THE CORRELATION BETWEEN GLYCATED HEMOGLOBIN LEVEL AND HEARING LOSS IN SUBJECTS WITH TYPE 2 DIABETES

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Introduction

According to the World Health Organization (WHO) data, about 5% of the world population experience a hearing loss problem. Isolation, melancholy, and cognitive decline are all factors that might exacerbate when someone has hearing trouble.

Diabetes mellitus has been implicated as a risk factor for hearing loss. Hearing loss is approximately twice as common in adults with diabetes as in those who do not have the disease. The prevalence of hearing loss in type 2 diabetic patients varies from 34.4 to 60.2%, according to different studies. The pathology of hearing loss in diabetics remains unclear. Microangiopathy, auditory nerve demyelination, spiral ganglion cell loss, and organ of Corti atrophic changes are the suspected causes of diabetes-induced hearing loss.

Serum glycated hemoglobin (HbA1c) level is the main biomarker for long-term glycemic control in individuals with diabetes. The serum HbA1c level evaluates and monitors the effectiveness of treatment given over a previous period, usually within the past two or three months.

Strong evidence supports that timely diagnosis and use of hearing aids can significantly improve quality of life, improve communication, and reduce depression and the rate of cognitive decline in patients with hearing loss. This makes it important to identify patients with T2DM who are at greater risk of developing hearing loss.

Aim of the Work

This study aims to determine the correlation between Glycated hemoglobin serum level (HbA1c) and the audiometric parameters in type 2 diabetic patients.

Subjects and Methods

This case-control study was conducted on 82 people aged 20-60 years who were divided into two groups: 42 patients diagnosed with T2DM and 40 age- and sex-matched healthy controls. The diabetic group was then divided based on serum HbA1c level into two groups, a well-controlled group (HbA1c <7%) and a poorly controlled group (HbA1c ≥ 7%).

All participants underwent pure-tone audiometry (PTA) and immittancemetry measurement evaluation. PTA was performed using a calibrated Interacoustics clinical audiometer (AD629audiometer, Denmark). Thresholds were obtained at frequencies of 250, 500, 1000, 2000, 4000, 8000, 12500, 14000, and 16000. Fasting blood glucose and serum HbA1c levels were also measured for all participants.

Results

Regarding the comparison between the two study groups based on hearing status and severity, the diabetic group (42 patients) shows the following results. For frequencies from 250 to 2000 Hz, most of the patients (38 patients) (90.5 %) demonstrated normal hearing status with a gradual increase in hearing thresholds starting from 4000 Hz towards the higher frequencies. The rest 4 patients (9.5%) show SNHL starting at the low and mid frequencies (2 mild and 2 moderate degrees according to the WHO classification of mean pure tone average). Within the 40 control subjects, 2 subjects had within normal hearing thresholds at all frequencies from 250 -16000 Hz and 38 had within normal hearing thresholds till 8000 Hz with a gradual increase in hearing thresholds at the extended high frequencies. The average hearing thresholds of diabetic patients in the age groups (30-39), (40-49) and (50-60) years were higher than those of the control group, and there was an increasing tendency for elevation of the hearing thresholds level towards the higher frequencies in both groups. Figures (1) and (2).

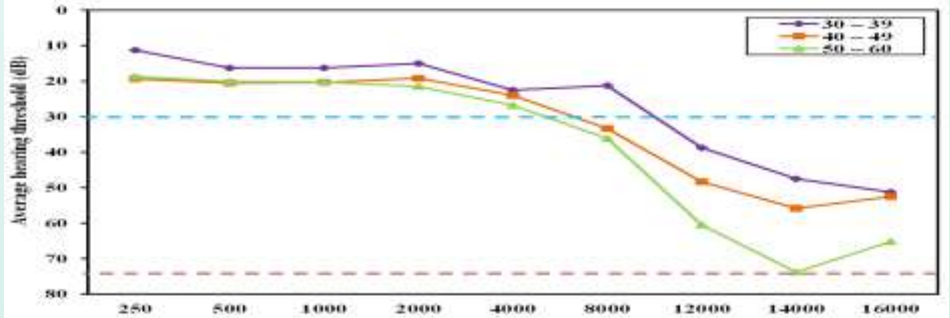

Figure 1: Relation between age and the average hearing thresholds forcases group (n = 42)

