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## Dr. M Erin Jino

Post Graduate, Department of  
Ent. Sree Mookambika Institute of  
Medical Sciences, Kulasekaram,  
Tamil Nadu, India

## Dr. Lyra Joy

Assistant Professor, Department of  
Ent. Sree Mookambika Institute of  
Medical Sciences, Kulasekaram,  
Tamil Nadu, India

## Dr. Deepak Rajadurai V

Post Graduate, Department of  
Ent. Sree Mookambika Institute of  
Medical Sciences, Kulasekaram,  
Tamil Nadu, India

## Effect of diabetes mellitus on sensorineural hearing loss patients in a tertiary healthcare centre

Dr. M Erin Jino, Dr. Lyra Joy and Dr. Deepak Rajadurai V

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### Abstract

In patients with diabetes mellitus, by the time hearing loss is detected using conventional tuning for ktests, damage has already affected the sensorineural component, which will affect the hearing component of the patient and hence affect the quality of life. Therefore by using audiometry early detection of hearing loss in people affected with Type 2 Diabetes mellitus can be done. It will help us to take early steps to make the patients affected by diabetes aware of the deafness and to take early measures for prevention and further progression of deafness.

**Keywords:** Pure tone audiometry, sensorineural hearing loss, conventional tuning fork test, microvascular, vestibulocochlear, neuropathic, type 2 diabetes mellitus

### Introduction

Diabetes Mellitus is the single most important metabolic disease which can affect nearly every organ system in the body. Almost all the macro and microvascular complications of diabetes have been studied extensively [1, 2].

Sensorineural hearing loss (SNHL) is a type of hearing loss, or deafness, in which the root causes lie in the inner ear (cochlea and associated structures), vestibulocochlear nerve (cranial nerve VIII), or central auditory processing centers of the brain [3].

Hearing impairment is defined by the World Health Organization (WHO) as a hearing loss with thresholds higher than 25db in one or both ears. The degree of hearing loss is classified as mild, moderate, severe or profound [4].

Sudden sensorineural hearing loss (SSNHL) is defined as the sudden onset of unilateral sensorineural hearing loss of 30dB or more at least three contiguous audiometric frequencies [5]. Diabetes is a risk factor of SSNHL, possibly due to microangiopathy [6, 7]. Currently, the clinical studies of SSNHL rarely focus on diabetic patients. The correlations between biochemical data and hearing outcomes in SSNHL are seldom analyzed.

### Materials and Methods

#### Aims and objectives

- Early detection of Hearing loss in higher is kind visuals, with predilection to Diabetes Mellitus.
- To compare the efficacy of conventional hearing assessment (Tuning fork test) against the high frequency audio meter in detection of hearing loss
- Early intervention and prevention of diabetes mellitus induced hearing loss

#### Secondary Objectives

- To study type of hearing loss in diabetes mellitus.
- To study audio metric pattern of hearing loss in diabetes mellitus.

### Methodology

**Study Design:** Hospital based cross sectional study.

**Study Participants:** Patient coming to ENT OP

**Inclusion Criteria:** Any patient male or female with Type II Diabetes Mellitus above the age 30 years, with complaints of hearing loss and requiring assessment of hearing loss and willingness to participate in the study.

#### Corresponding Author:

#### Dr. M Erin Jino

Post Graduate, Department of  
Ent. Sree Mookambika Institute of  
Medical Sciences, Kulasekaram,  
Tamil Nadu, India

**Results and Analysis**

**Table 1:** Frequency based on age group

Age group	Frequency	Percent
35-50	11	36.7
51-65	12	40.0
66-80	7	23.3
Total	30	100.0

**Table 2:** Frequency based on Gender:

Gender	Frequency	Percent
Male	17	56.7
Female	13	43.3
Total	30	100

**Table 3:** Frequency based on duration of diabetes mellitus

DM Duration (in years)	Frequency	Percent
≤15	22	73.3
>15	8	26.7
Total	30	100
Mean=11.53;StandardDeviation=8.17		
Mean of Weight= 67.4kgs ± 11.72		

**Table 4:** Frequency based on hearing loss type

Hearing loss type	Frequency	Percent
Normal	10	33.3
SNHL	17	56.7
Mixed	3	10.0
Total	30	100.0

**Table 5:** Frequency based on hearing loss degree

Hearing loss degree	Frequency	Percent
Normal	10	33.3
Mild	1	3.3
Mild-Moderate	5	16.7
Moderate	6	20
Moderate-Moderately Severe	3	10
Moderately Severe	1	3.3
Moderately Severe-Severe	1	3.3
Severe	3	10
Total	30	100

