



## The Spectrum and Burden of Otologic Disorders in a Geriatric Nigerian Population: A Cross-Sectional Study

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### ABSTRACT

Published Online: August 03, 2026

**Background:** The global population is aging, leading to an increased prevalence of age-related health conditions, including otologic disorders.

**Objective:** To determine the prevalence, pattern, and associated characteristics of otologic disorders in a geriatric population in Southern Nigeria.

**Methods:** A prospective cross-sectional study was conducted over six months (December 2024-June 2025) at the General Practice Clinic. A total of 423 consecutive patients aged 60 years or more were enrolled. Data were collected with the aid of a structured interviewer-administered questionnaire, otoscopic examination, and comprehensive audiological evaluation (pure tone and impedance audiometry). Data were analyzed using IBM SPSS Statistics Version 27.

**Results:** The mean age was  $67.52 \pm 7.28$  years, with a female predominance of 274 (64.8%). The overall prevalence of otologic disorders was 228 (53.9%). Hearing impairment was the most prevalent disorder, reported in 214 (50.6%) participants, predominantly sensorineural in type. Cerumen auris was observed in 155 (36.6%), followed by tinnitus in 137 (32.4%). Impedance audiometry revealed normal tympanograms in 238 (56.3%) and 242 (57.2%) of the right and left ears, respectively. Hypertension was the most common comorbidity, affecting 227 (53.7%) participants, 406 (96.0%).

**Conclusion:** There is a high burden of otologic disorders, particularly hearing loss and cerumen impaction, among geriatric patients in Southern Nigeria. The widespread use of unsafe ear cleaning practices is a major public health concern. These findings underscore the urgent need for integrated routine ear screening and targeted patient education on safe aural hygiene as a standard component of geriatric care in this setting.

### KEYWORDS:

Otologic disorders, Hearing loss, Noise exposure, Ototoxicity, Tinnitus.

### 1. BACKGROUND

The world is undergoing a major demographic shift towards an aging population. Globally, the number of people aged 60 years and above is projected to reach 2.1 billion by 2050, with the most rapid growth occurring in developing regions.<sup>1</sup> This demographic transition brings an increased burden of non-communicable diseases and age-related physiological decline, among which otologic disorders feature prominently.<sup>2</sup>

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*\*Cite this Article: Oseghale, E., Akpalaba, I.O., Ehis, B. (2026). The Spectrum and Burden of Otologic Disorders in a Geriatric Nigerian Population: A Cross-Sectional Study. International Journal of Clinical Science and Medical Research, 6(8), 289-296. <https://doi.org/10.55677/IJCSMR/V6I8-01/2026>*

Conditions such as age-related hearing loss (presbycusis), tinnitus, and cerumen impaction are leading causes of disability in the elderly, significantly impacting communication, social integration, cognitive function, and overall quality of life.<sup>3,4</sup>

Internationally, studies consistently report a high prevalence of hearing loss in the elderly, affecting approximately 30% of individuals over 65 years and 65% of adults aged 70 years and above.<sup>5,6</sup> The pattern of otologic diseases varies, with sensorineural hearing loss being the most common type of auditory deficit.<sup>5,7</sup> In high-income countries, robust health systems often facilitate early detection and management, including hearing aid provision and aural rehabilitation services. However, in Africa, the situation is compounded by limited access to specialized healthcare, a high burden of untreated infectious diseases, poverty, and a general lack of

awareness about geriatric-specific health issues.<sup>8</sup> While studies from Africa have reported a significant prevalence of hearing impairment among older adults, data remain fragmented and insufficient to guide effective public health policy.<sup>9,10</sup> Population-based studies from sub-Saharan Africa estimate that between 10% and 25% of adults aged 60 years and above experience disabling hearing loss, with prevalence rising sharply after age 70.<sup>9</sup> In Nigeria, Africa's most populous nation, the elderly population is increasing in line with continental trends, as people across the region are living longer than ever before. The number of older persons in sub-Saharan Africa, estimated at 43 million in 2010, is projected to rise to 67 million by 2025 and 163 million by 2050.<sup>11</sup> Despite this demographic transition, geriatric otology remains a critically under-researched field in Nigeria, where studies suggest that up to half of adults above 60 years may suffer from some degree of hearing impairment.<sup>12,12</sup> Age-related hearing loss not only limits communication and social participation but also heightens psychological stress, social isolation, and cognitive decline, particularly where access to hearing aids and community support systems is limited.<sup>13</sup> Understanding the prevalence and pattern of these conditions is the essential first step towards developing effective preventive and therapeutic strategies. Without this foundational data, planning for resource allocation, training of healthcare workers, and public health intervention remains challenging. This study, therefore, aimed to determine the prevalence, pattern, and socio-demographic correlates of otologic disorders among geriatric patients in a tertiary health facility in Southern Nigeria, to inform future clinical and public health actions. Many of these conditions affecting the quality of life of older people are amenable to simple therapeutic measures.

