# AFRICAN JOURNAL OF MEDICINE and medical sciences

Volume 32, No 3 September 2003

EDITOR
B. O. OSOTIMEHIN

ASSISTANT EDITOR
A. O. UWAIFO

ISSN 1116—4077

# Perceived susceptibility to noise induced hearing loss and attitude towards preventive care among metal workers at Gate, Ibadan: a pilot study

**OS Osowole,[1] OGB Nwaorgu[2] and PA Osisanya[2]**
*[1]Department of Health Promotion and Education, College of Medicine, University of Ibadan and*
*[2]Department of Otorhinolaryngology, University College Hospital,Ibadan, Nigeria.*

**Summary**
Audiometric assessment was carried out on 26 metal workers at the spare parts market, Gate Ibadan to corroborate their perceived susceptibility to noise induced hearing loss. Of the 26 studied, 13 (50.0%) indicated non-susceptibility, 11 (42.3%) indicated susceptibility while 2 (7.7%) did not know. Otology symptoms mentioned by those who indicate susceptibility were tinnitus (63.6%), hearing loss (36.4%), otalgia (18.2%), headache (9.1%), and post-aural pain (9.1%). Audiometric results showed 10 (76.9%) of non-susceptible subjects, 5 (45.5%) of susceptible subjects and 1 (50.0%) of undecided group had normal hearing bilaterally. Unilateral high frequency hearing loss was observed in 4 (36.4%) of the susceptible subjects. Implications of the findings for taking preventive action are discussed.

**Keywords**: *Perceived susceptibility, noise induced hearing loss, attitude, metal workers*

**Résumé**
Une évaluation audiométrique a été faite sur 26 ferrailleurs dans un marche de vente des piéces detachées dans un coin de la ville Ibadan (Gate). Cette étude avait pour but de corroborer leur susceptibilité de percevoir les bruifs induits par la perte de perception (sourdité) dû aux bruifs. Sur les 26 cas étudiés, 13(50,0%) n'etaient pas susceptible, 11 (42.3%) étaient suceptible et 2 ( 7.7%) était sourd. Les symptomes otologiques mentionés par ces cas susceptible étaient la tinnité ( 63.6%) sourd ( 36.4%), otologie (18.2%) maux de tete ( 9.1%) et les douleurs posturales(9.1%). Les résultats audiométriques montraient que 10 ( 76.9%) des patients non suceptible aux bruits et 5 ( 45.5%) des sujects susceptible et 1 ( 5%) de cas indécis avaient une perception bilatérale normale. L'elévation de la frequence de sourdité unilaterale était observé chez 4 (45.5%) des sujects susceptible. Les implications de ces resultats en vue d'une action preventive ont été discuté.

## Introduction

Noise has been described as sound without agreeable musical quality or an unwanted or undesired sound that is loud and disturbing or an erratic intermittent or statistically random vibration [1,2]. In practice, noise seldom comprises a single frequency. It is usually the combination of a number of frequencies [2,3]. Although it appears that the sources of noise are diverse, the basic cause can be traced in nearly every case to one of the five methods of generating fluctuating forces. These are aerodynamic (jets), impact forces (hammering), frictional forces (unoiled door hinges or fingernails scratched over blackboards), unbalanced forces (machines), magnetic forces and in recent times blaring disco, 'juju', 'fuji' [4], those from religious houses and bomb blasts. Sounds that are sufficiently loud to damage sensitive inner ear structures can produce hearing loss that is irreversible by any presently available medical or surgical treatment. Hearing impairment associated with noise exposure can occur at any age, including early infancy [5] and is often characterized by difficulty in understanding speech and the potentially troublesome symptom, tinnitus [6]. Very loud sounds of short duration such as an explosion or gunfire can produce immediate, severe and permanent loss of hearing called acute sonorous trauma [7]. Longer exposure to less intense but still hazardous sounds, commonly encountered in the workplace or in certain leisure-time activities exacts a gradual toll on hearing sensitivity, initially, without the victim's awareness. Occupational noise exposure, the most common cause of noise induced hearing loss (NIHL) [5] threatens the hearing of metal workers, truck drivers, construction and factory workers to mention a few.

