

Assessing Prevalence of SNHL in Type 2 Diabetes Patients and to Find the Effect of Duration and Control of Diabetes on Hearing Loss.Priyanshu Shekhar¹, Namira Azmi², Shudhanshu Shekhar Prasad³, Satyendra Sharma⁴¹Senior Resident, Department of ENT, Nalanda Medical College and Hospital, Patna, Bihar, India²Senior Resident, Department of ENT, Nalanda Medical College and Hospital, Patna, Bihar, India³Assistant Professor, Department of ENT, Nalanda Medical College and Hospital, Patna, Bihar, India⁴Professor and HOD, Department of ENT, Nalanda Medical College and Hospital, Patna, Bihar, India

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Conflict of interest: Nil

Abstract**Aim:** The aim of the present study was to find the prevalence of SNHL in type 2 diabetes patients and to find the effect of duration and control of diabetes on hearing loss.**Methods:** The present analytical cross-sectional study was conducted in Department of ENT for period of two years. The present study was conducted on 100 type 2 diabetes patients and age and gender matched 100 non-diabetic controls in the age group of <50 years.**Results:** In the present study, 65% were females and 35% were male. The mean age of patients was 43.17, mean fasting blood sugar was 131.49±28.52, mean PP blood sugar was 170.20±40.25 and mean HbA1c was 7.43±0.49. Mean age of patients was 36.54, mean fasting blood sugar was 109.01±3.14, mean post-prandial blood sugar was 124.56±9.81 and mean HbA1c was 6.006±0.222. The result showed that only 26 patients had normal hearing and 74 patients had SNHL whereas 14 patients in this group had minimal hearing, 20 had mild SNHL, 48 had moderate, 5 had severe SNHL and 13 patients had profound SNHL. 70 patients had DPOAE refer whereas 30 patients had DPOAE pass. Wave V grossly delayed in DM group as compared to non-DM with all frequencies (i.e. 70, 80 and 90) whereas interpeak latencies of wave I-V at 70 db frequency is almost equal in DM and non-DM group but it increase with increase in frequencies (i.e. 80 and 90 db).**Conclusion:** This study concluded that the diabetics are at definite risk of developing auditory dysfunction, therefore it is recommended that all newly diagnosed diabetic patients should undergo a complete audiological evaluation at the time of diagnosis and a regular half yearly or yearly follow up is warranted for early detection of damage to auditory functions. Although factors other than diabetes contribute to hearing loss, early glycemic control for type 2 diabetic patients may reduce the incidence rate of this disease.**Keywords:** Sensorineural hearing loss, Diabetes mellitus

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Introduction

Diabetes mellitus is a metabolic disorder due to relative or absolute lack of insulin resulting in elevated blood glucose levels associated with long term vascular and neurological complications. [1] WHO factsheet on Diabetes states that the number of people with diabetes has risen from 108 million in 1980 to 422 million in 2014 and the global prevalence of diabetes among adults over 18 years of age has risen from 4.7% in 1980 to 8.5% in 2014 and its prevalence has been rising more rapidly in middle and low-income countries. [2] Over 5% of the world's population that is 466 million people have disabling hearing loss and 432 million of these are adults. [3]

Hearing loss in severity may vary from being mild degree to severe and profound degree and in general it is of Conductive, sensorineural or mixed type. Diabetes mellitus has been implicated as independent causative factor of sensorineural hearing loss (SNHL). [4] Hearing loss in diabetics is described as progressive, bilateral sensorineural type usually affecting the higher frequencies. [5,6] Though there were incidences where authors have reported the possibility of having early onset sensorineural loss, hearing loss in low and medium frequencies and the occurrence of unilateral sudden hearing loss. [7-9]

In addition to the cardiovascular outcomes and the long-term damage to the kidneys, eyes, and nervous system caused by diabetes [10], this disease was also associated with alterations in hearing function in a meta-analysis of 18 clinical and epidemiological studies. [11] The pathological support to this association may be related to an increase in capillary lesions in the cochlea, more specifically in the stria vascularis and basilar membrane. Other studies have also reported a reduction in the number of spiral ganglion neurons. These differences could be related to the duration of diabetes and to comorbidities that could affect the inner ear. [12] The biggest difficulty in investigating the association between diabetes and HL is the presence of confounding variables and the complexity of the auditory system. [13,14]

