Original Article

Hearing Loss among the Elderly at a Geriatric Centre in South-west Nigeria

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Abstract

Background: Aging is an unavoidable process that is connected with several health issues, including presbycusis, a degenerative disease of the cochlear hair cells and central auditory pathways with a resultant reduction in hearing acuity. In developing countries like Nigeria, little attention is given to the elderly population with possible underreporting of presbycusis, hence the need for this study. **Aim:** The aim of this study was to investigate hearing loss, the type, and associated risk factors among the elderly attending a geriatric clinic in South-west Nigeria. **Patients, Materials and Methods:** It was a cross-sectional study of patients aged 60 years and above in a geriatric centre. All consented participants were given a structured questionnaire to collect important data such as demographics, history of hearing loss, family history of hearing loss, risk factors, and so on. Ear examinations, otoscopy, pure-tone audiometry, distortion-product otoacoustic emissions, and tympanometry were also performed on all patients. **Results:** Ninety-five participants, comprising 33 males and 62 females, were recruited, and their ages ranged from 60 to 89 years (74.5 ± 7.6 years). The mean pure-tone average was 42.2 dB ± 17.4 and 39.21 dB ± 17.4 in the right and left ears, respectively. About 80% of them have a hearing threshold above 15 dB, with 13 (13.7%) being conductive hearing loss, 48 (50.6%) sensorineural hearing loss, and 15 (15.8) mixed hearing loss. Presbycusis was diagnosed in 37 (38.9%) participants. There was a significant correlation between the pure-tone average and distortion-product otoacoustic emissions results in both ears of the participants (P = 0.0001). Tympanograms were abnormal in 21 (22%) right ears and 27 (28%) left ears. **Conclusion:** Hearing loss is highly prevalent among the elderly, with presbycusis being the most common type. Periodic hearing screening for the elderly is hereby recommended.

Keywords: Elderly, geriatric, hearing loss

Introduction

Aging is an inevitable process that is associated with some clinical disorders in certain individuals. As the population of the elderly increases worldwide, so also is the prevalence of age-related ailments like presbycusis.[1,2] Hearing loss is the third-most common chronic health problem in older persons after hypertension and arthritis.[3] It affects approximately a quarter of adults aged 61–70 years[4] and more than 80% of adults older than 85 years.[4] An estimated 70%–80% of the elderly between 65 and 75 years are reported to suffer from age-related hearing loss.[4] If diagnosed early in the elderly, adequate and quality health care can be rendered to reduce morbidities associated with it.[2] However, there are limited data in Nigeria on age-related hearing loss, which can assist in policy formulation for their ear health care. The elderly who are on medications for other age-related illnesses, such as hypertension, arthritis, and diabetes, may develop ototoxic hearing loss adding to their disability. Their hearing is worse in a noisy environment, and they tend to increase the volume of their television or radio set, a volume annoyingly too loud for other hearing individuals, to hear at the initial stage. Uninformed people erroneously believe that age-related hearing loss is part of the development and, hence, do not seek treatment.[4] According to the WHO, more than two-thirds of the world population with disabling hearing impairment reside in developing countries, Nigeria inclusive.[5] Furthermore, it is estimated that by 2025, about 1.2 billion people in the world

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will be those aged 60 years and above.[6] This marks a shift in the world population to have a greater proportion of the elderly.[6-8] With improvement in the average life expectancy in developing countries like Nigeria, the population of the elderly with hearing loss is also envisaged to increase, hence the need for this study. Therefore, this study was designed to investigate hearing loss, the types, and the associated risk factors in the elderly attending a geriatric clinic in South-west Nigeria. The findings from this study may be used by Nigerian policymakers to develop legislation pertaining to the hearing health of the elderly.

Patients, Materials and Methods not Methods

It was a cross-sectional study of elderly persons (aged 60 years and above) at a geriatric centre, University College Hospital (UCH), Ibadan. It is the first and only geriatric health centre established to cater to the health needs of elderly persons in south-west Nigeria. Ethical approval was obtained from the UI/UCH Ethical Review Board for the conduct of the study. Informed consent was obtained from patients or their caregivers before participation in the study. Exclusion criteria included participants who were not fit for hearing assessment, those with active ear discharge, childhood history of hearing loss, and history of otologic surgery. A structured questionnaire was administered to collect information on demographics, history of hearing loss and other ear symptoms, family history of hearing loss, medications, risk factors for hearing loss, medical comorbidities, history of ear surgery, and so on.

