www.abiosci.com

RESEARCH ARTICLE

Annals of Biological Sciences
2013, 1 (1):1-4

ISSN: 2348-1927

The Effects of Occupational Noise on Sound Perception of Engine Grinders and Airport Staff in Northern Nigeria

J.A. Tende[1*], A. Mohammed[1], E.D. Eze[2], O.A. Daikwo[1], O. Onaadepo[3] and A. Shaibu[1]

[1]Department of Human Physiology, Faculty of Medicine, Ahmadu Bello University, Zaria, Nigeria.
[2]Department of Physiology, Faculty of Basic Medical Sciences, College of Health Sciences, Bingham University, Karu, Nasarawa State, Nigeria.
[3]Department of Physiology, Faculty of Basic Medical Sciences, College of Health Sciences, University of Abuja, Abuja, Nigeria.

ABSTRACT

Hearing or audition is the ability to perceive sound by detecting vibrations through the ear. Noise is perhaps, the most common occupational and environmental hazard. Grinding machines and airplanes can generate considerable noise (above 85dB) and thus, may cause hearing loss. This research was conducted using an instrument known as an audiometer to investigate the effect of noise generated from these sources on individuals that are exposed to it for a long duration. One hundred and fifty (150) subjects divided into three groups of A, B and C, were used for this study, each group comprising of 50 subjects. Group A (control group), comprised of secondary school staff, while local engine grinders and staff of Airport Operations Department made up groups B and C (study groups), respectively. Results obtained from the study showed that individuals in the study groups had a significantly increased hearing threshold from 28.22±1.26 and 28.80±1.29 to 50.08± 1.14 and 50.56±1.21 for the engin e grinders, 44.92±1.31 and 44.59±1.38 above the norma l (0-25dB) in both ears when compared to the control group. This revealed that the study groups had a poor hearing perception as well as a greater hearing loss than the control group. In conclusion, since engine grinders and staff of airport operation department are susceptible to this adverse effect due to their daily exposure to excessive sound (noise), it is advisable that they always work with ear protective devices.

Key words: Noise, audiometric test, airport staff, engine grinders, hearing threshold

---

INTRODUCTION

Hearing depends on a series of events that change sound waves in the air into electrical signals. Vibration of sounds are detected by the ear and transduced into nerve impulses that are perceived by the brain, especially in the temporal lobe [1]. When sound enters the outer ear, it vibrates the eardrum. These vibrations pass into the inner ear via tiny bones where eventually delicate nerve cells like blades of grass convert the vibrations into messages which are sent to the brain [2]. When we are exposed to harmful noise-sounds that are too loud or loud sounds that last a long time can cause sensitive structures in our inner ear (called hair cells) to be damaged, causing noise-induced hearing loss (NIHL), which is the second most common cause of sensory-neural hearing loss after age-related hearing loss (presbycusis). Hence, noise is perhaps, the most common occupational and environmental hazard [3]. Factors affecting occupational hearing loss include; overall intensity of noise, duration of exposure, susceptibility and frequency characteristics of noise [4]. Most temporary hearing loss recovers within 24 hours under quiet conditions

and may be accompanied by a ringing in the ear, called tinnitus. Estimates of the number of people affected worldwide by hearing loss increased from 120 million in 1995 [5]-[6] to 250 million worldwide in 2004 [7]. With this yearly increase in the number of victims, there is need to evaluate the adverse effect of noise on people exposed to loud sounds and enlighten them about precautionary measures. The aim of this study was to evaluate the effect of noise on engine grinders and airport staff so as to determine the hearing perception and hearing loss levels in these groups of people exposed to occupational noise.

MATERIALS AND METHODS

Materials

Field portable audiometer (Model name: Peters; Serial number: 279062-67), tuning fork, digital weighing scale (Model name; Beurer GmbH; Serial number: 654.02) and a tape.

Study location and population

A total of one hundred and fifty (150) subjects were employed for the study. The study was carried out in three different locations within North-Eastern part of Nigeria: Zaria-Kaduna, where the staff of Demonstration Secondary School, Ahmadu Bello University, Zaria were recruited for the study and served as the control subjects; Katsina State, where the test or study subjects which comprise of fifty (50) engine grinders were recruited and Kano State where fifty (50) staff of Airport Operations Department of Aminu Kano International Airport, Kano were also recruited as the study subjects.

