Dra. Blanca Navarro Llevat.
Family Physician. Attending Physician at CAP Raval Sud, Barcelona, Spain

Hearing loss and diabetes

Diabetes mellitus (DM) is a chronic disease with a high global prevalence, recognized for its multiple microvascular and macrovascular complications. Traditionally, clinical attention has focused on the most common target organs, such as the retina, kidneys, and cardiovascular system. However, in recent years, increasing evidence has shown that the auditory system may also be affected.

Hearing loss in patients with diabetes is an increasingly reported finding in the literature, with prevalences higher than those observed in the general population (1, 2).

Among the proposed **pathophysiological mechanisms** are damage to small blood vessels (diabetic microangiopathy) of the inner ear—particularly the cochlea—damage to the auditory nerve, and metabolic alterations that disrupt inner ear homeostasis. These processes result in hearing loss that is often bilateral and symmetrical, predominantly sensorineuralin type.

Because of population aging and the sustained increase in diabetes prevalence, early identification of diabetes-associated hearing loss has become especially relevant in clinical practice.

Recognizing the association between DM and hearing loss allows for the implementation of simple screening strategies in primary care, facilitating early detection, appropriate referral, and prevention of auditory sequelae.

In this context, the present review focuses on the relationship between diabetes and hearing loss, aiming to highlight its clinical relevance and the need for a systematic approach in medical practice. »

» PATHOPHYSIOLOGY

Before describing the pathophysiology, it is important to recall that hearing loss is categorized into 3 types:

- Conductive hearing loss: Occurs when the lesion is located in the external or middle ear, affecting air conduction and preventing sound from adequately reaching the inner ear.
- Sensorineural hearing loss: Occurs when the lesion affects the inner ear and/or the auditory nerve. This is the most common type and is most closely associated with aging (presbycusis).
- Mixed hearing loss: Combines features of both conductive and sensorineural hearing loss (3).

Hearing loss in individuals with diabetes is predominantly **sensorineural, slowly progressive**, and bilateral, affecting mainly the higher frequencies (4000–8000 Hz).

As is well known, diabetes affects multiple organs and systems through 2 major pathogenic mechanisms: diabetic microangiopathy and diabetic neuropathy. Prolonged hyperglycemia damages the blood vessels and nerves of the inner ear, impairing oxygen delivery and auditory function, which can result in progressive hearing loss. These mechanisms explain why people with diabetes develop hearing **loss more frequently and at younger ages than the general population** (4).

Of note, other factors commonly associated with type 2 diabetes mellitus (T2DM)—such as hypertension and dyslipidemia—potentiate vascular damage and accelerate hearing loss. Aging also acts synergistically, making it difficult to distinguish presbycusis from diabetes-related hearing loss.

CLINICAL SIGNS

The most common clinical signs include:

- **Difficulty understanding conversations**, especially in noisy environments.
- Need **to increase the volume** of the television or radio.
- Sensation of **ear fullness or aural pressure**.
- **Tinnitus** (ringing in the ears), often bilateral.
- In some cases, **mild dizziness or instability**, although less frequent than in vestibular hearing loss.
- **Slow and silent progression:** many patients are unaware until hearing loss becomes significant.

Hearing loss has important consequences for patients' lives, including social isolation, depressive symptoms, increased risk of dementia, and even reduced treatment adherence due to difficulty understanding medical instructions.

Its impact on quality of life justifies the need for early screening and treatment of hearing loss in people with diabetes.

SCREENING AND DIAGNOSIS

Although definitive recommendations have not yet been established, good clinical practice includes evaluating any individual who perceives hearing loss and those with risk factors for its development (5).

There are differing opinions regarding systematic screening. The American Diabetes Association (ADA) reports that hearing loss is more common among patients with diabetes but does not recommend routine screening (6).

Diagnosis is based on the combination of clinical signs and audiological tests.

Hearing loss should be **suspected** in patients with long-standing diabetes, particularly those with poor glycemic controland one or more of the previously described symptoms.

Basic physical examination should not be overlooked; in sensorineural hearing loss, otoscopic examination is usually normal.

It is recommended to add the following **specific questions** to the annual diabetes review (7):

"Have you noticed any changes in your hea- »

RECOGNIZING THE LINK BETWEEN DM AND HEARING LOSS OPENS THE POSSIBILITY OF IMPLEMENTING SIMPLE SCREENING STRATEGIES IN PRIMARY CARE, PROMOTING EARLY DETECTION, APPROPRIATE REFERRAL, AND PREVENTION OF AUDITORY SEQUELAE

MANAGEMENT SHOULD BE MULTIDISCIPLINARY, WITH PARTICIPATION FROM PRIMARY CARE NURSING AND FAMILY MEDICINE, AS WELL AS ENDOCRINOLOGY, OTORHINOLARYNGOLOGY, AND SPEECH THERAPY

» *ring or ringing in your ears?", "Has anyone in your family noticed that you hear less well?"*

A positive response justifies further evaluation, such as audiometry or referral to an otorhinolaryngology specialist for more detailed studies.

Available diagnostic tests include:

- Pure-tone audiometry: Measures hearing thresholds at different frequencies and confirms the sensorineural pattern.
- Speech audiometry: Useful for evaluating speech comprehension and functional impact.
- Otoacoustic emissions (OAE) and auditory brainstem responses (ABR): Used less frequently, mainly in research or complex cases. These tests allow very early detection of auditory pathway alterations and neural conduction damage (8).

