



## 1. Introduction

- Hearing is perhaps man's most important sense, for without it, his power to communicate is greatly diminished. It is, after all, this superior ability to communicate that sets man above other animals. Unfortunately, it is frequently affected by pathology in which an individual develops a hearing impairment which results in a hearing disability.
- According to World Health Organization, 1.5 billion people, that is, 20% of the world's population have some degree of hearing loss<sup>[1]</sup>, more so, National Institute on Deafness and Other Communication Disorders reported that one in three people ages 65–74 have hearing loss, and almost half aged 75 and older have hearing loss<sup>[2]</sup>.
- The population of the elderly people in Nigeria between 65 years and above was 4,536,761 (male 2,534,541, female 2,002,220)<sup>[3]</sup>, with a prevalence of 6.1% hearing loss among them<sup>[4]</sup>. It was estimated that 4.7% of the elderly population is found in sub-saharan Africa while in developed countries, people of this age group constitute 11% - 18% of the population<sup>[5]</sup>.
- Hearing loss due to age is called presbycusis. It is a progressive, bilateral, sensorineural hearing loss that occurs in older people as they age, a multifactorial process driven by environmental factors and exacerbated by concurrent disease<sup>[6]</sup>. It is this clinical picture of a gradually progressive, bilaterally symmetrical hearing loss associated with age that has been termed presbycusis (Greek: Presbys meaning-old man and Akousis meaning-hearing, that is, old man's hearing).
- Clinically significant hearing loss is the most common condition in ageing adults after arthritis and heart disease<sup>[7]</sup>. Presbycusis, the predominant diagnosis in older adults, is a diagnosis of exclusion. Ageing and noise exposure are the key factors implicated. Hearing loss with ageing can be thought of as the incremental sum of many otologic traumas acquired throughout a lifetime, superimposed on the background of an intrinsic ageing process.
- According to Ogundiran and Olaosun, noise exposure has been linked to the occurrence and severity of presbycusis<sup>[8]</sup>. Noise exposure is not only the most common cause but the one most difficult to separate from the aging process itself<sup>[9]</sup>. The link between diabetes and auditory decline has long been hypothesized, the National Institute of Health reported that hearing loss is about twice as common in adults with diabetes compared to those who do not have the disease<sup>[10]</sup>, a study by Nwosu et al. In their study found that the prevalence of hearing loss was higher in diabetic adults (46.9%) than in the control group (15.6%)<sup>[11]</sup>. There is a continuous, consistent, and independent relationship between elevated blood pressure and risk of cardiovascular events.

