

**ORIGINAL RESEARCH****Sensorineural hearing loss among diabetic patients****Preeti Sharma<sup>1</sup>, Neha Sharma<sup>2</sup>, Seerat Bashir<sup>3</sup>, Rimjhim Sharma<sup>4</sup>, Shweta Purbi<sup>5</sup>, Parneet Singh<sup>6</sup>**<sup>1</sup>Senior Resident, Department of ENT, NRCIMS, Meerut, U.P., India<sup>2</sup>Senior Resident, Department of ENT, GMC Jammu, J & K, India<sup>3</sup>Senior Resident, Department of ENT, GS Medical College & Hospital, Hapur, Uttar Pradesh, India<sup>4</sup>Senior Resident, Department of ENT, GMC Rajouri<sup>5</sup>Senior Resident, Department of ENT, VCSG Medical College, Garhwal, India<sup>6</sup>Senior Resident, Department of Nuclear Medicine, AIIMS Bhuvneshwar, India**Corresponding author:** Dr. Seerat Bashir, Senior Resident, Department of ENT, GS Medical College & Hospital, Hapur, Uttar Pradesh, India**Abstract****Background:** To evaluate sensorineural hearing loss among diabetic subjects.**Materials & methods:** A total of 20 cases with diabetes were enrolled. 20 control groups were included. The age of subjects was between 20- 60 years. Complete history was taken and ENT examination was done. Laboratory investigations were done. Random blood sugar concentration was noted. Chi square test was used to compare the categorical data. Significance level was fixed at  $p < 0.05$ .**Results:** 20 were diabetic subjects and 20 were the control group. 15 (75%) cases had sensorineural hearing loss and 5 (25%) cases had normal hearing. Only 4 (20%) controls had sensorineural hearing loss and 16 (80%) controls had normal hearing.**Conclusion:** Duration of diabetes plays a significant role in hearing loss.**Keywords:** diabetes, hearing loss, sensorineural.**Received: 12-11-2022****Revised: 24-12-2022****Accepted: 25-12-2022****Introduction**

Diabetes Mellitus (DM) is defined as a disorder of metabolism characterized by hyperglycaemia due to inadequate insulin production, action or both.<sup>1</sup> Statistics have indicated a recent increase in the prevalence of DM worldwide, making it a global health concern. As a result, there has been a vast amount of on-going research devoted to DM and complications associated with the disease. Type 2 Diabetes Mellitus (T2DM) is usually a long standing metabolic disorder, which cannot be cured but only managed therapeutically; hence, complications usually evolve over time. Chronic complications occur as a result of pathological changes affecting the lens, skin, nerves and vascular system; therefore, the disease is not confined to a single organ system rather it affects multiple systems.<sup>2</sup> Microvascular abnormalities complicating DM have been proposed to affect the auditory system and ultimately hearing. Various studies have been conducted to identify the relationship between DM and hearing loss (HL); however, discrepancies in literature have emerged and the verdict remains unclear. Few studies have reported no correlation between HL and DM, whereas, other studies have found a positive correlation between the variables.<sup>3-6</sup>

There is a little awareness of hearing loss as a possible comorbid condition associated with type 2 diabetes among persons with diabetes as well as healthcare professionals, despite several studies having demonstrated the link between the two clinical conditions.<sup>7</sup> More than 43% of diabetic patients are likely to have some degree of hearing impairment related or unrelated to chronic hyperglycemia.<sup>8</sup> There is a requirement for further studies for the exploration of the relationship between diabetes and hearing abnormalities. The presence of hearing defects among diabetic 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.<sup>9</sup> Hearing enables us to interact with people, work and earn. Hearing is an integral part of speech. It helps us to lead our lives happily without any restrictions. Hearing impairment will hamper ones personal and social life and hence affect the quality of life. Our ability to hear has a very great impact on almost every aspect of our lives. The sense of hearing, the perception of sound and its biological purpose is not therefore, a trivial consideration that cannot be lightly dismissed. Diabetes mellitus is a common non communicable metabolic disease that causes various impairments of the body systems. As diabetes mellitus occurs most commonly in general population, the effects caused by it on various organs of our body assume greater importance. Prevalence of diabetes mellitus is increasing worldwide and it is more pronounced in India. According to the estimation, total number of diabetes patients in India is around 40.9 million and by 2025, the number would be around 69.92 million.<sup>10,11</sup> Chronic

complications of diabetes mellitus can be attributed to number of changes occurring at variable time period involving the vascular system, nerves, skin and lens. These complications are the cause of considerable morbidity and mortality and negatively affect the quality of life in individuals with diabetes.<sup>12</sup> Hence, this study was conducted to evaluate sensorineural hearing loss among diabetic subjects.

### Materials & methods

A total of 20 cases with diabetes were enrolled. 20 control groups were included. The age of subjects was between 20- 60 years. Complete history was taken and ENT examination was done. Laboratory investigations were done. Random blood sugar concentration was noted. Pure tone audiometry was performed on all the subjects. Degree of Hearing Loss was categorized as mild hearing loss (26 dB HL to 40 dB HL), moderate hearing loss (41 dB HL to 55 dB HL), moderately severe hearing loss (56 dB HL to 70 dB HL), severe hearing loss (71 dB HL to 90 dB HL) and profound hearing loss >91 dB HL. Data was collected and results were analysed using SPSS software. Chi square test was used to compare the categorical data. Significance level was fixed at  $p < 0.05$ .

### Results

20 were diabetic subjects and 20 were the control group. 15 (75%) cases had sensorineural hearing loss and 5 (25%) cases had normal hearing. Only 4 (20%) controls had sensorineural hearing loss and 16 (80%) controls had normal hearing. There was a statistically significant association found between diabetes and sensorineural hearing loss ( $p = 0.001$ ). There was a statistically significant association between age and sensorineural hearing loss among cases ( $p = 0.050$ ).