## **2. METHODOLOGY**

### **2.1 Study Setting and Population**

The research was conducted at the General Practice Clinic of the University of Benin Teaching Hospital (UBTH), which serves as a prominent tertiary referral center in Benin City, located in Edo State, South-South Nigeria. The study spanned a six-month period, beginning in December 2024 and concluding in June 2025.

This investigation employed a prospective cross-sectional design. The target population comprised patients aged 60 years and above who were attending the clinic for the first time. Enrollment included all consecutive, consenting older adults within this age bracket. Patients who were critically ill were excluded from participation in the study.

A pretested, interviewer-administered questionnaire was utilized to gather information regarding the participants' socio-demographic characteristics, potential risk factors, and habits related to ear cleaning. Following this, each participant underwent a clinical examination that included otoscopy using a Heine mini 3000 otoscope, as well as tuning fork tests

performed with a 512 Hz tuning fork. For audiological assessment, Pure Tone Audiometry was conducted with an Amplaid A132 audiometer inside a sound-proof booth, enabling determination of both the type and degree of hearing loss according to World Health Organization classifications. Impedance Audiometry was performed using an Interacoustics AT235 tympanometer to evaluate middle ear function and measure acoustic reflexes.

### **2.2 Data Analysis**

Data were analyzed using IBM SPSS Statistics Version 27. Descriptive statistics were used for data summarization. Categorical variables were expressed as frequencies and percentages, and continuous variables as means and standard deviations. The prevalence of disorders was calculated as proportions.

### **2.3 Ethical Consideration**

Ethical approval was obtained from the University of Benin Teaching Hospital Ethics and Research Committee with protocol number: ADM/E22/A/VOL.VII996. Written informed consent was obtained from all participants after detailed explanation of the study in either English or Pidgin. Participation was voluntary and did not affect clinical care, of which patients were clearly informed. All data were anonymized and stored securely to ensure confidentiality. Participants found to have otologic disorders were appropriately referred for management.

## **3. RESULTS**

### **3.1 Sociodemographic characteristics of respondents (Table 1)**

Out of the 423 respondents studied, the majority were aged 60–69 years (235; 55.6%), followed by those aged 70–79 years (132; 31.2%), while only 56 (13.2%) were aged 80–89 years. The mean age of respondents was  $67.52 \pm 7.3$  years. By sex distribution, 274 (64.8%) were females, while 149 (35.2%) were males, giving a female-to-male ratio of almost 2:1.

In terms of religion, most respondents practiced Christianity (385; 91.0%), while 26 (6.1%) identified with African Traditional Religion, and 12 (2.8%) with Islam.

Regarding marital status, 319 (75.4%) were married, 37 (8.7%) were widowed, 29 (6.9%) were single, 22 (5.2%) divorced, and 16 (3.8%) separated.

Among those who disclosed their income ( $n = 361$ ), half (182; 50.4%) earned less than ₦20,000 monthly, 99 (27.4%) earned ₦20,000–40,000, while a few (16.7%) earned above ₦40,000. Only 10 respondents (2.8%) reported earnings above ₦150,000.

Ethnically, the majority were Bini (230; 54.4%), followed by Esan (90; 21.3%). Others included Yoruba (33; 7.8%), Igbo (17; 4.0%), Etsako (14; 3.3%), Hausa (5; 1.2%), and other ethnicities (34; 8.0%).

**Table 1: Sociodemographic characteristics of respondents**

| Variables                    | Frequency (n=423)  | Percentage (%) |
|------------------------------|--------------------|----------------|
| <b>Age</b>                   |                    |                |
| 60-69                        | 235                | 55.6           |
| 70-79                        | 132                | 31.2           |
| 80-89                        | 56                 | 13.2           |
| <b>Mean ± S.D</b>            | <b>67.52 ± 7.3</b> |                |
| <b>Sex</b>                   |                    |                |
| Male                         | 149                | 35.2           |
| Female                       | 274                | 64.8           |
| <b>Religion</b>              |                    |                |
| Christianity                 | 385                | 91.0           |
| Islam                        | 12                 | 2.8            |
| African Traditional Religion | 26                 | 6.1            |
| <b>Marital status</b>        |                    |                |
| Married                      | 319                | 75.4           |
| Widowed                      | 37                 | 8.7            |
| Single                       | 29                 | 6.9            |
| Divorced                     | 22                 | 5.2            |
| Separated                    | 16                 | 3.8            |
| <b>Monthly income (₦)</b>    |                    |                |
| <b>(n = 361)</b>             |                    |                |
| <N20,000                     | 182                | 50.4           |
| N20,000-40,000               | 99                 | 27.4           |
| N40,000-60,000               | 39                 | 10.8           |
| N60,000-80,000               | 25                 | 6.9            |
| N80,000-150,000              | 6                  | 1.7            |
| >150,000                     | 10                 | 2.8            |
| <b>Ethnicity</b>             |                    |                |
| Bini                         | 230                | 54.4           |
| Esan                         | 90                 | 21.3           |
| Other                        | 34                 | 8.0            |
| Yoruba                       | 33                 | 7.8            |
| Igbo                         | 17                 | 4.0            |
| Etsako                       | 14                 | 3.3            |
| Hausa                        | 5                  | 1.2            |

