# Journal of Medical - Clinical Research & Reviews

## Pattern of Hearing Loss, Etiology and Burden of Rehabilitation among Patients in Ondo State University of Medical Sciences

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Received: 10 Nov 2023; Accepted: 17 Dec 2023; Published: 23 Dec 2023

**Citation:** Akpalaba IO, Olarinoye TO, Ikong MA, et al. Pattern of Hearing Loss, Etiology and Burden of Rehabilitation among Patients in Ondo State University of Medical Sciences. J Med - Clin Res & Rev. 2023; 7(12): 1-6.

## ABSTRACT

*Aim:* To ascertain the level of hearing loss among the residents of Ondo State in a free public hearing screening and hearing aid donation programme.

**Method:** This is a survey study of participants during the World Hearing Day Celebration organized by the Department of Audiology & Speech-Language Therapy in collaboration with the department of Ear, Nose and Throat (ENT) of university of Medical Sciences Teaching Hospital. A total of (243) volunteered to participate in the survey. Volunteers were examined using a portable sync video Otoscopes to ascertain the state of the outer ear. Pure Tone Audiometry was carried out using a calibrated GSI 61 clinical audiometer to ascertain hearing sensitivity level. Tympanometric examination was done with a calibrated GSI 39 middle ear analyser. Audiometric testing was conducted in a room whose ambient noise level was less than 45dB (A) with attached audio cups to conventional TDH39 headphone for noise attenuation purposes. A self-reporting questionnaire consisting of bio data, past or current medical/surgical history, drug/medication history, occupational noise exposure history, social habit/past-time history, past history of amplification, if any, was administered on all the participants.

**Result:** Hearing Loss by degree/type: (209) people were identified with hearing loss, eighty-eight (88) {42.1%} were found to have a mild hearing loss (20-40dBHL), (30) {14.4} moderate hearing loss (41-60dBHL). (39) {18.7%} people accounted for moderately-severe hearing loss (41-80dBHL) while profound degree of hearing loss revealed only (21) {10.05%} Sensori-neural (SNHL) (95) {45.5%} individuals were found while (92) {44.01%} came up with conductive hearing loss. (22) {10.5%} individuals had mixed hearing loss.

**Conclusion:** Hearing loss remains grossly under reported and undiagnosed. More Ear/Hearing care centres are advocated.

#### Keywords

Hearing loss, Healthcare services.

## Introduction

Hearing loss is one of the most common public health disorders among humans in all parts of the world. It has been estimated that 1 out of 1000 infants have hearing disorder and this is likely to increase with age. World Health Organization estimates that over 460 million people have hearing disorder with 1 in every 10 people envisaged to have a disabling hearing loss by 2050. South Asia, Asia Pacific and Sub-Saharan Africa are the parts of the world with the greatest prevalence. It is further reported that Nigeria like many other African countries have high prevalence of individuals with unaddressed disabling hearing loss due to the inadequacy of Otolaryngologists, Audiologists and Speech Therapists in addition to the high cost of hearing healthcare services and rehabilitation which most patients cannot afford [1-6]. Hearing loss can be disorienting to the individual, family and even the society. Hence, it is associated with poor speech sound interpretations, ineffective communication, poor interpersonal relationship, delayed in language acquisition for children, educational disadvantages, social isolation, stigmatization, dementia, poor quality of life etc. McDaid, Park and Chadha [7] estimated the global cost of hearing loss to be \$981 billion, with 57% of this figure from Africa and other developing countries of the world. This thus calls for a rapid global action to combat hearing loss and factors responsible for it.

Many factors are responsible for hearing loss whether in infants or adults and individuals are impacted depending on the severity of the condition, the age of onset, personality of the individual, the kind of intervention service sought after and the level of motivation toward rehabilitation. While hearing loss globally is commonly associated with factors such as noise exposure, trauma, infections/ illnesses, presbycusis, ototoxic drugs, genetic alteration, lifestyle-related factors etc. studies have shown that presbycusis, ototoxicity, noise exposure, canal blockage, tympanic membrane perforation etc. are quite profound among patients in Nigeria and other developing countries due to ignorance and lack of hearing care education. Also there is a culture of non-prioritization of the sense of hearing among many people in the country. It is further reported among researchers that many people lose their hearing from avoidable factors that are more often lifestyle related or cultural practices. Typical examples of such practices is the regular cleaning of the ears with the used of cotton buds or whatever object at sight especially when the person perceived itching symptoms or irritations, and this may lead to tympanic membrane perforation and many other related complications [8,9].

