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ORIGINAL ARTICLE

Hearing Loss in Diabetic Patients Linked with Glycolyzed Hemoglobin A1C

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ABSTRACT

Objective: Glycolyzed haemoglobin A1c (HbA1c) and hearing loss in diabetic individuals are the primary goals of the present research.

Study Design: Randomized Case Control

Place and Duration: THQ Hospital Kamalia. Aug 2021 to Feb 2022.

Methods: There were 80 patients of both genders with ages 16-75 years were presented. Detailed demographics of enrolled cases included age, sex, body mass index and comorbidities were recorded after taking informed written consent. Patients were divided in two groups. Group I had 40 diabetic patients and group II had 40 non-diabetic patients. Hearing loss among both groups was compared by different glycolized hemoglobin levels. SPSS 25.0 was used to analyze complete data.

Results: There were 32 (80%) males and 8 (20%) female in group I and in group II 24 (60%) males and 16 (40%) females. Mean age in group I was 41.31±5.81 years and had men BMI 24.13±7.15 kg/m^2 while in group II mean age was 39.11±4.28 years with mean BMI 22.17±11.32 kg/m^2. In group I 18 (45%) patients were smokers and in group II 15 (27.5%) were smokers. Frequency of hearing loss in group I was higher found in 23 (57.5%) patients as compared to non-diabetic patients in only 2 (5%). Frequency of tinnitus, vertigo and dizziness were also significantly higher in diabetic patients with p value <0.05.

Conclusion: Patients with diabetes mellitus may suffer from impaired hearing and balance even if they do not show any symptoms. As a result, early rehabilitative care should be established to prevent future difficulties.

Keywords: Diabetes Mellitus, Hearing Loss, Hemoglobin A1c

INTRDUCTION

For those who are deaf or have reduced hearing, the ability to communicate and do everyday tasks can be severely impacted [1-2]. 5 percent of the world's population, or 360 million individuals, suffer from hearing loss, according to the World Health Organization (WHO). This number is expected to rise as the older population grows.[3] Adults' hearing loss can be caused by a variety of variables, including ageing, genetics, neurological disease, vascular disease, metabolic disease, ototoxic medicines, loud noise, and diabetes, to name just a few of these. For this reason, it is vital to identify preventive causes of age-related hearing loss [4-6].

Diabetic individuals might suffer from a wide range of organ dysfunctions or deficits as the illness progresses. There are a variety of long-term sequelae associated with diabetes [7], including heart and circulation problems, peripheral vascular illnesses, neuropathy, kidney problems, retinopathy, and issues with the brain. Non-enzymatic and slow glycolysis of haemoglobin in blood produces Hemoglobin A1c (HbA1c), which is utilised for long-term glycemic management in diabetics and for diagnosis in non-diabetic individuals. Diabetes complications and the quality of patients' follow-up care can both be predicted by this test. Although HbA1c is less than 6% in those without diabetes, it can be more than 10% in people with poorly managed diabetes [8].]

Glycaemic management, which has been found to be beneficial in the prevention of various microvascular consequences of diabetes, such as retinopathy, nephropathy, and neuropathy, may thus prevent diabetic hearing loss.[9–12]

Hearing impairment has been linked to a glycaemic control measure, haemoglobin A1c, in three trials. [13–15] In one study, HbA1c was linked to lower-frequency hearing loss when measured with a pure-tone average threshold,[15] whereas in the other two, HbA1c was linked to a higher-frequency loss when measured with a pure-tone average threshold. Thirteen to fourteen No research has found a clear link between elevated HbA1c levels and high-frequency hearing loss, however. HbA1c levels haven't been studied to see if they're linked to diabetes-related hearing loss.

The purpose of this study is to investigate the link between diabetes and hearing loss in diabetic individuals by measuring glycolyzed haemoglobin A1c.

MATERIAL AND METHODS

This study was conducted at THQ Hospital Kamalia and comprised of 80 diabetic and non-diabetic patients. Data on enrolled patients' age, gender, BMI, co-morbidities and informed written consent were gathered before the study began. Patients <16 years of age and those did not give any written consent were excluded from this study.

