

Prevalence of Sensorineural Hearing Loss in Young Adults with Type 2 Diabetes Mellitus - An Observational Study

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Received: 28.03.26, Revised: 06.04.26, Accepted: 20.05.26, Published: 25-05-2026

ABSTRACT

Background: Sensorineural hearing loss (SNHL) is an under-recognized complication of type 2 diabetes mellitus (T2DM). Chronic hyperglycemia can lead to microangiopathy, neuropathy, and oxidative stress affecting cochlear structures. Early-onset T2DM in young adults may predispose patients to early auditory dysfunction. This study aimed to estimate the prevalence of SNHL among young adults with T2DM and evaluate associated factors including age, sex, duration of diabetes, and glycemic control.

Methods: A hospital-based observational descriptive study was conducted among 95 patients aged 18-40 years with T2DM attending the Departments of ENT and Endocrinology at Travancore Medical College, Kollam. Consecutive sampling was used. Hearing assessment was performed using pure tone audiometry, and hearing loss was classified according to WHO criteria. HbA1c values and clinical variables were recorded. Statistical analysis was performed using Chi-square test and Pearson correlation analysis.

Results: The prevalence of SNHL among young adults with T2DM was 52.6%. Mild SNHL was the most common form (72%), followed by moderate (22%) and moderately severe hearing loss (6%). Patients aged 30-40 years demonstrated significantly higher prevalence of SNHL compared to those aged 20-30 years ($p=0.001$). Duration of diabetes and poor glycemic control were significantly associated with hearing loss. A strong positive correlation was observed between HbA1c levels and degree of hearing loss ($r=0.833$). No statistically significant association was observed between gender and SNHL.

Conclusion: SNHL is highly prevalent among young adults with T2DM and is strongly associated with poor glycemic control and longer disease duration. Routine audiological screening should be considered in diabetic care protocols for early identification and intervention.

Keywords: Sensorineural Hearing Loss, Type 2 Diabetes Mellitus, HbA1c, Pure Tone Audiometry.

INTRODUCTION

Type 2 diabetes mellitus (T2DM) is one of the most prevalent metabolic disorders worldwide and constitutes nearly 90% of all diabetes cases.^[1] The incidence of T2DM among younger individuals has increased considerably in recent years because of sedentary lifestyle, obesity, dietary changes, and genetic predisposition.^[2] Early-onset diabetes is associated with prolonged disease duration and increased risk of chronic microvascular and neuropathic complications.^[3]

Sensorineural hearing loss (SNHL) has emerged as a potential but frequently overlooked

complication of diabetes mellitus.^[4] SNHL occurs due to damage to the cochlea or auditory pathways and may lead to progressive impairment in speech perception, communication, and quality of life.^[5] Several mechanisms have been proposed to explain the association between diabetes and hearing impairment, including microangiopathy of the stria vascularis, auditory neuropathy, oxidative stress, and accumulation of advanced glycation end products.^[6]

The cochlea is highly vascular and metabolically active, making it particularly susceptible to chronic hyperglycemia.^[6] Previous studies have

demonstrated elevated hearing thresholds among diabetic individuals compared to non-diabetic populations, especially at higher frequencies.^[7] However, hearing impairment among young diabetic adults remains under-recognized in routine clinical practice. Unlike retinopathy and nephropathy, audiological assessment is not routinely included in diabetic screening protocols.^[8]

Pure tone audiometry (PTA) remains the gold standard for assessment of hearing thresholds and classification of hearing impairment.^[9] Early identification of hearing dysfunction may permit timely intervention and prevent progression to disabling hearing loss. The present study was conducted to determine the prevalence of SNHL among young adults with T2DM and evaluate its association with age, sex, duration of diabetes, and glycemic control.

AIMS AND OBJECTIVES

1. To estimate the prevalence of sensorineural hearing loss among young patients with type 2 diabetes mellitus.
2. To study the relationship between age, sex, and duration of diabetes with sensorineural hearing loss.
3. To assess the correlation between HbA1c levels and degree of sensorineural hearing loss.

MATERIALS AND METHODS

This hospital-based observational descriptive study was conducted in the Departments of Otorhinolaryngology and Endocrinology, Travancore Medical College Hospital, Kollam, over a period of one year after obtaining institutional ethical committee approval.

A total of 95 patients aged between 18 and 40 years with diagnosed T2DM of more than one-year duration were included in the study. Consecutive sampling technique was used. Patients with history of middle ear disease, ear surgery, conductive hearing loss, occupational noise exposure, ototoxic drug intake, hypertension, hypothyroidism, chronic systemic illnesses, and type 1 diabetes mellitus were excluded. Detailed history taking and clinical examination were performed. Routine investigations including fasting blood sugar, postprandial blood sugar, and HbA1c values were documented from patient records. Hearing assessment was performed using pure tone audiometry (Maico MA42). Hearing thresholds were evaluated at frequencies of 250 Hz, 500 Hz, 1000 Hz, 2000 Hz, 4000 Hz, and 8000 Hz.