Noise induced hearing loss (NIHL) is the most common form of occupational hearing loss. From the pathological point of view, the main lesions are to be observed in the ciliated cells of the organ of Corti where there is fragmentation and loss of hairs, breakage of cellular membrane, leakage of the nucleus and proliferation of the cells of Deuters. Furthermore, NIHL is a well know epidemiological problem and those affected show alteration of hearing thresholds as well as worsening of the cochlea analysis and usually, an impaired speech discrimination in the presence of background noise [1]. To define what sounds can damage hearing, the duration of exposure (typical daily exposure and accumulated exposure over many years) is critical in addition to sound level. Although sound exposures that are potentially hazardous to hearing are usually defined in terms of sound level, frequency and duration, there are several simple approximations that indicate that a sound exposure may be suspected as hazardous. These include the following:

1. If the sound is appreciably louder than conversational level,
2. If listener experiences difficulty in communication while in the sound,
3. Ringing in the ear after exposure to the sound and /or
4. Muffled sounds after leaving the sound exposure area [8].

In the consideration of sounds that can damage hearing, one point is clear: it is the acoustic energy of the sound reaching the ear, not its source that is important.

Despite the important feature of NIHL being preventable, too many individuals still unnecessarily develop it [9]. A specific set of beliefs described in the Health Belief Model [10] has been found to predict behaviours to avoid health risks. This model assumes that the perception and knowledge of people about a particular subject such as NIHL are critical determinants of their health related behaviour. Persons who believe they are personally susceptible to NIHL through long exposure to hazardous sound, that the consequences of exposure (tinni

Correspondence: Dr. O.S. Osowole, Department of Health Promotion and Education, College of Medicine, University of Ibadan, Ibadan, Nigeria.E-mail: omoyisola2002@yahoo.com; oyedunni@hotmail.com.

*Presented at the 10th Annual Scientific Conference of Ortohinolaryngological Society of Nigeria, Owerri, November 9-11, 2000.

tus, hearing loss, communication difficulties) are severe, that protective measures such as use of ear plugs are effective and perceive few barriers to the use of such protective devices may be more likely to adopt such behaviour. According to this model, people make rational cost – benefit analysis when trying to decide whether to adopt preventive behaviour. Actual changes in behaviour may then be stimulated by cues to action such as awareness and preventive educational messages as well as availability and affordability of protective gadgets.

This pilot study identified the level of perceived susceptibility to NIHL; factors that predispose metal workers to NIHL and their attitude towards seeking preventive care.

**Methodology**

Advocacy visits were made by the researchers to the Executive members of the Metal Workers Association in order to seek permission for the study. After obtaining permission, the researchers also met with members of the Association during one of their meetings to explain the purpose of the study. At this meeting a day of the week was agreed on by the subjects as the day to visit the Ear, Nose and Throat clinic of the University College Hospital, Ibadan for assessment. The subjects were not coerced into taking part in the study. Only those who were willing to participate attended the Ear, Nose and Throat clinic. During these visits, otoscopy was done first and if there is no active suppurative otitis media (the exclusion criterion set) that subject is enrolled into the study. After enrolment, questionnaires on subjects' socio-demographic characteristics consisting of their age, gender, marital status, number of years they had worked at the metal market, number of hours per day, number of days per week, their perceived susceptibility to NIHL, presence of any otology symptoms and hearing acuity were administered. A total of 26 subjects took part in the study.

The noise level at the market was measured using the following parameters:

1. sound level higher than conversational level.
2. difficulty in communication while in the noise.
3. the use of sound level meter.

Amplivox 2150 portable audiometer was used for the audiometry in an acoustically treated room.

**Results**

*Noise level*

The noise level at the market using the sound level meter was 100dB. This noise level was measured in the open as the metal workers practice their profession outside in the open air. There were no organised enclosed work sheds at the metal market surveyed. This was coupled with communication difficulty while in the market. The noise generated at the metal market is that produced by impact forces (hammering).

*Demographic characteristics*

The subjects comprised 24 (92.3%) males and 2 (7.7%) females. Their ages ranged from 22 years to 62 years with a mean age of 42.5 years. More than a third (38.5%) were in the fourth decade of life while 23 (88.5%) were married (Table 1).

