

Original Research Article

Study of audio vestibular dysfunction in type2 diabetes mellitus


Deepti Pandey^{1*}, Abha Pandit², Abhay Kumar Pandey³

¹Consultant, Department of Otorhinolaryngology, SRLNM Charitable Trust Hospital, Varanasi, U.P., India

²Associate Professor, Department of Medicine, Index Medical College, Indore, M.P., India

³Assistant Professor, Department of Physiology, Govt. Medical College, Banda, U.P., India

*Corresponding author email: drdpbent@gmail.com

	International Archives of Integrated Medicine, Vol. 3, Issue 6, June, 2016. Copy right © 2016, IAIM, All Rights Reserved. Available online at http://iaimjournal.com/ ISSN: 2394-0026 (P) ISSN: 2394-0034 (O)	
	Received on: 15-05-2016 Source of support: Nil	Accepted on: 21-05-2016 Conflict of interest: None declared.
How to cite this article: Pandey D, Pandit A, Pandey AK. Study of audio vestibular dysfunction in type2 diabetes mellitus. IAIM, 2016; 3(6): 23-26.		

Abstract

Background: Improved quality of life is prime concern of management of diabetes, which is affecting vast population in later years. Audio vestibular function monitoring and care in the diabetics is part of such concern.

Materials and methods: A cross sectional investigation was carried out, of type 2 diabetes patients at different stages of disease and therapy to evaluate audio vestibular dysfunction profiles.

Results: Hearing loss (HL) was fairly common even in mild early disease while, tinnitus and vertigo too, occurred in all age, gender, disease duration and therapy categories of diabetics. Some 39% of patients bearing tinnitus or vertigo had normal audiograms. Aged males were found to have more exaggerated prevalence of audio vestibular problems than females. Insulin therapy in presumably, patients of long standing disease had lower prevalence of vertigo.

Conclusion: Findings imply, more complex relation of audio vestibular complications to diabetes than, to glycemic status or duration of disease. Monitoring of such complications from the earliest, may alone, bring understanding of their pathogenesis and proper prevention and management.

Key words

Audio vestibular dysfunction, Diabetic hearing loss, Diabetic tinnitus, Diabetic vertigo, Type2 diabetes.

Introduction

Universal presence of some degree of sensorineural hearing loss irrespective of age, sex or disease duration, in type 2 Diabetes managed without tight glycaemic control even at tertiary care level was earlier reported [1]. Age and prehypertension too were found to compromise hearing function in the non-diabetic controls in that study. Mechanisms that cause diabetic vascular pathology, neuropathy and dyslipidemia have been logically suggested as contributory to hearing dysfunction in the diabetics [2-4]. While progressive hearing loss in diabetes is documented in several reports [5-8], the diabetic patients do not differ from non-diabetic people in respect to speech discrimination scores [7]. The association between diabetes and hearing loss appears to be complex with implied organ/system dysfunctions. In the present study, all the inner ear disorders viz. hearing loss, tinnitus and vertigo were studied toward better understanding of their linkage to type 2 Diabetes mellitus, which is relevant to their rational prevention and management strategies.

Materials and methods

A cross sectional study was carried out over period from January 2011 to September 2012 in patients under outdoor care of Ashadeep Trust Hospital Indore, Central India. In all there were 81 patients of type 2 diabetes (48 males and 33 females) aged between 42 years to 68 years. Patients were explained of the study intention and were offered free additional tests planned in the study. The patients were also assured of maintaining confidentiality on their identities. Informed written consent of patients was obtained for their inclusion in the study. Clinical history, information on disease duration, type of diabetic audio vestibular complications and drug therapy of diabetes were all recorded. Patients were consequently subjected to detailed otoscopic ear examination, tuning fork tests and pure tone audiometry at frequencies 500Hz to 8000Hz. The number of patients with hearing loss, tinnitus and vertigo were documented.

Exclusion criteria included presence of overt external or middle ear pathology. Patients taking any potentially ototoxic medication and those with any past history of cranial injury were also excluded. Those patients complaining of giddiness were subjected to proper vestibular function evaluation.

Results

Out of the 81 patients, 34 had diabetes without complication. Twenty eight patients were hypertensive, 9 patients had added retinopathy and 10 had added significant albuminuria. Audiometry revealed total 56 of 81 cases having hearing loss. There were 16 patients complaining of tinnitus and 7 had vertigo. Among the later 23 patients with tinnitus or vertigo, 9 (39%) had normal audiograms. Ten of them had sensorineural hearing loss (SNHL), while 4 had mixed (sensorineural plus conductive) hearing loss. The pure tone average among hearing loss patients was 56 dB. The SNHL affected high frequency in majority (49 cases). Further, the demographic and diabetes therapy determinants were also examined for possible association to hearing loss, tinnitus and vertigo (**Table – 1**).

