Diabetes and hearing loss:
A call to action for early detection and prevention

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THE RISKS OF BLINDNESS, kidney failure, heart attack, stroke and lower-limb amputation associated with diabetes are well known among healthcare practitioners.[1–3] However, it is perhaps less well recognised that diabetes is also associated with increased risk of hearing loss. Individuals with diabetes experience hearing loss at twice the rate of those without diabetes and might experience onset of hearing loss compared to their non-diabetic counterparts.[4] Hearing loss predominantly manifests as progressive, bilateral sensorineural and early onset deafness, primarily affecting higher frequencies in people with diabetes.[1] This pattern of hearing loss can resemble early onset presbycusis (age-related hearing loss), further highlighting the need for differential diagnosis.[5]

The mechanism underlying sensorineural hearing loss in diabetes is primarily attributed to diabetic angiopathy, which involves diffuse thickening of the basal membranes of the vascular endothelium, disruption of cochlear blood supply and nutrient transport.[4] This vascular impairment can result in secondary degeneration of the eighth cranial nerve. Correlations have also been observed between blood glucose levels and poorer pure-tone audiometric thresholds, suggesting that both acute hyperglycaemia and the duration of diabetes might contribute to hearing damage over time. In addition to sensorineural hearing loss, diabetes might increase the risk of conductive or mixed hearing loss.[2,4,6] Diabetes increases susceptibility to infections such as chronic otitis media, leading to conductive hearing loss by affecting the middle ear structures. Eustachian tube dysfunction caused by inflammation and fluid accumulation also impairs sound conduction. Diabetes-related vascular issues affect the blood supply to the middle ear and ossicles.[2,7]

Diabetes-related hearing loss is moderated by various factors, including age, obesity, noise exposure, smoking, alcohol consumption and medication use. Loud noise can damage cochlear hair cells, smoking diminishes inner ear oxygenation and alcohol consumption exacerbates blood sugar fluctuations, thereby further impairing hearing.[7] A combination of ageing and diabetes increases the risk of auditory dysfunction.[5] Some diabetes medications have been associated with potential ototoxic effects,[7,8] so it is essential to evaluate the cumulative effects of medications on hearing, including biguanides, synthetic insulin, dipeptidyl peptidase-4 inhibitors, glucagon-like peptide-1 (GLP-1) receptor agonists, and sodium–glucose cotransporter 2 (SGLT2) inhibitors (Table 1). Additionally, diabetes and hyperglycaemia are major risk factors for cardiovascular disease, hypertension and obesity. Those with type 2 diabetes and obesity are also at higher risk for some cancers and bacterial infections; certain antibiotics, loop diuretics and anticancer agents can also cause hearing loss. Synthetic insulin's potential ototoxicity might result from additives, preservatives or insulin fluctuations, and requires further research. Clinical evaluation should assess medication history, ototoxic risks and refer high-risk individuals to an audiologist.

Given the irreversible nature of sensorineural hearing loss, identifying opportunities for prevention is critical, especially for people with diabetes who manage complex treatments and lifestyle adjustments as part of their diabetes management. Undiagnosed hearing loss can lead to social isolation, depression and cognitive decline.[9] Additionally, hearing loss can hinder effective communication with healthcare providers, affecting the quality of care and management of diabetes. Early screening for hearing loss facilitates timely intervention, potentially alleviating adverse outcomes. Early detection of hearing loss in people with diabetes can prompt more frequent monitoring and management of blood glucose levels, thereby preventing further hearing loss.[9]

Despite the established association between hearing loss and diabetes, there remains limited awareness of the need for screening for hearing loss among people

Table 1. Medications with potential ototoxic effects[7,8]

Medication class	Examples	Potential ototoxicity mechanism	Recommended considerations/prescription modifications
Biguanides	Metformin	Possible mitochondrial toxicity; potential B12 deficiency-related neuropathy	Regular B12 monitoring is advised for long-term use; assess for tinnitus or other auditory symptoms
Synthetic insulin	Long-acting insulin analogs	Potential ototoxic effects caused by additive preservatives	Although uncommon, monitor for any auditory symptoms and consider alternative formulations if concerns arise
DPP-4 inhibitors	Sitagliptin, Saxagliptin	Unknown mechanism; possible neural effects	Routine monitoring for auditory symptoms is recommended, though a direct causal relationship is unclear
GLP-1 receptor agonists	Exenatide, Liraglutide	Limited evidence; potential vascular impact on auditory function	Patients should be advised to report any new-onset auditory symptoms; further research is needed
SGLT2 inhibitors	Canagliflozin, Dapagliflozin	Might exacerbate neuropathic changes, potentially affecting auditory function	Monitoring for auditory symptoms is recommended, especially in patients with existing neuropathy
Antibiotics	Aminoglycosides	Direct cochlear toxicity leading to sensorineural hearing loss	Avoid concomitant ototoxic drugs; therapeutic drug monitoring is essential; use the shortest effective course
Anticancer agents	Cisplatin, Carboplatin	Irreversible hair cell damage in the cochlea	Dose adjustments based on renal function; consider otoprotective agents such as amifostine where appropriate
Loop diuretics	Furosemide, Bumetanide	Disruption of cochlear electrolyte balance leading to transient or permanent hearing loss	Use the lowest effective dose; avoid rapid IV administration; monitor serum electrolytes closely
Sulfonylureas	Glipizide, Gliclazide	Potential ototoxic effects, though evidence is limited	Monitor for tinnitus and hearing changes, particularly in older adults or those with pre-existing hearing impairments
Salicylates	Aspirin	Reduced cochlear blood flow and potential hair cell damage	Avoid high doses; monitor for tinnitus; reversible ototoxic effects might resolve upon discontinuation

DPP-4, dipeptidyl peptidase-4; GLP-1, glucagon-like peptide-1; IV, intravenous; SGLT2, sodium–glucose cotransporter-2.

with diabetes, creating a gap in preventive care.[4] Barriers to hearing screening among people with diabetes include underestimating hearing loss prevalence, masking hearing impairments with coping strategies, cognitive and functional limitations, concerns about cost and communication issues.[9] Unlike eye examinations, hearing assessments are not commonly incorporated into diabetes management protocols because of a lack of awareness and prioritisation of other diabetic complications. Currently, there are no specific recommendations for hearing loss screening in diabetes. Simple hearing-related questions can help identify those needing pure-tone audiometry, especially if not tested in the past two years.[9]

Healthcare systems must prioritise the early detection and prevention of diabetes-related hearing loss. Routine hearing assessments should be integrated into standard care protocols for people with diabetes, as early detection can mitigate the impact of hearing loss on quality of life. Public health initiatives should enhance awareness of the links between diabetes and hearing loss, encourage people to monitor their hearing and seek prompt medical advice. Certain populations, such as Aboriginal and Torres Strait Islander peoples with diabetes, might be at higher risk because of the prevalence of otitis media and genetic factors highlighting the need for targeted screening strategies.[10] Allocating resources for specific screening guidelines and treatment strategies for hearing loss is essential. Collaboration among diabetes specialists, audiologists and primary care providers in routine hearing assessments, awareness campaigns and interdisciplinary collaboration will improve the management of diabetes and auditory health and enhance overall patient wellbeing.

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