Research has also shown that rehabilitation of persons with hearing loss in Nigeria is in piecemeal scale and is being faced with numerous challenges both from the sides of persons with hearing loss to the side of inadequacy of personnel, quality service delivery and lack of funding on hearing healthcare. On the part of persons with hearing loss, it has been discovered that most people in the country still attribute hearing loss to a spiritual problem needing a spiritual solution. Hence, they hardly report their hearing challenges to the doctor or audiologist. Besides, majority do not know what to do about their hearing difficulty as a result of lack of public awareness. There is also the issue of lack of financial capability to cater for hearing care services, coupled with high patronage for traditional cure and negative societal perception, which prevent many from disclosing their hearing challenges and seeking appropriate medical and audiological intervention [10,11]. More so, hearing care intervention in the country is also hampered by lack of hearing facilities, centers, equipment and personnel to attain to the vast majority of people in the country. Currently, with a population of over 200 million people, it is estimated that there are less than 1000 otolaryngologists, 2000 ENT nurses, 150 audiologists, and also less than 100 testing/audiological centers in the country. Nwankwo, Vite and Udom cited Olusanya et al. [12] that the population of ENT surgeons in the country were fewer than 250 and in addition many of the ENT centers are ill-structured

and inaccessible especially outside major cities. Mulwafu, Ensink, Kuper and Fagan [13] reported an increase in otolaryngologists and audiologists from 2009 to 2015, yet these professionals are 0.76 per 100000 population, thus contributing to impart negatively on the rehabilitation of individuals with hearing loss in the country.

Understanding the etiological pattern of hearing disorders and the accompany rehabilitation effort puts forth by patients is beneficial not only to physicians and audiologists but also to patients, researchers, policymakers and healthcare providers to enhance quality service delivery in the country and this underlines the rationale for this study.

#### **Materials and Methods**

This is a descriptive survey study of patients with hearing loss who participated in the 2023 World Hearing Day Celebration by the Department of Audiology and Speech-Language Therapy, Faculty of Medical Rehabilitation, University of Medical Sciences in collaboration with the department of Ear, Nose and Throat (ENT) University of Medical Sciences Teaching Hospital, Ondo State between the months of March to May 2023. During this period, participants with hearing related difficulties were screened and rehabilitated accordingly. Professionals that conducted this screening include two (2) consultants Otolaryngologists, three (3) Audiologists and two (2) Speech Therapists. Pure Tone Audiometry was carried out using a calibrated GSI 61 clinical audiometer to ascertain hearing sensitivity level. Tympanometric examination was done with a calibrated GSI 39 middle ear analyser. Audiometric testing was conducted in a room whose ambient noise level was less than 45dB (A) with attached audio cups to conventional TDH39 headphone for noise attenuation purposes.

During the exercise, after the sensitization lecture, patients were first screened through otoscopy by the consultant otolaryngologists to roll out conditions that are correctable with drugs before sending them to the Audiologists for hearing evaluation. Audiologists determined the hearing level of the patients, the nature and type of hearing loss using Audiometers for pure tone measurements, and the tympanometer. In the pure tone measurement to test the air and bone conduction, 250Hz, 500Hz, 1KHz, 2KHz, 4KHz and 8KHz frequencies were tested respectively to determine if patients hearing loss were normal(0-25dB), mild (26-40dB) moderate (41-55dB) moderately severe(56-70dB) severe(71-90dB) and profound (91dB+) or if it was a conductive or sensorineural, symmetrical or asymmetrical, unilateral or bilateral etc in line with the global best practices and WHO recommendations. Tympanometry test was conducted to evaluate if the middle ear shape was either a Type A, As, Ad, B or C. Hearing conservations, hearing amplifications, counselling etc. were some of the rehab programmes administered to patients. On amplification devices, only hearing aids were freely dispensed to patients. Hearing Aids of different brands and styles were dispensed to those that benefitted from hearing aids trial whereas others were counselled on other rehab options available for them such as cochlear implants, hearing conservation and regular audiological monitoring. Information from the questionnaires were basically centred on demographic characteristics such as

