International Journal of Otorhinolaryngology and Head and Neck Surgery
Khadhar FHG et al. Int J Otorhinolaryngol Head Neck Surg. 2025 Oct;11(5):519-522
http://www.ijorl.com
pISSN 2454-5929 | eISSN 2454-5937
DOI: https://dx.doi.org/10.18203/issn.2454-5929.ijohns20252514

Original Research Article

A study on hearing loss in population with diabetes mellitus and its correlation with HBA1C values among patients attending a tertiary care hospital in Chennai

Khadhar Farzi Hussain G.*, Ilangovan P., Prabaakharan J., Praveen R.

Department of Otorhinolaryngology, ACS Medical College and Hospital, Chennai, Tamil Nadu, India

Received: 27 July 2025
Accepted: 11 August 2025

***Correspondence:**
Dr. Khadhar Farzi Hussain G.,
E-mail: Abukhadhar01@gmail.com

ABSTRACT

Background: Individuals with diabetes have twice the incidence of hearing loss compared to non-diabetics, and those with prediabetes show a 30% higher rate of hearing loss. HbA1c serves as an essential marker of glycaemic control in diabetics and is useful in predicting the development of complications associated with diabetes mellitus. This study was undertaken to estimate the prevalence of sensorineural hearing loss (SNHL) in the diabetic population and to determine the association between HbA1c levels and the degree of hearing loss in these patients.
Methods: This hospital-based analytical cross-sectional study was conducted at ACS Medical College and Hospital. A total of 85 diabetic patients aged between 20 and 55 years were included. Data were entered and analyzed using the Statistical Package for Social Sciences (SPSS) version 21.0. The chi-square test was applied to determine the correlation between study variables. A p-value of <0.05 was considered statistically significant.
Results: The majority of participants exhibited poor glycaemic control. Profound and severe SNHL was observed in 28.2% and 16.5% of participants, respectively. Increasing age, longer duration of diabetes, and poor glycaemic control were significantly associated with SNHL.
Conclusion: Poor glycaemic control is a significant risk factor for SNHL among diabetics. Routine audiometric screening and strict glycaemic control may help prevent or delay the onset of hearing loss in this population.

Keywords: Type 2 diabetes mellitus, Sensorineural hearing loss, HbA1c, Glycaemic control, Pure tone audiometry

INTRODUCTION

World Health Organization has documented that disabling hearing loss affects 466 million people globally. They have also reported that around 463 million adults are diagnosed with diabetes they have also reported an increasing trend with increasing age. Individuals with diabetes have twice the incidence of hearing loss compared to those without diabetes and those with prediabetes have a 30% higher rate of hearing loss. Studies have shown that among the diabetics, pathologies in the insulin/glucose signaling leads to possible ear pathology resulting in hearing loss but a direct causal relationship has been difficult to prove.[1-3] Diabetes mellitus has become a dangerous public health problem over the years due to the complications like neuropathy, nephropathy and retinopathy and sensorineural hearing loss (SNHL). The study of diabetes has a paradigm shift from management to additional focus on the prevention diagnosis and management of complications associated with diabetes mellitus.[5-7]

Glycated haemoglobin (HbA1c) is an essential marker of glycaemic control among diabetics. HbA1c estimates the blood glucose concentration for the past three months and. It is also used to assess the prognostic effect of medications and lifestyle modification in addition it is also helpful in determining the prospective development of complications associated with diabetes mellitus.[8-10] The pathophysiology of hearing loss in diabetic patients may be attributed by microangiopathy, oxidative stress,

free radical damage, brain stem involvement loss of hair cells and nerve demyelination. Confounding factors such as age, hypertension and occupational noise exposure hinder in the determining the association between diabetes mellitus and hearing loss. The early diagnosis and prompt management of sensorineural hearing is effective and produce enhanced patient outcomes. Many of the impacts of hearing loss can be mitigated through early detection and interventions.[11,12]

The present study was undertaken to estimate the prevalence of sensorineural hearing loss in diabetic population and to determine association of HBA1C values and degree of hearing loss among these patients.

METHODS

The present study was a hospital based analytical cross-sectional study conducted at ACS Medical College and Hospital. The sample size was calculated to be 85 patients with diabetes (p=54.7, q=45.3, d=10.94) of age group 20-55 years. Patients above 55 years and those with existing ear pathologies were excluded to adjust for confounding effects. Information regarding socio-demographic characteristics, duration of diabetes was collected.

Glycemic control was assessed by HbA1c values and pure tone audiometry was performed to assess sensorineural hearing loss. Severity of hearing loss was classified based on the grading criteria by the World Health Organization (WHO). Patients were classified into categories namely, normal (≤25), mild (26–40 dB HL), moderate (41–60 dB HL), severe (61–80 dB HL) or profound (>80 dB HL). Informed consent was obtained from all the participants before the procedure.