**Table 6:** Duration of diabetes mellitus Hearing loss type

Hearingloss type	DMDURATION(Years)				Total	Total percent
	<15years	PERCENT	>15years	PERCENT		
Normal	10	33.30%	0	0.00%	10	33.30%
SNHL	9	30.00%	8	26.70%	17	56.70%
Mixed	3	10.00%	0	0.00%	3	10.00%
Total	22	73.30%	17	56.70%	30	100%

**Table 7:** Degree of hearing loss degree inrtrandlptavs Dm

Rtpta (dB)	Duration of diabetes mellitus (in years)				Total	Total Percent
	≤15	PERCENT	>15	PERCENT		
≤25	10	33.3%	0	0%	10	33.3%
26-40	6	20%	2	6.7%	8	26.7%
41-60	5	16.7%	2	6.7%	7	23.3%
61-80	0	0%	4	13.3%	4	13.3%
>80	1	3.3%	0	0%	1	3.3%
Total	22	73.3%	8	26.7%	30	100%

**Discussion**

Study shows the effect of diabetes mellitus on SNHL with relation to age, gender, duration of disease that is associated to hearing loss.

The sample population consisted of 30 diabetic patients above the age of 30years, among the majority 40% were from age group 51-65 and 43% male subjects.

Audio logical investigation, PTA was performed by the department audiologist in sound treated room after necessary clinical examination for hearingloss was under taken. Clinical examination that aided to maintain inclusion criteria were local examination of ear, nose, throat and systemic examination for otherco-morbidities and tuning fork test which helped attaining the focused group.

PTA test was measured with instrument ALPs Advanced digital audiometer AD2100, Telephonics Headphone, Bonevibrator Radioear B-71, atvaried frequencies of 250Hz, 500Hz, 1KHz, 4KHz, 8KHz.

After assessing and confirming the type and degree of hearing

loss by PTA, confirmation and classification of degree of hearing loss was done with the help of WHO grades of hearing impairment [8].

In this study, SNHL comprised of majority at 56.7%. While comparing degrees of hearing loss, from bilateral mild to moderate comprised of 40%. In the past, studies gave outcomes ranging from 40% onwards. Friedman *et al.* [9] incurred an average of 55% hearinglossindiabeticpatients

Renetal [41] and Kakarlaupadi *et al.* [10] found that hearing loss in diabetics coincided with higher frequencies yielding to moderate degree of hearing loss. Celiko *et al.* [42] compared age groups and gender similar to this study. Similarly, they also Compared age groups with duration of diabetes and other diabetic related conditions, hence establishing relation of duration of diabetes with hearing loss.

Affection of bilateral SNHL was seen in study conducted by Meena Retal [11] which showed near equal distribution in various frequency thresholds. Even though SNHL was in majority, diabetics included in this study also showed sudden onset SNHL

before 15 years having dominance at 30% participants showing hearing loss.

SSNHL in diabetes may be a result of micro angiopathy showed a study by Shikowitz MJ *et al.* [6], while Friedman [9] and Cullen A. showed SNHL on setin

Younger individuals.

Li *et al.* [12] and Abdulbari Beneretal [13] found significant hearing loss with advance men to fage and disease in diabetics. There fore, to avoid larged is crepancies in age related changes in hearing status, conducted study in DM patients were focused from 35-80 years age group in comparison to their DM illness duration which was a maximum of 30 years and was included in DM duration of > 15 years which comprised of 57% of study subjects.

In this study, even though DM duration had comparative significance P-value = 0.011, ABC test showed better significance at P value = 0.001 which was further confirmed by PTA in relation to SNHL where 56.7% SNHL cases with 50% mild-moderate level of hearing loss were present.

Degree of bilateral type hearing loss in correlation to DM duration at 37% in early diabetics and majority comprised of mild-20%, moderate-7% degrees which was similarly observed in the study where Tay HL *et al.* [44] and Morales LV *et al.* [14] described.

### Conclusion

Keeping in mind the limitations of time and sample size, the study gives significant insight into clinical outcome of undertaken subject that is effect of diabetes on SNHL.

Hearingloss observed in diabetics is mostly bilaterallysym metrical, progressive, ranging from mild to severe.

Factors such as age, gender, family history, weight, occupation had no role inetiology of hearing loss. In addition to above factors, non-communicable conditions ordiseases, such as smoking, drinking, hypertension and thyroid disorders which may affect hearing loss in different manners were considered and excluded, so as to show direct effect of diabetes on hearing loss.

Even though clinical tests may help finding and proving hearing loss type and to a certain extent the degree as well, health care providers must take into account, the condition progression and refer to audiology for proper screening and evaluation for all diabetes mellitus cases, to have a better insight as well as preparedness for the outcome.

In future, there is a lot of scope to understand other aspects of SNHL with timely assessment of hearing threshold and diabetic management to improve auditory status.

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### Conflict of Interest

Not available

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Not available

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