name, gender, date of birth and age, contact and mobile address; hearing/medical history, presenting symptoms, duration, cause of hearing loss, previous intervention efforts etc. Data obtained from the questionnaires and Audiological findings were analysed using the Statistical package for Social Sciences (SPPS). Other quantitative data were summarized and presented in tables and bar chart in the form of frequencies, percentages, means and standard deviations etc.

More female with 141 (58.02%) participated more in the study and had more hearing loss than male with 102 (41.08%). The age range of 51-60 was the most represented in the study with 38 (15.64%).

#### **Results and Discussion**

243 participants including adults and paediatrics, 141(58.0%) female, 102(42.0%) male took part in the exercise and were screened, of which 209 (86.01%) met the inclusion criteria of having a hearing loss either on one or both sides of the ears with a

gender ratio of (M: F) of 1:1.6. The mean age of participants that were screened was 41.89 year with SD of  $\pm$  22.08.

Table 1: Shows Age-gender	distribution of the	participants	(n=243).
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S/N	Age group of participants	Male	Female	Frequency (%)
1	1-10	11	18	29 (11.93%)
2	11-20	8	12	20 (8.23%)
3	21-30	14	18	32 (13.20%)
4	31-40	9	19	28 (11.52%)
5	41-50	15	20	35 (14.40%)
6	51-60	17	21	38 (15.64%)
7	61-70	16	18	34 (13.99%)
8	71+	12	15	27 (11.11%)
9	Total	102	141	243 (100%)

S/N	Degree of Hearing loss	Conductive HL	Mixed HL	Sensorinural HL	Unilateral	Bilateral	Symmetrical	Asymmetrical	Total
1	Normal (-10-25dB)								34
2	Mild (26-40dB)	52	6	30	24	64	60	28	88
3	Moderate (41-55dB)	17	4	9	8	22	17	13	30
4	Moderately severe (56-70dB)	11	7	21	11	28	30	9	39
5	Severe (71-90dB)	6	3	22	7	24	20	11	31
6	Profound (91dB+)	7	2	12	5	16	11	10	21
7	Total	92	22	95	55	154	138	71	243

Table 2: Showing the degree of hearing loss among participants.

From the table, of 209 identified with hearing loss, majority 88 (42.110%) were those with mild hearing loss, followed by moderately severe hearing loss with 39 (18.66%), severe 31 (14.83%) and moderate 30 (14.35). Those with profound hearing loss with 21 (10.05%) were the least represented in the study. Also from the table those with sensorineural 95 (45.45%), bilateral 154 (73.68%) and symmetrical 138 (66.03%) hearing loss were more represented than those with conductive 92 (44.02%) and/or mixed 22 (10.53%), unilateral 55 (26.32%) and asymmetrical 71 (33.97%).



Chart 1: Showed the distribution of causes of hearing loss (n=209).

Presbycusis was the most predominant cause of hearing loss with 37 (17.70%) from the 209 screened to have hearing loss, followed by unknown causes with 32 (15.31%). BP related causes 12 (5.74%) was the least causes of hearing loss among the patients as seen in the table above. Other identified causes such as noise-induced 18 (8.61%), congenital 27 (12.92%), ototoxicity 21 (10.05%), otitis media-related 22 (10.53%), infections 24 (11.48%) and genetic causes 16 (7.66%) were also significantly represented as common causes of hearing loss among patients.

