UNIVERSITY OF ILORIN

THE ONE HUNDRED AND FIFTY-FIFTH (155TH) INAUGURAL LECTURE

"HEARING LOSS: THE HIDDEN HANDICAP"

By

PROFESSOR FOLUWASAYO EMMANUEL OLOGE
MB.BS. (IBADAN); FWACS; FMCORL.
Department of Otorhinolaryngology,
Faculty of Clinical Sciences,
College of Health Sciences,
University of Ilorin, Ilorin, Nigeria

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The Vice-Chancellor
Professor Abdul Ganiyu Ambali
DVM (Zaria); M.V.Sc., Ph.D. (Liverpool); MCVSN (Abuja)

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My Lords, Spiritual and Temporal,
Distinguished Invited Guests,
Gentlemen of the Press,
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Friends and relations,
My dear students of the University of Ilorin and Sister Institutions,
Ladies and Gentlemen.

Introduction

The Vice Chancellor Sir, it is with gratitude to God and to you that I stand to deliver this Inaugural Lecture before this distinguished audience. Otorhinolaryngology/Head and Neck

Surgery, or more commonly Ear, Nose, and Throat Surgery, is a branch of medicine related to the study, diagnosis and treatment of the diseases of the ear, nose, throat as well as related aspects of the head and neck. Otorhinolaryngology/Head and Neck Surgery and Ophthalmology were carved out together as a specialty from Surgery in General. We still have eye and ear hospitals as evidence of this. With time and further development of the specialties, the marriage between Ear, Nose, and Throat Surgery and Ophthalmology became clumsy; and they separated amicably. Even then, *'on to baojuobaimu'* i.e. whatever pertains to the eye also pertains to the nose. Today, Ear, Nose, and Throat Surgery has its diverse subspecialties: mainly Otology, Rhinology, Laryngology/Head and Neck Surgery and, more recently, neuro-otology, skull base surgery, rhinoplasty, allergies, audiological medicine, and speech pathology. Tomorrow some of these divisions may gain independence and stand on their own. Today, as implied by the title of this lecture, I will concentrate on the ear.

My journey into Otorhinolaryngology

I almost fell out of line of medicine for two reasons. I was very poor in mathematics up till my form 3 but, ironically, Mr. S.J. Fatoye, our Principal then established a mathematical society and made me the secretary. Rapidly, I became the best in maths, and maths became my best subject. I was even tempted to pursue maths as a course. Thanks to Mr. Fatoye for the challenge. The other reason was our Youth Corps Physics Teacher. He was so soft spoken that his voice became music to our ears, luring us to sleep in class. And he insisted no one should wake up a sleeping student! Actually, he was waiting for the day everyone in the class will go to sleep then he would

excuse all of us to sleep. The Physics class became thinner and thinner. I also fell out of the class and replaced Physics with Agric Science. Our Agric Teacher called me into a counselling session. He requested for the course I wanted to pursue and I promptly replied, Medicine. He told me he would like me to be in his class because he knew I would do well. But he counselled me to return to Physics class, dropping Agric Science, as I could not become a Medical Doctor without Physics. I heeded his advice and went back to Physics class. Today, I know he was God sent. I tender my sincere appreciation for your unselfish counsel. I did a large part of the Physics syllabus by myself. I could not cope with MN Nelkon or Abbot. But I found lecture notes in Physics by Mr. Oyewole very useful. By providence, topics that I mastered in that small book covered the exams for that year. I came out with A^1 in Physics!

Medical School was an interesting story. I was through in 4½ years; despite 2 months stay at home for ***Aluta***: "Olayide must go". House job was in Ilorin. At the end of the one year, I decided I would be an Obstetrician and Gynaecologist. For whatever reason, the National Postgraduate Medical College of Nigeria sent back my one hundred naira bank draft exam fees saying that I needed to have NYSC discharge certificate to sit the Primary Exams in O & G. After the Youth Service year, I collected an application form for Residency in Obstetrics and Gynaecology and approached Prof. Bojuwoye to write a referee report to support my application. I do not know if he remembers but he wondered why I wanted to go to Obstetrics and Gynaecology. He said I did not look like an Obstetrician and Gynaecologist. I did not know that they had a special "facie". I went back to rethink, I knew I wanted to be a Surgeon, but not a General Surgeon. Ophthalmology was

ruled out because the entire Ophthalmologists at Ibadan were women. So what will I be doing among them? Eventually I decided on Otorhinolaryngology and the journey began on September 3rd, 1990. I resumed under the tutelage of Prof. Oyekwere Ogan, a First Class gentle man, teacher and mentor. He is commonly called "the Gentleman of ORL". Sadly, almost one year into the five-year programme, Prof. Ogan passed on in a ghastly motor accident near Enugu. Then his Residents became orphans.

With Prof. Ogan's last rites over, we started in search of new mentors. Eventually, Prof. P.A. Okeowo, LUTH took me under his wings. I thank him immensely. Although his time was very tight, he managed to review weekly essay questions with me. And after a while he accepted 6months of the one year I stayed under Prof. Ogan, in recognition of his person and tutelage. This is significant because UITH did not have a formal accreditation for ENT Training yet. Despite all these hiccups I managed to complete my programme in April 1996; 5½ years after I began. Once again, I thank Prof. Okeowo who not only catered for the Resident of his colleague while he was alive, but remained faithful to him when he passed on. Professor Okeowo was very busy, so the day-to-day training actually fell on Prof. C.C. Nwawolo. I owe him a debt of gratitude.

On returning to Ilorin, I eagerly informed the Teaching Hospital of the successful completion of my Residency training in Otorhinolaryngology. I was promptly offered a temporary appointment as a Hospital Consultant because the University was on ASUU Strike. Eighteen years have passed now so I believe the files are now de-classified. The comment of Prof. Fakeye, (then CMD) caught my attention. "Justification of our decision" was what he wrote. I did not

understand it until I probed and discovered that it was a tug of war sending us out as Supernumerary Residents after the demise of Prof. Ogan. There were concerns if we would return after the investments on us. All of us returned to build the Department that Prof. Ogan meticulously laid its foundation. I thank those who stood by us and influenced the decision to keep us rather than let us drift away.

Today, I am standing before you to deliver the first Inaugural Lecture of the department of Otorhinolaryngology and the 155th Inaugural Lecture of the University of Ilorin entitled "Hearing Loss: the Hidden Handicap".

Hearing Loss: The Hidden Handicap

There are efforts to move away from the words handicap and disable. We now use physically challenged, differently able etc. This is intended to position the affected to aim at achieving the best possible in spite of his challenge. And this has worked in many respects. People with hearing challenges have achieved tremendous feats comparable to those not similarly challenged.[1]Thomas Edison and Henrietta Leavitt had significant hearing loss, but were outstanding researchers and inventors.[1] Stephen Hopson is a Deaf Pilot.[1] Terrence Parkin, a Deaf Swimmer, is an Olympic Champion.[1] Also Amy Wong and Heather Whitestone McCallum are crowned beauty queens in spite of being deaf.[1]But sometimes there are still issues. In a milieu where even the fittest survive with strain, more still need to be done for individuals with hearing challenges.

I heard the story of an elderly couple celebrating their 50th wedding anniversary. The following conversation ensued between them.

Husband: Our love is tried and true

Wife: Pardon me.

Husband: I said our love is tried and true

Wife: I cannot hear you please

Husband (much louder): I said our love is tried and true

Wife: I am tired of you too!

Handicap cannot be obviously seen in this family. Yet it exists, and could lead to real problems and misunderstanding. I am sure the average person in the audience today will readily say there are more blind people, lame people, than deaf people. To a large extent the reason for this is because hearing loss is hidden. Even those who manifest hearing loss are more likely called pretenders; and not taken seriously. So the deaf receive sympathy and help late and many times grudgingly, with suspicion.

The organ of hearing is the ear.

The Ear: The ear is composed of the external, middle, and inner ear. (Figure 1)

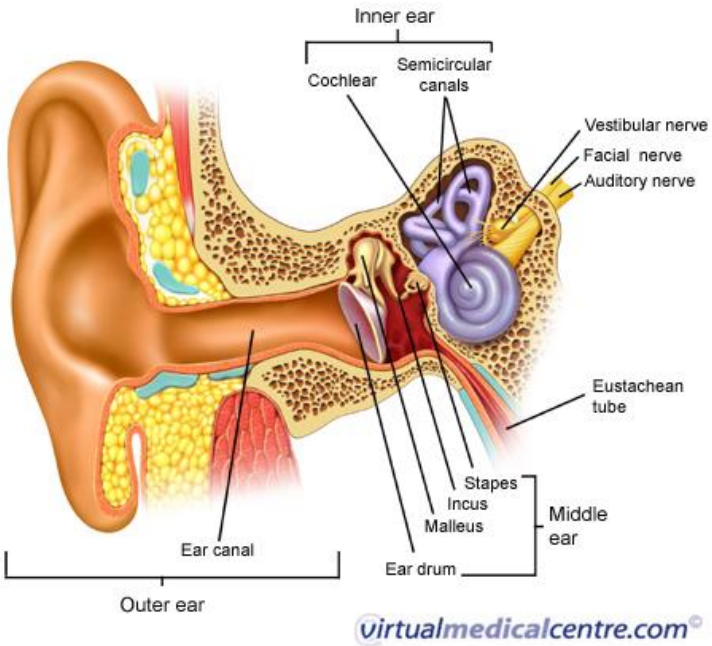


Figure 1: The Human Ear.

