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RESEARCH ARTICLE
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"AUDIOLOGICAL EVALUATION OF HEARING LOSS IN PATIENTSHAVING TYPE-2 DIABETES MELLITUS & ITS CORRELATION WITH DURATION OF DISEASE."

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ABSTRACT

Aim: To study the influence of duration of NIDDM on hearing loss and its association withHBA1c levels.

Materials and Methods: 50 patients including Male and Female from 25 – 75 years attendingENT OPD, at Index Medical College with complain of hearing loss and were diagnosed cases of type-2 diabetes mellitus (NIDDM, Non Insulin Dependent Diabetes Mellitus) (with or without treatment) were evaluated audiologically. These patients will undergo ENT
examination, Further the patients were advised Pure Tone Audiometry & HbA1c.

Results: The results of the present study showed that patients having longer duration and higher levels of HbA1c had more degree of hearing loss.

Conclusion: Hearing loss was significantly higher in diabetic patients who had long history of diabetes and is also more common in patients with uncontrolled blood sugar levels

INTRODUCTION

Diabetes mellitus (DM), commonly referred to as diabetes, is a group of metabolic diseases inwhich there are high blood sugar levels over a prolonged period. It is commonly associated with low insulin production or no response of the cells toward the produced insulin. They affect the normal metabolism and show various signs and symptoms. The classic symptoms include weight loss, polyuria (increased urination), polydipsia (increased thirst), and polyphagia (increased hunger). Other symptoms which denote the onset of diabetes such as fatigue, tiredness, blurred vision, headache, slow healing of wounds and cuts and itchy skin insome cases.[1]

The relationship between diabetes and hearing loss was first proposed by Jordoa, in 1857. Alterations in inner ear glucose concentration occur in diabetes and may alter hearing.

Changes in systemic insulin concentration can alter the endolymphatic potential by altering the

glucose concentration.
The typical hearing loss described is a progressive, bilateral, gradual onset Sensorineural type of deafness which affects predominantly the higher frequencies and older patients. There is a decrease in auditory acuity which is similar to that of presbycusis, but those affected show a hearing loss greater that that expected at that age.[2]

Hearing loss in diabetes may be the result of microangiopathy in the inner ear, neuronaldegeneration or diabetic encephalopathy, but it could also be due to deranged glucose metabolism and hyperactivity of oxygen free-radicals.[3]
Rosen and Davis, who sought a possible correlation between sensorineural hearing loss and microangiopathy in diabetic patients, conclude that hearing loss is definitely common in these patients.[4]

AIM: To study the influence of duration of NIDDM on hearing loss and its association withHBA1c levels.

MATERIALS & METHODS

Study design: Hospital based cross sectional observational study.
Study center: Dept. of Otorhinolaryngology, Index Medical College Hospital and ResearchCentre, Indore
Sample size: 50 patients were taken for the study. Study duration: January 2018 to July 2019 (18 months).

INCLUSION CRITERIA:

- Patients between age range of 25 to 75 years.
- All patients of either sex with Hearing loss and are known case of Diabetes Mellitustype 2 with or without treatment.

EXCLUSION CRITERIA:

- Patients below 25 & above 75 years of age.
- Patients having history of Noise induced HL, CSOM / Ear perforation.
- Patients with known history of hyperthyroidism.
- Patients with prolonged use of ototoxic medications.PROCEDURE:

In this study, we evaluated 50 diabetic subjects from Index medical college hospital & research center who were selected after getting their informed consent and were subjected for pure tone audiometry testing as part of baseline hearing assessment. Overnight fasting blood sample was taken for glycated haemoglobin measurements to know its control. Socio- demographic characteristics and medical and occupational histories were recorded.

STATISTICAL ANALYSIS:

All the data analysis was performed using IBM SPSS ver. 20 software. Frequency distribution and cross tabulation was used to prepare the tables. Quantitative variables were expressed as the mean and standard deviation. Categorical data was expressed as percentage.

PRISM and Microsoft office was used to prepare the graphs. Student t- test and ANOVA was used to compare the means. Chi Square test was used to compare the categorical data. P valueof < 0.05 is considered as significant.

OBSERVATIONS & RESULTS

Table 1: HbA1c levels in patients

HbA1c	Frequency	Percent
<6.5	5	10
6.5- 8	37	74
>8	8	16
Total	**50**	**100**

Table 2: Duration of diabetes

Diabetes duration (years)	Frequency	Percent
<5	7	14.0
6-10	22	44.0
>10	21	42.0
Total	**50**	**100.0**

Table 3: Comparing degree of hearing loss with duration of diabetes in both ears.

Degree of Hearing loss	Diabetes duration (years)						P value
	<5		6-10		>10		
	Rt.	Lt.	Rt.	Lt.	Rt.	Lt.	
Normal hearing	6	1	5	9	1	5	0.001
Mild hearing loss	0	0	4	2	2	10	
Moderate loss	1	0	7	4	8	2	
Moderately severe	0	5	3	5	7	0	
Severe	0	1	3	2	3	4	

Table 4: Comparing degree of hearing loss with HbA1c levels in both ear.