Table 3 showed that 149 (61.32%) participants responded that they have had previous intervention and /or rehabilitation related to their hearing and hearing loss, whereas 94 (38.68%) indicated no previous intervention. Of the intervention service or rehabilitation for those with hearing loss, drugs was the predominant services sought after by participants while only a handful of patients had previously used hearings Aids 11 (4.53%) or did a surgery 2 (0.82%) because of their hearing conditions despite obvious needs for amplification devices.

#### **Discussion of Findings**

Evidence from the demographic characteristics of participants revealed that female, both adults and paediatrics participated more in the study than their male counterparts in a ratio (M:F) of 42%: 58%. With adults presenting with hearing loss than paediatrics.

S/N	Age Group (years)	Previous intervention	No previous Intervention	Drugs intervention	Surgery	Hearing Aids and others
1	1-10	9	20	9	0	0
2	11-20	11	9	7	1	1
3	21-30	18	14	18	0	0
4	31-40	21	7	19	0	2
5	41-50	17	18	17	1	2
6	50-60	25	13	22	0	3
7	61-70	29	5	27	0	2
8	71+	19	8	18	0	1
9	Total	149	94	137	2	11

 Table 3: Showing the intervention and nature of intervention of participants (243=).

This findings confirms previous clinical and nonclinical studies of the difference in the trajectory between the hearing of male and female gender and even their response to intervention services. While it is reported that men are likely to have as twice disabling hearing loss as women, they are less likely to seek help and also to talk about their conditions, and this is mostly common among the elderly [14,15]. This gender discrepancy in hearing has to do with lifestyle than biological factors as there are no sufficient biological evidence to account for the discrepancies, only that men tend to be exposed to noise and other exogenous factors hazardous to their hearing than women.

On the degree of hearing loss among participants, it was found that individuals with mild, 88 (42.11%) were the most represented in the study, followed by moderately severe 39 (18.66%), severe 31 (14.83%), moderate 30 (14.35%) and profound 21 (10.05%). Speech and Hearing Associates (2021) confirmed this finding that mild hearing loss is the most common and under-diagnosed degree of hearing loss especially among people with little or no concern for hearing care. Of the 209 participants screened with hearing loss, 95 (45.46%) presented with sensorineural hearing loss, 92 (44.02%) with conductive and 22 (10.53%) with mixed hearing loss. Kodiya, Afolabi and Ahmad [16] confirmed the findings of this study in which almost 80% out of 5485 patients reviewed in their study had sensorineural hearing loss. Olajide [17] also in a sample of 84 Bottling Company workers found that 64.9% of them presented with a sensorineural hearing loss while 35.1% had conductive hearing indicating a high prevalence of sensorineural pathology among patients in Nigeria. Sensorineural disabling hearing loss unlike conductive pathologies are not correctable with drugs and surgery except with the use of hearing aids, cochlear implants and assistive listening devices, therefore demanding extra care and measures on the sense of audition to avoid hearing loss and poor quality of life.

On the pattern of hearing loss, it was found that individuals with bilateral hearing loss constituted the majority of those with hearing loss with 154 (73.68%) compared to 55 (26.32%) of those with unilateral pathology in a sample of 243 where 209 are identified with hearing loss. Kodiya, Afolabi and Ahmad [16] in their study on the burden of hearing loss in Kaduna, Nigeria, using a sample of 5485 patients discovered that more than 80%

of the patients had bilateral hearing loss. It was further concluded that it is possible most of the patients had initially experienced a unilateral hearing loss that went unidentified and untreated thus progressing to a bilateral hearing loss. So, having more patients with sensorineural loss with high proportion of elderly in the sample justify the findings of this study but the limited nature of the sample may not permit such generalizations. More so, it was found that more participants with hearing loss had symmetrical hearing loss (66.03%) compared to 33.97% with asymmetrical pathology.

On the aetiological pattern of hearing loss among patients and/or participants, the findings revealed presbycusis 37 (15.23%) was the most predominant cause of hearing loss, followed by unknown/ unidentified factors 32 (15.31%), congenital 27 (12.92%), infections/illnesses 24 (11.48%), otitis media related causes 22 (11.48%), ototoxicity 21 (10.05%) noise-induced 18 (8.61%) and blood pressure/cardiovascular 12 (5.74%) causes. The finding thus agrees with numerous studies that acquired hearing loss is common than congenital hearing loss in many part of the world due to negligence and little attention given to factors that affect the sense of audition coupled with the dearth of hearing healthcare services in the country, lack of awareness on preventive hearing care strategies, especially in the rural parts of the country [12].

