Original Research Paper

Volume - 14 | Issue - 09 | September - 2024 | PRINT ISSN No. 2249 - 555X | DOI : 10.36106/ijar

Otorhinolaryngology

"A CLINICAL STUDY TO EVALUATE THE PREVALANCE OF SENSORINEURAL HEARING LOSS IN PATIENTS WITH TYPE 2 DIABETES MELLITUS IN A TERTIARY HEALTH CARE CENTRE"

Dr. Reena A Vare Professor Of Ent

Dr. Ch. Sri Meher Keerthana Resident Dept Of Ent

ABSTRACT This is a case series which aims to know the prevalence of sensorineural hearing loss in type 2 diabetes patients coming to tertiary health care centre. This study also throws light on the association between sensorineural hearing and diabetes mellitus and affect of diabetes on hearing loss and its progression.

KEYWORDS : diabetes mellitus, sensorineural hearing loss, prevalence, association

INTRODUCTION

Hearing is the most important integral part of our life. Hearing impairment will hamper one's personal and social life and hence quality of life is disturbed. The sense of hearing, the perception of sound and its biological purpose hence is not be taken lightly.

Diabetes mellitus (DM) is a metabolic disorder with uncontrolled sugar level which affects all systems of the body. According to the International Diabetes Federation (IDF), 463 million people in the world and 88 million people in the Southeast Asia region have diabetes in 2020. Out of this 88 million people in the Southeast Asia, 77 million belong to India. As we know, Diabetes mellitus lead to development of several complications like peripheral neuropathy, retinopathy, accelerated atherosclerosis and nephropathy.[1]

Diabetic otopathy (DO) is defined as by the presence of vestibular and auditory symptoms such as dizziness, vertigo, tinnitus and hearing loss in patients with diabetes mellitus after the exclusion of other ear complaints.

Hearing threshold level (HL) in patients with type 2 diabetes mellitus has been described by some studies as a progressive, bilateral, gradual sensorineural hearing loss that affects the low and mid frequencies.[2]

However, not all Researchers agree that type 2 diabetes mellitus (DM) can lead to sensorineural hearing loss (SNHL) or hearing loss at all; with some reporting a unilateral conductive or sensorineural pattern of hearing loss . The hearing loss associated with DM maybe as a result

1. localized microangiopathy in the inner ear,
2. neuronal degeneration
3. diabetic encephalopathy
4. derangement in the metabolism of glucose
5. mechanism associated with hyperactivity of free oxygen radical[3]

These pathological changes and metabolic disturbance might result in a cochlear, retrocochlear, or combined cochlear-retrocochlear hearing disorder. Auditory involvement in adult patients with type 2 DM have been reported to be either a gradual bilateral SNHL similar to presbycusis but with greater losses than expected for age range, a sudden onset of early SNHL affecting low frequencies or a low to mid frequency loss or even a unilateral and bilateral conductive hearing loss . Some studies even describe DM as the possible cause of unilateral sudden hearing loss [4]

Aims And Objectives

Aim Of The Study

To evaluate the prevalance of sensorineural hearing loss in type 2 diabetes patients coming to tertiary health care centre

Objectives Of The Study

- To study the association between diabetes and sensorineural hearing loss
- To study about the prevalance of sensorineural hearing loss in type 2 diabetes patients
- To study the severity of hearing loss with the duration of diabetes

MATERIALS AND METHODS

1. Methadology

This study was conducted in our hospital, a tertiary care referral center.

After the approval of Institutional ethical committee approval, an informed written consent from the patients will be attained before taking up the study.The selected patients are questioned regarding about the ear complaints and about the diabetes and its duration.This is followed by recording case history and followed by checking their sugar levels and getting pure tone audiometry done.

2. Study Design- It is a cross-sectional observational study

3. Inclusion Criteria:

All diabetic patients presenting with and without hearing loss with no other ear complaints are included.
From age 30- 45yrs
Both sexes

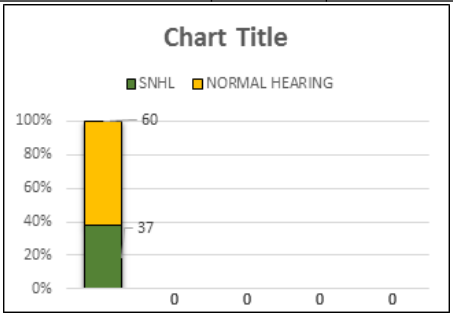
4. Exclusion Criteria:

