

Assessing Prevalence of SNHL in Type 2 Diabetes Patients and to find the Effect of Duration and Control of Diabetes on Hearing Loss: An Analytical Cross-Sectional Study

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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, Gauri Devi Institute of medical Sciences and Hospital, Durgapur, West Bengal, India for period of one year after obtaining the ethical clearance from the Institutional Ethical Committee. 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: The findings of this study indicate that individuals with diabetes are at a significant risk of experiencing auditory dysfunction. As a result, it is strongly advised that individuals who are newly diagnosed with diabetes undergo a comprehensive audiological assessment upon diagnosis. Additionally, regular follow-up evaluations every six months to one year are recommended in order to promptly identify any impairment to auditory functions. While it is acknowledged that hearing loss may be influenced by other variables apart from diabetes, maintaining optimal glycemic control in individuals with type 2 diabetes may potentially decrease the likelihood of developing this condition.

Keywords: Sensorineural Hearing Loss, Diabetes Mellitus.

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Introduction

Diabetic neuropathy, which affects the eighth cranial nerve directly or at the cochlear level, may present with variable degrees of hearing loss, while chronic infections like malignant otitis externa that affect the external ear are usually observed among diabetes patients and usually are associated with structural damage.[1] Sufficient data support that hearing loss is one of the commonly occurring diseases in diabetes patients that could affect quality of life and lead to hearing disabilities and psychological depression.[2] Some studies have found positive correlations between hearing loss and diabetes duration or the degree of metabolic control. Although the findings of studies focusing on the relationship between hearing acuity and the degree

of hyperglycemia by diabetes type are conflicting,[3] several risk factors have been identified as being associated with hearing loss in diabetes patients.[4]

In addition to the cardiovascular outcomes and the longterm damage to the kidneys, eyes, and nervous system caused by diabetes[5], this disease was also associated with alterations in hearing function in a meta-analysis of 18 clinical and epidemiological studies.[6] 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.[7] The biggest difficulty in investigating the association between diabetes and HL is the presence of confounding variables and the complexity of the auditory system.[8,9]

More than 43% of diabetes patients are likely to have some degree of hearing impairment related or unrelated to chronic hyperglycemia.[10] 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.[11]

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, Gauri Devi Institute of medical Sciences and Hospital, Durgapur, West Bengal, India for period of one year. after obtaining the ethical clearance from the Institutional Ethical Committee. 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.

Result

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.[12] Type 2 diabetes mellitus occur as a result of obesity and lack of exercise.[13] Some people are genetically more prone to diabetes.[18] Globally as of 2015, it was estimated that there were 392 million people with type 2 diabetes making up about 90% of diabetes cases.[14,15] This is equivalent to about 6% of the world's population.[20] 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, 65% were females and 35% were male. The mean age of patients was 43.17. Study by Ashish et al conducted on diabetic patients consisting of similar age group between 18-50 years of age.[16] 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.[17] The 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.

Sunkun et al conducted a similar study on DM patients and found in his study that 82% had SNHL.[18] Rajendran S et al[17] 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.[19] Tiwari conducted a similar study and he also found 76.8% patients of DM had SNHL.[20] 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 increased 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.[21] Batham C et al found that there was significant difference for BERA abnormalities (for 70, 80 and 90 db) in study group when compared to controls.[22] Suresh S et al done a study on topic, brainstem auditory response in type 2 DM.[23]

Conclusion

The findings of this study indicate that individuals with diabetes are at a significant risk of experiencing auditory dysfunction. As a result, it is advised that

individuals who are newly diagnosed with diabetes undergo a comprehensive audiological assessment upon diagnosis. Additionally, it is recommended that these individuals receive regular follow-up evaluations every six months to one year in order to promptly identify any impairment to auditory functions. While it is acknowledged that hearing loss may be influenced by other variables apart from diabetes, there is evidence to suggest that maintaining optimal glycemic control in those with type 2 diabetes might potentially lower the likelihood of developing this condition. In the development of solutions aimed at mitigating the risk of hearing loss, it is important to take into account other comorbidities such as hypertension and hyperlipidemia. It is essential to enhance healthcare practitioners' understanding of the prevalence of hearing loss as a frequently co-occurring condition in individuals with diabetes. The inclusion of hearing acuity screening as a regular component of diabetes patient screening is essential to mitigate the severe ramifications associated with this often-disregarded medical ailment.

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