*Occupational findings*

The subjects have spent varied number of years in their chosen career. Twelve (46.2%) had spent between 11 to 20 years, 5 (19.2%) each had spent between 1 to 10 years and 21 to 30 years. On number of hours spent at the market in a day, 14 (53.8%) spend 12 hours a day, 5 (19.2%) spend 11 hours a day, 2 (7.7%) spend 10 hours a day, 3 (11.5%) spend 9 hours a day, 1 (3.8%) each spend 8 hours and 6 hours respectively. Only 2 (7.7%) had other occupations apart from the metal work and these are minister of the Gospel and tailoring (Table 2). All of the 26 subjects spend six days in the week at the metal market.

**Table 1:** Demographic characterisitics of 26 metal workers studied

| Demographic characterisitic | No | % |
|---|---|---|
| *Gender* | | |
| Male | 24 | 92.3 |
| Female | 2 | 7.7 |
| *Age (years)* | | |
| 21-30 | 6 | 23.1 |
| 31-40 | 6 | 23.1 |
| 41-50 | 10 | 38.5 |
| 51-60 | 3 | 11.5 |
| 61-70 | 1 | 3.8 |
| *Marital status* | | |
| Married | 23 | 88.5 |
| Single | 3 | 11.5 |

**Table 2:** Occupational characterisitics of 26 metal workers studied

| Occupational characterisitics | No. | % |
|---|---|---|
| *No. of years spent* | | |
| 1-10 | 5 | 19.2 |
| 11-20 | 12 | 46.,2 |
| 21-30 | 5 | 19.2 |
| 31-40 | 4 | 15.4 |
| *No. of hrs. spent per day* | | |
| 12 hours | 14 | 53.8 |
| 11 hours | 5 | 19.2 |
| 10 hours | 2 | 7.7 |
| 9 hours | 3 | 11.5 |
| 8 hours | 1 | 3.9 |
| 6 hours | 1 | 3.9 |

*Otology/Audiometric and perceived susceptibility findings*

Subjects were asked if they perceived themselves as being susceptible to NIHL. Of the 26, 13 (50.0%) said they were not, 11 (42.3%) said they were while 2 (7.7%) were not sure. When asked if they had any otology symptoms, all the 11 who perceived themselves as being susceptible had. The symptoms mentioned were tinnitus (63.6%), hearing loss (36.4%), otalgia (18.2%), headache (9.1%), and post-aural pain (9.1%) (Table 3).

The degree of hearing loss arising from the audiometric assessment was assessed using the National Acoustic Laboratories four frequency averaging formula

Average hearing loss = $^1/_6$ x [HL 500Hz + (2 x HL 1000Hz) + (2 x HL2000Hz) + HL 4000Hz]

On this scale hearing loss is graded into

- Category 1 – Normal i.e. loss not exceeding 25dB
- Category 2 – Mild i.e. loss between 26 and 40dB.
- Category 3 – Moderate/Severe i.e. loss more than 41dB.

**Table 3:** Perceived susceptibility and otologic symptoms presented by the 26 metal workers studied

| Perceived susceptibility and otologic symptoms characterisitics | No | % |
|---|---|---|
| *Perceived susceptibility* | N = 26 | |
| Yes | 11 | 42.3 |
| No | 13 | 50.0 |
| Not sure | 2 | 7.7 |
| **Otologic symptoms* | N = 11 | |
| Tinnitus | 7 | 63.6 |
| Hearing loss | 4 | 36.4 |
| Otalgia | 2 | 18.2 |
| Headache | 1 | 9.1 |
| Post aural pain | 1 | 9.1 |

**Multiple response*

Ten (76.9%) of the 13 who did not perceive themselves as being susceptible to NIHL, 5(45.5%) of the 11 who perceive themselves as susceptible and 1(50.0%) of the 2 who were not sure had normal hearing bilaterally. Hearing losses identified are shown in Table 4.