Otoscopy was performed to exclude the presence of wax that may impair the auditory tests. Thereafter, pure-tone audiometry, distortion-product otoacoustic emissions (DPOAEs), and tympanometry were performed on the participants in the audiologic booth.

The pure-tone audiometry was performed at frequencies 500 Hz, 1000 Hz, 2000 Hz, 4000 Hz, 6000 Hz, and 8000 Hz; however, the pure-tone average (PTA) was determined at the speech frequencies 500 Hz, 1000 Hz, and 2000 Hz.[1,2] In this study, conductive hearing loss was present when the air-bone gap was >10 dB; however, the bone conduction thresholds were within the normal limit (<25 dB). The sensorineural hearing loss was present when bone and air conduction thresholds were within 10 dB of each other but both are higher than 25 dB. Mixed hearing loss was diagnosed when both conductive and sensorineural hearing loss components were present, but with air conduction thresholds poorer than bone conduction thresholds. However, presbycusis was diagnosed on audiogram by the presence of bilateral symmetrical high-frequency hearing loss.[3] The tympanometry types are classified as either normal (Jerger's type A) or abnormal (Jerger's types Ad, As, B, and C).[4] The DPOAEs were interpreted as either "pass" or "fail."[4] Data obtained were recorded and analyzed using the Statistical package and service solutions, version 20 (IBM CORP. Released 2020, Armonk, NY: IBM CORP). Descriptive statistics was done with data presented in the table of frequencies, percentage counts, and chart illustration. Inferential statistics of the Chi-square were used for categorical variables such as age group, sex, and hearing levels in decibels. The independent *t*-test was used for continuous variables, including the mean difference in the age group and PTA.

Results

Sociodemographic characteristics of the study population

There were 95 participants comprising 33 (34.7%) males and 62 (65.3%) females. Their ages ranged from 60 to 89 years, with a mean age of 74.5 ± 7.6 years. The frequency [Table 1] shows the age groups and gender of the participants.

Hearing threshold of the participants

The mean PTA in the right and left ears of the participants was 42.2 ± 17.4 dB and 39.21 ± 18 dB, respectively. The hearing thresholds were higher in the higher frequencies than lower frequencies in both ears as shown in Table 2 and Figure 1.

Prevalence of hearing loss

Self-reported hearing loss was in 32 (34%) participants; however, on audiometry, 76 (80%) participants had hearing loss. The type of hearing loss recorded is shown in Figure 2, with sensorineural hearing loss constituting slightly more than half of the hearing disability.

Severity of hearing loss

The hearing loss was more in the left ear with 42.2% of participants having mild left hearing loss compared to

Table 1: Age groups and gender of the participants

Variables	Frequency, *n* (%)
Age ranges	
60–69	48 (50.5)
70–79	30 (31.6)
80–89	17 (17.9)
Sex	
Male	33 (34.7)
Female	62 (65.3)

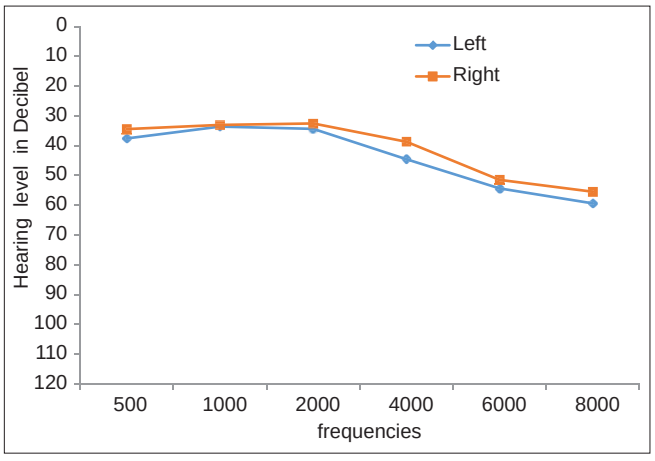

Figure 1: Average audiogram in both ears

34.7% of participants with mild right hearing loss as shown in Table 3.

Association of hearing loss with age and sex

The age group of the participants was found to be significantly associated with hearing loss (P = 0.020, χ^2 = 7.790). The proportion of elderly with hearing loss increased with the advancing age group. More female participants, 53 (85.5%), had hearing loss than their male counterparts, 23 (69.7%), as shown in Table 4.