Within the studied sample size of 81 patients, none of above comparisons displayed statistically significant differences. There was appreciably, no overall impact of age on frequency of studied audio vestibular dysfunction. However, aging makes males more vulnerable to suffer audio vestibular dysfunction. The impact of disease duration over 10 years was apparent as hearing loss but not other audio vestibular dysfunction. The patients on dietary regulation regimen alone ought to be the mild and recent onset cases, while those on insulin regimen may largely be long standing disease cases. It was notable that even in patients, not necessitating drug therapy; incidence of hearing loss was beyond 50%. Vertigo was least prevalent in insulin group but occurred with higher frequency in 'no drug' group and intermediate in oral anti-diabetic drugs group. Tinnitus has similar prevalence in all therapy groups. Among the 7 cases with vertigo,

4 were of benign positional vertigo. Rest 3 had unilateral symptoms and episodes accompanied nausea and vomiting. They also traced beginning of complaints to acute febrile episode of respiratory infections. They were thus considered to be vestibular neuronitis (**Table – 2** and **Table – 3**).

Table – 1: Profile of hearing loss, tinnitus and vertigo in type2 diabetics vis a vis age and gender.

Complication	Age below 58 (n=54)					Age above 58 (n=27)				
	Male	Female	Total	M/F	%	Male	Female	Total	M/F	%
Hearing Loss	22	16	38	1.4	70	13	5	18	2.6	67
Tinnitus	8	4	12	2	22	3	1	4	3	15
Vertigo	2	2	4	1	7	2	1	3	2	11

Table – 2: Profile of hearing loss, tinnitus and vertigo in type2 diabetics vis a vis disease duration.

Complication	Disease duration under 10 years (n=51)		Disease duration above 10 years (n=30)	
	Total	%	Total	%
Hearing Loss	32	63	24	80
Tinnitus	9	18	7	23
Vertigo	4	8	3	10

Table – 3: Profile of hearing loss, tinnitus and vertigo in type2 diabetes vis a vis treatment regimen.

Complication	Insulin regimen (n=26)		Oral anti-diabetics (n=44)		Diet regulation only (n=11)	
	Total	%	Total	%	Total	%
Hearing Loss	19	73	31	70.5	6	54.5
Tinnitus	6	23	8	18	2	18
Vertigo	1	4	3	7	3	27

Discussion

Pathogenic mechanisms of diabetic complications entertain hyperglycemia, dyslipidemia, angiopathy and neuropathy, conventionally. As regards auditory damage, the diabetics suffering hearing loss has been seen with atrophy of spiral ganglion in cochlea and degeneration of auditory nerve myelin sheath [9]. Neuronal degeneration in inner ear can also occur in hypertension. Auditory nerve vasa vasorum wall atherosclerosis in diabetes may lead to neuropathy [10]. Microangiopathic changes in stria vascularis and basilar membrane is reported in diabetes, as well [11]. Evidence of damage to mitochondrial DNA is implicated in diabetic SNHL [12]. Occurrence of vestibular neuronitis, following acute viral and bacterial febrile illness in diabetes is known also [13]. Mechanism for tinnitus is ill understood but

appears related to diabetic pathology in central nervous system [14]. Studies have shown healthy life style to reduce diabetic hearing loss [15]. Significant association of tinnitus and high frequency SNHL has lately been proposed [16]. Reorganized auditory pathway induced by hearing loss is believed to be main cause of tinnitus sensation. In the present study, about 39% persons with tinnitus or vertigo had normal audiograms; hence such explanations are not without flaw.

Selective impact of aging in males increasing audio vestibular morbidity may appear to support lifestyle impact, proposed on these complications. Significant prevalence of hearing loss even in mild diabetics managed on non pharmacological therapy indicates hearing loss as early consequence than uncontrolled glycemic

state. Vertigo was less frequent in insulin therapy group who may be expected to have longer disease duration and severity. Insulin action may provide track of causal mechanisms.

Conclusion

Complications are consequence of disease progression, but audio vestibular disturbance in diabetes does not bear straight forward relationship to the disease. Screening of these dysfunctions in type 2 diabetes from the earliest and consistent monitoring with reference to other clinical and laboratory monitors, may provide right understanding to pathogenesis and prevention /management strategies.

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