Data was entered an analyzed using Statistical Package for Social Sciences (SPSS) (version 21.0) software package. Descriptive statistics was used to define the study population. Categorical and ordinal variables were expressed as frequency/percentages. Continuous variables were expressed as mean and standard deviation. Appropriate test of significance (Chi square test) was applied to the study variables to establish the relation between the study variables. A p value of less than 0.05 was considered to be statistically significant.

RESULTS

In the present study, 55.3% of the study participants were aged between 41 to 55 years followed by 31.8% aged between 31 to 40 years of age. Increasing age was significantly associated with sensorineural hearing loss in our observations. We also observed an increased male predominance in our study; however, this was not significantly associated with sensorineural hearing loss among the study participants.

It is observed that patients with duration of diabetes more than 10 years constituted 37.7% of the study participants, while patients with diabetes for less than 5 years and those with diabetes for 5 to 10 years constituted 28.2 and 34.1% of the study participants respectively. The increased duration of diabetes was significantly associated with sensorineural hearing loss.

The glycaemic control was good in 25.9% of the patients, while it was sub-optimal and poor in 37.7% and 36.4% of the study participants respectively.

In the current study profound and severe sensorineural hearing loss was observed in 28.2% and 16.5% of the study participants respectively. Mild and moderate hearing loss was noted in 21.2% and 23.5 % of the patients respectively. The patients with normal hearing constituted 10.6% of the diabetic patients in the current study. We observed that sensorineural hearing loss was significantly higher among patients with poor glycaemic control.

Table 1: Socio-demographic characteristics of the study participants (n=85).

Characteristics	Frequency (%)
Age (in years)	
21-30	11 (12.9)
31-40	27 (31.8)
41-55	47 (55.3)
Sex	
Male	52 (61.2)
Female	33 (38.2)

Table 2: Diabetic profile and hearing loss among the study participants (n= 85).

Characteristics	Frequency (%)
Duration of diabetes (in years)	
<5	24 (28.2)
5-10	29 (34.1)
>10	32 (37.7)

Continued.

Characteristics	Frequency (%)
Glycaemic control	
<7	22 (25.9)
7–8.9	32 (37.7)
≥9	31 (36.4)
Severity of sensorineural hearing loss	
Normal	9 (10.6)
Mild	18 (21.2)
Moderate	20 (23.5)
Severe	14 (16.5)
Profound	24 (28.2)

Table 3: Correlation between Sensorineural Hearing Loss and various study variables (n= 85).

	Frequency	Sensorineural hearing loss					P value*
	n=85	Normal n=9	Mild n=18	Moderate n=20	Severe n=14	Profound n=24	
Age (in years)							
21-30	11	8	3	0	0	0	0.0001*
31-40	27	1	13	13	0	0	
41-55	47	0	2	7	14	24	
Sex							
Male	52	6	12	13	10	11	0.48
Female	33	3	6	7	4	13	
Duration of diabetes (in years)							
<5	24	9	15	0	0	0	0.0001*
5-10	29	0	3	14	4	8	
>10	32	0	0	6	10	16	
Glycaemic control							
Good	22	7	12	3	0	0	0.0001*
Sub optimal	32	2	6	12	6	6	
Poor	31	0	0	5	8	18	

*p value of less than 0.05 was considered to be statistically significant.

DISCUSSION

Diabetic patients are at increased risk of hearing impairment, although they may frequently have other confounding comorbidities. The present study was undertaken to assess the association between HbA1c levels, duration of diabetes on the development of sensorineural hearing loss. In the present study, we excluded patients aged more than 55 years to remove the confounding effect of age-related hearing loss. We observed that 55.3% of the study participants were aged between 41 to 55 years with male predominance. International studies conducted by Cullen et al, Al-Rubeaan et al have also reported similar findings.[13,14] based on the findings from Pemmaiah et al and Fathima et al it is documented that increasing age was a risk factor for developing sensorineural hearing loss, similar to the observations from this study.[15,16]

In this study it is observed that patients with duration of diabetes more than 10 years constituted 37.7% of the study participants, The increased duration of diabetes was significantly associated with sensorineural hearing loss. The decrease in SNHL in our study can be attributed to the age limit among our study participants. Fathima et al, Lin et al and Gupta et al.[16-18] in their study had reported that patients with long standing diabetes were more prone to develop sensorineural hearing loss, similar to the findings from our study are consistent with the observations from the forementioned studies. The association between increased duration of diabetes and increased severity of hearing loss can be attributed to microvascular damage in the cochlea.