Tympanometry pattern of the participants

An abnormal tympanometry pattern was found in 21 (22%) right ears and 27 (28%) left ears. Type As was the most common abnormal pattern of tympanogram recorded among the participants. The distribution of the tympanometry types is shown in Table 5.

Otoacoustic emission of the participants

Distortion-product otoacoustic emission was referred in 42 (44.2%) right ears and 41 (43.2%) left ears as presented in Table 6.

Correlation between the pure-tone average and distortion-product otoacoustic emissions results

There is a significant association between the PTA and DPOAE results in both ears of the participants (P = 0.0001 in both ears), done at frequencies of 1–4 kHz. This is presented in Table 7.

Discussion

Hearing loss in the elderly has long been recognised, with aging being one of the leading causes. The prevalence of elderly women with hearing loss in this study is similar to what was previously reported in a similar study by Olaosun *et al*.[5] in Nigeria, but differs from what was reported by Lee *et al*.[6] The specific cause for this difference cannot be established from this study; however, women's better health-seeking behavior, as well as the fact that women outnumber males in Nigeria's elderly population, may explain this female preponderance in this hospital-based study. The observed larger proportion of elderly women with hearing loss than their male counterparts is, however, not statistically significant (0.061). This may be attributed to the fact that in old age, the body's metabolic process and risks of medical comorbidities for hearing loss are similar in both sexes.

Self-reported hearing loss was discovered in 34% of the individuals, which is much lower than the percentage observed when an audiological hearing test was done. This underscored the need for periodic hearing assessments in the elderly population, who are prone to a variety of age-related disabilities. The high prevalence of hearing loss discovered in this study of 80% is comparable to the 83% reported by

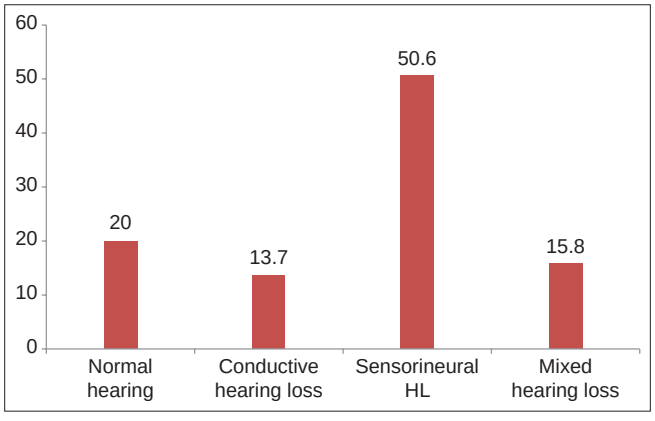

Figure 2: Distribution of the type of hearing loss among the participants

Table 2: The mean hearing thresholds of the participants across various frequencies

PTA threshold	Participants, mean±SD	95% CI
Right ear		
500	34.5±13.1	19.8 (16.2–23.5)
1000	33.1±23.5	18.3 (13.1–23.5)
2000	32.6±19.0	15.6 (11.2–20.2)
4000	38.8±20.7	27.7 (22.8–32.7)
6000	54.4±24.5	39 (32.9–46.3)
8000	55.9±25.8	50.9 (45.1–56.8)
Left ear		
500	37.6±17.2	10.4 (6.3–14.5)
1000	33.5±9.6	11 (6.6–15.4)
2000	34±20.4	12.5 (8.7–16.4)
4000	44.6±23.4	16.7 (12.2–21.2)
6000	54.3±24.9	12.6 (8.4–16.8)
8000	59±25.5	8.9 (13.0–16.8)

PTA: Pure-tone average, SD: Standard deviation, CI: Confidence interval

Table 3: Severity of hearing loss among the participants

Severity of HL	Frequency	
	Right, *n* (%)	Left, *n* (%)
Normal	23 (24.2)	12 (13.7)
Mild	33 (34.7)	43 (42.2)
Moderate	30 (31.6)	28 (29.5)
Severe	5 (5.3)	7 (7.4)
Profound	4 (4.2)	5 (5.3)

