



Hearing Impairment in a Tertiary Hospital in the Niger Delta Region: Prevalence, Aetiology and Pattern

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Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

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ABSTRACT

Aim: This study is to determine the prevalence, causes, types and patterns of hearing impairment seen in a tertiary hospital in the Niger delta region.

Study Design: A hospital based descriptive study of all patients with complaints of hearing impairment seen at the ear nose and throat clinic of the university of Port Harcourt teaching hospital within the period of January 2015 to December 2019.

Results: Bilateral affectionation was commoner among those that have hearing impairment n = 366(65.2%) 91.2% while n = 54(8.8%) was found to have normal hearing. Majority of the ears had profound degree of hearing loss n= 313 (25.4%) with the highest number of it found in the right ear 27.0% however, there is no statistical significance between the side of the ear affected and the degree of hearing loss.

Conclusion: The young adults are the most affected; age 30-39 years with bilateral affectionation and profound degree of hearing loss. Infective conditions such as CSOM are still very predominant in the aetiology of hearing loss in our environment.

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1. INTRODUCTION

Hearing impairment is a public health issue that can affect all age groups and all socioeconomic class. The sense of Hearing is the most affected and neglected sensory organ [1]. Hearing impairment as a condition can range from a mild deficit in hearing to an outright deafness [1]. World health organization had an estimate of about 466 million people globally living with disabling hearing impairment in 2018 and projected this number to increase to 630 million by the year 2023 [2] it is also postulated that majority of this population with hearing impairment are found in the developing countries [1].

In terms of disease burden, hearing impairment has differing implications on different groups of the population. In children, it can result in failure or inability to develop speech or delay in language acquisition which invariably affects the child's education. However, in the adult it can lead to poor communication abilities. This can affect economic, emotional and social life of the individual and can also result in possible stigmatization [3,4]. However, hearing impairment is found to be commoner in adults than children [1].

There are several factors predisposing to or associated with hearing impairment. These can be congenital or acquired [5]. In the sub-Saharan Africa, the acquired causes appear commoner and affects all ages [6,7]. In the industrialized nations, exposure to loud noise is one of the common factors causing hearing loss [8] while in the developing countries such as ours, preventable causes of hearing impairment such as infections are predominant [9,10,11]. Some of the acquired causes include; ototoxicity, trauma, neoplasia, some infections such as, otitis media, meningitis, labyrinthitis etc while some congenital causes include; Down syndrome, Marfan's syndrome, maternal rubella etc.

Hearing impairment is therefore broadly classified into three major types; conductive, sensorineural and mixed hearing loss. Conductive hearing loss (CHL) occurs when there is a lesion anywhere from the external auditory canal to the footplate of the stapes in the middle ear [12]. Sounds are therefore not conducted from the external ear to the inner ear. Sensorineural loss (SNHL) on the other hand arises due to affectation at the level of the

cochlear (sensory), auditory nerve, neural pathway or at the auditory cortex(neural) [13] Mixed hearing loss is when there is a component of both CHL and SNHL [14,15].

CHL is the most common type of hearing impairment seen in children and often arises due to infections and inflammatory conditions [5,16]. Tympanometry test, helps in determining the presence of conductive component of hearing loss as it shows the integrity of the middle ear. The result is shown by a graph known as tympanograms. Several classifications are available that can be used to show the result of this test but the commonly used is the Jeger's classification which has the following classes; Type A (normal), Type B (fluid in the middle ear), Type C (Eustachian tube dysfunction), other variants of type A: Type A_d and A_s [17].

In the determination of the degrees or levels of hearing impairment WHO classification is often used which is based on obtaining the pure tone average from the better hearing ear, of four frequencies; 500, 1000, 2000 and 4000 Hz. Therefore based on this, the hearing can be normal when the result is between 0 to 25 dB HL, mild loss: 26-40 dB, moderate loss: 41-60 dB, severe loss: 61-80 dB and profound loss: => 80 dB [18]. The WHO also defines disabling hearing loss as hearing loss greater than 40 dB in the better hearing ear for an adult and 30 dB in that of children [19].

The prevalence of hearing impairment is placed at 4% [1] worldwide however different studies from different countries have shown varying results; that from India showed prevalence of 6.3% [20] while Bangladesh was 11.9% [21] Turkey and Iran had 10.4% and 14.3% respectively [22,23]. In Nigeria, there has been a record of 9.45% and 21.2% [24,25]. There therefore appears to be a rise in the prevalence of hearing impairment and this has been attributed to an increase in the use of personal listening devices such as phones and radios [26].

