

# ASSOCIATION BETWEEN SENSORINEURAL HEARING LOSS AND TYPE II DIABETES MELLITUS

Hari Krishna \*.

\*Associate professor in the department of ENT, Viswabharthi Medical College, Kurnool, Andhra Pradesh, India.

## ABSTRACT

**Introduction:** sensorineural hearing loss is usually common in diabetics. Microangiopathy and neuropathy are the main attributed caused for sensorineural hearing loss.

**Objectives:** planned to study the prevalence of sensorineural hearing loss(SNHL) among Type II DM patients and to study the association between age, duration of DM and HbA1C levels with SNHL in India.

**Methodology:** A cross-sectional study was done on 256 type II Diabetic patients who attended medicine OP. sensorineural hearing loss was measured using Pure tone audiometry and were classified according to WHO classification.

**Results:** 45.7% were males and 54.3 % were females. 88.7% had bilateral SNHL. 17 % had severe degree of SNHL. The prevalence of SNHL increased with advancement of age, increased duration of DM and poor glycaemic control.

**Conclusion:** There is a strong association between diabetes and SNHL. Hence proper glyceemic control in diabetics must be ensured to prevent from complications.

**KEY WORDS:** Diabetes Mellitus, Glycaemic, Hearing loss, and Sensorineural.

**Address for correspondence:** Dr. Hari Krishna, Associate professor in the department of ENT, Viswabharthi medical college, Kurnool, Andhra Pradesh, India – 518467.

**E-Mail:** [belagantiharireddy@gmail.com](mailto:belagantiharireddy@gmail.com)

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## INTRODUCTION

Diabetes mellitus (DM) is a disease caused due to a disorder in the endocrine pancreas, which, when not controlled causes numerous complications in multiple systems. One of the known complications is hearing loss which leads to decreased quality of life [1]. Hearing loss in DM is usually Bilateral and sensorineural [2]. According to the WHO reports, the prevalence of DM has nearly doubled in developed countries and the prevalence is increasing in middle and low income countries. The prevalence of hearing loss is alarming and it is expected to double by 2050. WHO also states that around 60% of

the hearing losses are due to preventable causes [3,4]. The suggested reason for sensorineural hearing loss(SNHL) in diabetes is diabetic angiopathy. Diffuse thickening of basal membranes of the vascular endothelium is the common pathogenesis in angiopathy which interferes with the cochlear blood supply thereby reducing nutrient transport which indirectly reduces blood flow in narrowed blood vessels causing secondary degeneration of eighth cranial nerve [5-7]. On the contrary, there are authors who report the possibility of early sensorineural loss due to multiple other factors and not due to DM [8-12].

Hence this study was planned to study the prevalence of sensorineural hearing loss (SNHL) among Type II DM patients and to study the association between age, duration of DM and HbA1C levels with SNHL in India.

**MATHODOLOGY**

256 known type II DM patients who attended the medicine OPD for regular diabetic consultation between October 2016 and October 2019 were included in the study after explaining about the study and getting prior informed consent. The patients who consented to participate were requested to attend ENT OPD at a particular time and date of their convenience and hearing loss was assessed.

**Inclusion criteria:**

1. Type II DM on oral hypoglycemic agents
2. Patients between 31-70 years of age
3. No other systemic illness (hypertension, Coronary heart disease, Thyroid disorder, renal failure, etc.,)
4. Tympanic Membrane intact on both sides.

**Exclusion criteria:**

1. Family history of deafness,
2. History of chronic suppurative otitis media (CSOM), meningitis, head or ear trauma,
3. History of chicken pox, smallpox, malaria, jaundice, typhoid.
4. History of ear surgeries performed in the past, and

5. History of ototoxic drug intake, chronic smoking, alcohol, radiotherapy, autoimmune diseases, and systemic diseases such as hypertension, cardiac diseases and renal failure and occupational noise exposure.

Threshold determination is done for both air and bone conduction using pure tone audiogram (PTA). The random, fasting and postprandial blood glucose levels, and hemoglobin A1C were estimated to find the glycemic status and serum urea and creatinine levels to rule out diabetic nephropathy. To assess the degree of hearing loss, WHO classification (1980) on the basis of PTA taking the average of the thresholds of hearing for frequencies of 500, 1000, and 2000 is used. Degree of hearing loss – mild: 26–40 dB, moderate: 41–55 dB, moderately severe: 56–70 dB, severe: 71–90 dB, and profound: more than 90 dB.

**RESULTS**

Of the 256 patients 45.7% were males and 54.3% were females. 227(88.7%) had bilateral SNHL. Majority of diabetics are in the age group of 40-60 years (Around 61%). Around 27% in 31-50 years of age have SNHL, while it is around 44% in 51-60 years of age and it increases to around 72% at 61-70 years of age (Table 1). Thus the prevalence of SNHL within each age group increases as the age group increases and the results are statistically significant.