The external ear consists of the pinna which assists in collecting and directing sound waves into the external ear canal. (Figure 2)

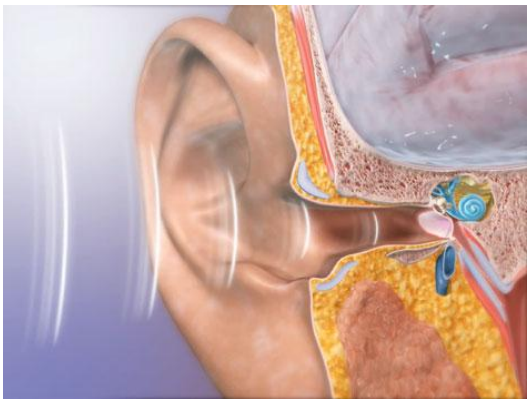


Figure2: The ear collecting sound waves.

Figure 3: Attempting to catch and direct more sound waves into the ear canal

This function is not as pronounced as in some animals such as the hare which has a bigger and relatively mobile pinna. Human beings sometimes augment the function of the pinna by cupping the hand behind the ear (Figure 3)

The external ear canal is an S shaped canal that runs inwards from the root of the pinna and terminates in the ear drum; also called tympanic membrane. This canal is a conduit that transmits sound waves from outside into the ear. The sound waves impact on the eardrum and make the drum move inwards and outwards. This sound energy is transmitted into mechanical energy in the small bones of the middle ear called ossicles: malleus, incus and stapes. (Figure 4)

Figure 4: Malleus, incus, and stapes.

The stapes has a foot plate that ends on the oval window: a window into the inner ear, specifically the cochlear which is the hearing component of the inner ear. (Figure 5). The balance component of the inner ear is called semi-circular canals.

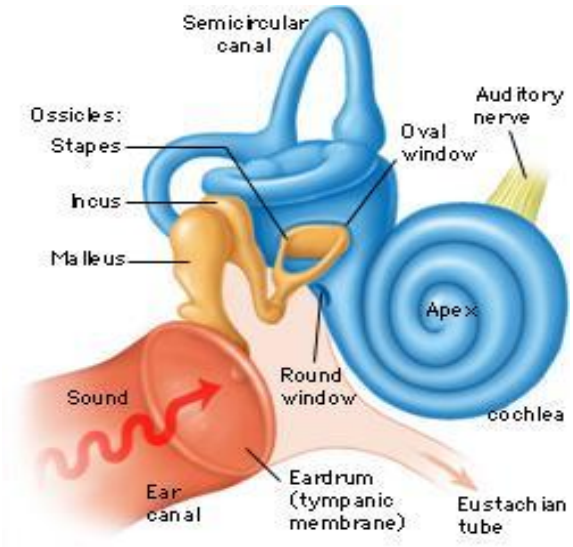


Figure 5: Pictorial description of transmission of sound energy from ear canal to cochlear nerve

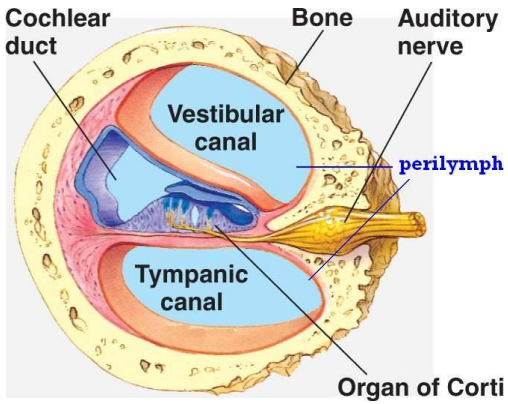


Figure 6: The organ of Corti (From www.studyblue.com)

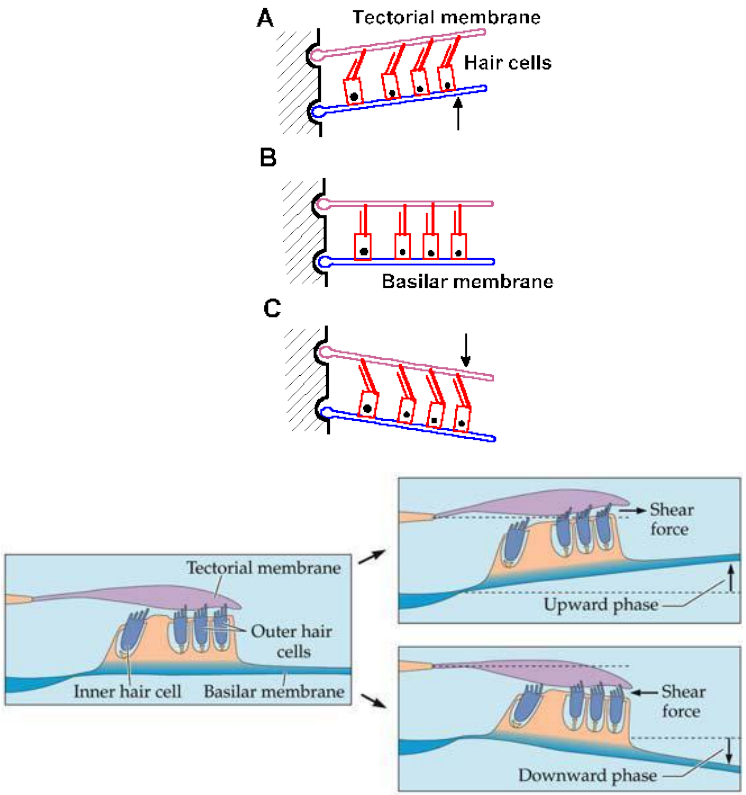


Figure 7: Movement of Tectorial Membrane changing mechanical energy to electrical energy (From www.doingverywell.com)

In the cochlear, the mechanical energy is converted into electrical energy in the organ of corti (Figure 6 and Figure 7).The cochlear nerve carries the electrical energy from the cochlea into the hearing centre of the brain. (Figure 8). The hearing centre in the brain interprets the signal as intelligible sound.

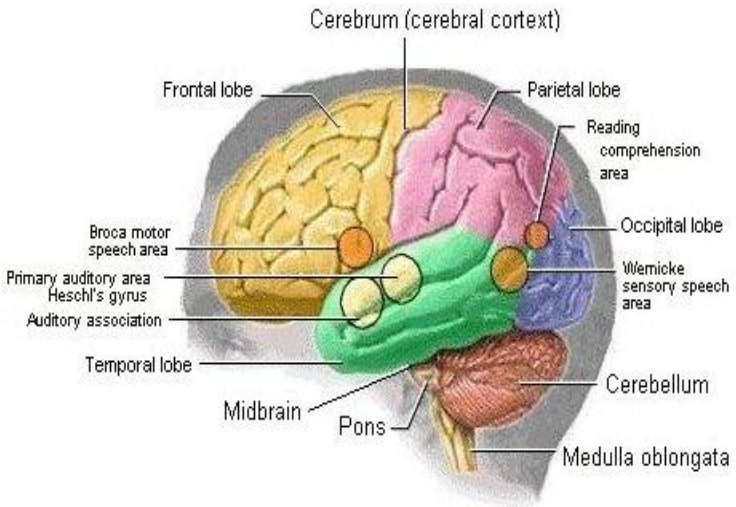


Figure 8: Hearing Centre of the Brain.

Whatever affects the normal functioning of the ear system will affect the hearing acuity of the individual. This we refer to as hearing loss. Hearing loss is a spectrum from mild to profound as depicted in Figure 9.