Degree of Hearing loss	HbA1c levels						P value
	<6.5		6.5- 8		>8		
	Rt.	Lt.	Rt.	Lt.	Rt.	Lt.	
Normal hearing	3	1	7	12	2	2	0.002
Mild hearing loss	1	1	4	9	1	2	
Moderate loss	1	0	13	5	2	1	
Moderately severe	0	3	9	5	1	2	
Severe	0	0	4	6	2	1	

Table 5: Comparison of mean hearing loss with duration of disease

Diabetes duration		PTA RT	PTA LT
<5 years	Mean	23.91	13.94
	SD	9.64	9.62
6-10 years	Mean	47.51	43.63
	SD	19.44	20.04
>10 years	Mean	56.71	53.83
	SD	17.78	16.89
P value		<0.001	0.005

Table 6: Comparison of mean hearing loss with HbA1c

HbA1c levels		**PTA RT**	**PTA LT**
<6.5	Mean	31.51	29.51
	SD	21.27	23.31
6.5- 8	Mean	48.28	36.30
	SD	19.48	22.48
>8	Mean	52.75	44.25
	SD	25.53	21.21
P value		<0.001	<0.001

DISCUSSION:

In Present study, majority of the patients had diabetes duration between 6-10 years (44%) followed by 42% patients who had diabetes duration of>10 years. Only 14% patients had diabetes duration of <5 years.

In present study, on comparing the degree of hearing loss of right ear with the duration of diabetes it was found that among the mild hearing loss patients, majority had diabetes duration between 6-10 years (18.2%). Of the moderate hearing loss patients, majority had diabetes duration of >10 years (38.1%) followed by 31.6% patients who had diabetes duration between 6-10 years. Among the moderately severe patients, majority had diabetes duration of 10 years (33.3%) followed by 13.6% patients who had diabetes duration between 6-10 years. Similarly majority of the patients with severe hearing loss had diabetes duration of 10 years (14.3%). This proved that degree of hearing loss of right had direct association with the diabetes duration. Hearing loss increases with increasing the diabetes duration as reveled by the present study findings. Similarly **Sachdeva K et al** compared degree of hearing loss of right ear with the duration of diabetes and observed that as the duration of diabetes increases, the prevalence as well as the severity of hearing loss increases. **Pemmaiah et al**[5] compared the degree of hearing loss of right ear with the duration of diabetes found that among 47 patients 27 had diabetes for more than 10 years, these patients showed more severe hearing loss then rest 20 patients who had shorter duration of diabetes. In **Bhaskar, et al**[6] study, on compared the degree of hearing loss of right ear with the duration of diabetes and found that among the moderate hearing loss patients, majority had diabetes duration between 5-10 years. Results were similar for left ear.

In present study the majority of cases had HbAlc between 6.5 to 8% (74%) and there were 16% cases who had HbAlc>8% which means majority of the patients had uncontrolled glycemia.

In present study, on comparing the degree of hearing loss of right ear with the HbAlc level it was found that among the mild hearing loss patients, majority had HbAlc level between <6.5% (20%). Of the moderate hearing loss patients, majority had HbA1c level of 6.5 to 8% (35.2%) followed by 25% patients who had HbAlc level >8%. In patients with moderately severe hearing loss, majority had HbA1c level of 6.5-8% (24.3%) followed by 12.5% patients who had HbAlc levels >8%. Similarly majority of the patients with severe hearing loss had HbA1c level of>8% (25%). The distribution was highly significant with p value of 0.002; which means hearing loss is more common among the patients with HbAlc>6.5%. A number of studies by **Krishnappa S et al**[7] and Panchu P et al have shown a positive correlation between HbA1c levels and the severity of hearing loss. **Tiwari A et al**[8] study examined the distribution of different degrees of hearing loss of right ear, the correlation between HbAlc levels and the severity of hearing loss are significant, as hearing loss increases with higher levels of HbA1c. Results were similar for left ear.

In Present study, with increasing the duration of diabetes, pure tone audiometry threshold of both the ears increases, which shows a direct association of diabetes duration with hearing loss.

In present study, mean pure tone threshold of right ear was significantly high among the patients with HbA1c >8%. Similar trend was observed in the left ear. Mean pure tone threshold increases

with increase in the HbAlc as revealed by the highly significant p value of <0.001.

CONCLUSION:

Early onset hearing loss in diabetes patients is significantly associated with the high HbAlc level and prolonged duration of diabetes mellitus. Hearing loss is more common in diabeticsthan general population. Hearing loss was significantly higher in diabetic patients who had long history of diabetes. Hearing loss is more common in diabetes patients with uncontrolled blood sugar levels (high HbAlc level) in comparison to patients whose blood sugar level is well under control.

Current study concludes that the diabetic patients should undergo periodic audiometry evaluation and regular monitoring of their blood sugar levels to avoid early or untimely severe hearing impairment.

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