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A Study of the Pattern of Hearing Loss in Diabetic Patients of RIMS Adilabad

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Original Research Article

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Abstract: The prevalence of diabetes mellitus in increasing due to increase in consumption of processed foods and sedentary lifestyle. The hyperglycemia in diabetes is due to relative or absolute deficiency of insulin. Chronic hyperglycemia leads to several complications including neuropathy. We in the present study tried to evaluate the effect of chronic diabetes mellitus type 2 on hearing thresholds. This cross-sectional study was conducted in Rajiv Gandhi Institute of Medical Sciences and Hospital [RIMS], Adilabad in the Department of ENT. The patients were subjected to pure tone audiometry to determine the auditory acuity. A total of n=65 normal individuals out of which Male/female 45/20 acted as control group A they did not have any significant medical conditions including hypertension, cardiovascular disorders, on ototoxic drugs. In diabetic group, B out of n=62 patient male/female were 38/24. No patient in the diabetic group had evidence of nephropathy, retinopathy or neuropathy. The incidence of SN hearing loss among nondiabetics was 21.88% whereas in diabetics it was 50% had SN hearing loss. The mean auditory threshold of the diabetic group was higher compared to the control group the differences were found to be clinically significant in all frequencies from 250 Hz to 8000 Hz. 24% showed a significant hearing loss in 25 dB in at least one frequency. The hearing impairment in these patients was usually bilateral and almost equal on both the sides. The degree of hearing loss was 12 out of 31 patients 38% had mild hearing loss 35% had a moderate hearing loss and 19 had a moderately severe hearing loss and 6% had a severe hearing loss. The study demonstrates that hearing loss was more in diabetic individuals as compared to normal individuals. In almost all of the individuals with diabetic hypoacusis, the pattern of hearing loss was bilateral and purely sensorineural hearing loss. Therefore hearing impairment may be one of lesser recognized complications of diabetes mellitus. Pure tone Audiometry must be done in every case of chronic diabetes mellitus.
Keywords: Hearing loss, Diabetes Mellitus, RIMS Adilabad.

INTRODUCTION

The prevalence of Diabetes Mellitus is increasing by the day around the world and more so in countries like India. According to estimates, the total numbers of diabetics in India is around 40.9 million and by 2025 the numbers would increase to 69.92 million [1, 2]. Diabetes mellitus is characterized by hyperglycemia and is broadly classified into type 1, and type 2, other specific types of diabetes and gestational Diabetes mellitus. DM is a systemic disease accompanying pathology affecting multiple organ systems [3, 4]. The complications of diabetes mellitus are attributed to a 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 the life in individuals with diabetes [5]. The risk of chronic complications increases as a function of the duration of hyperglycemia they become apparent in the second decade of hyperglycemia, since the Type 2 DM often has long asymptomatic period of hyperglycemia, many individuals with Type 2DM have complications at the time of diagnosis [6]. Neuropathy, involving somatic and autonomic nerve fibers is one of the many microvascular complications of diabetes mellitus. It has been postulated that diabetes mellitus is associated with progressive bilateral high tone sensorineural hearing loss starting at an earlier age than the normal population, but eventually the general population catches up; meaning that by the age of 60, they cannot be easily differentiated [7]. A number of studies have shown an association between DM and the increasing likelihood of hearing loss [8-12]. The exact mechanism of hearing loss in diabetes mellitus is unclear but the probable mechanisms are micorangiopathy of the inner ear, neuropathy of the cochlear nerve, an combination of both, outer hair cell dysfunction, and disruption of

endolymphatic potential [13] A study has found that diabetes to be predictor of severe noise-induced hearing loss among metal fabrication workers [14] However on the contrary Farmingham Heart study found no association between hearing thresholds and the presence or absence of diabetes or impaired glucose tolerance [15] On the other hand, the Epidemiology of Hearing Loss study found a weak association between NIDDM and hearing loss in a subset of participants that excluded those with hearing loss inconsistent with presbycusis [16] The characteristic features of hypoacusis in diabetes mellitus is bilateral symmetrical sensorineural hearing loss particularly in the higher frequencies. The severity of impairment seems to be dependent upon the severity and duration of diabetes. Despite the gravity of impairment, its management is traditionally ignored when it is a part of generalized metabolic degenerative disorder such as diabetes amongst others where the management of diabetes itself takes the preference over the management of hearing impairment [17]. With this background we in the present study tried to evaluate the degree of impairment of hearing in diabetes mellitus type 2 patients compared with controls in this tribal region of Adilabad.