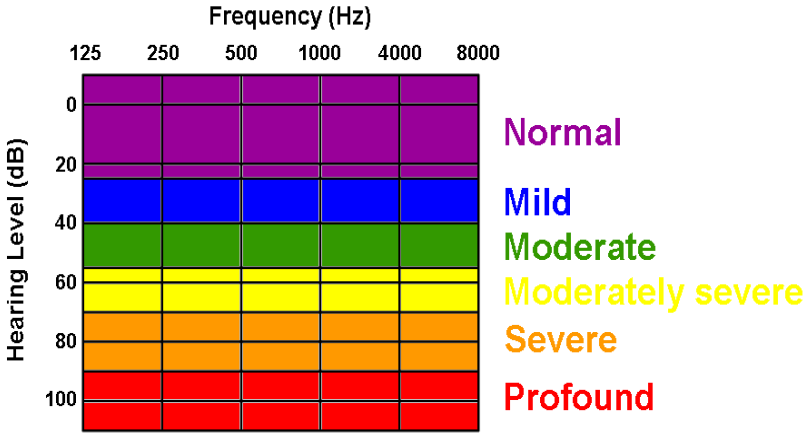


Figure 9: Audiogram showing various hearing thresholds.
(From www.d.umn.edu)

The purpose of prevention of hearing loss is to fight factors that have the capacity to alter the normal functions of the ear and thus affect hearing thresholds. These factors could occur before the child is born, called congenital causes. Those that occur afterwards are called acquired causes and these occur at the time of birth, also called peri-natal causes; or could occur after the child is born and onwards, called post natal causes. Congenital causes include genetic deafness, intra-uterine infections such as TORCHES (Toxoplamosis, Rubella, Cytomegalovirus, and Herpes Simplex). Some of the syndromes include Pierre Robin's syndrome, etc. These could lead to conductive hearing loss, sensorineural hearing loss or mixed hearing loss. Common peri-natal causes include birth asphyxia, hyperbilirubinaemia, sepsis, ototoxicity, etc. Post natal causes are mainly infections, ototoxicity, presbyacusis, noise induced hearing loss, trauma, etc.

My Contributions to Knowledge

Today, I will concentrate on contributions related to our subject matter: hearing loss. Ologe et al worked in the community (on the streets, schools, small scale workplaces, and organized industries), laboratories, and clinical posts in search of the causes, prevalence, severity, effects, and remedies of hearing loss, the hidden handicap.

1. Deafness and Blindness

Deafness and blindness are important, and possibly, the least redeemable deficits. The term 'deaf' refers to severe-to-profound hearing loss in the better ear.[2]And if pre-lingual, is associated with being mute. Legal blindness refers to visual acuity after correction of less than 6/60 in both eyes or a field of vision constricted to 10 degrees of arc or 5 degrees from fixation in the better eye irrespective of corrected visual acuity or a combination of visual defects resulting in the same degree of visual impairment as that occurring in the two points above.[3]And a deaf blind person, in our context, has severe-to-profound hearing loss in the better ear, and is legally blind.[4]Difficulty in mobility is the main problem of the blind; while difficulty in communication with people is the main problem with the deaf.

Ologe et al. assessed the perspectives of final year medical students, who had gone through two months Ophthalmology and Otorhinolaryngology clinical postings, regarding these special groups of individuals, to give an idea of the relative handicap associated with them.[5]

This study revealed three fundamental issues.

a. Blindness is perceived as worse than deafness.
b. A greater proportion of the blind are seen as beating the odds against their potential development than the deaf.

This implies that may be there are better support structures that help the blind overcome their problems.

c. Deaf/blindness could mean one plus one equals three.[4] Since vision and hearing are complementary for effective communication among humans, it is understandable that the loss of both senses could have an exponential effect.[4]

2. Noise and Hearing Loss

Although industrialization is a global index of development, it is a mixed blessing to mankind. While it enhances the quality of life, it poses serious threats to public health. Excessive sound damages the hair cells and the blood supply to the cochlea, initially at a frequency around 4 KHz. The damage is initially temporary, called temporary threshold shift, but with greater sound exposure, and for longer duration, it becomes permanent. At 90 dBA and above, the risk of noise induced hearing loss (NIHL) becomes higher, and worsens with prolonged exposure. NIHL is an important yet often overlooked illness. It is the major avoidable cause of permanent hearing loss worldwide. The cost of prevention is far less than the cost of hearing loss in terms of human suffering and economic loss.

The concern that excessive urban noise may be related to a generalized hearing deficit among residents prompted Ologe et al. to measure the ambient noise levels in carefully selected neighbourhoods of Ilorin, a city in North-Central Nigeria, in an effort to determine the sources and extent of the noise levels.[6] The areas of Ilorin that were chosen for this study were selected to reflect the differences in noise as a function of two residential areas of differing socio-economic status. The data summarized in Table I showed marked

differences in noise levels by neighbourhood, the time of the day, and day of the week. This was particularly true between 7:00 a.m. and 9:00 a.m. in the Taiwo road neighborhood when noise levels were found to average 62–76.6 dBA daily. The noise levels recorded in the Taiwo road neighborhood are comparable to peak noise levels reported in noisy parts of hospital intensive care units in Asia and Europe.[7,8] It is of particular importance that these noise levels (Table I) were similar to those observed around iron and steel factories in India.[9] It is also significant that they exceeded the limit of 50 dBA prescribed for residential areas in Brazil.[10] Even the lower ambient noise levels recorded in Adewole housing estate were far higher than 30 dBA and lower previously observed in Lagos, Nigeria, more than 20 years ago, and in excess of the 35 dBA (daytime) and 30 dBA (nighttime) ideal limits for residential areas overseas (Germany and Brazil).[11,12] This could indicate a rise in environmental noise levels in Nigerian urban centres. Our data establish a baseline and also indicate that noise levels in residential areas in Ilorin are excessive and need to be addressed for public health reasons.

Table 1: Ambient noise levels by neighbourhood and day of the week (dBA)

	Adewole			Taiwo		
Time	Sun	Wed	Fri	Sun	Wed	Fri
5.00 am	46.1	42.5	44.3	55.7	68.3	67.2
6.00 am	50.8	38.1	46.9	60.1	71.4	70.9
7.00 am	40.4	45.2	44.5	67.6	74.1	77.4
8.00 am	45.6	42.9	43.8	72.6	69.1	72.4
9.00 am	22.7	42.0	49.4	69.6	69.6	74.9
10.00 am	21.8	40.5	48.6	66.6	70.2	74.5
11.00 am	39.9	44.6	47.2	66.8	68.6	70.1
12 noon	39.9	42.7	47.7	67.8	71.6	72.3
1.00 pm	40.3	48.0	42.7	69.4	65.0	76.6
2.00 pm	40.4	43.8	44.6	68.8	68.4	61.7
3.00 pm	42.0	49.0	37.1	70.9	71.2	61.8
4.00 pm	51.1	53.0	55.2	67.1	67.0	67.3
5.00 pm	43.3	37.5	47.0	67.4	72.1	70.7
6.00 pm	44.4	45.1	45.8	64.6	69.0	69.4
7.00 pm	47.4	48.1	44.9	69.5	66.1	72.6
8.00 pm	44.7	53.3	47.1	72.8	67.8	69.8
9.00 pm	45.3	55.5	56.2	66.7	69.2	64.8
10.00 pm	53.2	39.4	40.1	64.3	69.6	68.9
11.00 pm	56.5	38.7	37.9	62.1	62.0	69.3

Informal occupational Sector

Today, many people regard commercial grinding ventures as a viable means of augmenting their income and meeting other financial needs. To keep the cost minimal and make for easy accessibility, the grinding machines are

stationed close to the owners' residence. This exposes the regular user, his or her family and neighbours to the risk of noise induced hearing loss. High concentration of grinding machines is also found in and around the open markets. Ologe et al studied the knowledge and attitude of the commercial grinders on NIHL.[13] While majority were aware of the hazard of noise induced hearing loss (NIHL) to themselves (80.0%) and to their neighbours (88.0%), they were unaware that they could be protected from the noise (80.0%) and most of them did nothing to protect themselves (79.0%).[13]Ologe et al. carried out a cross-sectional survey on six main streets selected by simple random sampling at different locations of Ilorin, and consenting operators of music recording centres on the selected streets were invited to participate.[14] Although, about 30% of the respondents indicated they reduced the volume of music as a protective measure thus, indicating an awareness of a link between excessive music loudness and possible health hazards particularly hearing loss, our findings at the time of data collection indicated high noise levels (96±2.5dBA). [14] It is possible that some of the respondents may not be aware of safe sound levels or the increased music volume may reflect existing hearing loss.

Our observations are at variance with the claim by the majority of the respondents of being aware of a link between loud music and hearing loss. This is troubling given that the most practicable way to decrease the risk of NIHL in our study population is to reduce the volume of the music to an acceptable level and in this case, this is easy and within control. This dichotomy between knowledge and practice is akin to what obtains in individuals involved in smoking, thus, reinforcing the view that change of behaviour will require more than an occasional piece of advice. An important area to

look into is the noise level generated by social parties and religious centres. We are aware that the loud speakers at such functions reach beyond the audience at the function to neighbours.