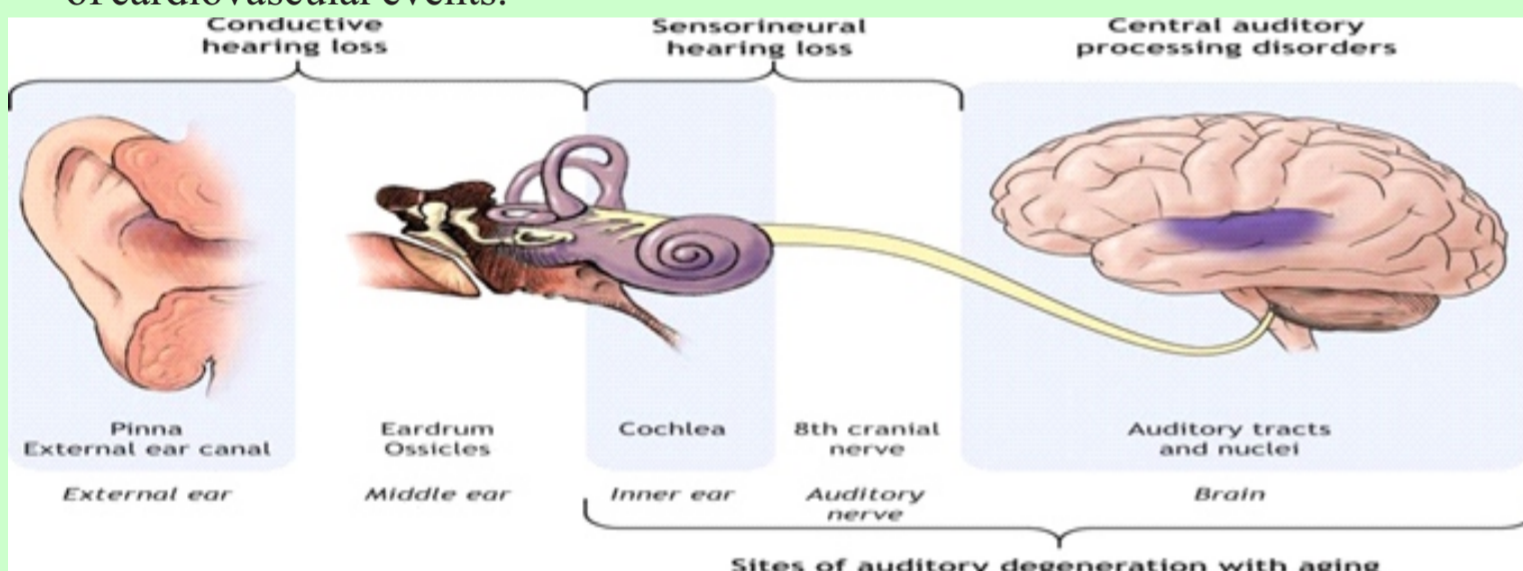


Fig. 1: Pathophysiology of Presbycusis. The hearing System<sup>[9]</sup>

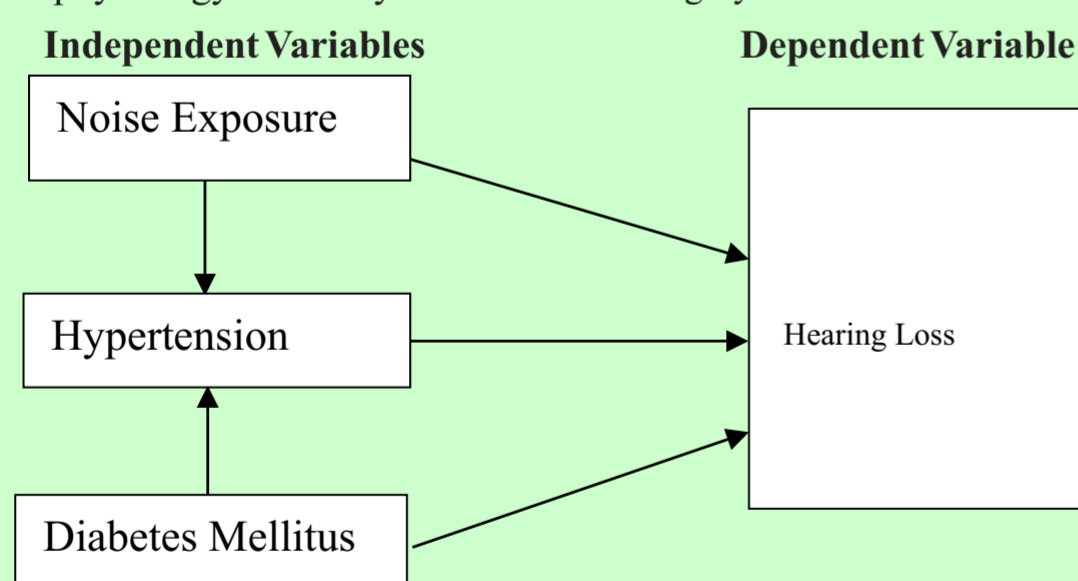


Figure 2: Conceptual Model of Elderly Patients with Noise Exposure, Diabetes Mellitus and Hypertension

## 2. Methods

- This study adopted the descriptive survey design. Since the variables of interest have already occurred, they were studied *ex-post-facto*.
- The target population for this study were all the elderly patients in South-West, Nigeria (65 years old and above) in six teaching hospitals in South West Nigeria.
- The sample for the study comprised four hundred and sixty-nine (469) elderly patients aged 65 years and above with hearing loss and history of noise exposure, diabetes mellitus or hypertension in six teaching hospitals in South-West, Nigeria.
- Purposive sampling technique was used to select the participants for the study, because of the nature of the study. The inclusion criteria are age, noise exposure, diabetes mellitus, hypertension and hearing loss. Age was one of the exclusion criteria used in this study. Also, those patients that had normal hearing thresholds bilaterally were excluded even though they were exposed to noise, had diabetes mellitus or hypertension.
- Audiograms, case notes (patients' medical records) and diagnostic audiometers were used in data collection.

