showed a statistically significant difference between the two types of CSOM with sensorineural type of hearing loss occurring more commonly in squamosal type of CSOM. CSOM was found to be strongly associated with low socio-economic status. Patients with chronic suppurative otitis media had a significant degree of sensorineural hearing loss in this study. The higher frequencies were more affected; however, the patient's age and duration of disease seem not to have any correlation with the degree of sensorineural hearing loss.

VII. Conclusion

- The age of patients in our study ranged from 10-50 years with a mean age of 35.23 years with standard deviation of 13.95 years.
- Association between type of hearing loss and age of the patient was seen. It had a p value of 0.04 and showed that sensorineural hearing loss was more commonly associated with old age
- The study population comprised of 78 (45%) females and 95 (54.9%) males.
- Association between type of hearing loss and sex was seen. It had a p value of 0.36 and did not show any statistically significant difference between the two sexes.
- In our study population 148 (85.6%) patients belonged to rural background and 25 (14.4%) patients belonged to urban background.
- 63 (36.4%) patients had squamosal type of CSOM and 110 (63.6%) had mucosal type of CSOM.
- Association between type of hearing loss and type of CSOM was seen. It had a p value of 0.002 and showed a statistically significant difference between the two types of CSOM with sensorineural type of hearing loss occurring more commonly in squamosal type of CSOM.
- 20 patients had large central perforation, 42 had medium central perforation, 24 had small central perforation, and 24 had subtotal central perforation, while 22 had attic perforation, 27 had retraction pocket and 14 had marginal perforation
- 146 (84.4%) patients had conductive type of hearing loss and 27 (15.6%) had mixed (conductive + sensorineural) type of hearing loss. 146 patients had purely conductive hearing loss while 27 patients had mixed hearing loss. Out of 27 patients, 9 patients had disease duration of 4-6 years and 18 patients had the disease for more than 6 years. As the duration of the disease increased, the degree of hearing loss also increased. Patients with 4- 6 years of disease duration had maximum 60 dB mixed hearing loss, while the patients with more than 6 years of CSOM had maximum 65dB mixed hearing loss. Out of 27 patients with sensorineural hearing loss in addition to conductive hearing loss, 18 (66.7%) had loss of high frequencies, whereas 9 (33.3%) had loss of low frequencies.
- The duration of CSOM in our study population ranged from 3 months to 20 years with a mean duration of 6.8 years \pm 2.2 years.
- Association between type of hearing loss and duration of CSOM was seen. It had a p value of 0.04 and show statistically significant association between type of hearing loss and duration of CSOM.

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