Participants who did not give consent
Participants with history of chronic noise exposure
With history of ear discharge
Perforated tympanic membrane
Any other chronic ear disease
With the history of intake of ototoxic drugs in the past 2 months
With family history of hearing loss
On central nervous system sedatives
Participants with trauma to the ear

OBSERVATIONS AND RESULTS

Table 1- frequency of SNHL in total diabetic patients

		Percentage
Total diabetic patients	**97**	
Patients with SNHL	**37**	**38.14**
Patients with normal hearing	**60**	**61.85**

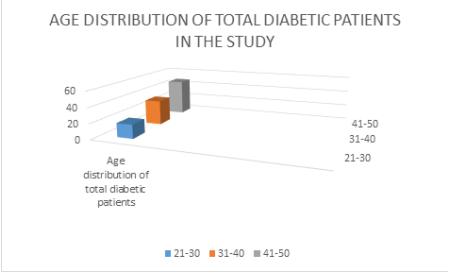


Graph 1- shows frequency of SNHL in total patients in the study

Table 1/graph 1- shows the distribution of patients according to auditory function. Patients were found to have either normal hearing or sensorineural hearing loss (SNHL). Total diabetic patients are 97 in which 38% were found to have SNHL while 61.85% were found to have normal hearing. The majority of the patients had normal hearing sensitivity.

Table 2- Shows Frequency Of Age Distribution Of Total Diabetic Patients In Particular Age Groups

Age	Total diabetic	Percentage
21-30	18	18.56
31-40	32	32.99
41-50	47	48.45
TOTAL	97	
RANGE	21-50	
MEAN ± SD	38.37±7.81	

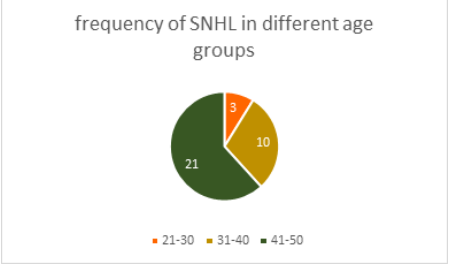


Graph 2- age distribution of total diabetic patients in the study

Table 2/graph 2 – shows distribution of total study participants in particular age groups. Majority of patients were in age group of 41-50yrs i.e 47 patients(48.45%) and 32.9% in age group of 31-40yrs and 18.56% in age group of 21-30yrs.

Table 3- Frequency Of Snhl In Particular Age Groups

Age group	Frequency of SNHL	Percentage
21-30	3	16.6
31-40	10	31.25
41-50	24	51.06

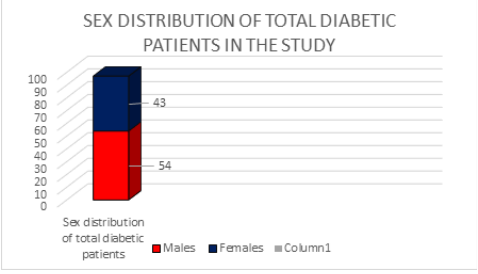


Graph 3- frequency of SNHL in different age groups

Table3 / graph 3 – shows distribution of SNHL in total study participants in different age groups. Majority of SNHL patients were seen in age groups of 41-50 yrs i.e 24 patients (51.06%). 10 patients had SNHL in age groups of 31-40yrs(31.25%). 3 patients had SNHL in age groups of 21-30(16.6%).

Table 4 - Shows Frequency Of Gender Distribution Of Total Diabetic Patients And Frequency Of Snhl In Particular Gender.
Sex Distribution

Sex	Total diabetic	Percentage
Males	54	44.3
Females	43	55.7

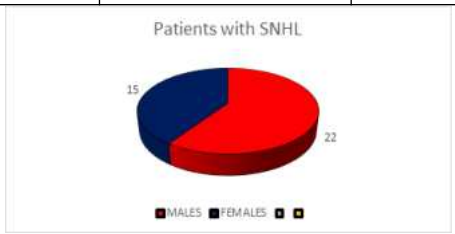


Graph 4- frequency of sex distribution of total diabetic patients in the study

Table 4/ graph 4- shows distribution of sex of total study participants. The majority of participants were males i.e 54 patients(44.3%) and 43 patients were females(55.7%).