Organized Occupational sector

Ologe et al. studied the exposure to noise, the attitudes and knowledge towards noise-induced hearing loss and the actual use of hearing protection in a steel rolling mill in Nigeria.[15] There was high awareness of the hazard of noise to hearing (93%) and of methods of prevention (92%) but only 27% possessed hearing protectors and only 28% of these stated that they used them all the time.[15]We also measured noise levels and showed a correlation between exposure to noise and awareness of noise as a health hazard.[15](Table 2)

Table 2. Awareness of exposure to noise and sound level measured

Work area	Admin	Maintenance	Mill floor	Finishing
Number of employees (%)	$n = 34$ (29)	$n = 21$ (18)	$n = 48$ (41)	$n = 13$ (11)
Sound level dBA (TWA)	49	72	86	93
Personal noise dose (%)	0.3	8.3	57.4	151.6
Awareness of noise exposure*				
Yes (%)	10 (32)	19 (90)	47 (98)	13 (100)
No (%)	21 (68)	2 (10)	1 (2)	0 (0)
Reason for non-use of protective device ($n = 65$)				
The level of noise is low (%)	25 (76)	3 (13)	0 (0)	0 (0)
Device not available (%)	8 (24)	20 (87)	0 (0)	0 (0)
Device defective (%)	0 (0)	0 (0)	7 (100)	2 (100)

The awareness appears to derive from personal experience of working in noisy environments rather than from health education. Our study supports this as 90% of our subjects were employed at this mill for at least 10 years but only 10% had

education on prevention of NIHL.[15] There is continuing evidence of poor compliance with NIHL preventive measures even in developed countries.[16,17] Thus, poor attitudes towards NIHL are global and may play a greater role in the universal burden of NIHL than uncontrollable harmful noise itself. Ologe et al. sought to determine the prevalence of sensorineural hearing loss among the workers in a steel rolling mill in Nigeria.[18]At the time of this test 28.2% of the study population already had mild to moderate sensorineural hearing loss in their better ear and 56.8% in their worse ear[18]. How much of this is attributable to their present employment is difficult to determine since there was no pre-employment audiometry.[18]But the pure tone average appears to worsen with length of stay in their present unit (Table 3). The pure-tone average and the average hearing thresholds at 4 kHz for the groups significantly increased with an increasing noise exposure level. Following these observations, Ologe et al decided to assess the progression of NIHL in a group of noised exposed workers.[19]The prevalence of sensorineural hearing loss among workers was noted to be 64.9 and 86.9 per cent for test one (2003) and test two (2005), respectively.[19] The degree of hearing deterioration within the two years of this study was 1.0–3.2 dB for the right ear and 1.6–3.4 dB for the left ear.[19](Table 4, Figure 10, Figure 11)

Table 3: Pure-tone average and length of stay in present unit.

Length (years)	Right ear (± SD) (dB)	Left ear (± SD) (dB)
0–4	25.73 (± 10.59)	24.36 (± 8.73)
5–9	23.55 (± 6.55)	17.91 (± 6.89)
10–14	26.16 (± 8.42)	19.00 (± 6.20)
15–19	29.59 (± 7.95)	23.59 (± 7.14)
20–24	33.82 (± 8.80)	26.30 (± 8.76)
> 25	21. 50 (± 8.66)	21.50 (± 12.72)
P value	0.001	0.004

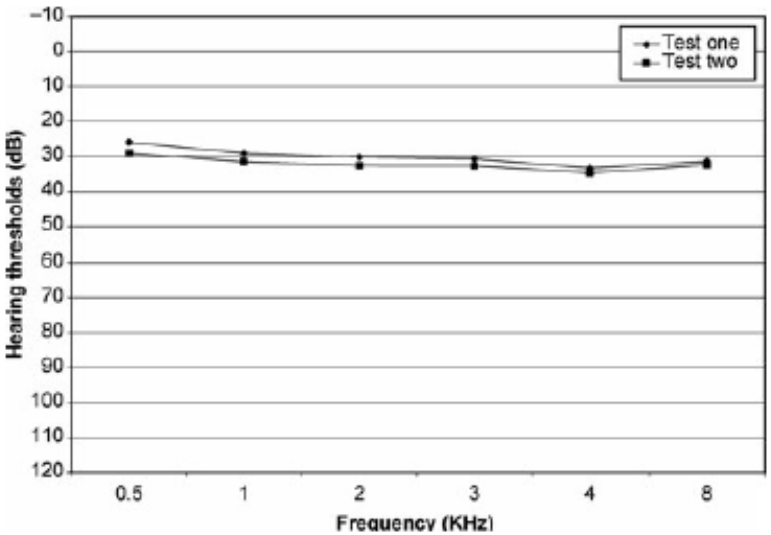
These findings showed that there was a high prevalence of sensorineural hearing loss and significant hearing deterioration among workers, due to exposure to excessive noise over a two-year period.[19]The implication of these findings is that continued exposure of these workers to their current noise level would lead to worsening noise-induced hearing loss. By the time they reach retirement age, they may possibly have moderate to severe noise-induced hearing loss. In Nigerian society, life in retirement can be challenging because some people withdraw from social life, largely because their retirement income cannot support their pre-retirement standard of living. There is also a tendency towards a perceived social irrelevance of older people. Significant hearing loss will worsen these effects and create greater isolation for older individuals. Hearing loss also reduces the likelihood of post-retirement employment and other contributions to society.

Table 4: Subjects' Mean Hearing Thresholds

Frequency (kHz)	Mean hearing threshold (dB ± SD)		Deterioration (dB)	*t*	DF	*p*
	Test 1	Test 2				
Right ear						
0.5	25.9 ± 5.8	29.1 ± 7.1	3.2	−3.216	166	0.002
1.0	29.1 ± 6.7	31.5 ± 6.6	2.4	−2.319	166	0.002
2.0	30.2 ± 6.2	32.6 ± 6.2	2.4	−2.554	166	0.01
3.0	30.7 ± 7.0	32.7 ± 6.6	2.0	−1.988	166	0.05
4.0	33.3 ± 8.1	34.7 ± 7.6	1.4	−1.165	166	0.2
8.0	31.4 ± 6.6	32.4 ± 6.2	1.0	−1.018	166	0.3
Left ear						
0.5	25.0 ± 6.2	28.0 ± 6.3	3.0	−3.093	166	0.002
1.0	27.3 ± 6.7	30.4 ± 7.3	3.1	−2.825	166	0.005
2.0	28.4 ± 6.7	31.3 ± 6.4	2.9	−2.811	166	0.006
3.0	27.8 ± 5.8	31.2 ± 6.3	3.4	−3.643	166	0.000
4.0	31.4 ± 8.4	33.0 ± 7.0	1.6	−1.363	166	0.2
8.0	29.1 ± 6.7	31.0 ± 6.9	1.9	−1.747	166	0.08

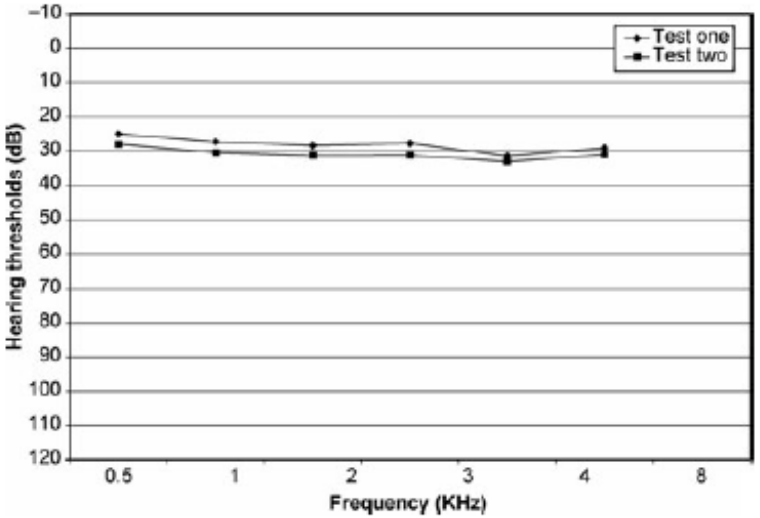
SD = standard deviation; DF = degrees of freedom

Figure 10: Average pure tone audiogram, right ear.



Ultimately, the overall burden of the hearing loss inducing employment may become greater than its benefits. The study demonstrates the practical importance of serial audiometry for noise-exposed workers as a means of monitoring hearing deterioration.

Figure 11: Average pure tone audiogram, left ear.