- The statistical techniques used in analysing the data in this study were both descriptive and inferential statistics. The descriptive statistics used were mean, standard deviation, simple percentage and frequency distribution while the inferential statistics employed was multiple regression analysis.

## 3. Results and Discussion

- The result of this study showed that sloping pattern of hearing loss predominated the hearing pattern among the elderly bilaterally, indicating that age related hearing loss is usually caused by cochlea degeneration, most pronounced in the basal cochlea coil and the most common audiometric configuration is a gently sloping audiogram, affecting high frequencies bilaterally.
- Moderately- severe hearing loss was prevalent in this study bilaterally. The impact of moderately severe hearing loss goes beyond its immediate effects. Apart from the expected problems with hearing and speech recognition even with loud speech, the elderly people may also have difficulty in processing and integrating hearing with other sensory modalities.
- The type of hearing loss that was prevalent was sensorineural hearing loss. This implies that hearing loss due to age affects the inner ear rather than the outer or the middle ear. The elderly patients often present with difficulty in understanding speech rather than the outer ear or the middle ear.
- The predictor variables (i.e. noise exposure, diabetes mellitus and hypertension) showed significantly joint prediction of hearing loss in the right ears ( $F(3, 465) = 72.05$ ;  $R = 0.56$ ;  $R^2 = 0.32$ ;  $p < .05$ ). The predictor variables jointly accounted for 32% variance of hearing loss in the right ears. The remaining 68% could be due to the effect of extraneous variables.
- The independent contributions of noise exposure ( $\beta = 0.41$ ); diabetes mellitus ( $\beta = 0.23$ ) and hypertension ( $\beta = 0.11$ ) to hearing loss in the right ears. In addition, noise exposure contributed most to the explained variation of hearing loss and was distantly followed by diabetes mellitus and hypertension. The table also shows that noise exposure ( $B=18.11$ ;  $t = 10.33$ ;  $p < .05$ ), diabetes mellitus ( $B=5.52$ ;  $t = 5.52$ ;  $p < .05$ ) and hypertension ( $B=2.65$ ;  $t = 2.65$ ;  $p < .05$ ) revealed significantly independent prediction of hearing loss in the right ears.
- The result in this study reveals that the predictor variables (i.e. noise exposure, diabetes mellitus and hypertension) showed significantly joint prediction of hearing loss in the left ears ( $F(3, 465) = 51.71$ ;  $R = 0.50$ ;  $R^2 = 0.25$ ;  $p < .05$ ). The exogenous variables jointly explained 25% variance of hearing loss in the left ears.
- The independent contributions of noise exposure ( $\beta = 0.36$ ); Diabetes Mellitus ( $\beta = 0.27$ ) and Hypertension ( $\beta = 0.02$ ) to hearing loss. Moreover, noise exposure contributed most to the explained variation of hearing loss in the left ears than other variables and was followed by diabetes mellitus and hypertension. Also, only two variables: noise exposure ( $B=15.28$ ;  $t = 8.57$ ;  $p < .05$ ) and diabetes mellitus ( $B=13.07$ ;  $t = 6.21$ ;  $p < .05$ ) could independently and significantly predict hearing loss in the left ears. However, hypertension ( $B=0.63$ ;  $t = 0.35$ ,  $p > .05$ ) could not independently predict hearing loss in the left ears.

## 4. Conclusion

- The findings revealed that the elderly patients possessed bilateral sensorineural moderately-severe and sloping pattern of hearing loss.
- Noise exposure, diabetes mellitus and hypertension significantly and jointly predicted hearing loss in the right ears and the contributions of these three factors to the dependent variable are in the following order: noise exposure, diabetes mellitus and hypertension.
- In the left ears, the three factors also significantly and jointly predicted hearing loss but only two factors (noise exposure and diabetes mellitus) significantly predicted hearing loss.

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