



## A Study of Sensorineural Hearing Loss (SNHL) in Patients with Chronic Suppurative Otitis Media (CSOM) Coming to Otorhinolaryngology (ENT) Out-Patient Department

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### Abstract

*Chronic suppurative otitis media is a persistent and insidious disease that often leads to destructive changes and irreversible sequel. sensorineural hearing loss in chronic suppurative otitis media is well documented.*

**Method:** *The prospective study carried out in 100 patients presented in department of ENT, G R Medical College, Gwalior from february2015 to September 2016 with complaint recurrent discharge from ear.*

**Objective:** *is to study incidence of age, sex, duration, nature of discharge, type of perforation in CSOM patients on development of SNHL and explore association in CSOM and SNHL. After taking detailed history of the patient, complete examination of ear, nose and throat has been carried out. Puretone audiometry is done.*

**Result:** *In present series of 100 patients with CSOM, incidence of Sensorineural hearing loss was found to be 15%.Incidence of SNHL increases with age i.e 40% of patients in age group of 51-60 years developed SNHL. Sex predominance was observed in male (60%) population. With increasing duration of disease, more propensity to develop SNHL, 53.4%patients with ear discharge for more than 10 years developed SNHL. In our study mucosal type of disease had more predisposition to develop SNHL and incidence of SNHL increase with size of perforation.*

**Conclusion:** *There was a relation and association between age, sex, disease duration, nature of ear discharge, Disease type, size of perforation in CSOM patients on incidence of SNHL.*

**Keywords:** *Sensorineural hearing loss (SNHL), Chronic suppurative otitis media (CSOM).*

### Introduction

Sensorineural hearing loss in chronic suppurative otitis media is well documented. It is hypothesized that in CSOM, toxins enter through semi

permeable round window membrane causing damage to organ of corti. Since long attempts have been made to establish relationship of hearing loss with the type of CSOM and duration

of disease. The role of chronic inflammatory disease of the middle ear as a cause of SNHL is still debatable. The hearing impairment in patients with CSOM has generally been observed to be of conductive deafness and less of sensorineural type. However, several investigators have reported a loss of cochlear function due to absorption of toxins across the round window, and hence SNHL does occur as a common sequel of long standing CSOM.

Most patients in a developing country like India are devoid of surgical intervention until very late due to ignorance, self-belief and poor access of health care facilities. Hence patients have repeated episodes of ear discharge and the pathology continues.

Therefore the role of this study is being undertaken to analyse clinically the incidence with respect to age of patient, sex of patient, duration of discharge and disease, type of perforation on the development of sensorineural hearing loss in CSOM patients..

### Material and Methods

The present study entitled “study of sensorineural hearing loss (snhl) in patients with chronic suppurative otitis media (csom) coming to otorhinolaryngology (ent) out-patient department” of Jaya Arogya Hospital and G.R. Medical College, Gwalior (M.P.) a cross sectional study was carried out during the study period from February 2015 to September 2016, 100 patients with CSOM was selected consecutively as and when they present during the study period based on inclusion and exclusion criteria.

**Inclusion Criteria:** All CSOM patients with History of recurrent discharge from ear is the main inclusion criteria coming to ENT out-patient department in GR Medical College in the present year of study and Patient with Tuning fork test, ABC decreased.

**Exclusion Criteria:** Patients in whom hearing loss could be attributed to reasons other than chronic suppurative otitis media such as Patients age <12 are excluded to eliminate the possibility

of inaccuracies and non-co-operative of audiological testing in children & >55 years of age were excluded because of the increased incidence of presbycusis in this age group, history of previous otologic surgery, familial hearing loss, prolonged exposure to noise, head trauma, not giving consent for the relevant investigation will be excluded from this study.

**History Taking and Examination:** A proforma of ENT examination was filled for each patient and documented. Consent of the patient was taken for clinical examination and required investigations.

**Special Investigations:** All the patients were being underwent complete history taking and clinical examination. Pure tone audiometry was performed by a calibrated audiometer in a sound-proof room and narrow band masking was used when appropriate. Pure tone air threshold (AC) and pure tone bone conduction (BC) threshold audiometry was done. The hearing of the patient was assessed by pure tone audiogram (type and degree of hearing loss recorded). Hearing loss upto 20 dB is considered normal, 21-40 dB mild, 40-55 dB moderate, 55-70 dB moderately severe, 70-90 dB severe, and above 90 dB as profound. Categorical data incidence was then analysed with respect to age of patient, sex, duration of discharge ,nature of discharge , size of perforation, topical use of ear drops, type of disease and the type of CSOM on the development of sensorineural hearing loss.