*\*Some respondents did not answer the question*

### 3.2 Prevalence of otologic disorders among respondents (Figure 1)

Out of the 423 respondents, 228 (53.9%) had no otologic disorder, while 195 (46.1%) were diagnosed with at least one

otologic disorder. This shows that nearly half of the study population experienced ear-related health problems.

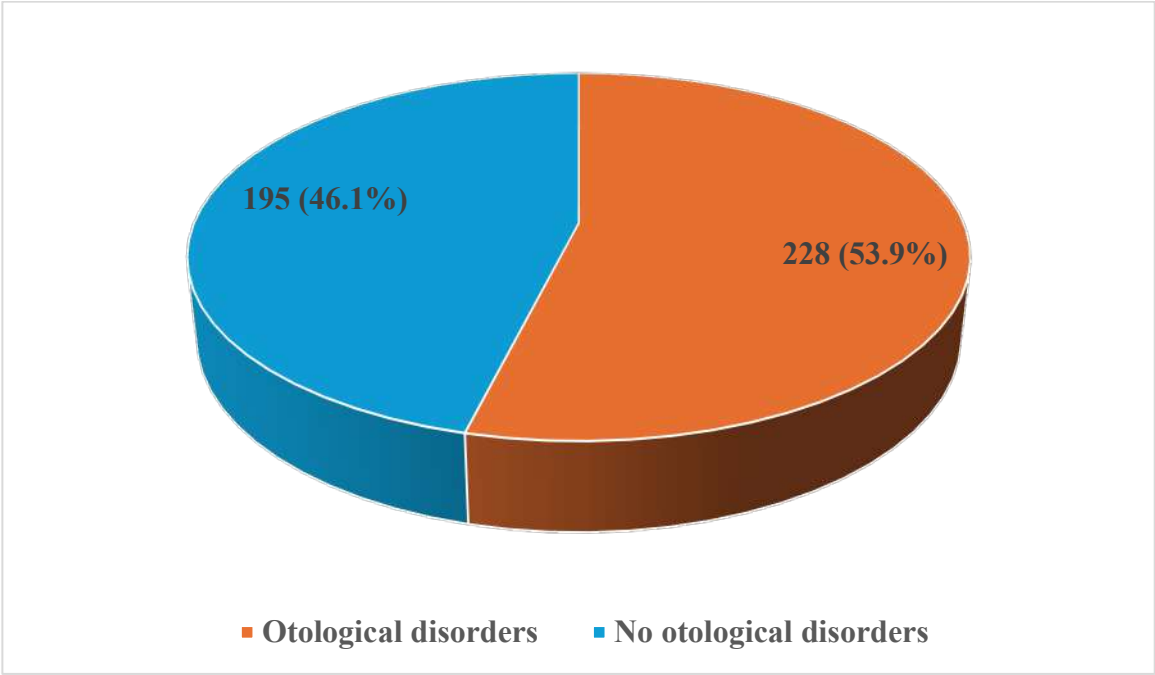


Figure 1: Prevalence of otologic disorders among respondents

3.3 Pattern of otologic disorders among respondents (Figure 2)

Among those with otologic disorders, the most common condition was hearing impairment (214; 93.9%). This was followed by cerumen auris (155; 68.0%) and tinnitus (137; 60.1%). Less frequent conditions were vertigo (15; 6.6%),

otitis externa (12; 5.3%), chronic suppurative otitis media (CSOM) (3; 1.3%), and foreign body in the ear (2; 0.9%). Functional disorders such as hearing loss and tinnitus were therefore more common than active infections or foreign bodies.