A thorough medical history was taken of all patients to include information on diabetes duration, HbA1C level, DKA, and hypoglycemia coma episodes, which all patients underwent. Please include a detailed account of your hearing loss, as well as any dizziness you've been experiencing, including frequency, length, kind, and progression. otoscopic examination: otological examination. a. Tympanometry and auditory reflexes (ipsilateral) were tested using tone stimuli at 500, 1000, 2000, and 4000 Hz for the basic audiological examination. The probe utilised has a frequency of 226 Hz. To evaluate air and bone conduction thresholds at octave intervals, we used narrow band noise to mask frequencies from 250 Hz to 8000 Hz. We then used this narrow band noise to examine the conduction thresholds from 500 Hz to 4000 Hz. An Arabic spondaic word and a word discrimination score (WDS) as well as an Arabic phonetically balanced word and a word discrimination score (WDS) were all used in the audiometry of the speech samples. Patients were divided in two groups. Group I had 40 diabetic patients and group II had 40 non-diabetic patients. Hearing loss among both groups was compared by different glycolized hemoglobin levels. SPSS 25.0 was used to analyze complete data.

RESULTS

There were 32 (80%) males and 8 (20%) female in group I and in group II 24 (60%) males and 16 (40%) females. Mean age in group I was 41.31±5.81 years and had men BMI 24.13±7.15 kg/m^2 while in group II mean age was 39.11±4.28 years with mean BMI 22.17±11.32 kg/m^2. In group I 18 (45%) patients were smokers and in group II 15 (27.5%) were smokers.(table 1)

Mean duration of diabetes in group I was 4.11±5.42 years. Among diabetic patients mean Hba1c was 9.9± 4.45. Mean bouts of hypoglycemia was 2.3±1.62. Frequency of diabetic ketoacidosis was found in 25 (62.5%) cases and hypoglycemic coma in 12 (30%) patients.(table 2)

Table-1: Included patients with enrolled cases

Variables	Diabetic	Non-Diabetic
Gender		
Male	32 (80%)	24 (60%)
Female	8 (20%)	16 (40%)
Mean age (years)	41.31±5.81	39.11±4.28
Mean BMI (kg/m^2)	24.13±7.15	22.17±11.32
Smokers		
Yes	18 (45%)	15 (27.5%)
No	22 (55%)	25 (72.5%)

Table-2: Association of hemoglobin level and diabetes effects on patients

Variables	Frequency	Percentage
Mean time of DM (years)	4.11±5.42	
Mean Hba1c	9.9± 4.45	
Mean bouts of hypoglycoma	2.3±1.62	
DKA		
Yes	25	62.5
No	15	37.5
Hypoglycemic coma		
Yes	12	30
No	28	70

Frequency of hearing loss in group I was higher found in 23 (57.5%) patients as compared to non-diabetic patients in only 2 (5%).(fig 1)

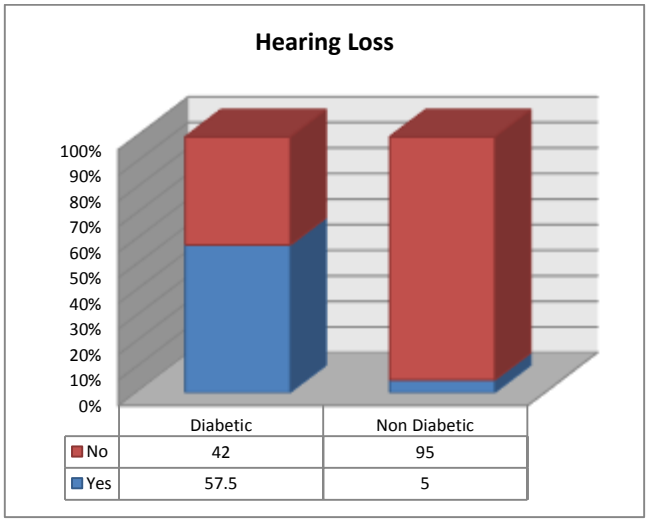

Figure-1: Comparison of hearing loss among both groups

Frequency of tinnitus, vertigo and dizziness were also significantly higher in diabetic patients with p value <0.05.(table 3)

Table-3: Comparison of symptoms among both groups

Variables	Diabetic	Non- Diabetic
tinnitus		
Yes	7 (22.5%)	1 (4%)
No	33 (77.5%)	39 (96%)
dizziness		
Yes	15 (37.5%)	2 (8%)
No	25 (62.5%)	38 (92%)
vertigo		
Yes	14 (35%)	3 (12%)
No	26 (65%)	47 (88%)

