ORIGINAL ARTICLE

Association between Sensorineural Hearing Loss and Complicated Diabetes Mellitus

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ABSTRACT

Background: In low-resource areas like ours where complicated diabetes is on rise, sensory neural hearing loss (SNHL) is commonly seen when it has caused disability. The available guidelines do not include screening for sensory neural hearing loss.
Objective: To determine the association between sensory neural hearing loss and complicated diabetes in patients presenting to tertiary care hospital.
Methods: This case control study was conducted in Departments of ENT of Akhtar Saeed Medical College and Central Park Medical College Lahore over a period of six months from 26th March 2015 to 25th September 2015. Two hundred and eighty six subjects were included. They were divided in two groups. One hundred and forty three cases with complicated diabetes and 143 controls with diabetes were included. Complicated diabetes was labeled among patients already diagnosed diabetic patients since at least 1 year with fasting blood sugar greater than 7mmol/dl determined by laboratory method and having diabetic retinopathy or neuropathy or both at time of presentation.
Results: When compared case and control groups with sensory neural hearing loss the results came out significant (p value =0.001). 29 patients of case and 6 patients of control showed up with sensory neural hearing loss. Odds ratio was 5.81. This association was strengthened by presence of retinopathy, young age, HbA1C > 7%. There was no effect of hypertension on SNHL.
Conclusion: There is no association between sensory neural hearing loss and complicated diabetes and accept the alternate hypothesis.
Keywords: Sensory neural hearing loss, Deafness, Complicated diabetes, Type II diabetes, HbA1c

INTRODUCTION

Diabetes mellitus is a serious public health concern and 347 million people worldwide are suffering from diabetes[1]. Diabetes mellitus is on rise in Pakistan and if proper intervention and preventive strategies were not adopted the epidemic of diabetes will prove fatal.[2] In a recent study the prevalence of diabetes is high ranging from 7.6 to 11% in Pakistan[3]. Although there are conflicting studies, credible evidence exists to prove that diabetes mellitus and hearing loss are medically linked. However, the association of sensorineural hearing loss and complicated diabetes has not been studied widely. Currently, there are no formal recommendations for screening for hearing loss in diabetic patients[4].

National Health Examination Survey of USA was used to determine the relative risk for sensorineural hearing loss in diabetic patients. It indicated that differences in socio-demographic characteristics, noise exposure, ototoxic medication use and smoking did not account for the association between diabetes and hearing impairment[5].

Researchers at American Diabetes Association meeting have explained that diabetic patients with poor glycemic control or vascular or neuropathic complications may also suffer from hearing loss, since patients with diabetes already have nerve damage in other areas[6,7,8]. Suboptimal glycemic control was also associated with a nearly threefold increased risk of high-frequency hearing impairment (OR 2.73, 95% CI 1.12 to 6.66). They also found a significant association between sensorineural hearing loss and glycemic control. They compared 50 patients who had diabetes with 50 matched controls ages 20 to 69 years and found that hearing loss was significantly higher in cases than in controls (94% versus 18%, *P*=0.001)**[6].**

SUBJECTS AND METHODS

This case control study was conducted in Departments of ENT Unit II Central Park Medical College and Akhtar Saeed Medical College Lahore over a period of six months after approval of synopsis i.e., from 26th March 2015 to 25th September 2015.

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Two hundred and eighty six subjects were included. They were divided in two groups. One hundred and forty three cases with complicated diabetes and 143 controls with diabetes were included. Patients of both sexes, age between 15-60 years, complicated diabetes mellitus and diabetes mellitus without complications for at least an year were included. Patients having history of Head injury, prolonged exposure to noise, current use of Ototoxic drugs like doxycycline, amikacin in last 3 months and otitis media determined by Otoscopic examination showing either perforation or loss of light reflex were excluded. The data was collected by researcher on a structured questionnaire (attached) which include variables like age, sex, type of diabetes, grades of retinopathy, peripheral neuropathy and sensorineural hearing loss and HbA1c. Time since diagnosis of diabetes in years and hypertension were treated as effect modifiers. Pure tone audiometry and retinal examinations was carried out by researcher under consultant supervision. Data collected was entered and analyzed in the SPSS version 17.