Hearing loss was classified according to WHO classification: normal (0–25 dB), mild (26–40 dB), moderate (41–55 dB), moderately severe (56–70 dB), severe (71–90 dB), and profound (>90 dB).

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using appropriate statistical software. Quantitative variables were expressed as mean $\pm$ standard deviation, while categorical variables were represented as frequencies and percentages. Association between categorical variables was analyzed using Chi-square test or Fisher's exact test. Correlation between HbA1c and hearing threshold was assessed using Pearson correlation coefficient. A p-value <0.05 was considered statistically significant.

RESULTS

Among the 95 study participants, 60 (63.2%) belonged to the 30–40 years age group, while 35 (36.8%) were aged 20–30 years. Females constituted 54.7% of the study population and males accounted for 45.3%. Most participants had diabetes duration between 2 and 6 years. The prevalence of sensorineural hearing loss among young adults with T2DM was 52.6% (50 patients). Mild SNHL was the predominant type observed in 72% of affected individuals, followed by moderate hearing loss in 22% and moderately severe hearing loss in 6%.

A statistically significant association was observed between age and SNHL. Patients aged 30–40 years showed significantly higher prevalence of hearing loss compared to younger participants (73.3% vs 17.1%, $p=0.001$). Duration of diabetes also demonstrated significant association with SNHL, with increased prevalence observed in patients with longer disease duration.

No significant association was observed between gender and hearing loss ($p=0.328$). However, poor glycemic control showed strong correlation with hearing impairment. Patients with elevated HbA1c values demonstrated greater degree of hearing loss. Pearson correlation analysis revealed a strong positive correlation between HbA1c levels and hearing threshold ($r=0.833$), suggesting worsening hearing function with poor glycemic control.

The majority of patients with SNHL were receiving combined oral hypoglycemic agents and insulin therapy, reflecting relatively advanced metabolic dysfunction among affected individuals.

Variable	Frequency	Percentage
Age 20–30 years	35	36.8%
Age 30–40 years	60	63.2%
Male	43	45.3%
Female	52	54.7%