Data collection technique

A total of 150 subjects of both sex, within the age range of 18-55 years, were used for this research study which was conducted in Northern Nigeria comprising of Zaria-Kaduna state, Katsina and Kano States. A random sampling technique was employed in selecting the subjects to undergo the audiometric assessment and was facilitated by the use of questionnaires to ascertain the suitability of the volunteers for the research study. The subjects were assigned into three groups as follows: Group A- Comprise of fifty (50) people which were staff of Demonstration Secondary School, Ahmadu Bello University, Zaria that were exposed to low noise levels. They served as the control; Group B- Consist of fifty (50) subjects which comprised of the test or study subjects that were engine grinders from Katsina State and Group C (another study group) included fifty (50) staff of Airport Operations Department of Aminu Kano International Airport, Kano. The study was carried out according to the specification of the Ahmadu Bello University Ethical Research Committee.

Methods

Audiometric assessment

Before the audiometric assessment, a questionnaire containing information on personal data (age, sex, weight, height), medical history (related to hearing problems) and occupational history (duration of career, period of daily exposure), medication history and use of hearing protective devices was administered on the studied subjects. Those with any incidence or past history of ear disease before their present occupation were exempted from the study. To reduce effect of temporary threshold shift to its barest minimum, the test was conducted at least one hour after the subjects left the noisy environment. An audiometer was used to test for right and left ears hearing perception and loss in each individual in a relatively quiet place. This evaluates the sensitivity of the sense of hearing at different frequencies. A headphone was placed over each ear as the subject sat in a less noise room. The headphones were connected to the audiometer which produced pure tones at specific frequencies (250 Hz to 4000Hz) as a calibrated knob is tuned. The knob is calibrated in Decibels (dB) ranging from -10 to 110dB. The subjects made signs if they have heard the tone by either raising their hands or nodding their head. As the test progressed, the hearing loss level was being recorded on an audiogram.

Statistical analysis

The data obtained from this study were expressed as mean ± SEM and analyzed using one way analysis of Variance (ANOVA) with Tukey's Post hoc test and Pearson's correlation coefficient (r) was used to determine the correlation between parameters. All statistical analysis was evaluated using SPSS version 17.0 soft ware and Microsoft Excel (2007). Differences between the mean± SEM of study and control groups were considered significant at $p<0.05$.

Table 1: Effect of Occupational Noise on sound perception of engine grinders and airport staff in relation to their duration of occupation and length of exposure per daily

GROUPS (n=150)	Duration of occupation (Years)	Daily exposure (Hours)	Hearing thresholds (dB)	
			Left ear	Right ear
Control (GROUP A)	-	-	28.22±1.26	28.80±1.29
Engine grinders (GROUP B)	13.70±1.09	5.52±0.14	50.08±1.14*	50.56±1.21*
Airport staff (GROUP C)	10.16±1.01	5.49±0.24	44.92±1.31*	44.59±1.38*

