



## CLINICAL EVALUATION AND INCIDENCE OF SENSORINEURAL HEARING LOSS IN PATIENTS WITH DIABETES MELLITIS

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### ABSTRACT

**Background:** The association between Hearing loss and diabetes, first mentioned by Jarda in 1857, had been under continuous research since then; giving both positive and negative results. This study aims to explore the relationship of hearing loss with type II diabetes.

**Aims and Objective:** To identify association between sensorineural hearing loss and diabetes mellitus

**Methods:** 120 patients with type II DM were enrolled in this study, audiometrically evaluated. Apart from audiological tests, haematological tests like FBS, PPBS, HbA1c etc done.

**Results:** In this study it was observed that 66 (55%) of the patients were females and 54 (45%) were males. The female were more effected than male, the prevalence of SNHL in patients with diabetes mellitus was found to be 48 (40%) patients and 72 (60%) patients having normal hearing, the severity of hearing loss was minimal in 24 (20%), mild in 18 (15%), moderate and moderately severe in 3 (2.5%) each. In the present study the prevalence of SNHL increased with age that is 37 (53.62%) of patients aged between 41 to 50 years had hearing loss compared to 3 (10.71%) of patients who were aged between 18 to 30 years. The 8 (34.78%) patients had hearing loss having aged between 31 to 40 years. In this study the prevalence of SNHL was high in those patients who presented with duration of more than 10 years (75.00%) while it was less in those who had duration of 4 years or less (32.97%). **Conclusions:** Our study evidently demonstrated the association between sensorineural hearing loss and diabetes mellitus. Advancing age was found to correlate well with increasing hearing impairment Duration of diabetes mellitus correlated significantly with increasing hearing impairment.

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### INTRODUCTION

Hearing is one of the most important among the five senses gifted to mankind. It plays an important role in the development of speech, communication and cognitive, emotional and social development of a human being<sup>1</sup>. Diabetes mellitus (DM) is a non-communicable chronic disease. Diabetes mellitus is a multisystem disorder with abnormally high blood glucose level, with numerous cardiovascular<sup>2</sup>, neurological<sup>3</sup>, infectious<sup>4</sup> and other complications. It is a disease known since ages. It is said that 1 in 8 individuals is a diabetic. The diabetes affects hearing by damaging the inner ear structures. The effect of diabetes mellitus on hearing is known since 1857, when Jarda first showed hearing loss in a patient with incipient diabetic coma. The effect of diabetes mellitus on hearing is known since 1857, when Jarda first showed hearing loss in a patient with incipient diabetic coma.<sup>6,7,8</sup>

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The typical hearing loss pattern in diabetics is progressive, bilateral sensor neural hearing loss affecting the higher frequencies.<sup>1,7</sup> But rarely, there are incidences where sudden onset, sensor neural hearing loss affecting lower frequencies are also noted<sup>6,9</sup>. The type of hearing impairment noted, is similar to that of presbycusis, but The relationship between diabetes mellitus and hearing loss has been debated for many years. Jarda<sup>(10)</sup> in 1857 published a case report of a diabetic patient with hearing loss. Edgar<sup>11</sup> in 1915 was the first to report a high-frequency sensor neural hearing loss (SNHL) in a diabetic patient. Some authors conclude that there is no relationship between hyperglycemia and hearing loss; however, the bulk of the literature supports a poorly defined association. those affected show a greater decrease in hearing than one would expect at that age.

The link between diabetes and SNHL makes intuitive sense, given the documented neuropathic and microvascular complications of diabetes and the complex blood supply of the inner ear. The effects of different variables such as duration of

diabetes, blood sugar control, and presence of end-organ damage on hearing loss have not yet been clarified, despite several studies on this topic.

**MATERIALS AND METHOD**

The present study was a time bound descriptive study conducted in the department of otorhinolaryngology, Govt Medical College Srinagar during the period from January 2016 to December 2017. Total 120 eligible patients presenting with diabetes mellitus during the period of study were taken for study. Patients with symptoms and signs of diabetes mellitus confirmed by; Fasting blood sugar level more than 100mg%, post prandial blood sugar level of more than 200mg%, Random blood sugar level of more than 200mg% in patients with symptoms of diabetes mellitus. All the patients fulfilling the selection criteria were explained about the nature of the study and a written informed consent was obtained. After the enrollment, demographic data such as age and sex were obtained through the interview. The history pertaining to the diabetes mellitus such as duration of diabetes, type and family history, history of other comorbid conditions were assessed. Thorough clinical examination was carried out followed by ENT examination. Patients were subjected to the following blood investigations; fasting blood sugar (FBS), Post prandial blood sugar (PPBS). To assess the hearing loss patients were subjected to tuning fork tests with 256, 512 and 1024 frequencies and Pure tone audiometry which was done by pure tone audiometer for pure tone air conduction(AC) threshold, pure tone Bone conduction(BC), Speech reception and Tests for recruitment. The hearing impairment was interpreted as below 9.

**Inclusion criteria**

The patients with Diabetes Mellitus on treatment, <50 years, diagnosed with DM for more than 2 years

**Exclusion criteria:** included Patients with middle ear pathology, history of noise exposure and ototoxic drug intake, hearing Loss caused by Inner ear pathologies like Meniere's disease, Acoustic neuroma and age > 50 years.

**RESULTS ANALYSIS**

This descriptive study included a total of 120 patients presenting with diabetes mellitus during the study period from January 2016 to December 2017.