### Observation and Results

**Age:** In patients, <20years SNHL is prevalent only in 6.6%. The incidence in 21-30 years age group was 6.6% where as it was 13.3% in 31-40 years age group. However the incidence is highest in the age group of 41-50 years and 51 – 60 years was 33.4% and 40% .thus there was increase in the incidence of SNHL with the age.(table 1)

**Sex:** Among the total number of 100 patients, 51 were males and 49 were Females. 40% of the females developed SNHL, where as in males the incidence was 60%. (table 2)

**Duration of ear discharge:** In our study None of the patients with history of ear discharge for less than 2 years had pure SNHL in this study. There was steady increase in the incidence of SNHL with increasing duration of ear discharge. In cases where the duration was 2-5 years, the incidence was 13.3% where as it was 33.3% in cases where the duration was of disease was 6-10 years. However the incidence is highest when the duration of ear discharge was > 10 years with SNHL present in 53.4% of cases (fig.1)

**Natura of ear discharge:** Patients with mucoid ear discharge had less propensity to develop SNHL (13.3%). Among patients with mucopurulent ear discharge, 33.3% SNHL. In the

group of patients with purulent ear discharge, 53.3% developed sensorineural hearing loss. (table 3)

**Type of disease:** Of 100 patients of CSOM in study, in pars flaccida perforation, SNHL was present 40% of the cases. In case of pars tensa perforation, the incidence of SNHL was 60%. (table 4)

**Size of perforation:** Of 100 patients in study Among the 80 patient who had mucosal type of disease with SNHL,11% had pure SNHL and incidence is increasing with the increase size of perforation respectively.(fig.2)

**Table No.1** Age Distribution

PURETONE AUDIOMETRY	AGE GROUP(Year)					TOTAL
	<20	21-30	31-40	41-50	51-60	
SENSORINEURAL HEARINGLOSS(SNHL)	1 (6.6%)	1 (6.6%)	2 (13.3%)	5 (33.4%)	6 (40%)	15 (100%)
MIXED HEARING LOSS(MHL)	4	9	14	27	31	85
<b>TOTAL</b>						100

**Table No.2** Sex Distribution

PURE TONE AUDIOMETRY	SEX		TOTAL
	MALE	FEMALE	
SENSORINEURAL HEARINGLOSS(SNHL)	9 (60%)	6 (40%)	15 (100%)
MIXED HEARING LOSS(MHL)	42	43	85
<b>TOTAL</b>			100

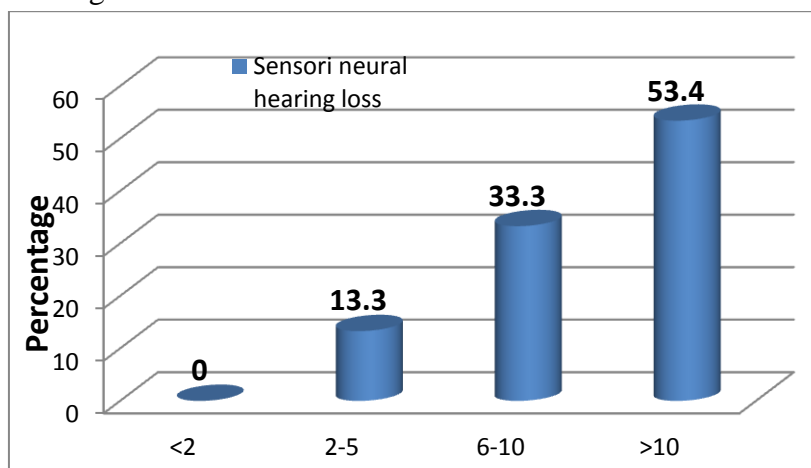
**Table No.3** Nature of Discharge

PURE TONE AUDIOMETRY	NATURE OF DISCHARGE			TOTAL
	MUCOID	MUCOPURULENT	PURULENT	
SENSORINEURAL HEARING LOSS(SNHL)	2 (13.3%)	5 (33.3%)	8 (53.3%)	15 (100%)
MIXED HEARING LOSS(MHL)	21	35	29	85
<b>TOTAL</b>				100