Table 5 - Frequency Of Snhl In Particular Sex

SEX	FREQUENCY OF SNHL	PERCENTAGE
MALES	23	42.5
FEMALES	14	32.5

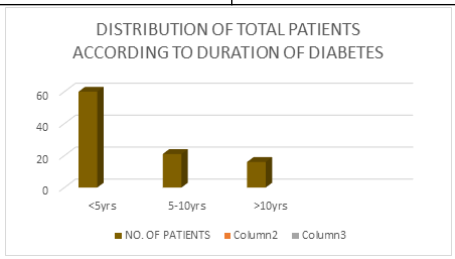


Graph 5- frequency of SNHL by gender distribution

Table 5/ graph 5 – shows distribution of SNHL based on gender of total participants. Majority of patients with SNHL were males i.e 22 patients(40.74%) and 15 SNHL patients were females.(34.88%).

Table 6 - frequency of distribution of diabetic patients according to duration of diabetes

Duration of diabetes	No. of patients	Percentage (%)
<5yrs	60	61.9
5-10yrs	21	21.6
>10yrs	16	16.5
Total	97	
Mean ± SD	5.57±3.82	
Range	01-16	

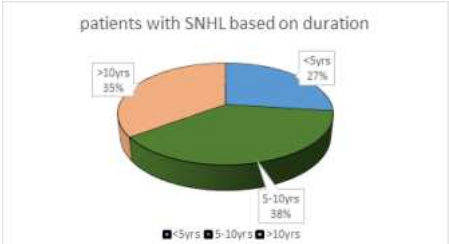


Graph 6- frequency of total patients according to duration of diabetes

Table 6/graph 6- shows distribution of total patients according to duration of diabetes. Majority of patients had <5yrs duration of diabetes i.e 60 patients (61.9%). 21 patients had 5-10 yrs of duration of diabetes i.e 21.6%. 16 patients had >10yrs of duration of diabetes i.e 16.5%.

Table 7- Frequency Of Patients With Snhl Based On Duration Of Diabetes

Duration of diabetes	No of patients with SNHL	Percentage
<5yrs	10	16.6
5-10yrs	14	66.66
>10yrs	13	81.25



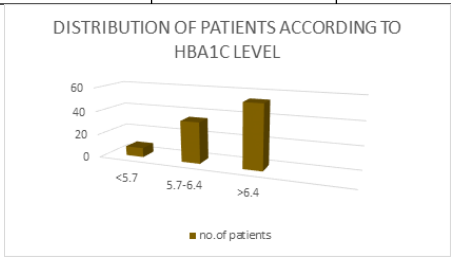
Graph 7- shows diabetic patients with SNHL based on duration

Table 7/ graph 7- shows distribution of patients with SNHL based on duration of diabetes. It was found that <5yrs of duration of diabetes had 10 patients(16.66%) with SNHL, 5-10yrs of duration of diabetes had 14 patients(66.66%) with SNHL and > 10yrs of duration of diabetes had 13 patients(81.25%) with SNHL.

Table 8- frequency of diabetic patients based on HBA1c levels

HBA1C levels	Frequency	Percentage
<5.7	8	8.25

5.7-6.4	35	36.08
>6.4	54	55.67

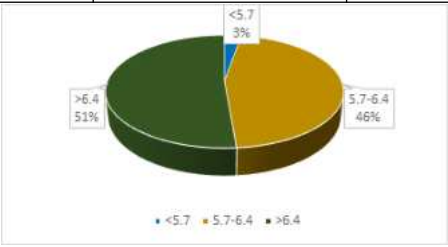


Graph 8 – distribution of patients according to Hba1c levels

Table 8/ graph 8- shows distribution of total participants according to HBA1C levels. It was found that majority of patients had HBA1C levels > 6.4 i.e 54 patients(55.6%) followed by hba1c levels between 5.7-6.4 had 35 patients(36.8%) and 8 patients had hba1c levels of <5.7(8.25%).

Table 9 – frequency of patients with SNHL based on HBA1C levels

HBA1C levels	No. of patients with SNHL	Percentage
<5.7	1	12.5
5.7-6.4	17	48.57
>6.4	19	38.9



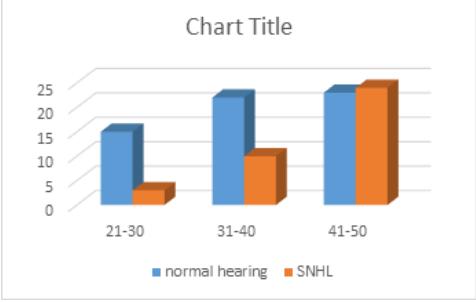
Graph 9- distribution of patients with SNHL according to HBA1C levels

Table 9/graph 9- shows distribution of total patients with SNHL according to hba1c levels. It was found that majority of patients with SNHL had hba1c levels >6.4 i.e 19 patients (19.58%), 17 patients with SNHL had hba1c levels 5.7-6.4(17.53%) and 1 patient with SNHL had <5.7 hba1c level.