More than 43% of diabetes patients are likely to have some degree of hearing impairment related or unrelated to chronic hyperglycemia. [15] There is a requirement for further studies for the exploration of the relationship between diabetes and hearing abnormalities. The presence of hearing defects among diabetes patients could be related to hyperglycemia or other associated conditions like decreased immunity that may predispose one to ear infections involving the external, middle, or internal ear. [16]

The aim of the present study was to find the prevalence of SNHL in type 2 diabetes patients and to find the effect of duration and control of diabetes on hearing loss.

Materials and Methods

The present analytical cross sectional study was conducted in Department of ENT, Nalanda Medical College and Hospital, Patna, Bihar, India for period of two years. The present study was conducted on 100 type 2 diabetes patients and age and gender

matched 100 non-diabetic controls in the age group of <50 years.

Study group included patients who were diagnosed as type 2 DM attending diabetic clinic in Endocrinology OPD while the control group comprised of age and sex matched non-DM individuals. Both groups were subjected to thorough audiological evaluation.

Inclusion Criteria

Inclusion criteria for current study were; biochemically proven hyperglycemic patients, age less than or equal to 50 years of both genders.

Exclusion Criteria

Exclusion criteria for current study were; patients with any other systemic illness or metabolic disorder, gestational, patients on ototoxic drugs or any ear surgery done/occupational exposure to noise, noise induced hearing loss, patients with CSOM and CHL and patients with congenital SNHL.

The present study was a comparative study with population of 100 diagnosed patients of diabetes mellitus and control group consists of 100 non-DM patients. All these individuals were evaluated with a detailed clinical examination and appropriate investigation. All these individuals were evaluated with a detailed clinical examination and appropriate investigation, such as PTA, BERA and DPOAE.

Statistical Analysis

Data was entered in Microsoft Excel Spreadsheet. Continuous variables were summarised as mean and standard deviation (SD). Categorical variables were summarised as frequency and percentage. The reported p values were based on analysis, in which $p < 0.5$ was considered significant.

Results

Table 1: Demographic details

Gender	N	%
Male	35	35
Female	65	65
Total	100	100
Parameters	Diabetic group	Non-diabetic group
Mean age (years)	43.17 ±6.34	36.54±8.52
Mean fasting blood sugar	131.49±28.52 (Range 81-253)	109.01±3.14 (Range 100-118)
Mean post prandial blood sugar	170.20±40.25 (Range 107-346)	124.56±9.81 (Range 108-148)
Mean HbA1c	7.43±0.49 (Range 5.4-9.6)	6.006±0.222 (Range 5.3-6.5)

In the present study, 65% were females and 35% were male. The mean age of patients was 43.17, mean fasting blood sugar was 131.49±28.52, mean PP blood sugar was 170.20±40.25 and mean HbA1c was 7.43±0.49. Mean age of patients was 36.54, mean fasting blood sugar was 109.01±3.14, mean post-prandial blood sugar was 124.56±9.81 and mean HbA1c was 6.006±0.222.

Table 2: Grade of hearing loss in study participants

PTA	N	%
Normal	26	26
Minimal SNHL	14	14
Mild SNHL	20	20
Moderate SNHL	22	22
Severe SNHL	5	5
Profound SNHL	13	13
Total	100	100

The result showed that only 26 patients had normal hearing and 74 patients had SNHL whereas 14 patients in this group had minimal hearing, 20 had mild SNHL, 48 had moderate, 5 had severe SNHL and 13 patients had profound SNHL.

Table 3: Distribution of study patients according to DPOAE

DPOAE	N	%
Refer	70	70
Pass	30	30
Total	100	100

70 patients had DPOAE refer whereas 30 patients had DPOAE pass.