**Table 4:** Audiometric characterisitics of 26 metal workers studied.

| Level of susceptibility | Degree of deafness: Normal Both Ear | Normal R Ear | Normal L Ear | Mild Both Ear | Mild R Ear | Mild L Ear | Moderate/severe Both Ear | Moderate/severe R Ear | Moderate/severe L Ear |
|---|---|---|---|---|---|---|---|---|---|
| Susceptible N = 11 | 5 (45.5) | 2 (18.2) | 3 (27.3) | - | 3 (27.3) | 1 (9.1) | - | 1 (9.1) | 2 (189.2) |
| Not Susceptibe N = 13 | 10 (76.9) | - . | 1 (7.7) | 2 (15.4) | 1 (7.7) | - | - | - | - |
| Not sure N = 2 | 1 (50.0) | - | - | 1 (50.0) | - | - | - | - | - |

## Discussion

Data presented in this paper are believed to be a pointer to what to expect on a larger scale study. The study revealed a correlation between those who perceived themselves as being susceptible and their audiometric findings as mild and moderate/severe hearing losses are higher among this group (Table 4). The otology symptoms mentioned especially tinnitus was in line with Noise and Hearing loss Consensus Conference [8] submission that this could be a pointer to hazardous noise so also are the findings of Tearle[1]. Also, the fact that half of the group did not perceive themselves as susceptible could be due to the fact that they are yet not aware of the gradual toll of this noise on their hearing sensitivity. This is a cause for concern. Furthermore, the level of normal hearing exhibited by the group when pooled together is a point that needs to be researched into. Could this be that the acoustic energy reaching their ears despite its source and apparent nuisance is not hazardous enough to damage hearing as would be found in their Caucasian counterparts who practise in a closed environment or is there any form of protective device the metal workers are using which was not disclosed to the team or is it anything in their genetic make up and could this be the reason for low turn out? These questions need answering.

The finding that none of the subjects knew of effective way of protecting their ears from NIHL is another source of concern. This calls for the development and implementation of a hearing conservation programme targeting the specific needs of this group. This should involve the metal workers at the planning stage as far as the messages are concerned and at the implementation stage if it is to be meaningful, effective and sustainable.

## Conclusion

Noise induced hearing loss occurs everyday and it can be corrected only to a small degree by hearing aids. Consequently, prevention is of primary importance. The most effective hearing protection devices are those, with which the worker is most comfortable, will use 100% of the time, can afford and is available. The occupational health team has a major role to play in promoting increased use of hearing protection devices through continued contact with workers, administrators and safety personnel. Furthermore there is need to conduct a formative research using qualitative methods in answering the questions that have been raised by this pilot study.

## References


1. Sallustio V. Portalani P., Soleo L., Cassano F., Pesola G, Lasorsa G, *et al.* Auditory dysfunction in occupational noise exposed workers. Scandinavian, Audiology. Supplementum 1998; 48: 95 – 110.
2. Zemlin, W.R. Speech and Hearing Science Anatomy and Physiology. Hall Inc. Englewood Cliffs 1968.
3. Bakare, C.A. Clinical Audiology. Ibadan University Press 1991.
4. Bakare, C.A. Loud Music as Causes of Sensorineural Hearing Disorder. Journal of Special Education1989; 5: 111-115.
5. Brookhouser, P.E, Worthington, D.W. and Kelly, W.J. Noise-induced hearing loss in children. Laryngoscope 1992; 102 (6): 645-55.
6. Jokitulpponi, J.S., Bjork, E. A. and Akaan-penttpla, E. Estimated leisure noise exposure and hearing symptoms in Finnish teenagers. Scandinavian Audiology 1997; 26 (4): 251- 262.
7. Buffe, P. [Noise and hearing]. [French] Bulletin de l Academie Nationale de Medecine. 1997; 176 (3): 363-70; discussion 370-1.
8. Consensus Conference Noise and Hearing Loss Journal American Medical Association 1990; 263, 23, June p 3185 – 3190.
9. Hallberg, L.R. Occupational hearing loss: Coping and family life. Scandinavian Audiology. Supplementation 1996; 43: 25 – 33.
10. Rosentock, I.M. The Health Belief Model and Preventive health behaviour. Health Education Monograph 1974; 2: 354 – 386.