Association between demographic variable with Hearing Loss Type

Table 10- association between age and SNHL

Age	Normal No. (%)	SNHL No. (%)
21-30	15 (83.3%)	03(16.6%)
31-40	22(68.7%)	10(31.25%)
41-50	23(48.9%)	24(51.06%)
χ2-Value	p-Value	
7.489	0.024 S p<0.05	

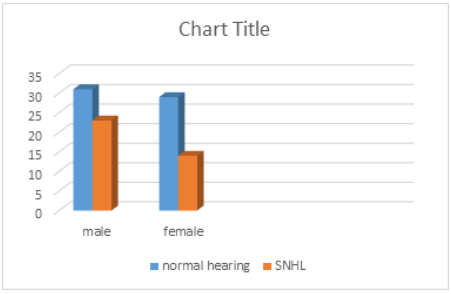


Graph 10- relation between age and SNHL

Table 10/graph 10- shows association between age and sensorineural hearing loss. It was found that 51% of patients have SNHL in age group of 41-50yrs, 31.2% and 16.6% of patients have SNHL in age groups of 31-40yrs and 21-30yrs respectively. Based on p value there was found a significant association between age and SNHL.

Table 11- association between gender and SNHL

Gender	Normal No. (%)	SNHL No. (%)
Male	31 (57.4%)	23(42.59%)
Female	29(67.4%)	14(32.5%)
χ2-Value	p-Value	
1.022	0.312 NS p>0.05	

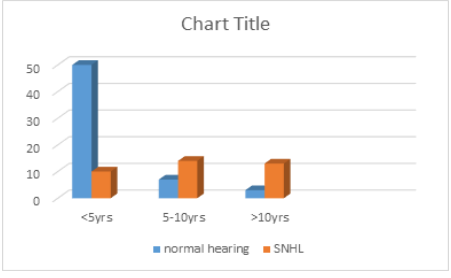


Graph 11- relation between gender and SNHL

Table 11/graph 11- shows association between gender and SNHL. It was found that 42.5% males have SNHL and 32.5% female patients have SNHL. Based on p value there was no significant association between gender and sensorineural hearing loss.

Table 12- association between duration of diabetes and SNHL

Duration of diabetes	Normal No. (%)	SNHL No. (%)
<5yrs	50(83.3%)	10(16.66%)
05-10yrs	7(33.33%)	14(66.66%)
>10yrs	03(18.75%)	13(81.25%)
χ2-Value	p-Value	
17.192	0.000 S p<0.05	

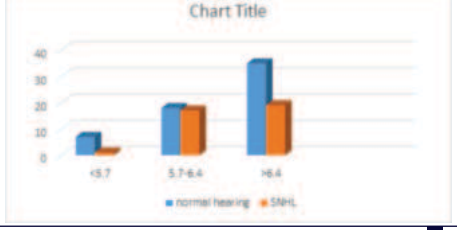


Graph 12- relation between duration of diabetes and SNHL

Table 12/graph 12- shows association between duration of diabetes and SNHL. It was found that 81.2% patients with duration of diabetes >10yrs have SNHL , 66.6% and 16.6% patients have SNHL with duration of diabetes between 5-10yrs and <5yrs respectively. Based on the p value it was found that there was a significant association between duration of diabetes mellitus and sensorineural hearing loss.

Table 13- association between HBA1C levels and SNHL

HBA1C levels	Normal No. (%)	SNHL No. (%)
<5.7	07(87.5%)	01(12.5%)
5.7-6.4	18(51.4%)	17(48.57%)
>6.4	35(64.8%)	19(35.18%)
χ2-Value	p-Value	
8.9496	0.0139 S p<0.05	



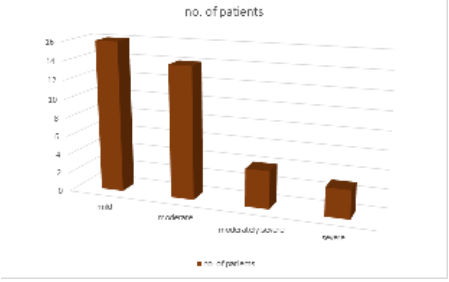
Graph 13- relation between hba1c levels and SNHL

Table 13/ graph 13- shows association between hba1c levels and SNHL. It was found that 35.18% patients with hba1c levels > 6.4 had SNHL, 48.7% and 12.5% patients with hba1c levels between 5.7-6.4 and <5.7 respectively had SNHL. Based on p value it was found that there was a significant association between hba1c levels and sensorineural hearing loss.