HL: Hearing loss

Table 4: Association of hearing loss with age and sex of the participants

Variables	Normal, *n* (%)	HL, *n* (%)	Total	Chi-square test	*P*
Age range (years)					
60–69	15 (31.2)	33 (68.8)	48	7.790	0.020
70–79	3 (10.0)	27 (90.0)	30		
80–89	1 (5.9)	16 (94.1)	17		
Total (*n*)	19 (20)	76 (80)			
Sex					
Male	10 (30.3)	23 (69.7)	33	3.355	0.061
Female	9 (14.5)	53 (85.5)	62		

HL: Hearing loss

Table 5: Proportion of tympanometry pattern in the elderly

Tympanometric type	*n* (%)
Right ear	
Type A	74 (77.9)
Type Ad	3 (2.85)
Type As	15 (14.25)
Type B	1 (1.1)
Type C	2 (2.1)
Left ear	
Type A	68 (71.6)
Type Ad	6 (5.7)
Type As	19 (18.05)
Type B	1 (1.1)
Type C	1 (1.1)

Table 6: Distortion-product otoacoustic emission results of the elderly participants

OAE	*n* (%)
Right	
Pass	53 (55.8)
Refer	42 (44.2)
Left	
Pass	54 (56.8)
Refer	41 (43.2)

OAE: Otoacoustic emission

Table 7: Correlation of the pure-tone average with distortion-product otoacoustic emissions of the elderly (at 1–4 kHz)

Ear	OAE	*n*	Mean±SD	95% CI	*t*-test	*P*
PTA right	Pass	53	30.2±11.8	26.9–33.4	48.809	0.0001
	Refer	42	50.6±16.7	45.4–55.8		
	Total	95	39.2±17.4	35.7–42.7		
PTA left	Pass	54	31.7±9.0	29.3–34.2		
	Refer	41	56.0±18.0	50.3–61.7		
	Total	95	42.2±18.1	38.5–45.9		

PTA: Pure-tone average, SD: Standard deviation, OAE: Otoacoustic emission, CI: Confidence interval

Mościcki *et al*.[7] and the 82% reported by Olaosun *et al*.[5] Fasunla *et al*.[8] reported similar finding in their study on the prevalence and trend of otorhinolaryngological diseases and also concluded that the pattern of hearing loss has not really changed, despite an increase in life expectancy in Nigeria. However, Cruickshanks *et al*.[9] observed a lower prevalence of 45.9% among the elderly population, which might be attributable to the inclusion of a younger age group (48–92 years) in their research.

According to this research, aging produces progressive degenerative changes in the hearing apparatus with resultant impaired hearing.[10] In this study, octogenarians (94.1%) had a greater rate of hearing impairment than septuagenarians (90%) and sexagenarians (68.8%). This demonstrates that the proportion of individuals with hearing impairment increases with age. More than half of the individuals (50.6%) had sensorineural hearing loss, with 38.9% having presbycusis as the cause. If presbycusis is not treated, it can result in social isolation, dependency, depression, frustration, and a typically lower quality of life.[10] The quality of life can be improved through early detection and appropriate interventions. Our study found a comparable prevalence of presbycusis to the 32.2% reported by Okhakhu *et al*.[11] in Benin City; however, it was greater than the 18.2%, 21.4%, and 25% reported by Afolabi and Ijaduola,[12] Aremu *et al*.,[13] and Ezeanolue and Obasikene,[14] respectively. These disparities might be attributed to the diverse age groups of participants in the research. In Europe, the prevalence of presbycusis ranges from 7.4% to 54.3%.[15] In contrast to Nigeria, Europe has multiple geriatric facilities with better health-care services and easier access to audiological and otologic health care.

Tympanometry is a measurement of middle ear compliance or impedance, which influences conductive hearing acuity indirectly. The 13.7% of participants with conductive hearing loss in this study is lower than the 21.5% reported by Sogebi *et al*.[16] Sogebi *et al*.[16] also reported that elderly Africans with type As > C > B > Ad had subclinical abnormalities in middle ear function. This is consistent with the findings of the current study and shows that middle ear pathology and/or Eustachian tube dysfunction is less common compared to sensorineural hearing loss among the elderly population. Furthermore, the likelihood of tympanosclerosis as a causative factor for type as in this study cannot be ruled out.

Conclusion

Hearing loss is highly prevalent among the elderly, with presbycusis being the most common type. Therefore, performing periodic hearing screening for the elderly is recommended.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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