



Hearing screening for type 2 diabetes mellitus patients at the internal medicine clinic, Sari Dharma Clinic, Denpasar

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Abstract

Background: The relationship between diabetes mellitus (DM) and hearing loss has been discussed for a long time. Several studies have found a possible correlation between the duration of diabetes mellitus and hearing loss.

Objectives: This study aims to determine the average hearing threshold in patients with diabetes mellitus.

Methods: This study is a descriptive observational study with a cross-sectional design. The population in this study were all patients with diabetes mellitus at the Internal Medicine Clinic, Sari Dharma Clinic, Denpasar. The samples taken were patients with a history of Diabetes mellitus based on the doctor's diagnosis at the Internal Medicine Clinic of the Sari Dharma Clinic. The variables in this study were gender, age, duration of suffering from diabetes mellitus and hearing threshold.

Results: This study consisted of six male patients (50%) and six female patients (50%). The age of the majority of patients was 56-65 years old (50%), while the lowest was 26-35 years old (0%). From the results of the hearing examination, it was found that the most common hearing in the right ear was normal hearing (58.3%), while in the left ear was normal hearing (41.7%). Most patients who experienced hearing loss were 56-65 years old (57.1%).

Conclusion: There is hearing loss in diabetes mellitus patients at the Internal Medicine Clinic, Sari Dharma Clinic.

Keywords: hearing screening, mellitus patients, sari dharma clinic

Introduction

Diabetes mellitus (DM) is a group of metabolic diseases characterized by hyperglycemia that occurs due to abnormalities in insulin secretion, insulin action or both. Complications that occur due to DM can be in the form of disorders of blood vessels, both macrovascular and microvascular, as well in the nervous system or neuropathy. This disorder can occur in patients with type 2 diabetes who have had the disease for a long time or type 2 diabetes who has just been diagnosed. Macrovascular complications generally affect the heart, brain and blood vessels, while microvascular disorders can occur in the eyes and kidneys. Neuropathic complaints are also commonly experienced by DM patients, both motors, sensory or autonomic neuropathy^[6].

The relationship between diabetes mellitus (DM) and hypo acoustic has been discussed for a long time. Several studies have found possible correlations between the duration of diabetes mellitus and hearing loss. The auditory system requires glucose and utilizes high energy for complex signal processing, suggesting that the cochlea can be a target organ for DM. Outer hair cells modulate auditory reception in the inner ear. Complications of DM such as retinopathy, nephropathy, and peripheral neuropathy involve pathogenic changes in the microvascular and sensory nerves. It causes common symptoms in people with diabetes mellitus, such as tinnitus, dizziness and bilateral and progressive sensorineural hearing loss. In addition, the specific pathological effects of hyperglycemia and its complications such as microvascular and neuropathic may also affect the ear^[3].

Although there is a lot of literature that shows the relationship between DM and hearing status, there is no consensus on the treatment of hearing loss in DM patients. Audiometric tests for hearing are not part of routine tests in the management of patients with diabetes mellitus while hearing loss caused by Type 2 DM can be prevented. In the future, the development of research related to hearing function in DM will help its management holistically.⁴ From the above background, the researcher wanted to know the average hearing threshold in people with diabetes mellitus.

Methods

This study is a descriptive observational study with a cross-sectional design conducted in July 2021. The population in this study were all patients with diabetes mellitus at the Internal Medicine Clinic, Sari Dharma Clinic, Denpasar. The samples taken were patients with a history of diabetes mellitus based on a doctor's

diagnosis at the Internal Medicine Clinic of the Sari Dharma Clinic who were willing to be respondents. The variables in this study were gender, age, duration of suffering from diabetes mellitus and hearing threshold.

Results

The subjects in this study were all patients with diabetes mellitus at the Internal Medicine Clinic, Sari Dharma Clinic, Denpasar in July 2021.

Table 1: Samples characteristics based on gender

Gender	Frequency (n)	Percentages (%)
Males	6	50
Females	6	50
Total	12	100

Table 2: Samples characteristics based on age

Age	N	%
26-35 years old	0	0
36-45 years old	2	16.7
46-55 years old	1	8.3
56-65 years old	6	50
65-70 years old	2	16.7
>70 years old	1	8.3
Total	12	100

Table 3: Samples distributions based on hearing impairment category

Hearing impairment	N	%
Right ear		
Normal	7	58.3
Mild	3	25
Moderate	0	0
Moderate-Severe	2	16.7
Severe	0	0
Very Severe	0	0
Total	12	100
Left ear		
Normal	5	41.7
Mild	4	33.3
Moderate	1	8.3
Moderate-Severe	2	16.7
Severe	0	0
Very Severe	0	0
Total	12	100

Table 4: Samples distribution based on age and hearing impairment

Age	Hearing impairment	
	n	%
26-35 years old	0	0
36-45 years old	1	14.3
46-55 years old	0	0
56-65 years old	4	57.1
65-70 years old	1	14.3
>70 years old	1	14.3
Total	7	100

Based on the results of descriptive statistics on study data, it was found that there were six male patients (50%) and six female patients (50%). The age of the majority of patients was 56-65 years old (50%), while the lowest was 26-35 years old (0%).