Among 23 cases of hearing loss in diabetic patients, 4 cases had moderate bilateral high frequency sensorineural hearing loss, 6 cases had mild bilateral high frequency sensorineural hearing loss and 13 cases had severe bilateral high frequency sensorineural hearing loss (SNHL).(table 4)

Table-4: Association of hearing loss in diabetic patients

Variables	Frequency	Percentage
SNHL		
Mild	4	17.4
Moderate	6	26.1
Severe	13	56.1
Total	23	100

DISCUSSION

5 percent of the general population suffers from hearing loss, which results in functional and vocational losses and, in certain cases, asociality and dementia [3]. The rate of age-related hearing loss rises after the fifth decade, according to research. If you have an underlying metabolic disorder, hearing loss may begin earlier than normal. To avoid hearing loss, it is vital to identify the reasons and implement preventative actions. Diabetes has a deleterious impact on nearly every function in the body. The vestibular and cochlear systems may also be affected by diabetes; regrettably, the processes of diabetes, the pathophysiology, and features on the cochlear system are not well understood. Diabetic symptoms and the characteristics of hearing loss have not been studied in depth [16]. Studies have shown that diabetes-related hearing loss is gradual, bilateral, and affects high frequencies, whereas others [17,18] have shown that it affects all frequencies.

In this study 80 diabetic and non-diabetic patients were presented. Patients were divided in two groups. Group I had 40 diabetic patients and group II had 40 non-diabetic patients. There were 32 (80%) males and 8 (20%) female in group I and in group II 24 (60%) males and 16 (40%) females. Mean age in group I was 41.31±5.81 years and had men BMI 24.13±7.15 kg/m^2 while in group II mean age was 39.11±4.28 years with mean BMI 22.17±11.32 kg/m^2. Findings of current research was comparable to the previous studies.[19,20] In group I 18 (45%) patients were smokers and in group II 15 (27.5%) were smokers.[21] As a result of microvascular problems, the high-frequency specific regions of the cochlea may be more sensitive to ischemia alterations [22] resulting in diabetes-related hearing loss. Demyelination and the loss of outer hair cells in the lower basal fold of the cochlea have been found in postmortem research on people with uncontrolled diabetes. [23] According to Nemati et al., when they examined the pure tone audiometry and otoacoustic emission results of 104 individuals diagnosed with type 2 diabetes, the pure sound test results showed a larger hearing loss in all frequencies in those who were not consistently monitored [24].

Frequency of hearing loss in diabetic group was higher found in 23 (57.5%) patients as compared to non-diabetic patients in only 2 (5%).[25] People with type 1 diabetes may have a lower conduction efficiency as a result of nerve demyelination in the auditory nerves, according to a new study. [13] Diabetes mellitus type 1 affects the vestibular system in a variety of ways, although the central component is most affected. Hypoglycemic episodes and the disease's length and management have a direct impact on this outcome.[14] Frequency of tinnitus, vertigo and dizziness were also significantly higher in diabetic patients with p value <0.05. Among 23 cases of hearing loss in diabetic patients, 4 cases had moderate bilateral high frequency sensorineural hearing loss, 6 cases had mild bilateral high frequency sensorineural hearing loss and 13 cases had severe bilateral high frequency sensorineural hearing loss (SNHL).

When Ooley et al. examined 175 individuals with diabetic retinopathy and whose HbA1c values were available in 2017, they discovered a link between hearing loss and both the HbA1c value and the severity of the diabetic retinopathy[26]. Hearing loss at higher frequencies was shown to be considerably greater in patients with a HbA1c of 7.3 or above in another study done by Nagahama et al. in 2018. (11). Non-diabetic people who have high HbA1c levels are more likely to suffer from hearing loss, according to a new research. [27]. HbA1c levels and diabetic hearing loss, according to Ashkezari et al., are unrelated. [28]

Using HbA1c values, we observed that severe diabetes may have a significant effect on all audiometric measures. As a result of these findings, we strongly advise endocrinologists to do a routine audiometric evaluation in patients with a HbA1c score of 6 and above.

CONCLUSION

Patients with diabetes mellitus may suffer from impaired hearing and balance even if they do not show any symptoms. As a result, early rehabilitative care should be established to prevent future difficulties.

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