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Assessment of Auditory-Related Symptoms and Comorbidities in Diabetic Type 2 Patients: A Cross-Sectional Study

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ABSTRACT

Background: Diabetes mellitus is a long-term metabolic disorder that is well established to produce systemic complications. Of these, auditory complications are underdiagnosed. This study sought to investigate the relationship between the duration of diabetes, comorbidities, and hearing-related symptoms in diabetic patients. **Methods:** A descriptive cross-sectional study was conducted on 100 patients with diabetes using a pretested proforma. Demographic characteristics, diabetes duration, and its complications and comorbidities were compiled using the questionnaire. Data were analyzed using descriptive statistics. **Results:** More than half of the patients (70%) were diabetic for more than 21 years. Hypertension and heart disease were the most prevalent comorbidities (each 22%), followed by renal problems (20%). Complications related to hearing were the most significant, with 72% mentioning that they could not hear, 57% struggling with words that sounded alike, and 35% hearing echo sounds. Notwithstanding these symptoms, only 29% of them had seen an ENT specialist, and 11% wore hearing aids. Ear complications were the most commonly occurring diabetes complication at 46%, indicating a good correlation between long-term diabetes and hearing impairment. **Conclusion**: This paper highlights the high prevalence of symptoms of hearing loss in long-standing diabetic patients. Early detection and treatment by incorporating regular auditory screening into the standard diabetes management should be incorporated.

INTRODUCTION

Diabetes mellitus is the most severe condition that affects several systems in the body. (1, 2) When the pancreas malfunctions and cannot create enough insulin, or when the body cannot use the insulin that the pancreas produces efficiently, blood glucose levels rise. (3, 4)The most prevalent forms of diabetes that are identified in many people are type 1 and type 2, even though there may be several varieties of the disease. Insulin resistance and insulin dependency resulting from pancreatic dysfunction (type 1) are factors in these forms of diabetes mellitus. DM affects a large number of people worldwide. With millions of people afflicted, it has spread like an epidemic around the world. According to the International Diabetes Federation, there are currently 537 million individuals with diabetes worldwide, and by 2045, the prevalence is predicted to rise to over a billion people, a 45% increase.(5) Due to a lack of health resources [6], the high prevalence of other infectious diseases like coronavirus and TB, as well as other communicable diseases like the human immunodeficiency virus, which are already taxing the health system [7], these high projections are concerning, particularly in low- and middle-income countries (6, 7).

In the twenty-first century, diabetes mellitus is a serious public health issue. The prevalence of DM is increasing in South Africa, as it is in many other countries. The rising prevalence of diabetes is caused by several factors, including sedentary lifestyles, changing food habits, urbanization, and genetic susceptibility. According to estimates, a significant percentage of South African adults either have diabetes or are at risk of getting it. People 60 years of age and older appear to have a greater frequency of diabetes mellitus, especially in low- and middle-income countries (LMICs) like China, India, and Sub-Saharan nations.(8-10) Although diabetes is becoming more commonplace globally, older people appear to have a greater prevalence of the disease than younger people. Several variables, including genetic composition, a long life expectancy that reduces insulin secretion, and other lifestyle choices that lead to central obesity, raise the chance of developing diabetes mellitus (DM) in individuals 60 years of age and beyond. (11, 12)

It is well recognized that diabetes mellitus (DM) affects

many human organs and systems, such as the kidneys, eyes, neurological system, and cardiovascular system. However, there hasn't been as much focus in the research on how diabetes may affect the auditory system, particularly the middle ear. Although there is previous research on diabetes mellitus and hearing loss, there is still little data linking the disease to middle ear disorders. With regard to that research indicates that diabetes mellitus may impact the human immune system, making people more susceptible to infections, the paucity of data in this area is alarming. According to earlier research, people with immunocompromised systems as a result of illnesses have also had middle ear diseases of varied kinds and severity.(13, 14)Furthermore, the latest strategy for evaluating DM comorbidities does not include hearing evaluation, even though Hearing Loss has been recognized as a potential side effect of DM. The study aimed to determine the prevalence of. Self-declared hearing-associated symptoms and related comorbidities and complications in patients diagnosed with diabetes mellitus.

MATERIALS AND METHODS

Study Design: This research used a descriptive cross-sectional study whose aim was to determine the prevalence of self-perceived hearing-related symptoms among those with a proven diagnosis of diabetes mellitus. A cross-sectional design was used because of its suitability in estimating the burden of health-related conditions at a given point and for the efficiency of determining likely associations between variables. The study was observational and not interventionist, involving only data collection by participant interview without any change to their current medical treatment.

Setting & Duration: The research was undertaken at a diabetic outpatient clinic in Karachi, Pakistan. The clinic is an ordinary care center for diabetic mellitus patients and has an ethnically diverse patient population from all socio-economic levels. Data were collected over a specified period of three months from 1st April 2025to 30th June 2025.