PREVENTION AND TREATMENT

The best treatment is prevention.

Maintaining good glycemic control and managing cardiovascular risk factors are key to reducing the risk of microvascular and neuropathic complications, including auditory involvement (9).

Early diagnosis, rehabilitation, and therapeutic interventions are essential to ensure adequate adherence and optimal outcomes in patients with diabetes, who are at increased risk of hearing loss.

Management should be multidisciplinary, involving primary care nursing and family medicine, as well as endocrinology, otorhinolaryngology, and speech therapy.

Hearing aids are the first-line option in most cases of mild to moderate hearing loss. Cochlear implants offer good results in severe hearing loss. Auditory rehabilitation and speech therapy support improve communication.

Of note, this article has focused exclusively on hearing loss. However, multiple otorhinolaryngological complications are associated with T2DM, including balance disorders, severe infections such as malignant otitis externa or invasive fungal rhinosinusitis, olfactory disturbances, and changes in voice or laryngeal function. These complications should also be considered when evaluating individuals with diabetes mellitus (10) ***(Table 1)***. D

ENT CONDITION	UNDERLYING MECHANISM	MAIN CLINICAL SIGNS	USUAL MANAGEMENT OR TREATMENT
Sensorineural hearing loss	Microvascular and neuropathic damage of the inner ear	Difficulty hearing conversations, tinnitus, bilateral and progressive hearing loss	Glycaemic control, hearing aids, cochlear implant in severe cases
Malignant otitis externa	Severe external auditory canal infection caused by Pseudomonas in immunocompromised patients	Severe pain, otorrhoea, fever; possible bone involvement	IV antibiotics, strict glycemic control, hospitalization
Balance disorders	Vestibular involvement due to neuropathy or microangiopathy	Dizziness, gait instability	Vestibular rehabilitation, physiotherapy, metabolic control
Invasive fungal rhinosinusitis	Immunosuppression and vascular impairment	Nasal congestion, facial pain, fever, necrotic lesions	ENT emergency: antifungal therapy and surgery
Olfactory and taste disorders	Neurosensory damage and metabolic changes	Loss or distortion of smell and taste	Metabolic control, ENT evaluation
Voice disorders (diabetic laryngopathy)	Laryngeal nerve neuropathy or mucosal dryness	Hoarseness, vocal fatigue	Speech therapy, hydration, environmental humidification

TABLE 1. Otorhinolaryngological conditions associated with diabetes

CONCLUSIONS

- Diabetes mellitus increases the risk of sensorineural hearing loss.
- Microangiopathy and neuropathy are key pathogenic mechanisms.
- Early detection through screening is advisable in primary care.
- Early diagnosis improves quality of life and treatment adherence.
- Multidisciplinary management optimizes auditory function and prevents complications.

HEARING LOSS SIGNIFICANTLY AFFECTS QUALITY OF LIFE, COMMUNICATION, AND MENTAL HEALTH

REFERENCES

1.- Imarai C, Aracena K, Contreras D, Caro J. Relación entre hipoacusia y diabetes mellitus tipo 2. Rev Otorrinolaringol Cir Cabeza Cuello. 2013;73(2):157-63.
2.- Kim CHS, Lauritsen KL, Nguyen SA, Meyer TA, Cumpston EC, Pelic J, Labadie R. Characteristics of Hearing Loss in Type 2 Diabetes Mellitus: A Systematic Review and Meta-Analysis. Otolaryngol Head Neck Surg. 2025 Aug 4.
3.- de Hoyos Alonso MC. Audiometría. AMF. 2009;5(2):103-10.
4.- Elangovan S, Spankovich C. Diabetes and auditory-vestibular pathology. Semin Hear. 2019 Nov;40(4):292-299.
5.- Abraham AM, et al. Should we screen patients with type 2 diabetes mellitus for hearing impairment? Aging Med Healthc. 2022
6.- American Diabetes Association Professional Practice Committee. 4. Comprehensive medical evaluation and assessment of comorbidities: Standards of Care in Diabetes—2025. Diabetes Care 2025;48(Suppl. 1):S59–S85
7.- Spankovich C, Yerraguntla K. Evaluation and Management of Patients with Diabetes and Hearing Loss. Semin Hear. 2019 Nov;40(4):308-314.
8.- Munjal M, Kaur H, Puri S, Mittal N, Munjal S. Hearing loss in diabetes mellitus – correlation with otoacoustic emissions. Indian J Otol. 2024;30(3):171–5
9.- Li, Marwin; Perlov, Natalie; Patel, Jena; Amin, Dev; Kumar, Ayan; Urdang, Zachary D.; Willcox, Thomas O.; and Chiffer, Rebecca C., "Association of Type 2 Diabetes Mellitus with Sensorineural Hearing Loss - A Population-Based Analysis" (2024). Department of Otolaryngology - Head and Neck Surgery Faculty Papers.
10.- Cohen Atsmoni S, Brener A, Roth Y. Diabetes in the practice of otolaryngology. Diabetes Metab Syndr Clin Res Rev. 2019;13(2):1141-1150.