3. Trauma and Hearing Loss

Trauma to the ear could be simple blunt trauma to the pinna, laceration of the pinna, avulsion of part or the whole of the pinna, uncomplicated rupture of the tympanic membrane, dislocation of the ossicles, longitudinal fracture of the petrous temporal bone, transverse fracture of the petrous temporal bone with associated loss of inner ear and facial nerve function, including hearing loss. Ologe et al. studied the aetiology and course of traumatic perforation of the tympanic membrane.[20]Fifty-five percent of the cases were due to assault

(slap); 30% to foreign body in the ear; 7.5% to road traffic accidents and 7.5% to miscellaneous causes such as fall off a tree, bomb explosion and welding spark.[20] All the 70% who were successfully followed up for 3 months healed spontaneously.[20]Family violence (spouses and siblings) was responsible for about a quarter (23%) of the cases of assault. Thirty percent were due to foreign body in the ear. Cotton buds alone were responsible 20% of the cases of traumatic perforation of the tympanic membrane. Aside from the perforation of the tympanic membrane, there may be damage to the ossicular chain and on occasions the cochlea. Ologe et al. carried out two studies on foreign body in the ear, in Ilorin and Iddo Ekiti, which showed traumatic tympanic membrane perforation with accompanying hearing loss of 1.7% and 4.9% respectively.[21.22]

Some 7.5% of the cases of traumatic perforation of the tympanic membrane were due to head injury in road traffic accidents.[20]Bleeding from the ear or CSF otorrhoea easily gives clue to a possible rupture of the tympanic membrane. In our centre, Ologe et al found the incidence of CSF rhinorrhoea and/or otorrhoea following head injury as 4.9%.[23]

4. Chronic Suppurative Otitis Media and Hearing loss

Chronic suppurative otitis media (CSOM) is a recognized cause of mild to moderate hearing loss. In general, the hearing loss associated with CSOM is conductive and tends to increase with posterior location and increasing size of the tympanic membrane perforation. The level of hearing loss is within 0-45 dB if there is no associated ossicular destruction or sensorineural component. Complete destruction of the ossicular chain and tympanic membrane usually produces a hearing loss of *50-60* dB. Socio-economic factors such as poor

living condition, overcrowding, poor hygiene and nutrition have been suggested as basis for the widespread prevalence of CSOM in the third world. Chronic and recurrent infection of the nose and paranasal sinuses, nasal allergies, certain head and neck tumours such as nasopharyngeal cancer, poor patronage of health facilities, could further predispose to CSOM. Potential loss of hearing as a result of otitis media has important consequences on the development of speech and cognitive abilities, including academic performance of children. Thus, the gap between the fortunate and the less privileged is further widened by an innate difficulty in learning occasioned by CSOM. Ologe et al. carried out a community survey aimed at identifying risk factors and characteristics for chronic suppurative otitis media in a rural community in Nigeria.[24,25]Some 7.3% of our study population had chronic suppurative otitis media.[25] More than 75% of their parents had no formal education. About half of the children had six or more siblings. Only 12% of those with CSOM had reported to hospital for treatment. Some 87.4% were malnourished. The frequency of CSOM rose with increasing number of siblings and there was a statistically significantly association between CSOM and chronic and recurrent infection of the nose and paranasal sinuses.[24]Unilateral disease was most prevalent (79.5%).[25]The higher prevalence of unilateral disease is good as it limits the risk of disability from accompanying hearing loss than for bilateral disease.

Ologe et al. undertook to compare the prevalence of CSOM among two populations of school children: a poor rural school and an affluent urban school.[26] Six percent (6%) of the pupils in the rural schools had CSOM, and no case of CSOM was observed in the children in the urban school at the time of this study.[26] The difference in the prevalence of CSOM

between the two populations is statistically significant (P<0.00l). The difference in socio-economic status between the two populations is statistically significant. The two study populations are just 7km apart geographically but there is a world of difference in their socio-economic status, availability of social infrastructure and health facilities. In the developing countries, there is differential prevalence of CSOM among the different socio-economic strata of the community. Ologe et al. conducted a cross-sectional study to determine the prevalence of hearing loss among schoolchildren who had chronic suppurative otitis media (CSOM) and to ascertain the effect this hearing loss had on their academic performance.[27] The study population was drawn from three schools in different socio-economic tiers-low (n = 300), medium (n = 400), and high (n = 800). The difference in prevalence of CSOM among the three schools was statistically significant, confirming our earlier observation.[26] In all, 52 ears were affected by CSOM; of these, 18 (34.6%) had a pure-tone average (PTA) within normal limits, 20 (38.5%) had a mild conductive hearing loss, and 14 (26.9%) had a moderate loss.[27] All but 2 of 160 control ears (1.2%) had hearing thresholds within normal limits.[27]In assessing academic performance, cumulative average test scores were significantly lower in the CSOM patients than in the controls-chi(2) = 14.57; df = 3; p = 0.002.[27] We concluded that hearing loss was a significant sequelae of CSOM in our study population and that it had an adverse effect on their academic performance.[27] Children in the low socio-economic group appeared to be more vulnerable.

Having demonstrated the deleterious effect of CSOM in our environment, Ologe et al. sought to determine the type and pattern of antibiotic susceptibility of the pathogenic micro-organisms causing chronic suppurative otitis media (CSOM) in

order to ensure more effective treatment.[28]We observed that the commonest bacterial aetiologic agents were *Pseudomonas aeruginosa* (26.0%) and *Proteus spp* (21.8%).[28]While the organisms remain the same as in studies done two or three decades earlier, the antibiotic sensitivity of the organisms has changed remarkably. Long standing drugs like ampicillin, septrin, even ampiclox were almost useless as the organisms have developed resistant strains. Thus medical practitioners who are locked in the past, using medications that used to be effective against CSOM could realize that times have changed! The organisms are smarter so prescribers should be at least a step ahead of them if they are to win the war against the microbes. Ofloxacin produced 100% sensitivity in both gram positive and gram-negative organisms tested.[28]Ceftazidime and cefuroxime were highly active (80%) against the gram-negative bacteria while erythromycin and cloxacillin were very effective (80%) against the gram-positive isolates.[28]Where possible and available, susceptibility tests should guide the management of CSOM in this environment, otherwise, ofloxacin appeared a drug of choice from this study.[28]

Ten years down the line Ologe et al. sought tore-evaluate the pattern of bacterial isolates and their antibiotic sensitivity in patients with chronic suppurative otitis media (CSOM) in Ilorin, Nigeria.[29]Essentially the micro-organism and their antibiotic sensitivity patterns remain the same as the ones isolated in our earlier study.[29] Such periodic re-evaluation will be necessary to keep in step with effective prescription.

An important finding is a recent study by Ologe et al. that highlighted anaerobic bacteria isolates.[30]Anaerobes require special culture environment and they are generally more cumbersome and expensive. It is not usually done in our environment as a routine. Anaerobes constitute a smaller

fraction of causative agents for CSOM but when they are present they do not respond to treatment with conventional drugs used for aerobic organisms. So when we have CSOM unresponsive to treatment a wise step is to seek anaerobic culture of possible causative organisms.[30]

Ologe et al. also carried out studies on chronic sinusitis, including nasal allergies and head and neck cancers.[31-33]These are known to predispose to Eustachian tube dysfunction and sometimes frank CSOM. These studies centred on early diagnosis and effective treatment of these diseases to avoid deterioration and complications in adjacent structures such as the ear.

5. Other studies on Hearing Loss in Children

Potential development and verbal expression in childhood depend on hearing capability. Mild hearing loss, which in adults is socially adequate and may be ignored or even unnoticed, can have a severe social and educational impact on children who are in the process of learning to speak. Detection of hearing loss in children therefore should not be left to chance. Organised audiometry screening should be made available for every child so that appropriate interventions can be made early in life. Screening using Otoacoustic emission is standard practice in the developed world. This is available in few centres in Nigeria.

Ologe et al. undertook a study to identify the present causes of profound sensorineural hearing loss, which in our environment is almost synonymous to a life sentence of silence and isolation.[34]Inabout a third (34.8%) of patients, causes were unknown, probably congenital. The main acquired causes were febrile illness (18.3%), measles (13.9%), meningitis (8.7%), mumps (6.9%), or severe birth asphyxia (4.3%)[33].(Figure 12)

Compared to the findings of two decades earlier, we conclude that there is no significant shift yet in the aetiology of profound sensorineural hearing loss in our environment. It could mean that the long-term benefits of the global expanded programme on immunization are late in coming or may be they are not as effective as anticipated. We are aware that recent evaluation of the programme indicates success below expectation and a need to rejuvenate efforts in this regard.[35]Also, the maternal and child health indices do not appear to be significantly better.[36]

Since childhood hearing loss remains with us Ologe et al. carried out a study to screen for hearing loss among apparently normal hearing school children.[37]Over half (54%) failed the screening test done using a hand-held audiometer (SA 50, Entomed, Sweden). Pass was defined as responding correctly to stimuli at 30 dB HTL at frequencies 1 KHz, 2 KHz and 4 KHz, and at 50 dB HTL at 0.5 KHz in both ears.[37] There was a correlation between deafness identified in this way and poor school performance, and parents were often not aware that their children had difficulties with hearing.[37] This buttresses the fact that hearing loss could be a hidden handicap. The parental unawareness further strengthens the need for regular screening of hearing loss among school and pre-school children. Occlusion of the ear canal by wax was a significant cause of hearing loss. Thus, simple, regular cleaning of the ear canals by qualified health personnel could significantly improve hearing and school performance in these children.[37]