Participants & Eligibility: 100 adult patients were enrolled in the study. The inclusion criteria were to be over 18 years of age and have a previous medical diagnosis of diabetes mellitus type 2. The diagnosis was verified by checking records in the clinic. Patients were recruited when they were attending their usual clinic visit and offered a place in the study. Exclusion criteria were used to remove potential confounding variables. In particular, participants with a recognized non-diabetic etiology of hearing loss (e.g., congenital hearing loss, occupational noise exposure, drug ototoxicity, or head injury) were excluded.

Sampling Method: Random sampling was performed using convenience sampling, where all those eligible and willing who attended the clinic while the study was being carried out were asked to participate.

Data Collection Instrument: Information was collected by a standardized interviewer-administered questionnaire on demographics (sex, age), duration, and comorbidities of diabetes, diabetes complications (e.g., in the eye, teeth, foot), and specific hearing-related symptoms.

Operational Variables: Key variables were age and sex; disease traits like duration of diabetes; presence of comorbidities or diabetic complications; and binary (yes/no) answers to hearing symptoms like tinnitus, inability to distinguish similar-sounding words, ear pain/discharge, history of ENT consultation, and the use of a hearing aid.

Data Collection Procedure: Written informed consent was obtained before face-to-face surveys were conducted by trained interviewers in a private clinic room. Responses on the questionnaire were documented and checked daily for completeness.

Ethical Approval: Ethical Approval was taken from Ziauddin University Karachi for this study.

Statistical Analysis: The collected data were typed into a computer database using Microsoft Excel and analysed using statistical software SPSS version 25. Results were presented using descriptive statistics. The categorical variables, including sex, presenting hearing symptoms, and complications, were enumerated as frequencies and percentages.

RESULTS

There were 100 diabetic patients involved in the study. Out of the respondents, 63 (63%) were males and 37 (37%) were females, which shows a greater proportion of male respondents in the study sample as demonstrated in Figure 1. The age grouping showed that most of the respondents were in the age groups 41–45 years (38 respondents, 38%) and 46–50 years (34 respondents, 34%). The rest of the respondents were in the following age groups: 13 (13%) were in the 36–40 years group, 7 (7%) were in the 30–35 years category, 5 (5%) were 56–60 years, and 3 (3%) were 65–70 years, as shown in Figure 2. In terms of diabetes duration, a majority of the participants, 70 (70%), had been diagnosed with diabetes for 21–25 years. 20 (20%) of the participants had diabetes for 16–20 years, and 10 (10%) participants had diabetes for 10–15 years. On being questioned regarding comorbidities, 22 participants (22%) mentioned that they had hypertension, the same number (22 participants, 22%) said they had heart conditions, and 20 participants (20%) mentioned kidney conditions. Thirty-six participants (36%) also identified other comorbidities, although they were not elaborated upon. With respect to diabetes-related complications, ear problems were the most-reported complication (reported by 46 = 45.5 percent of respondents) among all diabetes-related complications. This was followed by eye problems in 20(20.0%) participants, foot problems in 20(20%), kidney problems were observed among 10 (10%), and teeth difficulties were noted by 4 (4%). With respect to hearing and auditory symptoms, “Hearing loss” was the most frequent symptom in the study group, with 72 (72%) subjects reporting it. Mistaking words that sound similar was mentioned by 57 (57%), indicating problems of verbal discrimination and oral perception. Furthermore, echoes in their ears were also reported by 35 participants (35%). which may point towards middle ear effusion or pathology in the ear. 26 participants (26%) also reported pain in the ears, and 22 participants (22%) reported discharge from

the ears, which may be indicative of chronic infection or disease of the middle ear. Despite the commonness of hearing symptoms, just 29 participants (29%) had ever consulted an ENT (Ear, Nose, and Throat) specialist. Only 11 (11%) of the patients had used any type of ear or hearing aid, either amplifiers or hearing aids, as noted in Table 1. The findings reveal a high prevalence of symptoms of hearing loss among diabetic patients, particularly with increased duration of the disease. These results suggest a large disparity between symptom burden and utilization of ear care services and suggest the need for increased awareness, preventive ENT care visits, and periodic auditory screening in this population.