MATERIALS AND METHODS

This cross-sectional study was conducted in the Department of ENT and General Medicine, Rajiv Gandhi Institute of Medical Sciences [RIMS], Adilabad. A total number of (n=62) diabetes patients Male/Female patients 38/24 and (n=65) patients were taken as age and sex-matched normal controls male/female 45/20 were included in the study. The patients were informed regarding the study and written consent was obtained. Institutional Ethical Committee permission was obtained for the study. The inclusion criteria for diabetic patients were those previously diagnosed Type 2 Diabetes Mellitus by WHO criteria. [18] Without any complications like, Nephropathy, Retinopathy, and Neuropathy. The normal subjects were those free from Hypertension, Diabetes mellitus, CV disorders. Excluded patients were those with occupational noise exposure, Ototoxic and Chemotherapy Drug use, severe head injury, ear infections, ear surgery and head and neck radiation therapy, upper respiratory tract infections in past one month. Pure tone thresholds were measured using the Modified Hughson – Westlake method at 250, 500, 1000, 2000, 4000, 6000, and 8000 Hz for air conduction and 500, 1000, 2000, and 4000 Hz for bone conduction using a Diagnostic Audiometer. The results were categorized in according to WHO grades of hearing impairment. The statistical analysis was done with SPSS version 17 in Excel format was used.

RESULTS

A total of 65 normal individuals out of which Male/female 45/20 acted as control group. In diabetic group out of (n=62) patient male/female were 38/24. The total number of patients involved in the control group was (n=65) the 41 – 50 yrs age group had n=15 patients most of the patients out of which 2 showed SN hearing loss and in 51 – 60 yrs age group 20 patients were seen and out of which 4 had SN hearing loss and from the age group 61 – 70 years had 25 patients out of which 5 had SN hearing loss and from age group of 71 – 80 yrs 5 patients were seen out of which 3 had SN hearing loss. Similarly in the Diabetic group (n= 62) in the age group of 41 – 50 12 patients were tested and 6 had SN hearing loss. From 51 – 60 yrs 20 patients were examined and 11 had SN hearing loss, age group of 61 – 70 had 25 diabetic patients with 12 having SN hearing loss and from 71 – 80 years 5 patients were examined and 4 had SN hearing loss shown in table 1.

Table-1: showing the profile of patients with diabetes and controls involved in the study

Age group	Group A (Control)			Group B (Diabetics)		
	Total Patients	SN Hearing Loss	Percentage	Total number of patients	SN Hearing loss	Percentage
41 – 50	15	2	13.34	12	6	50
51 – 60	20	4	20	20	11	55
61 – 70	25	5	20	25	12	48
71 – 80	5	3	60	5	4	80
Total	65	14	21.88	62	31	50

The incidence of SN hearing loss among nondiabetics was 21.88% where as in diabetics it was 50% had SN hearing loss. There was a hearing loss also in nondiabetics especially as the age progresses age-related SN hearing loss may be the cause. The duration of diabetes and hearing loss was seen in table 2. Although the total number of hearing loss was seen more in duration of diabetes less than 5 years it may be because of the fact that more numbers of patients from this age group were seen as compared to the others. Most of the patients were having mild to moderate hearing loss and severe hearing loss was only seen in 2 patients.

Table-2: showing the duration of diabetes mellitus and severity of hearing loss

Duration of diabetes in years	Total number of patients with SNHL	Mild 26 – 40 dB dB	Moderate 41 – 55 dB	Moderately severe 56 – 70 dB	Severe 71 – 90 dB	Profound > 90 dB
0 – 5	15	5	6	3	1	0
5 – 10	9	4	3	1	1	0
> 10	7	3	2	2	0	0
Total	31	12	11	6	2	0

The mean auditory threshold of the diabetic group was higher compared to the control group the differences were found to be clinically significant in all frequencies from 250 Hz to 8000 Hz. (Table 3) 24% showed a significant hearing loss in 25 dB in at least one frequency. The hearing impairment in these patients was usually bilateral and almost equal on both the sides. The degree of hearing loss was 12 out of 31 patients 38% had mild hearing loss 35% had a moderate hearing loss and 19 had a moderately severe hearing loss and 6% had a severe hearing loss.