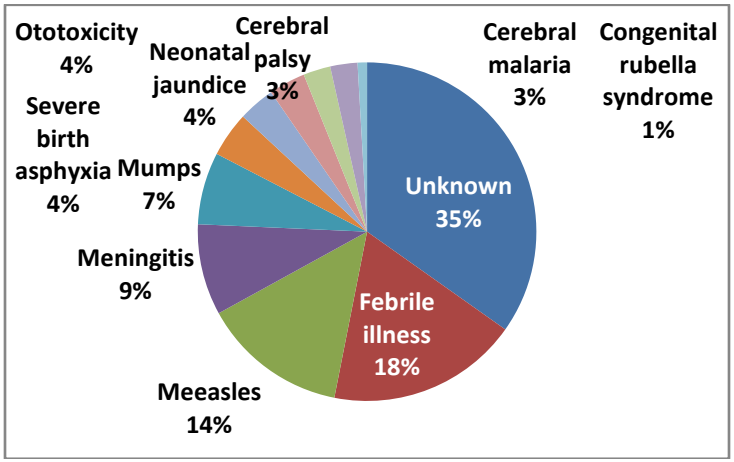


Figure12: aetiological factors of severe to profound sensorineural hearing loss among Nigerian children

As part of a wider study aimed at establishing baseline information (for planning purposes), Ologe et al. determined the pattern of disabilities in a Residential School for the handicapped.[38] Seventy-nine percent (65) were deaf, 13.6% (11) blind and 6.2% (5) had mental retardation. Our findings show that deafness was the commonest disability and strongly suggest that none of the disabilities observed had major impact on learning ability in this school system.[38]Unless there are other factors affecting mental development, they may do equally well at school as their peers, but they require special education, greater persistence and a greater desire to learn. What we cannot say for sure is the degree of benefit derived from the education. The age of primary school pupils in this study population compares with the age of secondary school pupils in a normal school. This delay in registration occur either because the handicap is not noticed early or based on the

idea that handicapped children are possessed of evil spirits, a spiritual solution is pursued.

6. Hearing Loss in the elderly

CURRENTLY 580 million people in the world are 60years or older, with 355 million in developing countries.[39]Also, in several developing countries, the population aged 60 years or over is increasing at a faster rate than is the population as a whole. Between 1980 and 2020 the population of the developing world is expected to increase by 95%, whereas the elderly population will probably rise by almost 240%.[40]

Ologe et al. studied the pattern of ear diseases among elderly Nigerians, so as to provide an objective basis for cost-effective health care planning for the emerging geriatric population.[41]Our data suggest that impacted cerumen (34.4%), hearing loss(27.5%), and infections (notably CSOM)(8.8%), are the common ear diseases among elderly Nigerians.[41](Table 5)Of the patients with hearing loss, 71.6% had sensorineural, 22.7% had presbyacusis, 1.1% had conductive, and 4.6% had mixed hearing loss.[41]Cerumen impaction and CSOM will significantly increase the proportion with conductive hearing loss. Removal of cerumen significantly improves hearing ability and prevents serious social withdrawal due to hearing loss. Cerumen removal must be carefully done by qualified personnel[42]. Hearing loss is a serious health problem among elderly people worldwide.[43,44] Social isolation, depression, acting out inappropriately, and paranoia have been related to impaired hearing,[43,44] and significantly reduce the quality of life of these individuals and their contribution to society.

7. Otomycosis and Hearing Loss

Otomycosis is fungal infection of the external ear canal. It may arisedenovo or secondary to bacteria infection. In Europe the incidence is about 6-9% of the cases of otitis externa.[45]In Gabon, Central Africa, the prevalence is 25% of infectious otitis externa.[46] In Nigeria, otomycosis constitutes 15.9% of otitis externa in Jos community; and 6.8% of chronic otitis externa in the South East.[47,48] Accumulation of fungal debri is a common cause of hearing loss. Ologe et al. studied the pathogenic fungi and treatment outcome of patients with clinical signs of otomycosis.[49,50] The isolates included: Aspergillus (63.2%), Candida (35.5%), and Mucor (0.7%). Further analysis showed that Candida species comprised C. Albicans (18.4%), C. tropicalis (10.5%), and C. Pseudotropicalis (6.6%), while A. fumigatus (39.5%), A. niger (23.7%), and Mucor (0.7%), were other significant pathogens. Ninety-six per cent were symptom free within 2 weeks of topical application of 1% cIotrimazole cream, after thorough cleaning of debri in the ear canal.[50]

Table 5: Pattern of ear diseases among elderly Nigerians

Disease	Type	No. of Patients	Percentage
Impacted cerumen		110	34.4
Hearing loss	Sensorineural	63	19.7
	Conductive	1	0.3
	Mixed	4	1.3
	Presbyacusis	20	6.3
Otitis externa/ media	Chronic suppurative otitis media	28	8.8
	Acute suppurative otitis media	11	3.4
	Acute otitis externa	11	3.4
	Otomycosis	8	2.5
	Chronic nonsuppurative otitis media	3	0.9
Miscellaneous	*Tinnitus	39	12.2
	Meniere's Disease	6	1.9
	*Vertigo	4	1.3
	Impacted foreign body	3	0.9
	Traumatic perforation of tympanic membrane	2	0.6
	Ear tumor	2	0.6
	Referred otalgia	2	0.6
	Ototoxicity	2	0.6
	Otosclerosis	1	0.3
Total		320	100

Note: *The etiology was undetermined.

8. Diabetes and Hearing Loss

Type 2 diabetes and deafness are major public health issues that affect the quality of life of many Nigerians. Several studies [51-53] investigating a possible link between diabetes and hearing loss have reported divergent findings. Most of these studies, however, involved mixed populations of Type 1 and Type 2 diabetes in Europeans and Americans with hardly any

information on hearing function in indigenous Africans with diabetes.

For these reasons, Ologe et al. investigated hearing thresholds in a group of Nigerians with Type 2 diabetes, as Type 1 disease is uncommon in black Africans.[54]The diabetic group consistently had significantly higher mean hearing threshold values.[54] (Table 6) There was no gender difference (P> 0.05). In contrast, analysis of covariance correcting for gender showed that age significantly affected hearing levels particular at 2000 Hz and above (P< 0.05).

Table 6: Comparison of hearing levels in diabetic population and controls

Frequency (Hz)	Hearing levels (dB)		P-values
	Diabetes	Controls	
L 125	27.7 ± 16.5	18.6 ± 9.7	0.001*
L 250	28.0 ± 18.3	17.0 ± 9.0	0.000*
L 500	28.3 ± 18.4	16.6 ± 11.6	0.000*
L 1000	28.5 ± 19.2	16.0 ± 12.5	0.000*
L 2000	31.3 ± 19.9	18.8 ± 13.1	0.000*
L 3000	34.1 ± 20.3	20.9 ± 14.2	0.000*
L 4000	37.8 ± 20.7	23.4 ± 16.4	0.000*
L 8000	47.4 ± 24.2	31.0 ± 19.6	0.000*
R 125	36.0 ± 13.4	22.1 ± 10.9	0.000*
R 250	36.0 ± 13.3	25.2 ± 11.4	0.000*
R 500	32.6 ± 16.5	21.4 ± 13.5	0.000*
R 1000	32.3 ± 17.1	23.7 ± 13.8	0.000*
R 2000	33.9 ± 17.9	23.3 ± 12.6	0.000*
R 3000	37.4 ± 17.5	24.3 ± 13.0	0.000*
R 4000	37.6 ± 20.0	23.7 ± 13.3	0.000*
R 8000	47.8 ± 21.6	32.8 ± 16.0	0.000*

Values indicated are mean and standard deviation. *Significant difference. L indicates left ear, R indicates right ear.

Likewise, age significantly correlated with hearing threshold particularly at higher frequencies (e.g.r= 0.4,P< 0.001 at 3000 Hz on the left ear), but no meaningful interaction (P> 0.05) was observed between disease duration or diabetic control (FBS) with hearing threshold. Six subjects (10.7%) with diabetes reported hearing loss by self-assessment.[54]This study indicates that middle-aged Nigerians with Type2 diabetes are more likely to have hearing loss than their non diabetic compatriots of a similar age.[54] This is consistent with observations [55,56] in elderly Americans, Europeans and Asians with Type 2 diabetes. The reasons remainun clear, from this study, but it is widely held[52] that angiopathy and/or neuropathy may underlie premature hearing loss in Type 2 diabetes. Nevertheless, our data supports the conclusion that neither disease duration nor degree of diabetic control influenced the extent of hearing loss[55,56]and raises the possibility that both hearing loss and Type 2 diabetes could be linked to a common genetic origin. There are a number of differences between our findings and previous data. First, hearing loss appears greater and occurred at a much younger age; by at least a decade earlier in our study population (both diabetic and control) compared with those reported in the Wisconsin study [55] and the majority of Australian sin the Blue Mountain study.[57] Strikingly, only 11% of the diabetic population reported any hearing difficulty. This is hardly surprising given the mild but progressive nature of diabetes-related deafness and the poor correspondence between audiometric measures and self-assessment of hearing handicap,[58] again, signifying that hearing loss is a hidden handicap.