Lin et al. [18] and Folorunso et al. [19] studies also confirm the finding of this study that presbycusis, ototoxicity and noiseinduced and other acquired hearing loss are widespread among Nigerians compared to developed countries of the world due to diagnostic and healthcare related services and aging measures put in place in the country. The unregulated occupational and environmental noise exposure, high patronage of over-the –counter (OTC) medications and poor aging lifestyle among the elderly in the country contribute to these high incidences of acquired hearing loss in the country.

Armitage et al. [20] revealed that less than 1% of Nigerians ensure the wearing of hearing protection aids against environmental, recreational and occupational noise compare to 2.1% of Americans using hearing protection wears. Also, Omolase, Adeleke, Afolabi and Afolabi [21] found that 85% of Nigerians engaged in self- medications, with a significant proportion likely to use ototoxic medications which have severe impact on their hearing ability. Tanyi, Andre and Mbah [22] reported that less than 10% of elderly in the country have adequate preparation and aging lifestyle, thereby leading to many of them struggling with diverse health conditions such as dementia, hearing loss, hypertension, osteoarthritis, diabetes mellitus, cancer etc. With adequate noise protection measures, purchase and used of medications laws, and national policy on the care of the elderly, factors resulting to hearing loss would be sufficiently mitigated in the country. On the rehabilitation of patients, it was found that 149 (61.32%) of the 243 participants indicated previous ear and/ hearing care intervention while 94 (38.68%) answered in the negative against any previous ear care intervention. Of the 149, a vast majority, 132 (91.95%) had previously used medications for their hearing difficulty, 11 (7.38%) had hearing aid intervention while only 2 (1.34%) indicated a previous surgery for their hearing conditions. Oyediran, Ayandiran, Olatubi and Olabode [23] in their study on awareness of risks associated with self-medication among patients in general out-patient department of tertiary hospital in South western Nigerian using a sample 1784 confirmed the revelation of this study that there is a general preference for medication over other treatment options, hence the reason more than 80% engaged in self-medication.

Aremu, Adewoye, Adeyanju and Ekpo [24] confirmed the uncommonness of hearing aids technology among patients in the country. In a sample of 420 motorcycle riders with 14.5% presenting with hearing loss, none of the participants used hearing aids except 17.9% and 16.2% on ear mufflers and earphone. This lack of hearing aids usage among patients with hearing loss was associated with lack of information and awareness on the availability of hearing aids, patients' inability to afford hearing aids considering the high cost of purchasing hearing technologies, stigmatization of those wearing these devices and many other practices preventing people from using hearing aids in the country. It could be further deduced from the above discussions that rehabilitation of patients with hearing loss in the country is hinder by poor response to intervention services and lack of quality hearing rehabilitation services thus inhibiting their overall quality of life, satisfaction and contribution to their immediate community.

## Challenges

Patients' information on previous hearing intervention/ rehabilitation services obtained was subjective hence it was through a structured questionnaire to elicit their responses and this could introduce biases to the reliability of the study. In addition, 243 participants is a relatively small sample size to draw any inference or conclusion on the general population of persons with hearing loss in Nigeria.

## Conclusion

Hearing loss is widespread and mostly unreported and underdiagnosed among Nigerians. Women participated more in the study than men and were diagnosed with hearing loss than men. More of the participants presented with mild, sensorineural, bilateral and symmetrical hearing loss. It was discovered that majority of the participants had not obtained hearing aid intervention. It was further recommended that more awareness and sensitization campaigns be carried out across Nigeria especially in the rural communities in addition to upgrading the quality of rehabilitation facilities and centers in the country.

## Acknowledgement

We thank the almighty God for the wisdom of this study. We appreciate our mentor, Prof Owolawi W.O., for his great input and initiatives towards the success of this study.

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