From the results of the hearing examination, it was found that the most common hearing in the right ear was normal hearing (58.3%), while in the left ear was normal hearing (41.7%). Patients who experienced hearing loss were mostly at the age of 56-65 years old (57.1%).

Discussion

Diabetes mellitus is a primary risk factor for neuropathy, retinopathy, and nephropathy. It is induced by glucose/insulin pathology that can have direct effects on sensory and cochlear supporting cells. Macro and microvascular disorders cause reduced blood flow, oxygen exchange, and ion transport. These are major factors in complications of hypertension and diabetes affecting the ear. Study shows that neuropathic hearing loss can be minimized by increasing nerve blood flow. A healthy diet and the adoption of a healthy lifestyle, in general, have been suggested to prevent the development of diabetes and hearing loss. Several pathologies caused by diabetes can cause hearing loss, but mostly it is caused by chronic excessive noise exposure.¹¹ Study by Meena confirmed the presence of SNHL in relatively young type 2 diabetes mellitus. The audiological tests to monitor hearing in patients with Diabetes mellitus should be considered a routine procedure^[9]

Diabetes mellitus is a chronic metabolic disease characterized by hyperglycemia and changes in fat and protein metabolism. It results in several microvascular complications that generally affect the eyes and kidneys, which are accompanied by diffuse polyneuropathy of the somatic and autonomic nerves. Nerve tissue and blood vessels contribute to the function of the organ of hearing. Diabetes mellitus can damage nerve cells and blood vessels, and thus can also harm the hearing organ. There may be a relationship between the function of the auditory organs in people with diabetes because the disease affects organs rich in blood vessels such as the cochlea and the central nervous system, including the brain, which plays a role in hearing.⁷ Patients with type 2 diabetes mellitus have a higher hearing threshold than healthy adults. They show significant high-pitched audiometry results, bilateral SNHL, mild to moderate^[5].

Based on the study results, there are six male patients (50%) and six female patients (50%). The majority of patients were 56-65 years old (50%), while the lowest was 26-35 years old (0%). From the results of the hearing examination, it was found that the most common hearing in the right ear was normal hearing (58.3%), while in the left ear was normal hearing (41.7%). Patients who experienced hearing loss were mostly 56-65 years old (57.1%).

The Shadman study found that patients with poor control exhibited more frequent hearing loss than patients in the well-controlled group, especially at higher frequencies. Patients in the uncontrolled group had a poorer cochlear function for DM testing. Nevertheless, poor control status of diabetes mellitus can affect auditory sensation and cause hearing loss, especially at high frequencies. Patients with a duration of more than ten years, diabetes mellitus complications, poor control status or comorbidities should undergo both endocrine and audiological follow-up to prevent greater sensory-neural hearing loss.¹⁵ The Shanmugasundaram study found the prevalence of SNHL was 51.3% with mild to moderate hearing loss. The use of audiological tests at the primary care level should be used as a hearing screening for all patients with diabetes mellitu^[10].

In Dayanand's study, 72% of patients with diabetes mellitus had mild SNHL, 20% moderate SNHL, 3% moderate-severe SNHL, 4% severe, and 1% with very severe hearing loss. DM patients are also more prone to develop mild to moderate SNHL. The same study also found that the duration of diabetes mellitus and gender did not affect the incidence of hearing loss.¹⁴ In a study in Saudi Arabia, 181 patients with sensorineural disorders were found. Ninety patients had a mild degree(49.7%), 69 were moderate (38.2%), 16 were severe (8.8%), and 6 were very severe degrees (3.3%).⁸ The results of the study in Manado showed that there were nine people (23.6%) who had normal hearing, 24 people (63.2%) had bilateral hearing loss and 5 (13.2%) had unilateral hearing loss. Of the 29 study subjects with hearing loss experienced mild and moderate hearing loss. There were no study subjects with moderate, severe or very severe hearing loss categories. Most subjects have hearing loss.²

In a cohort study of young and middle-aged men and women, diabetes mellitus was associated with the development of bilateral hearing loss. Patients with diabetes mellitus had a moderately increased risk of future hearing loss.¹³ Poor audiometric threshold had a statistically significant association among people with diabetes mellitus compared with patients in the control group. It is shown by the correlation between hearing loss and diabetes mellitus. Therefore, health workers should pay attention to hearing health in patients with diabetes mellitus.¹² In a study, 46 patients with diabetes mellitus had sensorineural hearing loss & 54 diabetic patients had normal hearing. This study found that the proportion of hearing loss in all diabetics was 46%, but in patients with diabetes mellitus with poor glycemic control, it was 95.8%. Patients with uncontrolled glycemic levels are more susceptible to hearing loss. Therefore, diabetes mellitus patients are advised to keep their glycemic levels under control to prevent hearing loss. Screening for hearing loss may be recommended for patients with uncontrolled diabetes mellitus on an outpatient basis^[1].

Conclusion

There is hearing loss in diabetes mellitus patients at Internal Medicine Clinic of Sari Dharma Clinic, Denpasar.

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