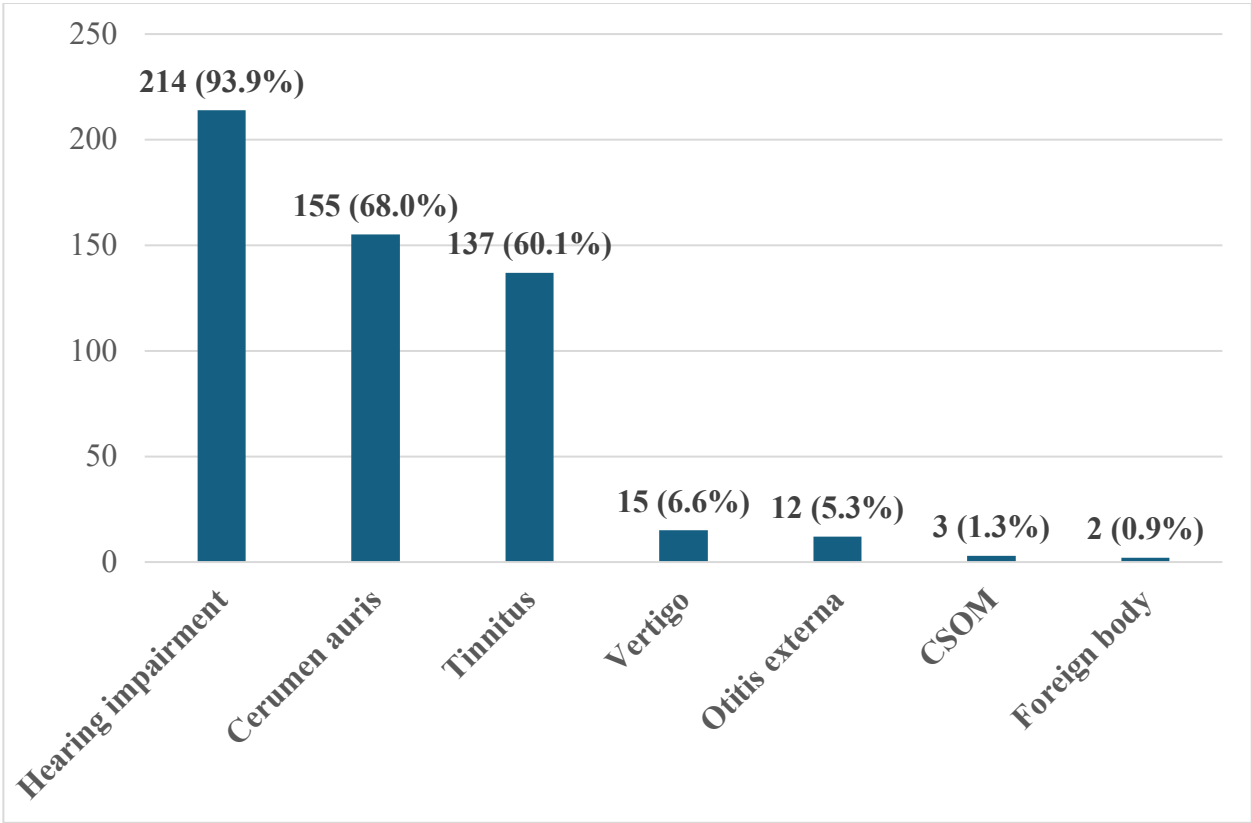


Figure 2: Pattern of otologic disorders among respondents.

### 3.4 Impedance audiometric findings in the patients (Table 2)

Impedance audiometry revealed that the most common tympanometric pattern was Type A (normal middle ear function), observed in 238 (56.3%) right ears and 242 (57.2%) left ears. Type As (stiff middle ear compliance) was the next most frequent, found in 102 (24.2%) right ears and 95 (22.4%) left ears. Type B (flat curve, middle ear effusion/perforation)

was seen in 67 (15.8%) right ears and 68 (16.1%) left ears. Type C (negative pressure due to Eustachian tube dysfunction) was identified in 15 (3.5%) right ears and 18 (4.3%) left ears. Type Ad (hypercompliant) was rare, seen in only one right ear (0.2%).

Regarding acoustic reflexes, they were present in 348 (82.3%) right ears and 315 (74.5%) left ears but absent in 75 (17.7%) right ears and 108 (25.5%) left ears.

**Table 2: Impedance audiometric findings in the patients**

| Variable                            | Right ear   | Left ear    |
|-------------------------------------|-------------|-------------|
| <b>Tympanometry (Jerger's type)</b> |             |             |
| A                                   | 238 (56.3%) | 242 (57.2%) |
| B                                   | 67 (15.8%)  | 68 (16.1%)  |
| C                                   | 15 (3.5%)   | 18 (4.3%)   |
| As                                  | 102 (24.2%) | 95 (22.4%)  |
| Ad                                  | 1 (0.2%)    | 0 (0.0%)    |
| <b>Acoustic reflexes</b>            |             |             |
| Present                             | 348 (82.3%) | 315 (74.5%) |
| Absent                              | 75 (17.7%)  | 108 (25.5%) |

### 3.5 Risk factors of otologic disorders (Table 3)

The most common systemic risk factor identified was hypertension (227; 53.7%). Other chronic medical conditions were reported by 192 (45.4%). Diabetes mellitus was present in 97 (22.9%).