This study therefore is to look at the recent prevalence, types and pattern and possible factors associated with hearing loss in a tertiary hospital in the Niger delta the region of Nigeria.

2. PATIENTS AND METHODS

A hospital based descriptive study of all patients with complaints of hearing impairment seen at

the ear nose and throat clinic of the university of Port Harcourt teaching hospital within the period of January 2015 to December 2019.

Data on patient demographics, clinical features, aetiology, audiometric and tympanometric findings were obtained from the hospital records and clinic registers using a structured Proforma. Data collected were then entered into Microsoft excel and then exported to the IBM statistical package for Social Sciences (SPSS) version 20 for statistical analysis.

The patients had pure tone audiometry and tympanometry done. The hearing threshold using audiometry was taken as the pure tone average from four frequencies; 500, 1000, 2000 and 4000 Hz in the better hearing ear according to world health organization (WHO) classification, while Jerger's form of classification was used for the tympanometry.

2.1 Sample Size Calculation

Using The Right Size software, a sample size of 600 was obtained based on alpha-level of 0.05, maximum proportion of 50% (0.50) and an error limit of 4% (0.04).

2.2 Statistical Analysis

Data presentation involved tables and charts. Frequencies and proportions were used to summarize categorical variables while numerical variables employed mean \pm standard deviation, and median/ranges. The differences in mean ages of patients were compared across type/degree of hearing loss using one-way Analysis of Variance (ANOVA) and presented using error bar chart format. Differences in proportions were compared using Chi square test. A p-value of less than 0.05 was considered statistically significant.

3. RESULTS

The total number of patients seen in the ENT clinic within the period of study was 5483 while the number that presented with complaints of hearing impairment which comprised the population of this study was a total of 615. The prevalence of hearing impairment was 11.2%. There were 332 males and 283 females with a male to female ratio of 1.17:1. The mean age of the patients studied was \pm SD=41.09 \pm 18.76 years and a median age of 38 years. The age

group 30-39 years were the most affected $n = 142(23\%)$ and this is closely followed by age group 20-29 with $n = 110 (17.9\%)$. The group least affected was the age < 10 years which comprised 2.3% of the population studied (Table 1). Bilateral affection was commoner among those that have hearing impairment $n = 366(65.2\%)$ 91.2% while $n = 54(8.8\%)$ was found to have normal hearing (Fig. 1). A percentage of 92.1 were obtained as the prevalence of hearing loss among the patients with hearing impairment Fig. 1. In terms of laterality of hearing loss, the left ear was the side most commonly affected $n=106(17.2\%)$ (Table 2). Majority of the ears had profound degree of hearing loss $n= 313 (25.4\%)$ with the highest number of it found in the right ear 27.0% however, there is no statistical significance between the side of the ear affected and the degree of hearing loss (Table 3.) while sensorineural type of hearing loss was the highest seen $n = 593(48.2\%)$ in most of the ears. The left ear comprised the majority of this (Table 4). Among all the age groups, those with hearing loss comprised the majority of their total numbers. This tended to increase the older the age group, however there was no statistical significance between increasing age and percentage of hearing loss (Table 5). Most of the patients that had tympanometry done had type A tympanogram, those with normal hearing did not have tympanometry carried out (Table 6). Chronic suppurative otitis media was implicated as a cause in 29.27% of these patients followed closely by wax impaction and otitis media with effusion in 11.38% (Table 7) commonest clinical feature seen was perforated tympanic membrane in 29.27% (Table 8.) The mean age of the patients were compared with both type and degree of hearing loss but found their relationships not to be statistically significant (Figs. 2 and 3).

4. DISCUSSION

The study involved 615 patients with hearing impairment out of a total of 5483 patients seen in the ENT Department within the period under study. There was a slight male preponderance. The male to female ratio was 1.7:1. This was also observed by other researchers [27,28] while in contrast the study in Ado Ekiti had female preponderance [25]. The prevalence from the study is 11.22% which appears higher than the 9.43% obtained in this region from an earlier study [24] this could be because the present study was more comprehensive involving all age groups while the earlier study was only on adults.