Table 1

Frequency and Percentage of Self-Reported Auditory Symptoms and Comorbidities in Diabetic Patients

Q. No	Question / Variable	Response Option	Frequency (n)	%age
Q1	Any comorbidities related to diabetes?	Blood Pressure	22	22%
		Heart Issues	22	22%
		Kidney	20	20%
		Other	36	36%
Q2	Duration of diabetes (in years)?	10–15 Years	10	10%
		16–20 Years	20	20%
		21–25 Years	70	70%
Q3	Any complications due to diabetes?	Eye	20	20%
		Ear	46	46%
		Kidney	10	10%
		Foot	20	20%
		Teeth	4	4%
Q4	Any difficulty in hearing?	Yes	72	72%
		No	28	28%
Q5	Difficulty understanding similar-sounding words?	Yes	57	57%
		No	36	36%
Q6	Do you have any pain in your ear?	Yes	26	26%
		No	74	74%
Q7	Any discharge from the ear?	Yes	22	22%
		No	78	78%
Q8	Do you feel an echo sound in your daily routine?	Yes	35	35%
		No	65	65%
Q9	Have you visited an ENT doctor?	Yes	29	29%
		No	71	71%
Q10	Do you use any ear device (e.g., hearing aid)?	Yes	11	11%
		No	89	89%

Figure 1

Gender Distribution Among Type 2 Diabetic Patients

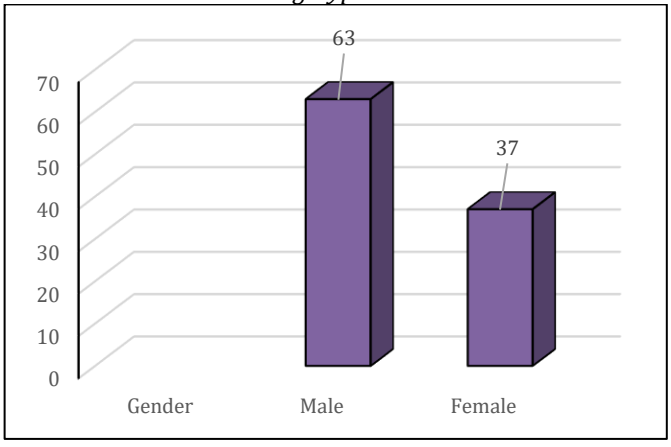
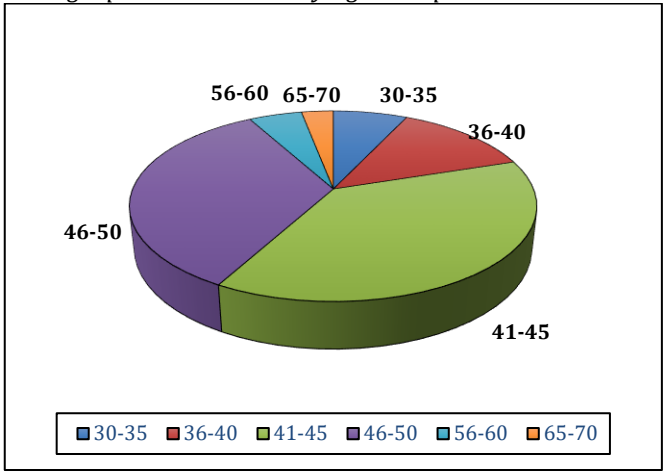


Figure 2

Demographic Distribution by Age Group



DISCUSSION

This research exposed a high incidence of auditory complications among long-standing diabetic patients with mellitus. Interestingly, 72% of subjects complained of difficulty in hearing, and 57% also complained of difficulty in hearing similar sounds, both of which are characteristic of sensorineural hearing loss that frequently occurs with chronic hyperglycemia-induced microvascular damage. The findings also show that there is a significant overlap between diabetes and comorbid conditions like hypertension (22%), cardiovascular problems (22%), and kidney disease (20%), which are all known to cause or aggravate auditory dysfunction. The lengthy duration of diabetes in the majority of the participants (70% with 21–25 years) may have contributed to the risk of developing these complications even more. Ear-related complications (46%) were the most commonly reported diabetes-related problem, even over eye and foot complications. Notwithstanding this, a remarkably low percentage of patients (29%) had ever seen an ENT specialist, and just 11% had utilized any hearing device, indicating a large gap in awareness and healthcare access or utilization. Notably, though ear pain and discharge occurred in 26% and 22% of patients, respectively, both these symptoms were overshadowed by more insidious but incapacitating factors such as echo sounds and difficulty in understanding words. This highlights the importance of early screening, particularly since some of the auditory complications are progressive and irreversible if not treated. The majority of research on the link between diabetes mellitus and hearing loss was cross-sectional. Since these prevalence estimates were based on considerably older populations, the prevalence of hearing loss reported in DM patients in previous studies varied from 44.0% to 60.2%(15-17) which is significantly higher than the number in our analysis. The majority of cross-sectional research has linked DM to common hearing loss(18, 19).

CONCLUSION

The implications of this study highlight the reflective but not well-documented burden of auditory complications in those with long-duration diabetes. Impairment of hearing, impaired ability to discriminate between different sounds,

and other symptoms related to the ear were widespread but frequently untreated. With the evident relationships between the duration of diabetes, comorbidities, and hearing impairment, routine diabetes care must include regular auditory tests. Improved awareness, early ENT referral, and availability of hearing aids or other assistive technologies can go a long way in improving the quality of life of diabetic patients.

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