**Table 1** Tuning fork tests with 256, 512 and 1024 frequencies interpretation

Test	Normal	Conductive deafness	Sensori-neural deafness
Rinne	AC>BC	BC>AC	AC>BC
Weber	Not lateralized	Lateralized to poorer ear	Lateralized to better ear
ABC	Same as examiner's	Same as examiner's	Reduced

**Table 2** Classification of severity of sensorineural hearing loss

Degree of hearing loss	Hearing loss range (db)
Normal	-10 to 15
Minimal	16 to 25
Mild	26 to 40
Moderate	41 to 55
Moderately Severe	56 to 70
Severe	71 to 90
Profound	91+

**Table 3** Sexwise Distribution of Patients

Males		Females	
NO	%	NO	%
54	45.00	66	55.00

In this study 66 (55%) of the patients were females and 54 (45%) were males. The female were more effected then male.

**Table 4** Severity of Hearing Loss

Severity of hearing loss	NO	Percentage (%)
Normal	72	60
Minimal	24	20
Mild	18	15
Moderate	3	2.5
Moderately severe	3	2.5
Severe	Nil	0.0
Total	120	100

**Table 5** Association of age with SNHL

Age Group (years)	SNHL			
	Present		Absent	
	No	%	No	%
18-30	3	10.71	25	89.29
31-40	8	34.78	15	65.22
41-50	37	53.62	32	46.38
Total	48	40.00	72	60.00

In the present study the prevalence of SNHL increased with age that is 37 (53.62%) of patients aged between 41 to 50 years had hearing loss compared to 3 (10.71%) of patients who were aged between 18 to 30 years. Patients aged between 31 to 40 years having 8 (34.78%) hearing loss (Table 5)

**Table 6** Association of duration of diabetes with SNHL

Duration(years)	SNHL			
	Present		Absent	
	No	%	No	%
4 or Less	30	32.97	61	67.03
5 -9	12	57.14	9	42.86
≥ 10	6	75.00	2	25.00
Total	48	40.00	72	60.00

In this study the prevalence of SNHL was high in those patients who presented with duration of more than 10 years (75.00%) while it was less in those who had duration of 4 years or less (32.97%). (Table 6).

**DISCUSSION**

The relationship between diabetes mellitus and hearing loss has been debated for many years. Jordao<sup>12</sup> in 1857 published a case report of a diabetic patient with hearing loss. Edgar in 1915 was the first to report a high-frequency sensorineural hearing loss (SNHL) in a diabetic patient. The typical hearing loss in diabetics is progressive, bilateral sensorineural hearing loss affecting the higher frequencies<sup>13,14</sup>. In this study the incidence of sensorineural hearing loss in diabetic patients were seen It has been discussed under the following headings. In this study 66 (55%) of the patients were females and 54 (45%) were males. The female were more effected then male. Taylor and Irwin<sup>15</sup> observed that female patients with diabetes had significantly greater hearing loss than male patients with diabetes. Most studies in the literature reported no differences between the sexes. Our study correlates with the Taylor and Irwin study, with higher incidence of SNHL in females compared to males.

In this study, the prevalence of SNHL in patients with diabetes mellitus was found to be 48 (40%) patients and 72(60%)

patients having normal hearing. In the present study the severity of hearing loss was minimal in 24 (20%), mild in 18 (15%), moderate and moderately severe in 3 (2.5%) each. In a study by Rajendra *et al*<sup>16</sup> shows that the diabetics had a 73% incidence of deafness when compared to the non-diabetics of the same age group. Friedman *et al*<sup>17</sup> showed a 55% incidence of hearing loss in diabetic patients. Kakarlapudi *et al*<sup>18</sup> found that hearing loss was more common in diabetic patients (13.1% prevalence) than the control non-diabetic healthy subjects. Weng *et al*<sup>19</sup> noted that among the 67 diabetic subjects examined, 44.8% of them had profound hearing loss.

Friedman *et al*<sup>17</sup> showed a 55% incidence of hearing loss in diabetic patients. Kakarlapudi *et al*<sup>18</sup> found that hearing loss was more common in diabetic patients (13.1% prevalence) than the control non-diabetic healthy subjects.

In the present study the prevalence of SNHL increased with age that is 37 (53.62%) of patients aged between 41 to 50 years had hearing loss compared to 3 (10.71%) of patients who were aged between 18 to 30 years. Patients aged between 31 to 40 years had 8 (34.78%) hearing loss.

In the study by Diniz and Guide<sup>20</sup> which reported higher prevalence of hearing loss among patients with older age it means in addition to diabetes age also plays an important role in hearing loss<sup>20</sup>. A study by Donald *et al*, indicated that the patient with < 50 years of age, has lower risk of hearing loss<sup>21</sup>. In this study the prevalence of SNHL was high in those patients who presented with duration of more than 10 years (75.00%) while it was less in those who had duration of 4 years or less (32.97%). Some studies state that the hearing threshold increases with increase in duration of diabetes mellitus<sup>14,22,23</sup>. While others state that there is no relation between hearing threshold and diabetes mellitus<sup>13,24,18</sup>.

The increase in hearing threshold is attributed to microvascular angiopathy occurring in capillaries of striavascularis which make these vessels thicker than normal. These changes can occur in vessels supplying other parts of auditory system as well<sup>25</sup>.

In our study, it was noted that, there was increase in hearing threshold with increase in duration of diabetes mellitus which was correlating with the studies done by Virteniemi J *et al*<sup>14</sup>, Celik *et al*<sup>22</sup> and Fangcha MA *et al*<sup>23</sup>.

## CONCLUSION

Our study evidently demonstrated the association between sensorineural hearing loss and diabetes mellitus. Advancing age was found to correlate well with increasing hearing impairment. Duration of diabetes mellitus correlated significantly with increasing hearing impairment.

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