Table 1. Age and sex distribution of the respondents

Variables (N = 615)	Frequency	Percentage
Age category		
<10 years	14	2.3
10 – 19 years	58	9.4
20 – 29 years	110	17.9
30 – 39 years	142	23.1
40 – 49 years	83	13.5
50 – 59 years	90	14.6
60 – 69 years	68	11.1
70 – 79 years	33	5.4
≥80 years	17	2.8
Sex		
Male	332	54.0
Female	283	46.0

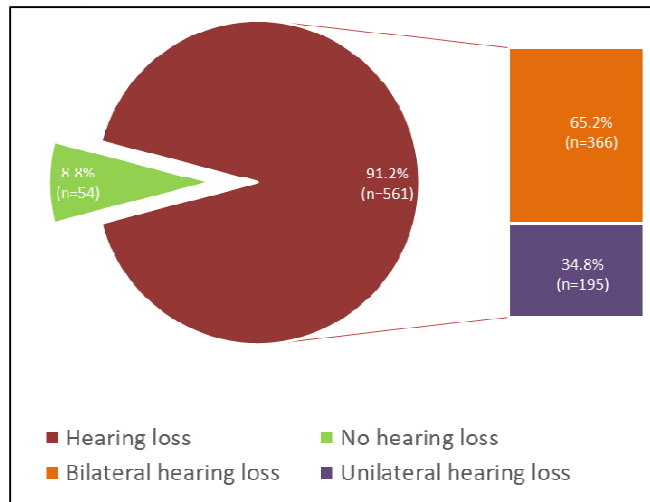


Fig. 1. Occurrence of hearing loss among patients in the study

Table 2. Laterality of hearing loss among the patients

Variables	Frequency	Percentage
No hearing loss (normal hearing in both ears)	54	8.8
Right ear hearing loss only	89	14.5
Left ear hearing loss only	106	17.2
Hearing loss in both ears	366	59.5
Total	615	100.0

The prevalence is higher however than the findings in United Kingdom and United States of America where the estimated prevalence was 0.7% in 2013 and 3.4% in 2001 respectively [29,30]. It however appears lower than that from Iran 14.3% [23] and locally from Ado Ekiti 21.2% [25].

The prevalence of children with hearing loss is also lower than that of the adults in this study similar to the WHO fact sheet and and Shuaibu et al. in North Western Nigeria [1,28,31].

The majority of these patients with hearing impairment were found in the age range of 20-39 years similar to other works [27,28]. Others also found the older age group being the most commonly affected [24,25]. We could not readily proffer a plausible reason for this. However, it is of note that even though the specific age group most affected was age 30-39, the bulk of the patients with hearing loss were found among ages 20-59 years and these constitute the bulk of the work force therefore could have far reaching economic burden on the society.

Table 3. Comparison of degree of hearing loss by side of ear

Degree of hearing loss	Side of ear		Total number of ears n (%)
	Right earn (%)	Left earn (%)	
Normal hearing	89 (14.5)	106 (17.2)	195 (15.9)
Mild	69 (11.2)	67 (10.9)	136 (11.1)
Moderate	142 (23.1)	155 (25.2)	297 (24.1)
Severe	149 (24.2)	140 (22.8)	289 (23.5)
Profound	166 (27.0)	147 (23.9)	313 (25.4)
Total	615 (100.0)	615 (100.0)	1230 (100.0)

Chi Square = 3.514; p-value = 0.4757

Table 4. Comparison of type of hearing loss by side of ear

Type of hearing loss	Side of ear		Total number of ears n (%)
	Right earn (%)	Left earn (%)	
Normal hearing	89 (14.5)	106 (17.2)	195 (15.9)
Conductive	126 (20.5)	119 (19.3)	245 (19.9)
Sensorineural	294 (47.8)	299 (48.6)	593 (48.2)
Mixed	106 (17.2)	91 (14.8)	197 (16.0)
Total	615 (100.0)	615 (100.0)	1230 (100.0)

Chi Square = 2.866; p-value = 0.4127

Table 5. Socio-demographics and hearing loss among patients

Variables (N = 615)	Hearing loss		Total n (%)
	Yes n (%)	No n (%)	
Age category			
<10 years	11 (78.6)	3 (21.4)	14 (100.0)
10 – 19 years	52 (89.7)	6 (10.3)	58 (100.0)
20 – 29 years	98 (89.1)	12 (10.9)	110 (100.0)
30 – 39 years	121 (85.2)	21 (14.8)	142 (100.0)
40 – 49 years	75 (90.4)	8 (9.6)	83 (100.0)
50 – 59 years	81 (90.0)	9 (10.0)	90 (100.0)
60 – 69 years	65 (95.6)	3 (4.4)	68 (100.0)
70 – 79 years	30 (90.9)	3 (9.1)	33 (100.0)
≥80 years	17 (100.0)	0 (0.0)	17 (100.0)
	<i>Chi Square = 9.358; p-value = 0313</i>		
Sex			
Male	293 (88.3)	39 (11.7)	332 (100.0)
Female	257 (90.8)	26 (9.2)	283 (100.0)
	<i>Chi Square = 1.059; p-value = 0303</i>		

Table 6. Tympanograms of patients studied

Variables	Frequency	Percentage
Type A	310	55.26
Type B	180	32.09
Type C	50	8.91
Not done	21	3.74
Total	561	100

Bilateral hearing loss was commonly observed in the study in 65.2% which was also recorded by others [27,28,32] however in terms of laterality,

the left ear was more affected in 17.2% in contrast to other studies that found right side more affected [24,25].