Consequent on these observations[54]Ologe et al. investigated whether abnormality in auditory function can precede overt diabetes in individuals with a genetic

predisposition to type 2 diabetes.[59]Frequency specific pure tone audiograms and fasting blood glucose (FBG) and 2 h post prandial blood glucose (2hrPBG) levels were measured in Nigerian children aged 9—19 years with at least a biologic parent with type 2 diabetes and compared with controls (contemporaries with non-diabetic parents).Both groups were similar in gender mix, age, body sizes, FBS, 2PPhr BG, SBP. Similarly, pure-tone air-conduction audiograms were comparable ($p > 0.5$) in both groups. (Table 7)The data shows normal glucose metabolism in teenage offspring of type 2 diabetes and a pattern of audiogram not different from those observed in their counterparts without a genetic predisposition to type 2 diabetes.

Table 7: Comparison of selected variables among offspring of diabetics and controls

Variables	Mean ± S.D.		*p*-values
	Control	Offspring	
Age (years)	14.32 ± 2.29	14.77 ± 3.10	0.54
BMI (kg/m^2)	19.47 ± 1.82	18.66 ± 3.12	0.26
SBP (mmHg)	103.73 ± 9.62	100.07 ± 13.77	0.27
DBP (mmHg)	56.87 ± 8.64	53.48 ± 10.35	0.20
FBG (mmol)	4.26 ± 0.68	4.04 ± 0.61	0.20
2hrPPBG (mmol)	5.07 ± 0.95	5.16 ± 1.04	0.74

*$p < 0.05$ considered significant difference.

Specifically, the data shows normal glucose metabolism in offspring of type 2 diabetes and an audio graphic pattern (Tables 7 and 8) similar to those observed in their controls.[59] Therefore, within the context of this data, Ologe et al. found no evidence to suggest that abnormal audiogram could pre-exist in Nigerian children with a family history of type 2 diabetes in the absence of abnormal glucose metabolism.[59]

Table 8: Comparison of hearing levels in type 2 diabetes offspring and controls

Frequency (Hz)	Hearing levels (dB)		p-values
	Diabetic offspring	Controls	
R125	20.17 ± 6.76	19.20 ± 8.38	0.64
R250	20.67 ± 6.79	20.20 ± 8.60	0.82
R500	19.83 ± 7.13	18.60 ± 8.48	0.56
R1000	18.33 ± 5.92	16.40 ± 7.57	0.29
R2000	17.00 ± 7.72	16.20 ± 7.40	0.70
R3000	16.50 ± 7.56	15.60 ± 9.39	0.70
R4000	14.33 ± 7.96	14.80 ± 8.23	0.83
R8000	14.83 ± 9.42	14.60 ± 7.96	0.76
L125	14.67 ± 7.84	14.40 ± 7.68	0.90
L250	16.17 ± 7.84	14.80 ± 6.69	0.50
L500	15.00 ± 6.70	15.40 ± 7.63	0.84
L1000	13.33 ± 6.21	14.40 ± 6.18	0.53
L2000	12.67 ± 7.04	13.80 ± 6.66	0.55
L3000	12.50 ± 7.16	13.40 ± 6.73	0.64
L4000	12.00 ± 8.57	13.20 ± 6.60	0.57
L8000	10.83 ± 7.96	12.00 ± 6.92	0.82

Consequently, we were unable to reach the conclusion that abnormal audio graphic pattern could form the basis of an early warning sign for type 2 diabetes as previously suggested by others.[59]

9. Sickle cell anaemia and Hearing Loss

Sickle cell anaemia (SCA) patients are known to have worse morbidity and mortality compared to their age- and sex-matched controls in the general population. An exception is the increased resistance of patients with sickle cell trait against malaria. Also, SCA patients have been observed to have a lower arterial blood pressure than controls.[60] Previous reports have shown a much higher prevalence of sensorineural hearing loss in adult SCA patients in the malarial-endemic tropical regions[61,62] than the developed countries.[63] Reasons given for this are related to the severity of the course of the disease due to the specific haematological profile, certain geographical factors and the level of medical care available.[61,62]

Advances in medicine resulting in better understanding of sickle cell disease and general improvement of the well-being of the sufferers even in developing countries have positively affected the dreadful outlook of this disease with resultant increase in the population of sickle cell disease patients reaching adulthood, and less severe complications.[64,65] Ologe et al. therefore set out to evaluate the presence and severity of sensorineural hearing loss in sickle cell anemia (SCA) patients in the light of the overall improvement in the morbidity and mortality.[66]Of the SCA patients tested, 95.7% exhibited hearing thresholds within normal limits, and 4.3% had mild hearing loss.[66] The controls had thresholds within normal limits. The incidence of significant sensorineural hearing loss in SCA seems to have reduced in line with the general improvement and survival of SCA patients.

In the present study, the SCA patients had consistently worse hearing thresholds at all frequencies tested, although the audiometric patterns were similar to that of the control subjects (Table 9, Figure 13, and Figure 14). Also, the differences in their hearing thresholds were statistically significant at both high and low frequencies in the right ear and at lower frequencies in the left.[66]

This proportion is quite low compared to the 30-66% reported for adult SCA patients with similar age range in our environment.[61,62] Most of these studies are about a decade or two old.[61,62]Thus, our findings could be the herald of a heart warming development indicative of improved medical care for these patients over the years, resulting in less vaso-occlusive crisis, which is believed to precipitate sensorineural hearing loss and most of the other associated complications of SCA.[67,68]

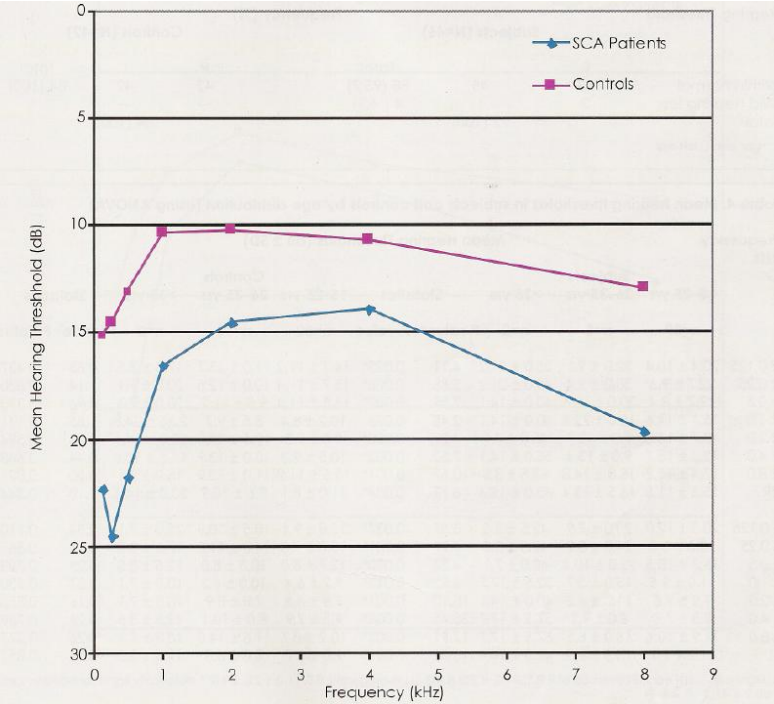
The present study has its limitations. The design cannot adequately answer the question of new trends in hearing threshold measurement relative to improved medical care of SCA patients in developing countries.

Table 9: Average hearing thresholds of subjects and controls (using t test)

Frequency kHz	Average Hearing Threshold (dB ± SD)		Statistics	
	Subjects (N=46)	Controls (N=42)	t Value‡	P Value
R 0.125	22.3 ± 11.4	15.1 ± 11.5	2.933	0.004*
R 0.25	24.5 ± 10.8	14.5 ± 11.6	4.172	0.0001*
R 0.5	21.7 ± 10.0	13.1 ± 11.2	3.832	0.0001*
R 1.0	16.5 ± 16.0	10.4 ± 9.7	2.165	0.03*
R 2.0	14.6 ± 16.5	10.2 ± 10.4	1.455	0.1
R 4.0	13.9 ± 17.5	10.7 ± 10.5	1.027	0.3
R 8.0	19.7 ± 17.9	13.0 ± 11.6	2.062	0.04*
RR	16.7 ± 13.0	11.1 ± 9.1	2.320	0.023*
L 0.125	21.2 ± 12.2	15.0 ± 9.8	2.614	0.01*
L 0.25	20.2 ± 9.9	14.9 ± 8.4	2.719	0.008*
L 0.5	19.7 ± 11.1	12.1 ± 7.7	3.652	0.0001*
L 1.0	12.2 ± 10.3	9.4 ± 6.3	1.511	0.1
L 2.0	9.0 ± 10.0	7.7 ± 7.0	0.690	0.5
L 4.0	10.4 ± 12.9	9.2 ± 8.2	0.546	0.6
L 8.0	14.4 ± 13.9	10.7 ± 9.9	1.398	0.2
LL	12.8 ± 9.4	9.6 ± 5.8	1.900	0.06