Table 4: Comparative BERA results of diabetic and non-diabetic groups

Wave latencies	Intensity (dBnHL)	Non-diabetic group Mean±S.D.	Diabetic group Mean±S.D. (ms)	P value
V	70	6.04±0.20	6.36±1.50	<0.001
I-V	70	3.20±0.04	3.70±0.24	<0.001
V	80	5.55±0.25	6.50±1.36	0.003
I-V	80	4.16±0.12	4.48±0.40	0.030
V	90	5.35±0.20	6.46±1.48	<0.001
I-V	90	4.76±0.21	5.55±0.60	<0.001

Wave V grossly delayed in DM group as compared to non-DM with all frequencies (i.e. 70, 80 and 90) whereas interpeak latencies of wave I-V at 70 db frequency is almost equal in DM and non-DM group but it increase with increase in frequencies (i.e. 80 and 90 db).

Discussion

Type 2 diabetes mellitus (DM) is a syndrome of chronic hyperglycemia due to relative deficiency of insulin, resistance to insulin or both. [17] Type 2 diabetes mellitus occur as a result of obesity and lack of exercise. [18] Some people are genetically more prone to diabetes. [19] Globally as of 2015, it was estimated that there were 392 million people with type 2 diabetes making up about 90% of diabetes cases. [20,21] This is equivalent to about 6% of the world's population. [21] The aim of the present study was to find the prevalence of SNHL in type 2 diabetes patients and to find the effect of duration and control of diabetes on hearing loss.

In the present study, 68% were females and 32% were male. The mean age of patients was 44.16. Study by Ashish et al conducted on diabetic patients consisting of similar age group between 18-50 years of age. [22] It was found in their study that majority

of them had minimal hearing loss followed by mild hearing loss. 30% of patients had normal hearing in both ears. Rajendran et al conducted a similar study in the age group 40-50 years and found that number of people affected with SNHL among the diabetes is 73.3% when compared to that of controls. [23] The mean fasting blood sugar was 130.60±28.62, mean PP blood sugar was 172.18±42.28 and mean HbA1c was 7.40±0.45. Mean age of patients was 36.60, mean fasting blood sugar was 108.02±3.16, mean post-prandial blood sugar was 126.54±9.99 and mean HbA1c was 6.004±0.220. The result showed that only 50 patients had normal hearing and 150 patients had SNHL whereas 32 patients in this group had minimal hearing, 38 had mild SNHL, 48 had moderate, 12 had severe SNHL and 20 patients had profound SNHL. This study corresponds to the study conducted by Ashish et al who had similar results as of ours study. In his study he found only 30% of patients had normal hearing and 70% had SNHL. [22-24] Sunkun et al conducted a similar study on DM patients and found in his study that 82% had SNHL.18 Rajendran S et al²² conducted a similar study on DM patients and in his results 73.3% of DM patients had SNHL as compared to 6.7% of that of non-DM patients. Dadhich conducted a similar

study and it was found in this study that 73 % patients had SNHL. [25] Tiwari conducted a similar study and he also found 76.8% patients of DM had SNHL. [26]

Wave V grossly delayed in DM group as compared to non-DM with all frequencies (i.e. 70, 80 and 90) whereas interpeak latencies of wave I-V at 70 db frequency is almost equal in DM and non-DM group but it increase with increase in frequencies (i.e. 80 and 90 db). It was found in present study that that latency of wave V was grossly delayed at all frequencies whereas interpeak latencies of wave I-V was almost normal at 70 db frequency but it increase with increase in frequencies (i.e. at 80 and 90 db). This study corresponds to study done by Joshi et al who found that absolute latencies of BERA were significantly delayed in for waves II and V and significantly delay was notice in interpeak latencies (IPL) of wave I to III and wave I to V. [27] Chhaya et al found that there was significant difference for BERA abnormalities (for 70, 80 and 90 db) in study group when compared to controls. [28] Siddarth et al done a study on topic, brainstem auditory response in type 2 DM. [29,30]

Conclusion

This study found that diabetics are at risk of auditory dysfunction, so all newly diagnosed diabetics should have a comprehensive audiological evaluation and a half-yearly or annual follow-up to detect auditory damage. Hearing loss may be caused by several things, however type 2 diabetics who regulate their blood sugar early may have a lesser chance. Comorbidities must be considered while creating hearing loss prevention strategies. It includes hyperlipidemia and hypertension. Healthcare providers should be aware of hearing loss as a common diabetes complication. Hearing acuity screening should be routinely performed and included in diabetes screening to avoid the serious consequences of this often-overlooked medical condition.

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