A family history of ear disease was reported by 56 (13.2%). Ear trauma was reported in 41 (9.7%), while head trauma was reported in 71 (16.8%).

Environmental and lifestyle factors included noise exposure (153; 36.2%) and ototoxic drug use (153; 36.2%). A history of previous ear disease was also common (112; 26.5%).

Only 50 (11.8%) reported previous air or sea travel. Nasal complaints were rare (2; 0.5%), while 41 (9.7%) reported throat-related symptoms.

**Table 3: Risk factors of otologic disorders**

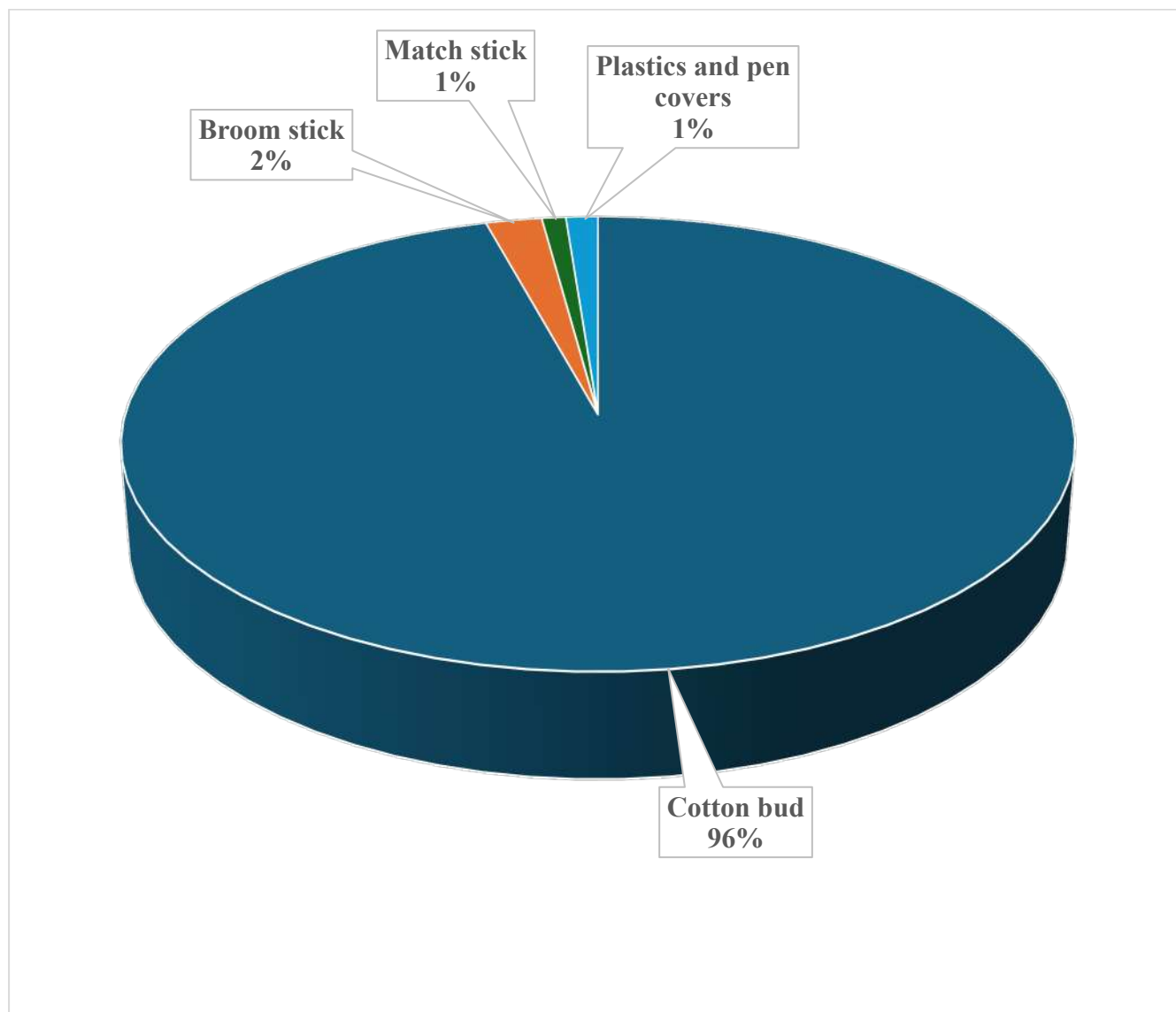
| Risk factor                     | Yes (%)     | No (%)      |
|---------------------------------|-------------|-------------|
| Hypertension                    | 227 (53.7%) | 196 (46.3%) |
| Diabetes*                       | 97 (22.9%)  | 320 (75.7%) |
| Other chronic medical condition | 192 (45.4%) | 179 (42.3%) |
| Family History of ear disease   | 56 (13.2%)  | 367 (86.8%) |
| History of trauma to ear        | 41 (9.7)    | 382 (90.3%) |
| History of trauma to head       | 71 (16.8%)  | 352 (83.2%) |
| Noise exposure                  | 153 (36.2%) | 270 (63.8%) |
| Ototoxicity**                   | 153 (36.2%) | 254 (60.0%) |
| Previous ear disease            | 112 (26.5%) | 305 (72.1%) |
| Previous air or sea travel      | 50 (11.8%)  | 373 (88.2%) |
| Nasal complain                  | 2 (0.5%)    | 421 (99.5%) |
| Throat complain                 | 41 (9.7%)   | 377 (89.1%) |