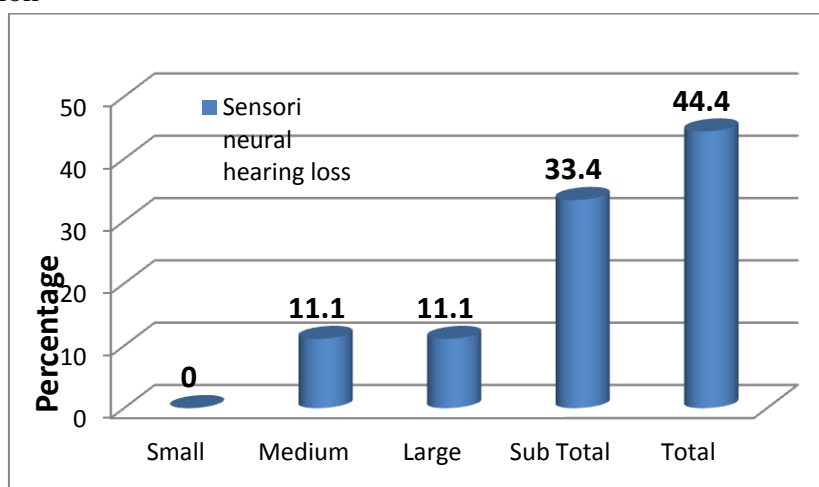
**Table No.4** Type of Disease

PURE TONE AUDIOMETRY TYPE	Type of Disease		Total
	Pars Flaccida Perforation	Pars Tensa Perforation	
SENSORINEURAL HEARING LOSS(SNHL)	6(40%)	9(60%)	15(100%)
MIXED HEARING LOSS(MHL)	14	71	85
<b>Total</b>			100

**Fig.1** Duration of ear discharge



**Fig.2** Size of perforation



**Discussion**

Chronic suppurative otitis media (CSOM) is one of the most common conditions encountered by otologist in routine day to day practice. CSOM has been conventionally described in terms of loss in the conductive component of hearing. The present study was undertaken to evaluate the presence of a sensorineural element in hearing loss associated with CSOM.

The present study was conducted in 100 subjects of age group 12-55 years of whom 51 were males and 49 were females. It has now been established that SNHL is encountered in CSOM as is evident from the studies of deAzevedo et al<sup>1</sup>, Vartiainen et al<sup>2</sup>, Kaur K et al<sup>3</sup>, Paparella et al<sup>4</sup>, English et al<sup>5</sup>. In the present study, SNHL was defined as bone conduction loss of more than 20 db at any one or more of frequency of 250 through 4000 Hz. The incidence was found to be 15 percent.

In a study conducted by Kaur et al<sup>3</sup>, the incidence of SNHL in CSOM was found to be 24%. SNHL occurred in 13% of patients with CSOM in study conducted by deAzevedo AF et al<sup>1</sup>. The incidence of SNHL in CSOM had variably been calculated, to be upto 43% Paparella (1984) et al<sup>4</sup>. Incidence of 43% as reported by Paparella et al could be because of their parameters of SNHL which was 15 Db or more. When he used the criteria of 30 Db or more, incidence came to down to 16%.

In the present study the incidence of SNHL in CSOM was highest in the age group of 51-60 years (40%). There was increase in the incidence of SNHL with age. In this study patients above age of 55 years were not selected so as to exclude the possible effects of ageing process. In a study by de Azevedo AF et al<sup>1</sup>, the increase in incidence of SNHL in CSOM patients with older age seen and supported study by vartiainen E et

al<sup>2</sup>, It seemed that older patients are more vulnerable to the effects of middle ear inflammation on cochlear function, and this can intensify hearing impairment due to aging.

Sex distribution of SNHL in CSOM in the present study was 60% in males and 40% in females. This shows sex incidence of SNHL in CSOM to be greater in males. This is similar to studies where CSOM was found more commonly in males than females. Such as in a study by Mohsin et al<sup>2</sup> SNHL was found in CSOM patients and risk of developing SNHL increases with patient age, more in males, duration of disease and to higher frequency of sound. It could be attributed to overcrowding in work place, environmental factors, low socio-economic status, exposure to outdoor activities like swimming etc. but according Vanderveen study there was no correlation between sex of the patient with mucosal CSOM and SNHL by Vanderveen et al.<sup>12</sup>

In this study there was an increase in the incidence of SNHL with increased duration of ear discharge. 53.4% of patients with ear discharge for >10 years developed SNHL. Also none of the patients with ear discharge for < 2 years developed SNHL. In cases where duration of ear discharge was 2-5 years and 6-10 years, SNHL was more often encountered. The incidence was 13.3% and 33.3% respectively.