Table 14- frequency of diabetes patients based on degree of hearing loss

Degree of hearing loss	No. of patients	Percentage
Mild	16	43.2
Moderate	14	37.8
Moderately severe	4	10.8
Severe	3	8.1

χ^2-value	P-value
1.019	0.907 Not Sig. p>0.05



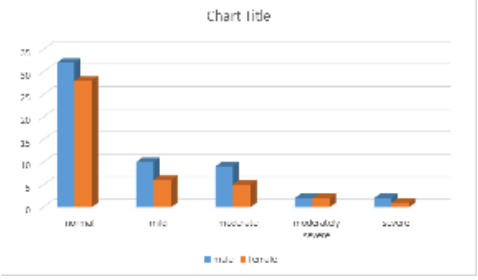
Graph 14 - distribution of diabetes patients based on degree of hearing loss

Table 14/graph 14- shows distribution of total diabetic patients based on degree of hearing loss. It is found that most of the patients with SNHL has mild hearing loss i.e 43.2% followed by moderate hearing loss i.e 37.8%. 10.8% of SNHL patients had moderately severe hearing loss and 8.1% of SNHL patients has severe hearing loss.

Table 15- degree of hearing loss in relation to gender of total diabetic patients

Gender	Degree of hearing loss				
	normal	mild	moderate	Moderatel y severe	severe
Male	31(57.4%)	10(18.5%)	9(16.6%)	2(3.7%)	2(3.7%)
Female	28(65.11%)	6(13.9%)	5(11.6%)	2(4.6%)	1(2.3%)

χ^2-value	P-value
1.019	0.907 Not Sig. p>0.05



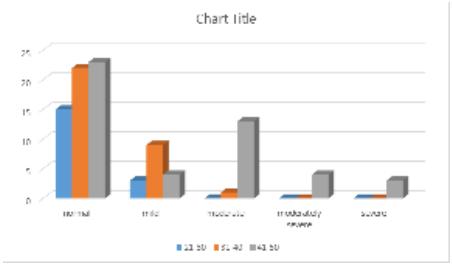
Graph 15- distribution of degree of hearing loss in relation to gender of total diabetic patients

Table 15/graph 15- shows distribution of degree of hearing loss of total diabetic patients in relation to gender. It was found that most of the patients with hearing loss were males and have mild hearing loss i.e 18.5%(10 patients), followed by moderate hearing loss i.e 16.6%(9 patients). There is equal distribution between moderately severe and severe hearing loss(i.e 2 patients each). Females have mostly mild hearing loss i.e 13.9%(6 patients), followed by moderate hearing loss i.e 11.6%(5 patients). There was no significant association between gender and degree of hearing loss.

Table 16- degree of hearing loss in relation to age group

Age group	Degree of hearing loss				
	Normal	Mild	Moderate	Moderatel y severe	Severe
21-30	15(83.3%)	3(16.6%)	0	0	0
31-40	22(68.75%)	9(28.1%)	1(3.1%)	0	0
41-50	23(48.9%)	4(8.5%)	13(27.6%)	4(8.5%)	3(6.3%)

χ^2-value	P-value
25.874	0.001 Sig. p<0.05



Graph 16- distribution of degree of hearing loss in relation to age group

Table 16/graph 16- shows distribution of degree of hearing loss in total diabetic patients in relation to age group of the patients. It was found that mopst of the patients with hearing loss was found in age group of 41-50yrs. Most of the patients in this age group has moderate hearing loss i.e 27.6%(13 patients). moderately severe and severe type of hearing loss is seen in this age group only in our study. only 4 patients have mild hearing loss in this age group i.e 4 patients(8.5%). Most of the patients had mild hearing loss in age groups from 31-40yrs and 21-30yrs i.e 28.1%(9 patients) and 16.6%(3 patients) respectively. There was a significant association found between the age of diabetic patients and degree of hearing loss.

