Research Paper

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A Study on Sensori-Neural Hearing Lossin Patients of Type 2 Diabetes Mellitus

Medical Science

KEYWORDS : Type II Diabetes Mellitus, Microangiopathy, Pure tone audiometry, Sensorineural hearing loss

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ABSTRACT

Background: The relationship between diabetes mellitus and hearing loss has been discussed over several years. The nature of hearing loss in diabetes is thought of as sensorineural type with microangiopathy as the cause of hearing loss.
Materials and Methods:
64 subjects were included in the study. Patients with type II diabetes mellitus were compared with age-matched controls for their hearing acuity in relation to their glycemic status.
Results:
39 subjects were diabetics and 25 were non-diabetics.73.7% of diabetics showed sensorineural hearing loss compared to 37.5% of non-diabetics suffering from sensorineural hearing loss.
Conclusion:
High fasting blood glucose and poor glycemic control had high incidence of sesorineural hearing loss. However, duration of diabetes did not have a significant impact on hearing acuity.

Introduction

The prevalence of hearing loss in diabetics has been debated over several years. Jordao in 1857 published a case report of a diabetic patient with hearing loss. Edgar in 1915 reported a high-frequency sensorineural hearing loss in a diabetic patient. [1]The type of hearing loss is found to be moderately high, progressive and bilateral. The predominant mechanism is said to be the microangiopathy of the inner ear. [2]

Aims and Objectives

- To study the hearing acuity in patients with type 2 diabetes mellitus and to understand their relationship
- To compare the hearing acuity with age and sex matched controls (non diabetics)
- To understand the significance between the duration of the disease, glycemic control and severity of hearing loss

Materials and Methods:

The study was conducted in a tertiary care hospital in Bangalore. 64 subjects were included in the study. 39 patients of Type 2 diabetes mellitus and 25 age matched non-diabetic controls were included in the study. The study and consent forms were approved by institutional ethics committee.

A detailed history regarding the onset of diabetes, duration of disease, presence of hearing loss, tinnitus and associated neurological impairments were obtained. Clinical examinations were done to rule out conductive causes of hearing loss. Fasting blood sugar, glycosylated haemoglobin (HbA1c) levels tested. The hearing acuity was examined with pure tone audiometric evaluation.The values were compared with age-matched controls. Pregnant and lactating women, subjects with other known causes of hearing loss such as ototoxicity, noise induced hearing loss etc. were excluded from the study.

Results:

A total of 64 subjects were included in the study between 30-70 yrs of age of both sexes. 37 were males and 27 were females. Among the subjects, 39 people (60.9%) were diabetics and 25 (39.1%) belonged to non-diabetic group.(Table 1)

Pure tone audiometric value of >25dB were considered to have hearing loss.

Among the diabetics 28 subjects (73.7%) presented with some grade of sensorineural hearing loss. Among the non diabetic group 9 (37.5%) presented with hearing loss and the difference was found to be statistically significant with p value <0.005.

Further the diabetics showed more of bilateral involvement in hearing loss (63.2%). Higher the fasting blood glucose and poor glycemic control suggested by HbA1C showed significant increase in hearing loss and it was statistically significant (student t test).Duration of diabetes did not have an impact on the hearing loss.

Discussion:

Hearing is an important special sense, which plays a vital role in speech, cognitive development, and emotional and social development. Hearing loss can affect most common and simple task of daily life.[3] Diabetes mellitus is a multifunctional metabolic disorder affecting almost all the systems of the body with a strong association to hearing.[4]Type II diabetes mellitus is the predominant form of diabetes worldwide accounting for 90% of cases.[4]

The prevalence of diabetes for all age-groups worldwide was estimated to be 2.8% in 2000 and 4.4% in 2030. The total number of people with diabetes is projected to rise from 171 million in 2000 to 366 million in 2030.5

The three main theories of pathogenesis of hearing impairment in diabetes are microangiopathy, neuropathy and combination of both.4 Cochlear microangiopathy, degeneration of striavascularis and cochlear outer hair cells are found in patients with type 2 diabetes mellitus. 6

Sandor et al did an interesting study of evaluating hearing acuity in diabetic patients with peripheral neuropathy. Although patients gave no history of earing loss, 55% had sensorineural hearing loss and they concluded that decreased hearing acuity in diabetic patients may be related to neuropathy of the auditory nerve.7

Comparison of temporal bones with clinical and audiometric history of diabetes mellitus with age and sex matched controls showed microangiopathic involvement of endolymphatic sac and/or basilar membrane vessels.8

Hearing loss is found to be progressive and bilateral. 9

Our study also had majority of the affected people showing bilateral involvement with 24 (63.2%) people in that category. Though most of the studies agree with hearing loss associated with diabetes mellitus, hearing frequencies involved in diabetes is controversial. According to a study by Tay HL et al., diabetic patients had worse hearing thresholds especially at low and mid frequesncies.10

According to a study by M Kurien et al., all age groups with diabetes showed a significant high frequency hearing loss as compared to control population.11

In our study we did not find any correlation between the duration of diabetes and hearing loss, similarly in the study by M Kurient there was no relationship between duration of diabetes and hearing loss.11 On the contraryTay HL et al., found a correlation between the duration of diabetes and hearing loss.10

Conclusion:

Incidence of sensorineural hearing loss is more in patients with diabetes mellitus compared to age matched controls. High fasting blood glucose and poor glycemic control had higher incidence of sensorineural hearing loss compared to nondiabetics. However the number of years of diabetes status did not have an impact on hearing loss suggesting that if there is good glycemic control, this impairment can be controlled.