*Values are considered significant at *p <0.05 when compared to control group*

RESULTS AND DISCUSSION

In this research, we studied the effect of long-term exposure of individuals to occupational noise amongst engine grinders and airport operation department staff. The results obtained from this study showed a significantly ($p< 0.05$) decreased hearing perception of the study groups (engine grinders and airport staff) when compared with the control group. The hearing threshold of grinders was found to be 50.08±1.14 for left ear and 50.3±1.22 for right ear; while, for the airport staff, the threshold was found to be 44.9±1.29 for left ear and 44.16±1.38 for the right ear. The difference, however, could be attributed to the long duration of occupation. This is so because; in this part of the world there is negligence or minimal control to the adverse effect of noise, which occurs with time. These values are far beyond the range of normal hearing sensitivity of the human ear which is between -10 to +25 dB. Sounds below -10dB are generally imperceptible. Anyone who cannot hear a sound unless its intensity is higher than 25 dB (at any frequency) is already experiencing hearing loss. The result however is not far from what was obtainable with previous findings as regards the effect of noise on hearing perception. Bisong *et al.* [8] reported that the noise level at grinding sites in Calabar markets in Nigeria was found to be about 105 dB. In addition, Abdel-Aziz *et al.* [9] reported that chronic exposure to sound of air plane engine which is about 150 dB impacts adversely on hearing and is a risk factor in airport workers. These values are far in excess of the National Institute for Occupational Safety and Health (NIOSH) Cincinnati, Ohio USA, recommended exposure limit (REL) of 85dB, and it is advised that if the ambient noise level reaches 90dB, one must use hearing protection equipment to prevent hearing impairment, [10]. The reason for the above findings in Nigeria is not far-fetched as there are few or poorly enforced noise-pollution control laws in many parts of the country [11]. Noise impacts negatively on the auditory sensitivity, especially when one is exposed to excessively loud sound for a long time with minimal or no conservation programme [12]. The degree of noise induced hearing loss that occurs is dependent on the level of noise, how long someone is exposed to it, and to some extent on individual susceptibility. Once damage to hearing occurs, it cannot be repaired – only further damage can be prevented [13]. The present study supports the previous findings that grinding machines and airplane can generate considerable noise and thus cause hearing loss. The dearth of regulatory measures against emission of loud noise and lack of protective gears by the workers increase the health risk posed by loud noise on them [11].

CONCLUSION

In conclusion, the present study have showed that daily exposure to occupation noise caused a decreased hearing perception as revealed by increased hearing threshold of the study groups (engine grinders and airport staff) respectively. Therefore, there is the need for both the individuals and government to device a means of reducing these risks associated with exposure to noise, especially at workplaces. Individuals should either reduce their daily exposure to excessive sound or wear protective devices while the government can help by enforcing the laws to regulate the environmental noise pollution.

REFERENCES

[1] AL Enrique, RP Alan, M Ray, NewYork Springer, **2010,** 99-110.
[2] S Jan, N Israel, K Andrew, The MIT Press, Cambridge, Massachusetts London, England, 2011.
[3] MR Peter, *American Family Physician*, **2000,** 61, 2749-2756.
[4] BFAbdel-Aziz, T A Mansour, F A Marakby, *Bulletin Alexandria Fac. Med.***,2007,** 43, 2, 372-374.
[5] World Health Organization, "Guidelines for community noise," Edited by Berglund, B., Lindvall, T, and Schwela D. H., Available at http://www.who.int/docstore/peh/noise/guidelines2.html, **1999.**
[6] World Health Organization. Occupational and community noise, Fact sheet Number 258. Revised February, **2001.**Geneva.

[7] A Smith, The fifteenth most serious health problem in the WHO perspective, Presentation to IFHOH World Congress, Helsinki, July **2004.**
Available at http://www.kuulonhuoltoliitto.fi/tiedoston_katsominen.php?dok_id=150, 2004.
[8] SA Bisong, A N Umana, V Onoyom-ita, EE Osim, *Nigerian Journal of Physiological Sciences*, **2004,** 19,1-2, 20-27.
[9] MM Abdel-Aziz, RA Magaji, IA Salisu. *Nigerian Journal of Neurosciences*, **2006,** 6, 1,1-2.
[10] National Institute for Occupational Safety and Health. Criteria for A Recommended Standard: Occupational Noise Exposure," Revised criteria 1998. U.S. Dept. of Health and Human Services Public Health Services. Center for Disease Control and Prevention. National Institute for Occupational Safety and Health. Cincinnati, Ohio,**1998.**
[11] ADA Ighoroje, C Marchie, ED Nwobodo, *Nigerian Journal of Physiological Sciences*, **2004,** 19, 1-2, 14-19.
[12] O Ekekwe, O W Owolawi, *Online Journal of Medicine and Medical Science Research*, **2012,** 1, 2, 32-36.
[13] Work Safe Victoria. Guide For Assessing and Fixing Noise Problems At Work,"
Available at: www.worksafe.vic.gov.au.retrieved on 12/5/2013, 2005