



ORIGINAL RESEARCH PAPER

Otorhinolaryngology

FREQUENCY OF SENSORY NEURAL HEARING LOSS IN TYPE 2 DIABETIC PATIENTS: AN EXPERIENCE FROM A TERTIARY LEVEL HOSPITAL IN KASHMIR

KEY WORDS: Type 2 diabetes mellitus, sensorineural hearing loss (SNHL), pure tone audiometry.

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ABSTRACT

AIM: The association between diabetes and sensorineural hearing loss has been contentious and arguable since a long time. The aim of this study was to evaluate the frequency of hearing loss in type 2 diabetics and to establish a relationship between gender, duration and glycaemic control.
STUDY TYPE: Descriptive Cross sectional.
MATERIAL AND METHOD: This study was done at Govt. Medical College, Srinagar for duration of 6 months. This study involved 136 patients, who were subjected to pure tone audiometry and evaluation of fasting blood sugar and glycosylated haemoglobin. The prevalence of sensorineural hearing loss with relation to gender, duration and glycaemic control was analysed.
RESULTS: A prevalence of sensorineural hearing loss was found in 63.23% of type 2 diabetic patients. Duration of diabetes and long term glycaemic control had a telling effect on the hearing threshold of the subjects.
CONCLUSION: The hearing threshold is increased in type 2 diabetics mainly in the higher frequencies. The glycaemic status and duration of diabetes had significant correlation with hearing loss. This study emphasized to do audiometry test for all diabetics in order to recognize this complication.

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 complications¹. The pathophysiological basis of the type 2 Diabetes Mellitus is a combination of impaired Beta cell function, with marked increase in the peripheral insulin resistance at receptor/post receptor levels and increased hepatic glucose output production. Apart from affecting lipid and protein metabolism, diabetes mellitus is also commonly associated with auditory disorders.

One of the known complications of DM is hearing impairment, especially hearing loss and tinnitus²⁻⁴, which leads to a decreased quality of life among those affected. There is a hypothesis that diabetes mellitus is associated with progressive bilateral high tone sensorineural hearing loss starting at an earlier age than the normal population⁵.

India has a diabetic population of around 50 million people which is expected to be doubled by 2030⁷. There is a variety of hearing loss seen in diabetic population. One of them is progressive, gradual bilateral sensorineural loss, affecting especially high frequencies and the elderly. It would be similar to presbycusis, but with more severe losses than those expected by aging⁸. Conversely, there are authors who report the possibility of having early sensorineural loss⁹ and others that reported hearing loss in low and medium frequencies¹⁰. Some studies described diabetes as the possible cause of unilateral sudden hearing loss¹¹. As conflicting results have been reported by many studies in diabetic population and only few studies have been done in Kashmir, the present study is undertaken to determine the incidence of auditory dysfunction in type 2 diabetes patients and whether or not such auditory dysfunction could be correlated with the severity of hyperglycaemia.

AIMS & OBJECTIVES

- To find out the frequency of sensorineural hearing loss among the type 2 diabetes mellitus patients.
- To study the correlation between hearing loss and the duration

of hyperglycaemia and glycaemic control.

- To evaluate whether hearing loss affects one particular gender predominantly.

MATERIAL & METHODS

This cross sectional study was done in 136 patients attending Government Medical College, Srinagar, J&K, India with type 2 diabetes mellitus for duration of six month from July 2017 to December 2017, in department of medicine with collaboration of department of ENT. Written informed consent was taken from all the participating patients.

Inclusion criteria:

- Type 2 diabetics on oral hypoglycaemic drugs.
- Patients of both genders in age group 30-60 years.
- No other systemic diseases (hypertension, thyroid disorders, ischemic heart diseases)
- Patients willing to undergo investigations.

Exclusion criteria:

- Patients on insulin treatment.
- Family history of deafness.
- Patients on dialysis.
- History of hearing loss prior to onset of diabetes.
- History of chronic suppurative otitis media.
- History of ear surgeries performed in the past.
- Patients with history of head trauma, autoimmune diseases, radiotherapy, ototoxic drug intake, noise exposure, chronic smoking, and alcoholism.

A detailed history including hearing loss – onset, duration, associated symptoms and diabetes – duration and treatment taken was obtained from the patients. The patients were subjected to thorough ENT examination including otoscopic examination and tuning fork tests. Patients further underwent audiometric assessment - Pure tone audiometry (PTA). We used the Amplirox 270 diagnostic audiometer and the same examiner to reduce confounding factors. Patients also underwent blood investigations - fasting blood sugar (FBS) and glycosylated haemoglobin (HbA1c) factors. Patients also underwent blood investigations – fasting

blood sugar (FBS) and glycosylated haemoglobin (HbA1c).

The hearing threshold was graded as per World Health Organization (WHO) guidelines¹² (snhl),

- 0 – 25 dB - hearing within normal limits
- 26 – 40 dB - mild hearing loss
- 41 – 55 dB - moderate hearing loss
- 56 – 70 dB - moderately severe hearing loss
- 71 – 90 dB - severe hearing loss
- > 90 dB - profound hearing loss

Ethical clearance was obtained from institutional ethical committee.

RESULTS

The mean age was 49.37±07.43 and there was no significant statistical difference in age regarding SNHL in paired student t test. In this study of 136 type 2 diabetic patients, 86 had sensorineural hearing loss – 63.23% and the rest 50 patients had hearing within normal limits – 36.76%. Of the patients with sensorineural hearing loss only 41 patients complained of hearing loss – 45.55%.