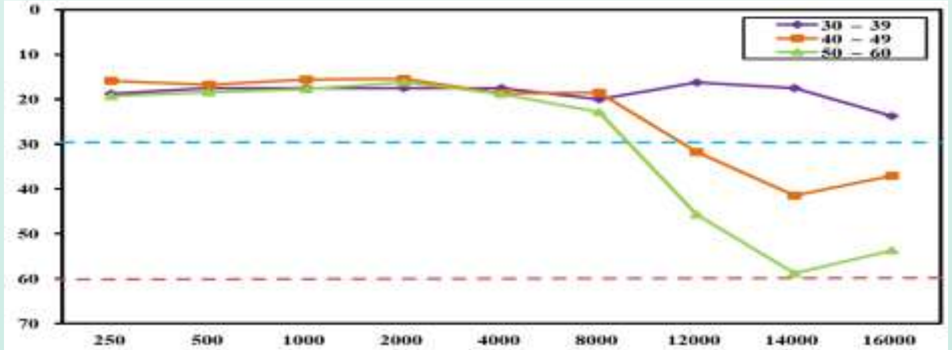

Figure 2: Relation between age and the average hearing thresholds for the control group (n = 40)

The Comparison of hearing threshold values between diabetic patients and the control group shows a significant difference from 1000 Hz to 16000 Hz with an increasing significant tendency at the higher frequencies. Figure (3)

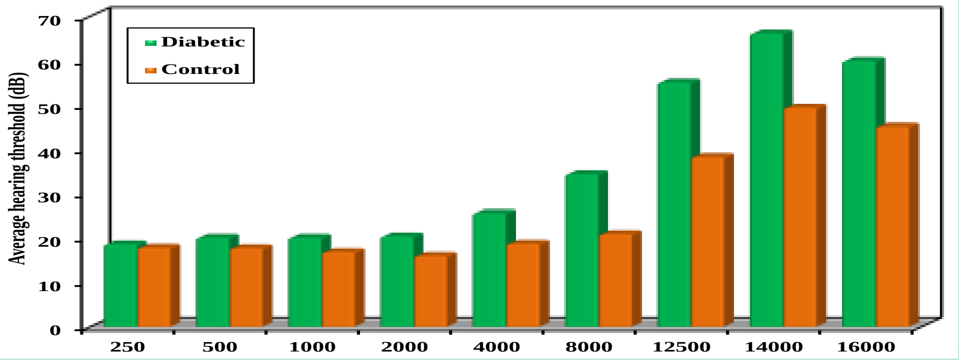

Figure 3: Comparison of the average hearing thresholds between the diabetic and the control groups.

Patients with poor glycemic control status had significantly higher hearing thresholds at all frequencies compared to the good glycemic control group with a significant difference from frequency 12,500 Hz to 16,000 Hz. Figure (4)

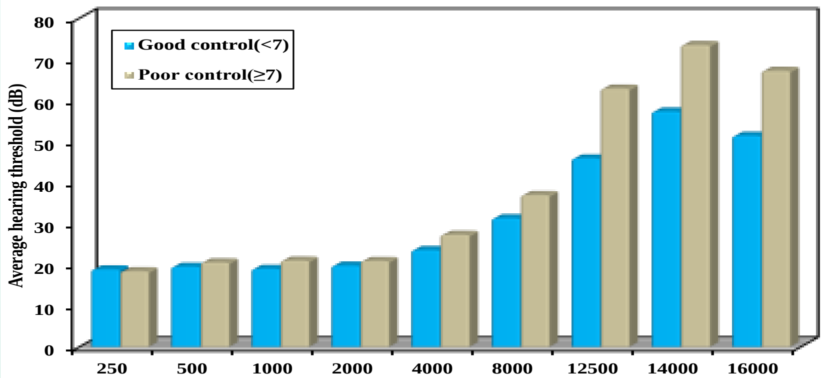

Figure 4: Comparison of the average hearing thresholds between the diabetic sub-groups.

To evaluate the effect of glycemic control status at the extended high frequencies, the mean value of the thresholds at 12.5 kHz, 14 kHz, and 16 kHz was calculated and the values were then compared between groups. Accordingly, there was a significant difference between the diabetic and control groups at the extended high frequencies as well as between the poor and good glycemic control groups.

Conclusion

The results of pure tone audiometric testing showed sensorineural involvement especially at the extended high frequencies, even in patients with normal conventional pure tone thresholds. Poor glycemic control status is significantly associated with hearing loss, as the type 2 diabetic group with poor glycemic control status [Hb A 1c ≥7%] had higher auditory thresholds than the good glycemic control group.

Maintaining good blood sugar control can prevent vascular injury and complications associated with diabetes. All patients with diabetes should undergo regular hearing evaluation, along with other tests of blood sugar status, for early detection of impending hearing complications.

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