The findings showed that the glycaemic control in majority of the patients was suboptimal to poor. We also observed that profound and severe sensorineural hearing loss was observed in 28.2% and 16.5% of the study participants respectively. The incidence of sensorineural hearing loss was significantly higher among patients with poor glycaemic control. Pemmiah et al have stated that hyperglycaemia could adversely affect cochlear structures responsible for high-frequency hearing.[15] Kaur et al have reported that the incidence of SNHL was higher among diabetic patients as compared to non-diabetics.[19] They have also documented that the severity of hearing loss depended on the duration of diabetes and increased HbA1c levels suggesting that microangiopathy could be a

contributing factor in the development of hearing loss. Vybhavi et al, also observed that the prevalence of SNHL was higher among diabetics with poor glycaemic control and longer duration of diabetes.[20]

The present study was a single centre study undertaken with a small sample size; hence generalizability might be difficult.

CONCLUSION

In the present study we observed a significant correlation between Hba1c levels and degree of SNHL among the diabetic patients. Poor glycaemic control appears to be a significant risk factor for the development of hearing loss among diabetic patients. Early detection and prompt management of diabetes with strict glycaemic control could be a protective factor against development of SNHL. Audiometry should be included in the routine screening for diabetic patients.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Samocha-Bonet D, Wu B, Ryugo DK. Diabetes mellitus and hearing loss: a review. Age Res Rev. 2021;71:101423.
2. Smith TL, Raynor E, Prazma J, Buenting JE, Pillsbury HC. Insulin dependent diabetic microangiopathy in the inner ear. Laryngoscope. 1995;105:236–40.
3. Roglic G. WHO Global report on diabetes: A summary. Int J Noncomm Dis. 2016;1;13(1):3-8.
4. Mohan V, Sandeep S, Deepa R, Shah B, Varghese C. Epidemiology of type 2 diabetes: Indian scenario. Indian J Med Res. 2007;125(3):217–30.
5. Deshpande AD, Harris-Hayes M, Schootman M. Epidemiology of diabetes and diabetes-related complications. Physical Therapy. 2008;88(11):1254-64.
6. Tripathi BK, Srivastava AK. Diabetes mellitus: complications and therapeutics. Med Sci Monit. 2006;12(7):130-47.
7. Harding JL, Pavkov ME, Magliano DJ, Shaw JE, Gregg EW. Global trends in diabetes complications: a review of current evidence. Diabetologia. 2019;62:3-16.
8. Sherwani SI, Khan HA, Ekhzaimy A, Masood A, Sakharkar MK. Significance of HbA1c test in diagnosis and prognosis of diabetic patients. Biomarker Insights. 2016;11:95–104
9. Schnell O, Crocker JB, Weng J. Impact of HbA1c testing at point of care on diabetes management. J Diabetes Sci Technol. 2017;11(3):611–7.
10. Kishnani N, Satyam, Rathore VS. A Clinical Study to Evaluate the Association of Hba1c Titres in Type 2 Diabetes Mellitus and Severity of Sensorineural Hearing Loss. J Popul Therap Clin Pharmacol. 2025; 32(5):1477-83.
11. Kakarlapudi V, Sawyer R, Staecker H. The effect of diabetes on sensorineural hearing loss. Otol Neurotol. 2003;24(3):382-6.
12. Maia CA, Campos CA. Diabetes mellitus as etiological factor of hearing loss. Braz J Otorhinolaryngol. 2005;71:208-14.
13. Cullen JR, Cinnamond MJ. Hearing loss in diabetics. J Laryngol Otol. 1993;107(3):179-82.
14. Al-Rubeaan K, AlMomani M, AlGethami AK, Darandari J, Alsalhi A, AlNaqeeb D, et al. Hearing loss among patients with type 2 diabetes mellitus: a cross-sectional study. Ann Saudi Med. 2021;41(3):171-8.
15. Pemmaiah KD, Srinivas DR. Hearing loss in Diabetes Mellitus. Int J Coll Res Internal Med Pub Health. 2011; 3(10):725-31.
16. Fathima, Lenka SR, Sridevi K, Lenka S. A Study on Hearing Loss Among Diabetic Patients. Int J Med Pub Health. 2024;14(2):502-5.
17. Lin Chung Er Bi Yan HouTou Jing Waikezazhi Auditory brainstem response and distortion product otoacoustic emission have been used in the clinical detection of hearing loss in diabetic patients. Int J Med Pub Health. 2007;21(19):875-9.
18. Gupta S, Eavey RD, Wang M, Curhan SG, Curhan GC. Type 2 diabetes and the risk of incident hearing loss. Diabetologia. 2019;62(2):281-5.
19. Kaur G, Srivastava SP. Effect of Diabetes Mellitus on Hearing. 2019;4(1):24–9.
20. Vybhavi MK, Srinivas V, Muddaiah D. A cross-sectional study of prevalence and association of sensorineural hearing loss in patients with type 2 diabetes mellitus. Int J Otorhinolaryngol Head Neck Surg. 2024;10(2):57.

Cite this article as: Khadhar FHG, Ilangovan P, Prabaakharan J, Praveen R. A study on hearing loss in population with diabetes mellitus and its correlation with HBA1C values among patients attending a tertiary care hospital in Chennai. Int J Otorhinolaryngol Head Neck Surg 2025;11:519-22.