Table-1
Prevalence of SNHL

	Subjects	Prevalence (%)
SNHL	86	63.23
Normal	50	36.76

In our study of 136 patients with type 2 diabetes mellitus, 61.76% patients (n= 84) were males and 38.23% (n=52) were females. In the 84 males, 59 patients were found to have sensorineural hearing loss – 70.23% and among the 52 females, 27 patients had sensorineural hearing loss – 51.92%. The incidence of SNHL, male: female is 1.3:1.

Table-2
Gender wise prevalence of SNHL

Gender	No of Patients	SNHL	Prevalence (%)
Male	84	59	70.23
Female	52	27	51.92

Based on the duration of diabetes four groups each of five years duration were made. It was observed that the incidence of sensorineural hearing loss increased with duration of diabetes.

Table-3
Duration of DM & SNHL

DURATION (years)	No of patients	SNHL	Prevalence (%)
1-5	39	13	33.33
6-10	48	32	66.6
11-15	27	22	81.48
16-20	22	19	86.36

In this study, patients with uncontrolled sugar levels had higher incidence of sensorineural hearing loss as compared to patients with patients with moderately controlled and well controlled sugar levels.

Table-4
Relation of FBS & SNHL

FASTING BLOOD SUGAR (mg/dl)	No of patients	SNHL	PREVALENCE (%)
<100	53	21	39.62
101-125	41	31	75.60
>126	42	34	80.95

This study showed that patients with uncontrolled HbA1C levels had higher incidence of sensorineural hearing loss as compared to patients with controlled levels.

Table-5 Relation of HbA1C & SNHL

HbA1C (%)	No of patients	SNHL	Prevalence (%)
<7	39	21	53.84
7-8	47	25	53.19
>8	50	40	80.0

DISCUSSION

Diabetes mellitus is a group of metabolic diseases characterized by hyperglycaemia resulting from defects in insulin secretion, insulin action, or both. The chronic hyperglycaemia of diabetes is associated with long-term damage, dysfunction, and failure of various organs, especially the eyes, kidneys, nerves, heart, and blood vessels. Type 2 diabetes mellitus consists of an array of dysfunctions characterized by hyperglycaemia and resulting from the combination of resistance to insulin action, inadequate insulin secretion, and excessive or inappropriate glucagon secretion.

Many studies suggested diabetes as aetiology of hearing loss. Many have tried to identify the cause and based on their conclusions, the probable mechanisms are microangiopathy of the inner ear, neuropathy of the cochlear nerve, outer hair dysfunction and disruption of endolymphatic potential, sorbitol accumulation, severe atrophy of the spiral ganglion in the basal and middle turns of the cochlea, thickening of the walls of the vasa nervorum of 8th nerve¹³⁻¹⁵. Wackym and Linthicum (1986)¹⁶ observed microangiopathic changes in the endolymphatic sac, stria vascularis and basilar membrane. Van den Ouweland et al¹⁷ observed a mutation in mitochondrial tRNA in a small subset of patients with maternally inherited diabetes with SNHL. Fukushima et al¹⁸ concluded that Type 2 Diabetes results in changes in cochlea, such as significant atrophy of stria vascularis & otic loss in basal turn. The hearing loss associated with diabetes mellitus is characteristically bilaterally symmetrical, gradual in onset and progressive in nature.

The association between type 2 diabetes mellitus and SNHL is a debatable topic, some studies showing strong association whereas some studies showing no relation between diabetes mellitus and sensorineural hearing loss.

Our study found a strong and consistent link between hearing impairment and diabetes using a number of different outcomes.

This study showed a prevalence of sensorineural hearing loss in 63.23 % of type 2 diabetics. These results were comparable with various previous studies¹⁹⁻²¹. Dalton et al have revealed low prevalence rates. The wide variation in prevalence of sensorineural hearing loss in diabetics may be due to difference in methodology including inclusion and exclusion criterias. In the present study hearing loss was found to be typically bilaterally symmetrical, progressive and gradual in onset. The hearing loss was more in higher frequencies 4 to 8 kHz and approximately 10-35dB difference was noted in the hearing threshold. These results were comparable with that of studies by Cullen R, Kurien M and Tay H L²²⁻²⁴. Effects of presbycusis were minimized as the patients included in the study were below 60 years of age.

The other significant finding in our study is duration of diabetes mellitus which is significantly associated with SNHL, showing increased prevalence of SNHL in patients with more than 15 years of diabetic duration (86.36%). These results were comparable to that of study by Wilson et al.

Glycaemic control and its association with sensorineural hearing loss has long been a debated topic and in our study both fasting blood sugar levels and glycosylated haemoglobin were taken into consideration. An interesting finding in our study was the fact that diabetics with poor glycaemic control had increased prevalence of sensorineural hearing loss when compared with diabetics of moderately and well controlled sugar levels. These results were comparable to that with studies published by Cullen R, Kurien M, Tay H L.²²⁻²⁴

Hearing loss may be an under-recognized complication of diabetes. As diabetes becomes more common, the disease may become a more significant contributor to hearing loss. Health care providers should be aware of the increased risk of hearing impairment. There are handheld devices that healthcare professionals can use to screen for hearing loss as a first line test, as well as written and online self-screening tools available to consumers.

CONCLUSION

Type 2 diabetic subjects had a higher prevalence of sensorineural hearing loss (62.23%). The diabetics showed significant bilateral, mild to moderate sensorineural hearing loss. Hearing loss was noted in all frequencies but characteristically hearing loss was found in higher frequencies. Male type 2 diabetic patients were more affected with sensorineural hearing loss than their female counterparts. A robust relation was found between blood sugar levels, glycosylated haemoglobin and hearing loss which showed sensorineural hearing loss was more prevalent in patients with poor glycaemic control. Therefore the auditory health of diabetic patients is to be more carefully followed up by health care professionals.

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