RESULTS

One hundred and fifty five patients (54.2%) were <55 years and 131 patients (45.8%) were > 55 years with mean age 54.87 ± 2.735 ranged from 44 to 60 years. Thirty five (12.2%) had sensory neural hearing loss, 45 patients (15.7%) fall in grade-I, 4 (1.4%) were in grade-II and 2 (0.7%) were in grade-III have retinopathy, 259 patients (90.6%) were neuropathic rest of 27 (9.4%) were not neuropathic, 182 patients (63.6%) were hypertensive. HbA1c level in 241 patients (84.3%) were uncontrolled while in rest of 45 patients (15.7%) it was controlled, duration of diabetes in 158 patients (55.2%) was less than 3 years however in 128 patients (44.8%) duration was either 3 year or above (Table 1). When we cross tabulated the case and control groups with sensory neural hearing loss and applied fisher exact test, the results came out significant (p=0.001). 29 patients of case and 6 patients of control showed up with sensory neural hearing loss (Table 2). Patients that showed positive results for neuropathy when statistically analyzed against study group and Sensory neural hearing loss, results showed up significantly (p=0.01). It depicted that, patients with neuropathy had equal distribution of Sensory neural hearing loss among case and control group (Table 3). Patients with uncontrolled diabetes when analyzed against study group and sensory neural hearing loss results gave us significant p value 0.001. Our results explained that, patients with uncontrolled HbA1c showed unequal distribution of Sensory neural hearing loss among case and control group (Table 4).

Table 1: Demographic information of the patients

Variable	No.	%
Age (years)		
<55	155	54.2
>55	131	45.8
Sensory neural hearing loss		
Yes	35	12.2
No	251	87.8
Retinopathy		
No retinopathy	235	82.2
Grade I	45	15.7
Grade II	4	1.4
Grade III	2	0.7
Neuropathy		
Yes	259	90.6
No	27	9.4
Hypertension		
Yes	182	63.6
No	104	36.4
HbAIC		
Controlled	45	15.7
Uncontrolled	241	84.3
Diabetes		
<3 years	158	55.2
>3 years	128	44.8

Table 2: Comparison sensory neural hearing loss between groups

Group	Neural hearing loss		P value
	Yes	No	
Case	29	114	0.001 (Significant)
Control	6	137	
Odds ratio = 5.808			

Table 3: Comparison sensory neural hearing loss and neuropathy between groups

Neuropathy	Neural hearing loss		P value
	Yes	No	
Case	19	97	0.001 (Significant)
Control	6	137	
Odds ratio = 4.47			

Table 4: Comparison sensory neural hearing loss and HbAIc between groups

HbAIc uncontrolled	Neural hearing loss		P value
	Yes	No	
Case	27	99	0.001 (Significant)
Control	2	113	
Odds ratio = 15.409			

DISCUSSION

Prevalence of diabetes is getting high day by day in Pakistan ranging from 7.6 to 11.[3] Although there are conflicting studies, credible evidence exists to prove that diabetes mellitus and hearing loss are medically linked. However, the association of sensorineural hearing loss and complicated diabetes has not been

studied widely. Currently, there are no formal recommendations for screening for hearing loss in diabetic patients[4].

This study was carried out to find the association between complicated diabetes and SNHL. In our study, 29 patients of case and 6 patients of control showed up with sensory neural hearing loss. When we cross tabulated our study group (case & control) with sensory neural hearing loss the results came out significant (p value =0.001). Odds ratio was 5.81.

It implies that sensory neural hearing loss is associated with diabetes with complications.[9] Our results match with the results of previous studies. In previous study, researchers compared 50 patients who had diabetes with 50 matched controls and found that hearing loss was significantly higher in cases than in controls (94% versus 18%, *P*=0.001)[6,10] In this study of association between presence of diabetic complications and SNHL, it was found a six-fold increased risk of high-frequency hearing loss associated with both peripheral neuropathy and coronary heart disease.

In National Health Examination Survey of USA it was found that among 399 adults with diabetes, for low to mild frequency hearing impairment of mild or greater severity assessed in the worse ear, age-adjusted prevalence estimates (95% confidence limits) were 21.3% (15.0, 27.5) and 9.4% (8.2, 10.5) among 4741 adults without diabetes. Adjusted odds ratios (95% confidence limits) of 1.82 (1.27, 2.60) and 2.16 (1.47, 3.18) for the low to mild frequency and high frequency impairments, respectively, indicated that differences in socio-demographic characteristics, noise exposure, ototoxic medication use and smoking did not account for the association between diabetes and hearing impairment[5,11-15].

This association was modified by young age group as Odds ratio increased to 8.556 for young patients ($p<0.05$). It implies that all young patients with complicated diabetes should be screened for sensory neural hearing loss.

Similarly the association between sensory neural hearing loss and was modified by control of diabetes as Odds ratio increased to 11.3 for patients with HbA1c >7% ($p<0.05$). It implies that all young patients with complicated diabetes should be screened for sensory neural hearing loss.

The association between sensory neural hearing loss and complicated diabetes was modified by duration of disease as Odds ratio increased to 11.3 for these patients ($p<0.05$). It implies that all patients with complicated diabetes for 3 years and above should be screened for sensory neural hearing loss.

CONCLUSION

There is an association between sensory neural hearing loss and complicated diabetes. All patients with complicated diabetes should be screened for sensory neural hearing loss.

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