Table-3: comparison of average values of pure tone audiometry between the control group and Diabetic group

	250Hz	500Hz	1000Hz	2000Hz	4000Hz	8000Hz
Control Group	21.25 ± 5.7	17.01 ± 6.5	15.5 ± 5.51	16.95 ± 3.31	18.85 ± 8.96	23.37 ± 7.71
Diabetic Group	9.95 ± 4.25*	8.15 ± 7.56*	8.9 ± 3.51*	12.07 ± 5.51*	8.19 ± 8.85*	8.85 ± 6.67*

* Significant

DISCUSSION

Recent epidemiologic studies have demonstrated an increased risk for sensorineural hearing loss in patients with diabetes mellitus. This condition is mostly subclinical and generally involves the high-frequency tones [19-22] In the present study we found 50% of diabetic individuals and 21.88% nondiabetics with some degree of sensorineural hearing loss. Rajendran *et al*. [23] observed a prevalence of hearing loss among Type 2 diabetics of 73.3%. In a similar study by S Krishnappa *et al.* studying age-related hearing loss in diabetics found 73% hearing loss [24]. In nondiabetics they found 61% hearing loss. They also found that diabetics of duration > 10 years and < 15 years had mild SNHL in 30% of cases in the present study we found 12 out of 31 patients 38% had mild hearing loss 35% had a moderate hearing loss and 19 had a moderately severe hearing loss and 6% had severe hearing loss. Studies have addressed the association has been conducted in adults screening type 1 and type 2 diabetics. They have established significant hearing impairment in patients with either type of diabetes and demonstrating it to be more prevalent in type 2 diabetic patients and it related to microvascular complications and age [22, 25, 26]. The exact etiology of hearing loss in diabetic patients is still a matter of debate however, evidence is accumulating in favor of a strong relationship between poor glycemic controls and hearing loss [27] Some reports have shown the there is evidence of demyelination of eighth cranial nerve, loss of ganglion cells and hair cells of organ of corti, central auditory pathway degeneration thickening of endothelial vessel has been seen in diabetic cochlea [28, 29] Netra A. Pathak *et al.* [30] have found that the patients with type 2 diabetes had higher hearing thresholds than healthy controls. This finding agrees with our finding where we found that the diabetic group had higher thresholds of hearing that is bilateral and having mild to moderate SNHL. This shows that diabetes affects all frequencies significantly. Aging increases the risk of diabetes as well as hearing loss [31]. In presbycusis the hearing loss is gradual and bilateral and similar pattern is also observed in individuals with diabetes mellitus and it is sometimes difficult to distinguish between the two. Isa *et al.* [8] found that a correlation between the duration of diabetes and development of hearing impairment. Díaz de León-Morales *et al.* reported a mean duration of DM of 7.2 ± 5.4 years and found that duration of DM affected hearing threshold [32]. In a study done by Ferrer *et al.* [33] in type I DM found a higher auditory threshold for all frequencies from 250 to 8000 when compared to healthy youngsters. This shows that DM is an important criterion for development of hearing impairment and it is independent of age. There is now strong evidence emerging that hearing loss is one of the complications of chronic diabetes mellitus which usually remains undetected and ignored. The treatment of hearing loss may improve the quality of life of the individuals [34]. Therefore hearing loss should be included as one of the chronic complications of diabetes.

CONCLUSION

The study demonstrates that hearing loss was more in diabetic individuals as compared to normal individuals. In almost all of the individuals with diabetic hypoacusis the pattern of hearing loss was bilateral and purely sensorineural hearing loss. Therefore hearing impairment may be one of lesser recognized complications of diabetes mellitus. Pure

tone Audiometry must be done in every case of chronic diabetes mellitus.

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