Table 17- degree of hearing loss in relation to duration of diabetes

Duration of diabetes	Degree of hearing loss				
	Normal	Mild	Moderate	Moderatel y severe	severe
<5yrs	50(83.3%)	9(15%)	1(1.6%)	0	0
5-10yrs	7(33.3%)	6(28.5%)	6(28%)	1(4.7%)	1(4.7%)
>10yrs	3(18.75%)	1(6.2%)	7(43.7%)	3(18.75%)	2(12.5%)

χ^2-value	P-value
51.629	0.000 Sig. p<0.05

Graph 17- distribution of degree of hearing loss in relation to duration of diabetes

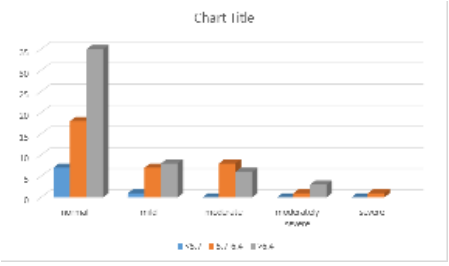
Table 17/graph 17- shows distribution of degree of hearing loss of total diabetic patients in relation to duration of diabetes. It is found that most of the patients with <5yrs of duration of diabetes have normal hearing and patients with hearing loss have mild hearing loss i.e 15%(9 patients) . and patients with duration of diabetes between 5-10yrs have mostly mild and moderate hearing loss i.e 28%(6 patients) each . patients with more than 10yrs of duration of diabetes have only 3 patients with normal hearing , have 7 patients(43.7%) with moderate hearing loss, 18.7%(3 patients) and 12.7%(2 patients) with moderately svere and severe hearing loss respectively. And there was only 1 patient with mild hearing loss.

It was found that there was a significant association between degree of hearing loss and duration of diabetes.

Table 18- degree of hearing loss in relation to hba1c levels

HBA1C levels	Degree of hearing loss				
	normal	mild	moderate	Moderately severe	Severe
<5.7	7(87.5%)	1(12.5%)	0	0	0
5.7-6.4	18(51.4%)	7(20%)	8(22.8%)	1(2.8%)	1(2.8%)
>6.4	35(64.8%)	8(14.81%)	6(11.1%)	3(5.5%)	2(3.7%)

χ^2-value	P-value
6.315	0.612 Not Sig. p>0.05



Graph 18- distribution of degree of hearing loss in relation to hba1c levels

Table 18/graph 18- shows distribution of degree of hearing loss in total diabetic patients in relation to hba1c levels. It was found that most of the patients with hba1c levels >6.4 have hearing loss i.e 14.8%(8 patients) have mild hearing loss and 11.1%(6 patients), 5.5%(3 patients), 3.7%(2 patients) have moderate, moderately severe and severe hearing loss respectively.

There was no significant association found between hba1c levela and degree of hearing loss.

DISCUSSION

Diabetes is a chronic condition that affects a person's blood glucose levels. People living with diabetes may be at a higher risk of hearing loss. This might be due to high sugar levels potentially causing nerve damage to the inner ear.

Research indicates that hearing loss is twice as common in people with diabetes as it is in people without the disease. Hearing loss may result from uncontrolled hyperglycemia, according to the Centers for Disease Control and Prevention (CDC) Trusted Source.

Additionally, the CDC notes that hearing loss may be associated with prediabetes. Individuals with normal blood sugar levels may be 30% less likely to get hearing loss than those with excessive blood sugar.

The most likely cause of diabetes-related hearing loss is microangiopathy of the inner ear, which thickens the stria vascularis. Other possible causes include hyperglycemia of the cerebrospinal fluid or perilymph, secondary degeneration of the eighth cranial nerve, dysfunctional neuropathy of the outer hair cells, and disruption of endolymphatic potentials.

Diabetes mellitus is mostly associated with bilateral sensorineural hearing loss (SNHL), which primarily affects high-frequency tones and progresses gradually.

With this backdrop, the current study sought to investigate the effect of diabetes mellitus on hearing and to determine the link between hearing impairment and diabetes duration.

In our study, the majority of participants (48.4%) were between the ages of 41 and 50, followed by 31 and 40 (34.3%). Only 18.5% of participants were aged 21 to 30 years.

In our study, the auditory functions of all diabetic patients were assessed and it was found that 38.14% of them had sensorineural hearing loss (SNHL) while the rest of the participants i.e. 61.86% had normal hearing function.

Therefore the prevalence of sensorineural hearing loss in type 2 diabetes mellitus patients in our study was 38.14%.

Nwosu JN et al. (2017)[5] found that 53.1% of diabetics had normal hearing and 43.8% had SNHL, which confirmed our findings. They said that the significant prevalence of hearing loss highlighted the importance of regular audiometric evaluations for diabetics.