**Table 1:** Association between age and prevalence of Sensorineural hearing loss.

Age group	Diabetics		Diabetics with SNHL		Chi-square value	P-Value	Prevalence within the age group
	Frequency	%	Frequency	%			
31-40	45	17.58	12	11.33	27.12	<0.05	26.67
41-50	78	30.47	21	19.81			26.92
51-60	80	31.25	35	33.01			43.75
61-70	53	20.7	38	35.85			71.7
<b>Total</b>	<b>256</b>	<b>100</b>	<b>106</b>	<b>100</b>			<b>41.4</b>

**Table 2:** Distribution of Study Population according to the degree of SNHL.

Degree of SNHL	Frequency	Percentage
<b>Mild</b>	51	48.12
<b>Moderate</b>	31	29.24
<b>Moderately severe</b>	6	5.66
<b>Severe</b>	18	16.98
<b>Total</b>	<b>106</b>	<b>100</b>

Around 48% of study population had mild degree of SNHL while around 29% had moderate degree of SNHL while only 17% had severe degree of SNHL. (Table 2) complications.

As shown in table 3, around 32.5% of study population had diabetes within 2-5 years while another 28.5% had diabetes within 2 years. Around 21.5% were diabetics for 5-10 years. Around 21.5% of study population had diabetes for more

than 10 years. 20.5 % of study population who had DM for less than two years had SNHL. The prevalence increased to 25%, 68.8%, and 70.9% respectively for those who had diabetic duration between 2-5 years, 5 – 10 years and more than 10 years. The prevalence of SNHL increases with increase in duration of diabetics and the results are statistically significant

**Table 3:** Association between Diabetic Duration and prevalence of Sensorineural hearing loss.

Duration of DM	Diabetics		Diabetics with SNHL		Chi-square value	P Value	Prevalance within the duration
	Frequency	%	Frequency	%			
<2 years	73	28.52	15	14.15	55.7	P<0.00001	20.55
2-5 years	83	32.43	21	19.82			25.3
5-10 years	45	17.57	31	29.24			68.8
>10 years	55	21.48	39	36.79			70.9

**Table 4:** Association between HbA1C and Sensorineural hearing loss in diabetics.

HbA1c Levels	Diabetics		Diabetics with SNHL		Chi-square value	P Value	Prevalance within the duration
	Frequency	%	Frequency	%			
< 7	107	41.8	19	17.93	72.357	P<0.00001	17.76
07 - 08	94	36.72	39	36.79			41.19
>8	55	21.48	48	45.28			87.27

As shown in table 4, only 41 % of the study population who had DM were under control. While all others were not under optimal control. The prevalence of DM was only 17.76% in those who were under control while it was around 41% in those who had HbA1C levels between 7-8 and it was 87.27% in those who had HbA1C more than 8.

**DISCUSSION**

This cross-sectional study was carried out to study the prevalence of sensorineural hearing loss(SNHL) among Type II DM patients and to study the association between age, duration of DM and HbA1C levels with SNHL in India.

The prevalence of SNHL in diabetics is 41.4%. In a study done by Kavitha and Saima [13] in Jabalpur the prevalence of SNHL was 33.7%. Higher prevalence was reported by Swati et al in Gujarat(73%), Anirudh and Ramesh [2] and shafee et at [15] in Karnataka(62.5%).

Around 88.7 % had bilateral hearing loss. Since microangiopathy is usually generalized and affects bilateral cochlea, the hearing loss due to this cause is also bilateral. In a study done by mozoffari et al [1] bilateral hearing loss is around 67%.

The prevalence of SNHL within each age group increases as the age group increases and the results are statistically significant. Similar results were observed in many other studies [2,14-18]. The prevalence of SNHL increases with increase in duration of diabetics and the results are statistically significant. Similar results were obtained in many other studies [1,2,13,15,17-20].

Few studies have observed no relation between duration and SNHL [14, 16,21-24].

The prevalence of SNHL was higher in those who did not have control over diabetes. Similar results were observed by Anirudh and Ramesh [2], Shafee et al [15] and Pemmiah and Srinivas [20].

The two mechanisms by which hearing loss occurs in diabetes are diabetic angiopathy and neuropathy. Microangiopathy due to hyperglycemia affects the highly vascular cochlea along with hypoxia to nerve fibres, resulting in loss of nerve fibres and demyelination. Angiopathy along with vascular thickening results in accumulation of toxins in the endolymph causing hair cell dysfunction. Neuropathy is a result of secondary degeneration of vestibule cochlear nerve due to endothelial proliferation and accumulation of glycoproteins in the capillary basement membranes. As these changes are detrimental over time and glucose levels, the duration of diabetes and glycemic control are influential in determining degree and pattern of hearing loss [15,16,21].

**CONCLUSION**

There is a strong association between diabetes and SNHL. The higher the age, the longer the

duration of DM and more poor glycemic control are contributing factors for the increased prevalence. Though the pathogenesis of SNHL in diabetes is not so clear, the role of DM in SNHL is clear. Hence proper glycemic control in diabetics must be ensured to prevention.

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