\*Does not add up to 423, as some participants failed to respond

\*\* Ototoxic drugs mentioned included chloroquine and quinine

### 3.6 Methods of cleaning the ear among respondents (Figure 3)

The most common method of ear cleaning was the use of cotton buds, reported by 96% of respondents. Other less common methods included broom sticks (2%), match sticks (1%), and plastics/pen covers (1%).



**Figure 3: Methods of cleaning the ear among respondents**

#### 4. DISCUSSION

The study revealed that the majority of respondents were elderly, with a mean age of 67.5 years, and most were between 60 and 69 years. This is consistent with the higher prevalence of otologic disorders among the elderly, as ageing is associated with degenerative changes in the auditory pathway, including presbycusis. Similar findings were reported in a study conducted in Oyo state, Nigeria, where advancing age was linked to a high burden of hearing impairment.<sup>14</sup> The predominance of females in this study may reflect health-seeking behaviour, as women are more likely to attend hospital screenings compared to men.<sup>15,16</sup>

The ethnic and religious composition reflects the study location, which is predominantly Bini and Christian. The low-income distribution, where over half of respondents earned less than ₦20,000, suggests socioeconomic disadvantage, which may influence both access to healthcare and risk of chronic diseases that predispose to otologic disorders. Poverty and poor living conditions have been

linked to higher risks of ear infections in studies from sub-Saharan Africa.<sup>13</sup>

Nearly half of the respondents had otologic disorders, indicating a significant burden. This prevalence is comparable to reports from hospital-based studies in Nigeria, where otologic problems often affect 30–50% of the adult population.<sup>18</sup> The high rate is likely related to increased age of the population, poor health-seeking behaviour, widespread use of harmful ear cleaning practices, and limited access to specialized ENT care. The finding highlights the need for routine ear screening among the elderly, as undetected hearing problems can impair communication, quality of life, and social participation.

Hearing impairment was the leading disorder, followed by cerumen auris and tinnitus. The predominance of hearing loss aligns with global reports that presbycusis is the most common sensory impairment in older adults.<sup>19,20</sup> Cerumen impaction being common may be linked to the widespread practice of using cotton buds for ear cleaning, which pushes

wax deeper. Tinnitus, on the other hand, is strongly associated with both presbycusis and noise exposure, as seen in studies in sub-Saharan.<sup>14,21</sup>

The relatively low occurrence of otitis externa and chronic suppurative otitis media compared to hearing loss may reflect that most respondents were elderly rather than children, since CSOM is more prevalent in paediatric populations. The rarity of foreign bodies further supports this.

This is important because hearing impairment affects communication, independence, and mental health in the elderly. Routine screening, timely provision of hearing aids, and education on safe ear practices are recommended.