These results were supported by studies done in which it was inferred that patients with the longer disease duration had more chances of developing SNHL. Studies by de Azevedo AF et al<sup>1</sup>, also found that development of SNHL in CSOM could be correlated to longer duration of ear disease. In a study by Kaur et al<sup>3</sup>, the incidence of SNHL was found to be 13.64% when the duration of disease was <5 years and progressively close to 33.33% when the duration of disease was > 26 years. Paparella et al<sup>4</sup>, have also noted increasing duration of the disease in their studies. However in studies by Levine et al<sup>6</sup>, no consistent relationship was found between the amount of relative SNHL and symptoms duration. It can be hypothesized from the present study that as the

duration of disease increases, there is prolonged exposure of inner ear to toxins that diffuse through round window membrane, resulting in SNHL. According to Kholmatov<sup>13</sup> in 2001 duration of disease when compared with incidence of SNHL, a progressively high increased incidence of SNHL was found as the duration of disease increased. Various other studies have shown increasing age was a risk factor in the evolution of SNHL in patients with CSOM.<sup>14</sup>

The only inference which can be derived is that patients with purulent ear discharge have more propensity to develop sensorineural hearing loss than mucopurulent and mucoid discharge. It can be hypothesized that mucoid ear discharge contains less amount of microtoxins and hence the chance of developing SNHL decreases. This result was not supported by studies of Levine et al<sup>6</sup>, Noordzij JP et al<sup>7</sup> where no consistent relationship was found between the amount of relative SNHL and character of ear discharge.

In this study, patients with pars flaccida perforation had less chance of developing SNHL (40%) than patients with pars tensa perforations (60%). These results were supported by Mac Andie C et al<sup>8</sup> where they found the presence of cholesteatoma and/or ossicular erosion was not associated with a significantly increased risk of sensorineural hearing loss. This result was not supported by studies of Levine et al<sup>6</sup>, in which the incidence of relative SNHL was greater when associated with pars flaccida perforation and cholesteatoma in middle ear. Studies by de Azevedo AF et al<sup>1</sup>, also showed no correlation between SNHL and the presence of cholesteatoma. Pars flaccid perforation is more frequently associated with cholesteatoma and active middle ear disease. According to the work of Goyocolea MV et al<sup>9</sup>, round window plays a significant role in the development of SNHL in CSOM. Round window is a semi permeable through which some substance can pass. Some of the substances can pass through it in physiological conditions. However, others such as microtoxins can only pass during active inflammation when

there is a lowering of the pH which occurs in cases of cholesteatoma.

In the present study, 11% of the 80 patients who had mucosal type of disease, had SNHL. SNHL was more frequently seen in those patients with sub-total and total perforation. There was a steady increase in the propensity to develop SNHL with increasing size of perforation. This was supported by the studies of Dumich et al<sup>10</sup>, which states that size of tympanic membrane perforation have an adverse effect on bone conduction threshold. These results can be explained on the basis of work of Paparella et al<sup>4</sup>, on the role of round window in the development of SNHL in CSOM. As the size of perforation increases, more amount of microtoxins can pass through the semi permeable round window membrane into the basal turn of cochlea leading to SNHL.

Some studies have shown SNHL associated with CSOM is more in patients from low socio economic status due to delayed treatments, lack of education, poor hygiene and inadequate follow up.<sup>15</sup>

### Conclusion

There was increase in incidence of SNHL in CSOM with increasing age of patient, risk is more in disease of longer duration and this factor should be considered while managing the patients with CSOM. Early detection and management can limit the SNHL in these patients. The risk of SNHL is much more in case of active stage disease with chronic discharge from ear, more in male sex predominant, more the duration of discharge, with increase in size of perforation in patients with mucosal type of disease.

Our study is a small study and we recommend more study for better understanding.

**Ethical approval:** All procedure performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent: informed consent was obtained from all individual participants included in the study.

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