Table 1: Baseline Demographic Characteristics

SNHL	Frequency	Percentage
Present	50	52.6%
Absent	45	47.4%

Table 2: Prevalence of SNHL

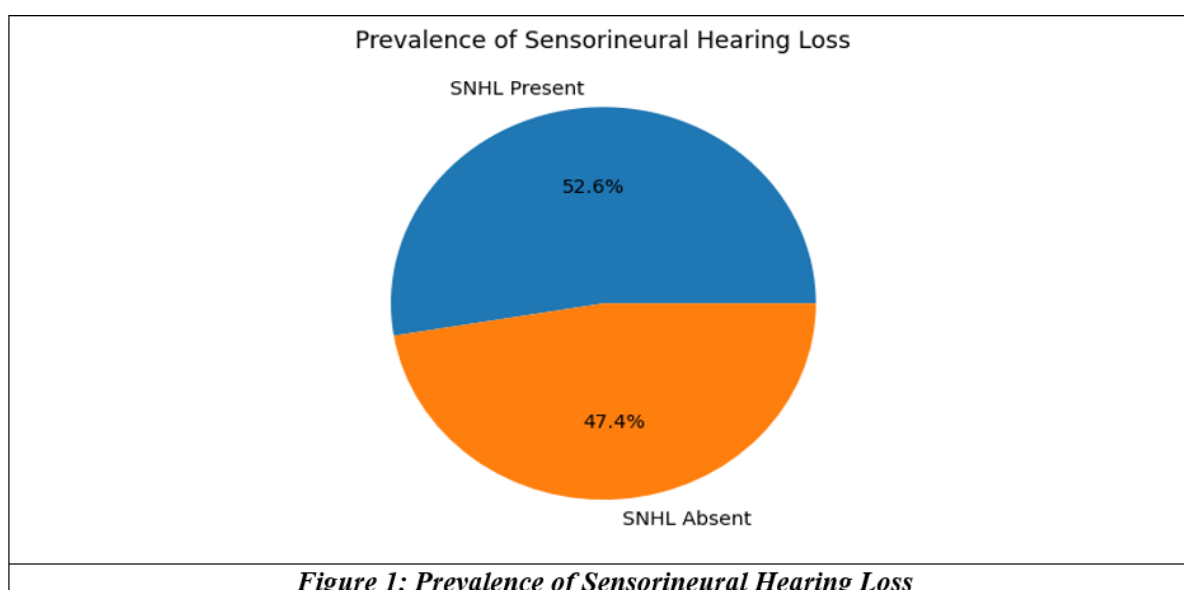


Figure 1: Prevalence of Sensorineural Hearing Loss

Degree	Frequency	Percentage
Mild	36	72%
Moderate	11	22%
Moderately Severe	3	6%

Table 3: Degree of Hearing Loss

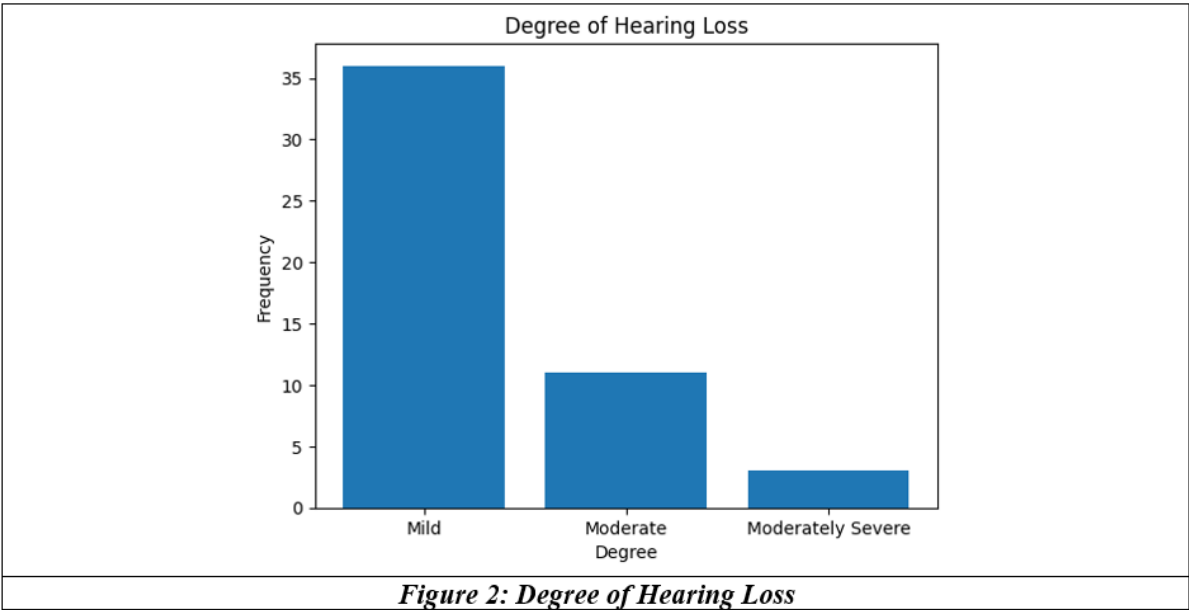


Figure 2: Degree of Hearing Loss

Age Group	SNHL Present	SNHL Absent	P Value
20–30	6	29	0.001
30–40	44	16	0.001

Table 4: Association between Age and SNHL

Gender	SNHL Present	SNHL Absent	P Value
Male	25	18	0.328
Female	25	27	0.328

Table 5: Association between Gender and SNHL

DISCUSSION

The present study demonstrated a high prevalence (52.6%) of sensorineural hearing loss among young adults with type 2 diabetes mellitus. These findings support the growing evidence that diabetes mellitus significantly affects auditory function, even among younger age groups.^[1,4]

The observed prevalence is comparable to previous studies that reported prevalence rates ranging from 21% to 70% among diabetic patients.^[4] Chronic hyperglycemia contributes to cochlear microangiopathy, auditory neuropathy, oxidative stress, and degeneration of the stria vascularis, ultimately resulting in hearing impairment.^[5,6] The present study reinforces the importance of considering hearing loss as a diabetic microvascular complication.

Age showed significant association with SNHL in the current study. Participants aged 30–40 years demonstrated substantially higher prevalence of hearing impairment compared to younger participants. Similar findings have been reported in earlier studies, suggesting that advancing age combined with prolonged

metabolic insult accelerates cochlear degeneration.^[7]

Duration of diabetes also showed significant association with hearing loss. Patients with longer duration of T2DM had greater prevalence and severity of SNHL. Persistent hyperglycemia over several years leads to cumulative vascular and neural damage affecting cochlear structures.^[3] These findings are consistent with studies demonstrating progressive elevation of hearing thresholds with increasing duration of diabetes.^[8]

The most important finding of this study was the strong positive correlation between HbA1c levels and degree of hearing loss. Poor glycemic control was associated with worsening auditory thresholds, emphasizing the importance of strict metabolic control in preventing auditory complications. Elevated HbA1c levels may reflect chronic exposure to oxidative stress and advanced glycation end products, which contribute to cochlear injury.^[6]

Gender did not show statistically significant association with hearing loss in this study. Similar observations have been reported in several previous studies, suggesting that metabolic factors may have greater influence

on cochlear dysfunction than gender-specific factors.^[4]

Most cases of hearing loss identified in this study were mild in severity. This finding highlights the importance of early screening and audiological assessment before progression to disabling hearing impairment occurs.^[9] Early detection can facilitate timely intervention, counseling, hearing conservation strategies, and rehabilitation.

Limitations of the present study include its single-center design, relatively small sample size, and absence of a non-diabetic control group. Longitudinal studies with larger populations are needed to further establish causal relationships and progression patterns.

CONCLUSION

Sensorineural hearing loss is highly prevalent among young adults with type 2 diabetes mellitus. Poor glycemic control and longer duration of diabetes were significantly associated with hearing impairment. Most patients demonstrated mild SNHL, emphasizing the importance of early detection through routine audiological screening. Incorporating hearing assessment into diabetic evaluation protocols may facilitate timely intervention and improve quality of life among diabetic patients.

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