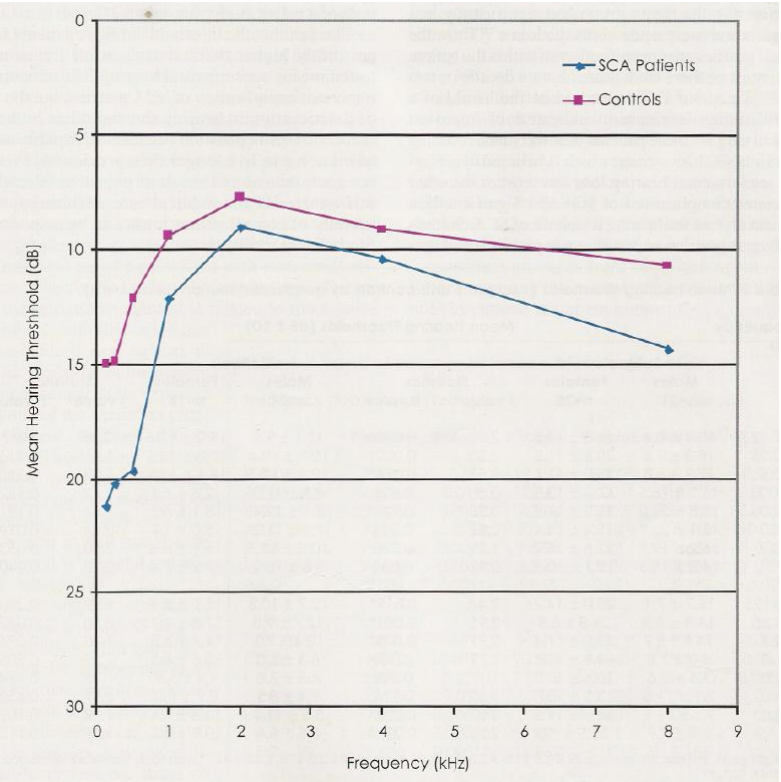
R: right ear; L: left ear; RR: average of R 0.5, R1.0, R 2.0, R 4.0; LL: average of L 0.5, L1.0, L 2.0, L 4.0; * statistically significant difference; ‡ df: 86

Figure 13: Mean hearing thresholds (right ear) in patients and controls



A comparison within SCA patients based upon l0-year age intervals would probably be more illustrative of this hypothesis, i.e., if the overall treatment of SCA patients is better, then one would expect to see fewer differences in hearing loss as an SCA patient moved from decade to decade. Even this proposition would have to bear in mind the confounding factor of the influence of age on hearing thresholds, particularly as this study shows that age has a greater impact on the hearing thresholds of SCA patients than on controls.

Figure 14:Mean hearing thresholds (left ear) in patients and controls



Challenges of combating hearing loss

- Genetic studies are not widespread. So what proportion of the hearing is genetic is not fully known. So genetic counselling is limited.
- Universal new born hearing screening is not popular yet. So early detection of hearing loss is not easy.

- The range of tests for hearing screening is inadequate. So correct and definitive diagnosis may not be possible. Only recently University of Ilorin Teaching Hospital acquired auditory brainstem response audiometer and Otoacoustic emission measuring equipment. The Centre for Supportive Services for the Deaf, University of Ilorin also has an auditory unit with some facilities.
- The management options currently available are far more advanced than what is available to us.
    - **Hearing aids**(Figure 15) are not freely available; and tend to be beyond the reach of average Nigerians.

Figure 15: Types of hearing aids (From www.floridamedicalhearing.com)

    - **Bone Anchored Hearing Aids (BAHA)** is not readily available to us.

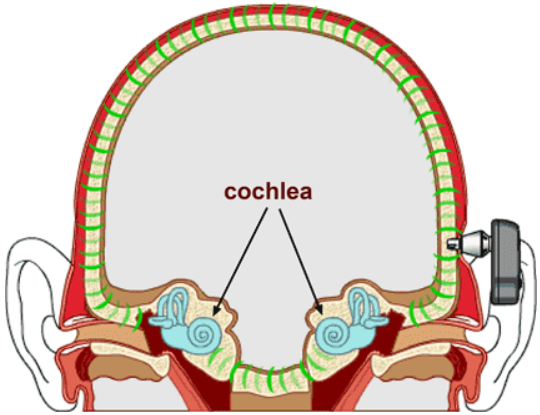


Figure 16: BAHA (From www.otosurgery.org)

- **Cochlear Implants**(Figure 17) which is almost routine in America, Europe and many parts of Asia is still largely outside our reach.

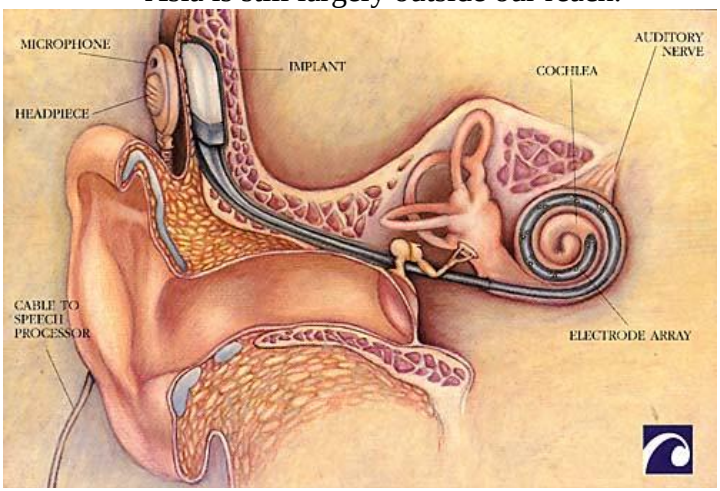


Figure 17: Cochlear Implant (From www.voltreport.com)

Conclusions

- Hearing loss is a significant handicap.
- The aetiological factors of hearing loss can be congenital or acquired. The acquired causes include birth asphyxia, hyperbilirubinaemia, childhood infections (measles, mumps, meningitis, cerebral malaria, etc), ear infections (bacteria or fungal), trauma, advancing age, noise exposure as well as systemic diseases like sickle cell anaemia and diabetes.
- Limited diagnostic facilities account for a large proportion of profound hearing loss being labelled as unknown aetiology. The correct label may be undetermined aetiology.
- Hearing loss can adversely affect the cognitive, verbal, social, academic and occupational development of individuals.
- Awareness of the prevalence, causes, effects, prevention and management of hearing loss is poor.
- Hearing loss can be prevented; and where it exists, hearing loss can be managed.
- I hope you will agree with me that although hearing loss is largely a hidden handicap; its manifestations and consequences are open, particularly to those with a high index of suspicion.

Recommendations

Hearing loss, being a hidden handicap, needs to be deliberately screened for so that it can be identified early, and appropriate remedy prescribed. Every opportunity of meeting patients in the hospital can be utilized to screen for hearing capabilities. There is a need to go outside the ear, nose and throat diseases clinic in surveillance for hearing loss in patients

attending other clinics of the hospital. There is also a need to develop a robust community ear, nose, and throat diseases programme: go into the schools, work places, relaxation centres, road sides and every other place man is found to screen for hearing loss and its possible aetiologies. And there is the need to return to the laboratories and operating theatres: laboratories to search deeper for causes, cures and rehabilitation modalities; and operating theatres to execute remedies. The following specific recommendations may be useful.

- Parents: should be vigilant at observing their children and report concerns about hearing acuity to the Physician without delay.
- Individuals: should report promptly any potential threat to their hearing. Routine yearly ear check up is strongly advised.
- Teachers: should take the pain to investigate poorly performing students. They could become key to detecting early hearing loss
- Primary care Physicians: should ensure a high index of suspicion for hearing loss.
- Obstetricians: Help improve Obstetric care which will reduceperi-natal causes of hearing loss
- Paediatricians: assist with neonatal hearing screening and at every subsequent visit. Screening at birth with Otoacoustic emission should be standard practice.
- Otolaryngologists: continue to conduct hearing loss research, clinical duties, and advocacy to help reduce the burden of hearing loss.
- Non-Governmental Organizations: advocacy and funding of hearing promotion activities.
- Government:

- Strengthen immunisation scheme to help reduce acquired causes of hearing loss.
- Enforce legislation regarding noise control. The Federal Government of Nigeria in 1988 established the Federal Environmental Protection Agency (FEPA). Federal EnvironmentalProtection Agency (Amendment) Decree No 59 of 1992 requires FEPA to establish environmental guidelines and standards for the abatement and control of all forms of pollution, including noise.[69] In addition, FEPA has been given some enforcement powers, including the right to inspect facilities and premises, search locations, seize items, and the right to arrest and to prosecute people contravening any laws on environmentalstandards.[69]
- Make guidelines to ensure hearing loss screening is incorporated into all forms of routine medical tests.
- Enforce adequate compensation of those affected by occupational hearing loss
- Make hearing aids available free of charge or at reasonable costs

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