On the contrary, Maran R et al. (2022)[6] discovered that 69.04% of diabetic patients had SNHL, while only 30.95% had normal hearing. Dhasmana G et al. (2021)[19] discovered that 79% of patients with hearing loss had SNHL that was bilaterally symmetrical.

Kumar V et al. (2021)[7] identified SNHL in 37.74% of diabetics, which is consistent with our findings. 54.6% of those with hearing impairment had SNHL, with the remainder having mixed or normal hearing.

Table 19- comparision with other studies (on hearing loss type in diabetes patients)

	Normal hearing	SNHL
Our study	62%	38%
Nwosu JN et al	53.1%	43.8%
Maran R et al	30.95%	69.04%
Kumar V et al	62.26%	37.74%

It was found in our study that in total diabetes patients , 60 participants with <5yrs duration of diabetes had 45 patients with normal hearing and 15 patients had sensorineural hearing loss i.e 25% which constituted a major proportion among those with SNHL. 21 participants had 5-10 yrs duration of diabetes among which 9 patients had SNHL i.e 42%. 16 participants had duration of diabetes >10yrs among which only 3 patients had normal hearing sensitivity and 13 patients had SNHL i.e 81.25%. By this we can get an idea that longer the duration of diabetes there is a higher chance of SNHL, as we can see that 13 patients out of 16 had SNHL with >10yrs duration of diabetes in our study.

A statistically significant association (p-value<0.05) between duration of diabetes and hearing was seen.

Similar to our study, Krishna H (2020)[8] found a significant association between the duration and hearing loss with a SNHL prevalence of 70.9% in persons with diabetes for over 10 years. In contrast to our study, Dhasmana G et al. (2021)[19] reported that, among patients with duration of diabetes <5 years, 46.6% had hearing loss, while among those with duration between 5-10 years, 57.7% had hearing loss. However, 21 patients had a duration between 11-15 years, of which 71.4% had loss of hearing. Nevertheless, no significant association between the duration and hearing loss was noted. Majority of the study participants (33.3%) had diabetes for more than 10 years in a study by Uju I et al (2021)[10] , however, no significant association was seen.

Table 20 - comparision with other studies (on hearing loss type based on duration of diabetes)

	Duration of diabetes	SNHL
Our study	>10yrs	81.25%
Krishna H et al	>10yrs	70.9%
Dhasmana G et al	11-15yrs	71.14%

Our study found that 8.25% of patients had HbAC1 values below 5.7, while 36% and 55% had high levels between 5.7-6.4 and >6.4%, respectively.

Our study found that 48.57% of people with SNHL had HbA1C levels between 5.7-6.4, 35.18% had levels above 6.4, and only 12.5% had levels below 5.7.

Our investigation found a statistically significant link between HbA1C levels and auditory function (p value < 0.05).

Uju I et al. (2021)[10] discovered that the majority of study participants (57.4%) had HbA1C levels above 7%, which supported our findings. According to Krishna H (2020)[37], 45.28% of diabetics had HbA1C levels higher than 8%.

Maran R et al. (2022)[6] found that 28 out of 42 diabetics had elevated levels (>8%) of HbAIC, indicating poor blood glucose control and increased SNHL, while 8 had values <7% and 6 had values between 7–8%.

Dhasmana G et al. (2021)[9] found that 69.2% of patients with poor glycemic control (HbA1C>7.64) had hearing loss, while only 30% of patients with acceptable glycemic control (HbA1C 5.97-6.80%) had hearing loss.

Table 21- comparision with other studies(on hearing loss type based on hba1c levels)

	Hba1c levels	SNHL
Our study	<5.7	12.5
	5.7-6.4	48.5
	>6.4	35.18
Uju I et al	>7	57.4
Krishna H et al	>8	42.28
Dhasmana G et al	>7	69.2

In the present study, the degree of sensorineural hearing loss was classified as mild, moderate, moderately severe and severe.

In the present study, most of the study participants had mild hearing loss (43.24%), followed by moderate hearing loss i.e 37.87%. it was found that as age and duration of diabetes increases, there is more degree of hearing loss.

In age groups of 41-50yrs out of 24 with SNHL 13 patients have moderate degree of hearing loss and most of the patients with >10yrs duration of diabetes have moderate hearing loss.

In our study, the association between age group and degree of hearing loss and the association between duration of diabetes and degree of hearing loss was statistically significant (p-value < 0.05).