Most respondents demonstrated Type A tympanograms, suggesting normal middle ear function, although a significant proportion had Type As, which is consistent with stiff middle ear systems commonly seen in otosclerosis and tympanosclerosis. Similar findings have been documented in elderly cohorts, where scarring and ossicular fixation increase with age.<sup>22,23</sup>

Type B tympanograms indicated middle ear effusion or perforation, possibly reflecting chronic Eustachian tube dysfunction or untreated infections. Type C curves suggested negative pressure, further supporting Eustachian tube pathology. The acoustic reflex was absent in about one-quarter of ears, which could be due to both middle ear pathology and sensorineural causes. These findings show the need for impedance audiometry as a complementary tool in evaluating elderly patients with hearing complaints, since it helps to differentiate conductive from sensorineural causes and guides appropriate management. The overwhelming use of cotton buds reflects a dangerous health behaviour. Cotton bud use is a known cause of trauma, cerumen impaction, and even tympanic membrane perforation. This finding agrees with reports from other Nigerian and African studies, which consistently show cotton bud use as the most common unsafe ear-cleaning practice.<sup>24,25</sup>

The use of broom sticks, match sticks, and pen covers, though less frequent, also reflects poor awareness of safe ear care. These practices persist due to cultural norms and lack of public health education. There is a strong need for targeted campaigns discouraging self-cleaning and promoting professional ear care. Hypertension and diabetes were prominent comorbidities among respondents. Both conditions are known risk factors for hearing loss due to vascular and neuropathic damage to the cochlea. This aligns with global evidence linking cardiovascular disease with auditory dysfunction.<sup>26</sup>

Noise exposure and ototoxic drug use were each reported by more than one-third of respondents, showing the combined occupational and medical determinants of hearing loss. A prior history of ear disease, documented in over one-quarter of participants, further heightened susceptibility, suggesting that pre-existing pathology may exacerbate the impact of environmental and pharmacologic risk factors. This aligns

with findings from previous studies<sup>22,27</sup> who reported that concurrent exposure to occupational noise and other risk factors significantly increased the risk of permanent hearing impairment compared one factor alone. The relatively lower contribution of family history, trauma, and barotrauma suggests that lifestyle and systemic diseases are more dominant drivers of otologic disorders in this population.

## **5. CONCLUSION**

This study demonstrates a high prevalence of otologic disorders, particularly hearing loss, among the elderly population. Most cases were associated with age-related changes, harmful ear-cleaning practices, chronic medical conditions, and lifestyle factors such as noise and ototoxic drugs.

## **6. RECOMMENDATIONS**

- Routine screening for hearing impairment in elderly patients, especially those with hypertension or diabetes.
- Public health campaigns discouraging cotton bud use and promoting safe ear care.
- Early referral and rehabilitation, including provision of affordable hearing aids.
- Integration of ear and hearing care into chronic disease management programs.

## **7. LIMITATIONS**

This hospital-based, single-center study may not fully represent the wider community, especially rural populations. Self-reported data on noise exposure, ototoxic drug use, and ear-cleaning practices carry risks of recall bias. In addition, advanced diagnostic tools such as otoacoustic emissions were not employed, which could have provided deeper insight into auditory pathology. Finally, the cross-sectional design limits causal interpretation of observed associations.

## **REFERENCES**

1. World Health Organization. Ageing and health. Preprint posted online October 2025.
2. Defo BK. Demographic, epidemiological, and health transitions: are they relevant to population health patterns in Africa? *Glob Health Action*. 2014;7(1). doi:10.3402/gha.v7.22443
3. Davis A, McMahon CM, Pichora-Fuller KM, et al. Aging and Hearing Health: The Life-course Approach. *Gerontologist*. 2016;56(Suppl 2):S256-S267. doi:10.1093/geront/gnw033
4. Hughes SE, Brenner CR, Pandian AT, et al. Age-Related Hearing Loss: Evidence-Based Strategies for Early Detection and Management. *ORL Head Neck Nurs*. 2025;43(2):26-39.
5. Huang AR, Jiang K, Lin FR, Deal JA, Reed NS. Hearing Loss and Dementia Prevalence in Older