1. Association between diabetes and sensorineural hearing loss

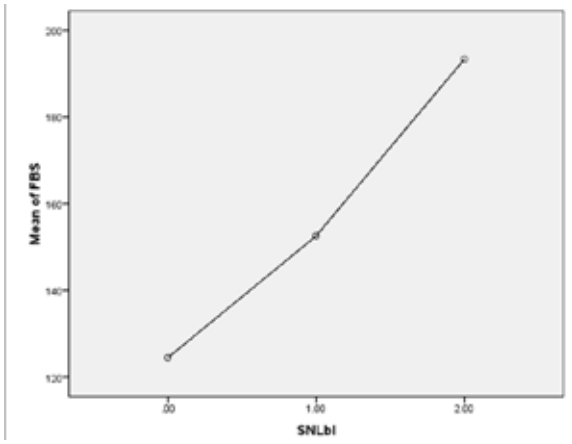
	Normal hearing (%)	Hearing loss (%)	Total	P value
Diabetics	10 (26.3%)	28 (73.7%)	38 (100%)	0.005 (significant)
Non-diabetics	15 (62.5%)	9 (37.5%)	24 (100%)	
Total	25 (27%)	37 (73%)	62 (100%)	

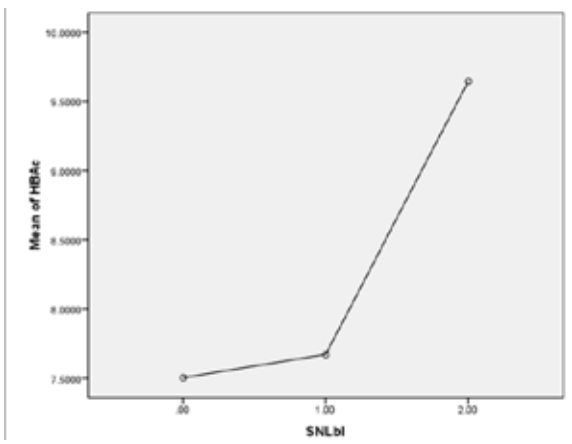
2. Laterality of hearing loss

	Normal hearing (%)	Unilateral (%)	Bilateral (%)	Total	P value
Diabetic	10 (26.3%)	4 (10.5%)	24 (63.2%)	38 (100%)	0.01 (significant)
Non-diabetic	15 (62.5%)	3 (12.5%)	6 (25.0%)	24 (100%)	
Total	25 (40.3%)	7 (11.3%)	30 (48.4%)	62 (100%)	

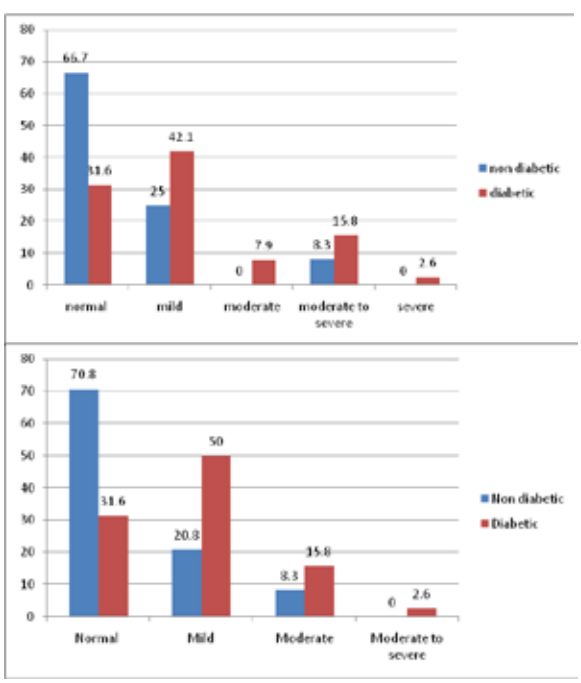
3. Association between various factors and hearing loss

	Normal hearing individuals		Hearing loss individuals		P value
	Mean	Standard error	Mean	Standard error	
Years of exposure to diabetes	7 yeazrs	1.44	8.19 years	1.45	0.646 (Not significant)
Fasting blood glucose	124.48 mg/dl	11.86	185.65 mg/dl	16.25	0.007 (significant)
HbA1c	7.50 %	0.49	9.26 %	0.48	0.019 (significant)





4. Bar diagram showing Hearing loss grading in left (1st diagram)and right ear (2nddiagram)in cases and controls



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