SUMMARY AND CONCLUSION

The study aims to know the prevalence of sensorineural hearing loss in type 2 diabetes patients coming to tertiary health care centre. The study was conducted in the tertiary care centre. 97 patients of with type 2 diabetes mellitus with and without hearing loss and no other ear complaints were enrolled in the study.

The findings of our study are summarized as:

The age of patients in the present study ranged from 18-50 years with majority in the age group of 41-50 years. And all the patients were diabetic.

On observing the type of hearing in relation to age group of the study participants, it was reported that a large number of study participants who had SNHL were in age group of 41-50yrs.

The association between age group and degree of hearing loss and the association between duration of diabetes and degree of hearing loss was statistically significant (p-value < 0.05).

Male preponderance was observed in the present study. And male preponderance is also seen in patients with SNHL(sensorineural hearing loss).

On assessment of auditory functions the prevalence of sensorineural hearing loss in type 2 diabetes mellitus patients in our study was 38.14%.

As all the patients were suffering from type 2 diabetes mellitus, it was observed that most of the participants have duration of diabetes <5yrs followed by 5-10yrs. Few patients have duration >10yrs.

Among SNHL patients, participants with diabetes for 5-10yrs constituted the major proportion followed by those who had diabetes for >10yrs. Longer the duration of diabetes there is a higher chance of SNHL. A statistically significant association (p-value<0.05) between duration of diabetes and hearing was seen.

Majority of study participants with SNHL had elevated HBA1C levels (>6.4%). The association between HBA1C levels and auditory function was statistically significant.

Mild degree of hearing loss was present in most of the study participants with duration of diabetes <5years. Among those with moderate degree of hearing loss most of patients have duration of diabetes >10years. Severe degree of hearing loss is mostly seen in patients with duration of diabetes >10years. The association between duration of diabetes and degree of hearing loss was statistically significant (p-value < 0.05).

Thus, we would like to conclude that routine evaluation of the auditory system can aid in the early detection of sensorineural hearing loss in type 2 diabetes mellitus, and that adequate glycaemic control is critical to preventing or delaying the formation of SNHL. Regular audiological evaluations for all diabetic individuals improves their quality of life.

REFERENCES

1. Sarwar N, Gao P, Seshasai SR, Gobin R, Kaptoge S, Di Angelantonio , Diabetes mellitus, fasting blood sugar and risk of vascular disease, a collaborative meta-analysis of 102 prospective studies, Lancet. 2010.
2. Mohammed al Hariri, The pathophysiology mechanism of diabetic otopathy, Journal of Talibah University of Medical sciences, Vol 11, issue 4, pages 401-403, 2016
3. Ah- Ra Lyu , Tae- Hwan Kim , Yong- Ho Park, Hearing impairment in a mouse model of Diabetes, associated with mitochondrial dysfunction synaptopathy and activation of intrinsic apoptosis pathway, multidisciplinary digital publication ,2019
4. Angela Mishra, vijay Kumar Poorey, Clinical and audiometric assessment of hearing loss in diabetes mellitus, Indian journal of otorhinolaryngology, Springer nature, 2018
5. Nwosu JN, Chime EN. Hearing thresholds in adult Nigerians with diabetes mellitus: a case–control study. Diabetes, metabolic syndrome and obesity: targets and therapy. 2017 May 2:155-60.
6. Maran R, Tekam V, Chaddha R, Meena K. Evaluation of Auditor Functions in Diabetic patients in a tertiary care center, central India. Asian Journal of Medical Sciences. 2022 Aug 1;13(8).
7. Kumar V, Purushotham K. Role of Diabetes Mellitus on Sensorineural Hearing Loss in Patients Attending a Tertiary Care Health Center: A Clinical Audit of Four and a Half Years. ENT Updates. 2021 Aug 1;11(2).
8. Krishna H. Association Between Sensorineural Hearing Loss And Type Ii Diabetes Mellitus. Int J Intg Med Sci. 2020;7(3):888-91.
9. Dhasmana G, Bist SS, Kumar L, Modi S, Agarwal VK, Mittal HK. Evaluation of Hearing Status in Patients with Type 2 Diabetes Mellitus: A Cross-Sectional Observational Study. Ent Updates. 2021 Dec 1;11(3).
10. Samayan K, Kumar JS, Venkataraman P, Ambethkar S. Effect of HbA1c Level on Hearing Sensitivity Among Patients with Diabetic Mellitus. Biomedical and Pharmacology Journal. 2022 Dec 20;15(4):1873-9.