Table 7. Aetiology of hearing impairments

Diagnosis	Frequency	Percentage
Wax impaction	70	11.38
Presbycusis	60	9.76
Ototoxicity	20	3.25
CSOM	180	29.27
OME	70	11.38
Noise exposure	40	6.50
Neonatal jaundice	3	0.49
Trauma	30	4.88
Meniere's disease	20	3.25
ASOM	20	3.25
Meningitis	2	0.33
Measles	4	0.65
Otitis externa	10	1.63
Not known	86	13.98
Total	615	100

Table 8. clinical features of the patients

Variables	Frequency	Percentage
Dull tympanic membrane	60	9.76
Tinnitus	80	13.0
Aural fullness	20	3.25
Otalgia	10	1.63
Perforated tympanic membrane	180	29.27
Vertigo	10	1.63
Blocked ears	80	13.0
Ear wax/debris	80	13.0

**multiple responses apply*

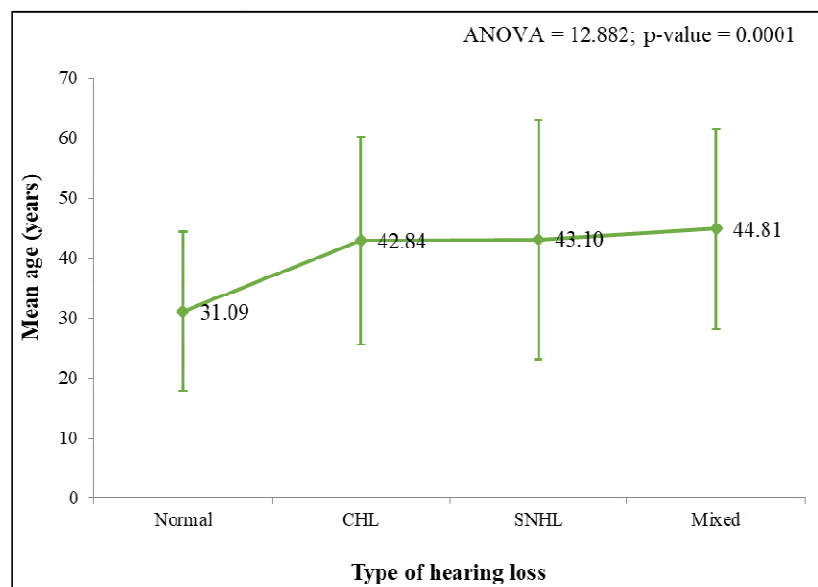


Fig. 2. Comparison of mean age by type of hearing loss among patients

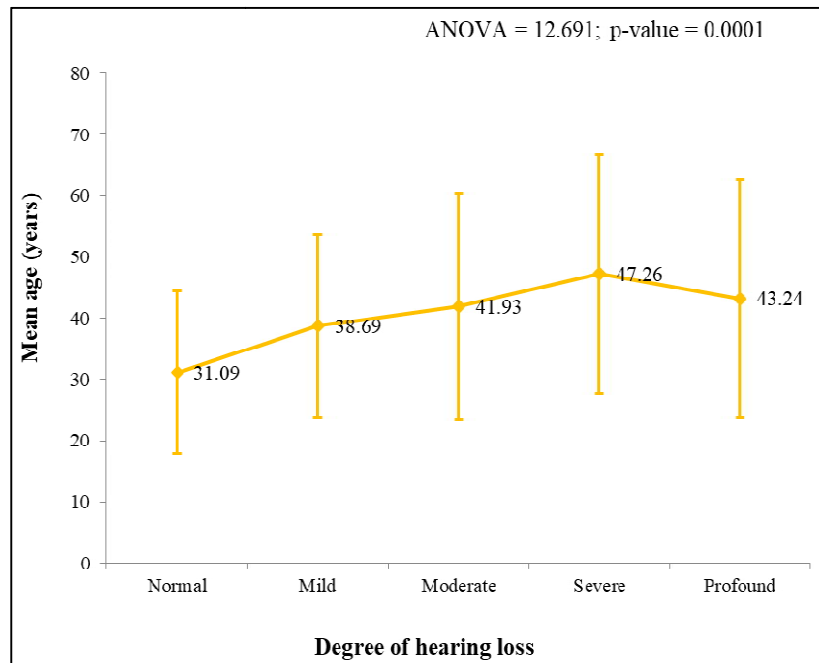


Fig. 3. Comparison of mean age by degree of hearing loss among patients

Profound degree of hearing loss was recorded in most of these patients. It was seen in 25.4% of the ears while some other works found mild to moderate degree of hearing loss commoner [32,33,34]. Yet some had severe degree as commonest [24]. Reasons for this discrepancy could not be deduced however, this means that majority of these patients have disabling hearing loss according to WHO definition [19]. Which invariably gives rise to both social and economic burdens both to the individuals and the society at large more so with both ears being affected. Economic burden stems from the fact that the ages more affected with this disability appears to be the age of the active working population. On the individual basis, the disability can result in conditions such as depression and social stigmatization [3]. The sensorineural type of hearing loss was the commonest in this study agreeing with the finding of other researchers; Rabbam et al in Bangladesh [31]. The study in Kano in the North western Nigeria also shows sensorineural loss being commoner [28] while the study by Adediji et al. in Ado Ekiti was also similar [25].

The commonest predisposing factor implicated in the present study was chronic suppurative otitis media seen (CSOM) in 29.27% of the patients similar to the study in Bangladesh by Rabbam et al. that found CSOM, otitis media

with effusion (OME) as commonest causes of hearing loss [31]. However in contrast, majority of other local works found wax impaction [25] presbycusis and ototoxicity [28,32] exposure to loud noise as the commonest factors [24]. It is however of note that in the study by Adomen and Onotai et al. CSOM was the second commonest predisposing factor [24,32]. Therefore when all these findings from our environment are pulled together, it may appear that CSOM is still a significant predisposing factor of hearing loss. This finding of infective and inflammatory conditions as possible causes of hearing loss in our environment was documented by earlier researchers and it still appears to be predominant even in recent studies [9,10,11]. While exposure to loud noise appear to be a major predisposing factor of hearing loss in the more industrialized countries [19] this gives credence to the conclusion of some researchers that majority of the factors implicated in hearing impairment in this environment are preventable [7,14]. The presence of infective causes such as meningitis and measles in the present study, though at a very low percentage raises issues of complete coverage of the MMR immunizations which is known to prevent hearing loss from these infections [35].