Table 1: Comparing patient's characteristic with sensorineural hearing loss

Characteristic	Mild	Moderate	Moderately severe	Severe	Profound	P value
Duration of diabetes ( years)						
1-5	1	0	0	0	0	0.03
6-10	1	2	2	0	0	
10-15 or more	0	0	6	2	1	
FBS (mg/ dl)						
<150	2	1	1	0	0	<0.001
150-200	0	3	5	1	0	
>200	0	0	0	1	1	

### Discussion

A person's day-to-day activities get affected with the presence of hearing defects in subtle ways. Sensorineural hearing loss involving the inner ear and its central connections is irreversible. Several previous authors have reported moderately high, progressive and bilateral hearing loss in patients with diabetes mellitus.<sup>13,14</sup> Hence, this study was conducted to evaluate sensorineural hearing loss among diabetic subjects.

In the present study, 20 were diabetic subjects and 20 were the control group. 15 (75%) cases had hearing loss and 5 (25%) cases had normal hearing. Only 4 (20%) controls had sensorineural hearing loss and 16 (80%) controls had normal hearing. A study by Mishra A et al, reported hyperglycemia to cause hearing loss. They evaluated hyperglycemic subjects with controls undergoing pure tone audiometry. Hundred subjects were divided into cases ( $n = 50$ , diabetes mellitus patients) and controls ( $n = 50$ , non DM subjects). Pure tone audiometry was performed for subjects. Degree of hearing loss was categorized as mild, moderate, moderately severe, severe and profound hearing loss. Out of 50 cases, 26% had normal hearing, 20% had moderately and 28% had moderately severe hearing loss. Longer duration of diabetes ( $p = 0.031$ ) was a significant predictor of moderately severe, severe and profound SNHL. Profound SNHL was more common in those with > 200 fasting blood sugar ( $p = 0.001$ ) and severe and profound SNHL was common in those having > 300 random blood sugar ( $p = 0.004$ ). To conclude age, duration and severity of diabetes was the significant predictor of hearing loss in patients of diabetes mellitus.<sup>15</sup>

In the present study, there was a statistically significant association between diabetes and sensorineural hearing loss ( $p = 0.001$ ). There was a statistically significant association between age and sensorineural hearing loss among cases ( $p = 0.050$ ). Another study by Al- Rubeaan K et al, patients with type 2 diabetes, aged 30 to 60 years, were randomly selected to participate. All patients underwent clinical ear examinations and were referred for full audiological evaluation. Otoacoustic emission was used to assess inner function, tympanometry to assess middle-ear function, and pure tone air/bone audiometry to assess hearing sensitivity. Risk factors for hearing loss were assessed by multivariate logistic regression. Of the 157 patients, 77 had hearing loss in both ears (49.0%), 13 in the right ear only (8.3%), 14 in the left ear only (8.9%), and 53 (33.8%) had normal hearing. In the 181 ears with sensorineural hearing loss, 90 had mild loss (49.7%), 69 moderate loss (38.2%), 16 severe loss

(8.8%) and 6 had profound loss (3.3%). Disabling hearing loss was observed in 46 (29%) patients. A higher frequency of hearing loss was present in patients with glycosylated hemoglobin levels  $\geq 8\%$ . In the multivariate logistic regression analysis, the most important factors associated with hearing loss were longer diabetes duration, poor glycemic control and the presence of hypertension. Hearing loss is an underestimated comorbid condition in type 2 diabetes that warrants frequent hearing assessments and management.<sup>16</sup> One of the study by Srinivas CV et al, concluded that the relationship between sensorineural hearing loss (SNHL) and Diabetes mellitus has been known since more than 150 years. The pathophysiology of diabetes related hearing loss is speculative. Hearing loss is usually, bilateral, gradual onset, affecting higher frequencies. A total of 50 type 2 diabetics of age group 30–65 years were involved in the study. FBS, PPBS, HbA1c of all the subjects were done and later subjected to PTA. The type and severity of hearing loss was noted. Occurrence of SNHL was later compared with age, sex, duration, and control of DM. Sensorineural hearing loss was found in 66 % of type II diabetic patients and 34 % were found normal. Out of 50 diabetes mellitus patients, 33 patients had SNHL. All cases of SNHL detected were of gradual in onset and no one had hearing loss of sudden onset. Normal hearing was found in 34 % of patients, whereas 54 % of patients had mild hearing loss and 12 % of patients had moderate hearing loss. Association of hearing loss of DM patients with sex of the patient is insignificant. However there is a significant association between older age group, longer duration and uncontrolled DM with that of SNHL. In subjects with HbA1c more than 8 and duration of diabetes mellitus more than 10 years, prevalence of SNHL is more than 85 %, which is statistically significant. Sensorineural hearing loss in diabetes mellitus is gradually progressive involving high frequency thresholds. Hearing threshold increases with increasing age, duration of diabetes and also high level of HbA1c greater than 8 %.<sup>17</sup> Kurien<sup>18</sup> and Cullen<sup>19</sup>, stated that there is no correlation between age of the patient and occurrence of SNHL in diabetes mellitus. Earlier studies carried out by Friedman<sup>20</sup> and Cullen<sup>19</sup> showed that it is difficult to distinguish whether hearing loss in diabetes is due to normal process of aging or due to biochemical and the vascular abnormalities associated with diabetes.<sup>21</sup>

### Conclusion

Duration of diabetes plays a significant role in hearing loss. Strict glycemic control is essential for preventing the effects of diabetes on hearing sensitivity.

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