- Adults in the US. *JAMA*. 2023;329(2):171. doi:10.1001/jama.2022.20954
6. Reed NS, Garcia-Morales EE, Myers C, et al. Prevalence of Hearing Loss and Hearing Aid Use Among US Medicare Beneficiaries Aged 71 Years and Older. *JAMA Netw Open*. 2023;6(7):e2326320. doi:10.1001/jamanetworkopen.2023.26320
7. Michels TC, Duffy MT, Rogers DJ. Hearing Loss in Adults: Differential Diagnosis and Treatment. *Am Fam Physician*. 2019;100(2):98-108. doi:10.26616/NIOSHPUB2018124
8. Azevedo MJ. The State of Health System(s) in Africa: Challenges and Opportunities. In: 2017:1-73. doi:10.1007/978-3-319-32564-4\_1
9. Mulwafu W, Kuper H, Ensink RJH. Prevalence and causes of hearing impairment in Africa. *Tropical Medicine & International Health*. 2016;21(2):158-165. doi:10.1111/tmi.12640
10. Ahmed A, Tsiga-Ahmed F, Bello-Muhammad N, Ajiya A, Gudaji M, Stefler D. Association of hearing loss with cognitive function and mental health in Africa: A systematic review. *BMC Public Health*. 2025;25(1):298. doi:10.1186/s12889-025-21548-3
11. Folorunso D, Dahilo E, Gbujie I, et al. Age-related hearing loss at Gwagwalada area council of federal capital territory, Abuja. *Niger J Clin Pract*. 2020;23(11):1494. doi:10.4103/njcp.njcp\_390\_19
12. Asoegwu CN, Osuji EC, Kanu OO, Nwawolo CC. Relationship between Tinnitus and Hearing Loss among Elderly Patients in Lagos State, Nigeria. *West Afr J Med*. 2024;41(10):987-992.
13. Prieur Chaintré A, Couturier Y, Nguyen THT, Levasseur M. Influence of Hearing Loss on Social Participation in Older Adults: Results From a Scoping Review. *Res Aging*. 2024;46(1):72-90. doi:10.1177/01640275231174561
14. Ogunkeyede S, Adebola S, Daniel A, Adeyemo A. Burden of hearing loss in Sub-Saharan Africa: Snapshot from an ENT clinic in Nigeria. *Heighpubs Otolaryngology and Rhinology*. 2019;3(1):001-005. doi:10.29328/journal.hor.1001016
15. Thompson AE, Anisimowicz Y, Miedema B, Hogg W, Wodchis WP, Aubrey-Bassler K. The influence of gender and other patient characteristics on health care-seeking behaviour: a QUALICOPC study. *BMC Fam Pract*. 2016;17(1):38. doi:10.1186/s12875-016-0440-0
16. Labaka A, Elordi-Guenaga U, Zubeldia-Etxeberria J, Zinkunegi-Zubizarreta N, Ugartemendia-Yerobi M, Pereda-Goikoetxea B. Gender differences in unplanned hospital admission: A population-based approach. *Nurs Health Sci*. 2024;26(1). doi:10.1111/nhs.13072
17. Sule SO, Fasunla AJ, Nwaorgu OGB. Hearing Loss among the Elderly at a Geriatric Centre in South-west Nigeria. *Nigerian Journal of Medicine*. 2023;32(4):351-355. doi:10.4103/NJM.NJM\_57\_23
18. Afolabi OA, Ijaduola GTA. 96 Pattern Of Ear Diseases Among Older People. <http://www.bioline.org.br/js>
19. Huang Q, Tang J. Age-related hearing loss or presbycusis. *European Archives of Oto-Rhino-Laryngology*. 2010;267(8):1179-1191. doi:10.1007/s00405-010-1270-7
20. Zheng Q, Xu Z, Li N, Wang Y, Zhang T, Jing J. Age-related hearing loss in older adults: etiology and rehabilitation strategies. *Front Neurosci*. 2024;18. doi:10.3389/fnins.2024.1428564
21. Dalrymple SN, Lewis SH, Philman S. Tinnitus: Diagnosis and Management. *Am Fam Physician*. 2021;103(11):663-671. <https://www.aafp.org/pubs/afp/issues/2021/0601/p663.html>
22. Guardiani E, Zalewski C, Brewer C, et al. Otologic and audiological manifestations of hutchinson-gilford progeria syndrome. *Laryngoscope*. 2011;121(10):2250-2255. doi:10.1002/lary.22151
23. Silva VAR, Pauna HF, Lavinsky J, et al. Brazilian Society of Otolaryngology task force – Otosclerosis: evaluation and treatment. *Braz J Otorhinolaryngol*. 2023;89(5):101303. doi:10.1016/j.bjorl.2023.101303
24. Gadanya M, Abubakar S, Ahmed A, Maje A. Prevalence and attitude of self-ear cleaning with cotton bud among doctors at aminu Kano teaching hospital, Northwestern Nigeria. *Nigerian Journal of Surgical Research*. 2016;17(2):43. doi:10.4103/1595-1103.194215
25. Khan NB, Thaver S, Govender SM. Self-ear cleaning practices and the associated risk of ear injuries and ear-related symptoms in a group of university students. *J Public Health Afr*. Published online December 31, 2017. doi:10.4081/jphia.2017.555
26. Baiduc RR, Sun JW, Berry CM, Anderson M, Vance EA. Relationship of cardiovascular disease risk and hearing loss in a clinical population. *Sci Rep*. 2023;13(1):1642. doi:10.1038/s41598-023-28599-9
27. Golmohammadi R, Darvishi E. The combined effects of occupational exposure to noise and other risk factors - a systematic review. *Noise Health*. 2019;21(101):125-141. doi:10.4103/nah.NAH\_4\_18