Most of the patients also had tympanometry carried out in addition to the pure tone

audiometry. Those patients with normal hearing from audiometric evaluation were not subjected to tympanometry. The type A tympanogram which means normal middle ear activity was the commonest type recorded while type B was seen in 32.09% this agrees with other works where type A is the most seen [16,28]. This confirms the sensorineural being commoner than the conductive type of hearing loss in the present study.

The commonest clinical features noted was perforated tympanic membrane in 29.27% in contrast, the study in Ekiti found wax impaction as the commonest clinical feature [25]. The perforated tympanic membrane could result from different causes but in the present study majority was from chronic ear infections.

In this study comparing age with hearing loss, there appears to be an increasing percentage of hearing loss with increasing age among the groups however this was not statistically significant with a p-value = 0.313. Comparison of mean age with type of and degree of hearing loss also shows no statistical significance. Neither was there any significance between sex and type of hearing loss similar to findings by Shuaibu et al. [28].

Owing to the fact that from the findings in the present study as well as that of other researchers that the factors associated with hearing impairment in our environment is often preventable, there is need to embark on enlightenment and education of the general public on the care of the ears as well as on common infections and diseases that affect the ears. Chronic suppurative otitis media is a disease that is related to poverty. There is therefore need to promulgate policies on the part of government, to eradicate poverty since it is known that poverty and ignorance worsens this disease burden [36].

5. LIMITATIONS

The sample size may be too small to base conclusions affecting the general population on its findings.

Lack of proper details and possibility of bias from the records and register.

6. CONCLUSION

The young adults were the major age group affected. And the degree of hearing loss was

mainly profound and bilateral. This means that majority of those that should comprise the work force have disabling hearing loss. Therefore the implication and impact on the economy is enormous. The main cause was infective, hence preventable. The prevalence is still appreciable and more from chronic supportive otitis media. Therefore there is need for more aggressive treatment of these ear infections especially at childhood, ensure more coverage of the immunisations. Then better public enlightenment on the disease and implications.

CONSENT AND ETHICAL APPROVAL

Consent was obtained and clearance was sought and obtained from the hospital ethical committee.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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