

Subjective tinnitus and its association with use of ear phones among students of the College of Medicine, University of Lagos, Nigeria

OGHU Dibaal Sunny¹
ASOEGWU, Chinyere Nkiruka¹
SOMEFUN Oladapo Abayomi²

Abstract

Introduction: The ear can be damaged by excessive noise levels. Noise can arise from variety of occupational/recreational sources causing tinnitus, hearing loss and hyperacusis. The use of different types of ear phones for entertainment has become very common/fashionable among our youths. **Objectives:** This research aims to determine the prevalence of use of ear phones for entertainment and the prevalence of subjective tinnitus in students in an urban university setting; and the relationship between the two. **Methods:** This is a descriptive, cross sectional study of students of the college of medicine, University of Lagos, Nigeria from January to April 2012. A total of 388 willing participants (203 males, 185 females) were recruited by stratified random sampling from the 14 student hostel blocks. A self administered questionnaire was used. Data collected was analyzed using SPSS version 17.0.1. **Results and Conclusion:** The prevalence of earphone use among the students and subjective tinnitus was 95.6% and 20.6% respectively. More than 90% of the ear phone users had duration of ear phone use of duration of 3 to 6 years.

Keywords: hearing loss, noise-induced, questionnaires, tinnitus.

¹ Department of Ear, Nose and Throat - Lagos University Teaching Hospital, Lagos, Nigeria. - Lagos - Nigeria. E-mail: drnkirusoegwu@yahoo.com

² Department of Ear, Nose and Throat - College of Medicine University of Lagos, Nigeria - Lagos - Nigeria. E-mail: aosomefun@yahoo.com

Institution: Lagos University Teaching Hospital, Idi Araba Lagos.

Send correspondence to:

Oghu, Dibaal Sunny.

C/O P.O. Box 2832 Surulere Post office Box, Surulere Lagos, Nigeria.

Paper submitted to the ITJ-SGP (Publishing Management System) on August 15, 2013; and accepted on September 15, 2013. cod. 135.

INTRODUCTION

Tinnitus is an abnormal perception of sound in the absence of an external mechanical or electrical stimulation¹. It is a common symptom in otological pathologies suggesting an abnormality in perception which may be subjective or objective. There are otogenic (local) and systemic causes of tinnitus². For forty three percent of tinnitus sufferers, there is no known cause for their suffering - idiopathic³. For some people, tinnitus may be caused in part, by noise exposure³. Majority of cases of tinnitus with known causes involving the cochlea include: age-associated hearing loss, noise-induced hearing loss, head/ear trauma, disorders of endolymphatic hydrops, cochlear vascular deficiency and viral infection².

Global prevalence of tinnitus is 10% to 33% among adult population^{3,4}. The prevalence of tinnitus increases directly in persons with high frequency hearing loss; although, the association between severity of tinnitus and degree of hearing loss is very weak¹. Tinnitus is a frequent accompanying symptom in noise induced hearing loss². Otoscopy in such a person usually reveals a normal tympanic membrane (unless the patient has had previous middle-ear disease) and the audiogram will often show a dip at around 4-6 kHz in the early stages⁵.

The ear is a sound-sensitive organ that can be damaged by excessive noise levels⁶. However, there is biological variability such that individuals are not affected equally by the same level of noise exposure⁷. Male gender and increasing age appear to have a positive influence on susceptibility⁷. However; with increasing noise levels above 90 dB SPL a greater proportion of any exposed population will exhibit pathological changes⁷. Excessive loud sounds (noise) can arise from a variety of occupational and non occupational sources. Occupational sources are factory machinery, generators, building sites and high-impact tools. Non occupational sources include shooting, home power tools, discos and personal stereos.

Close coupling of sound to the ear when using a personal stereo player (PSP) has caused considerable discussion and concern from as early as 1980 in developed countries regarding the effects on hearing/ear from regular use of PSPs⁸⁻¹². Young adults from anecdotal sources, are fond of noise exposure arising from social exposure, especially use of ear phones for prolonged hours. A population based survey of 18-25 year olds in Nottingham (UK) was done that revealed that listening to various devices comprised 58% of the total average leisure-time activity¹³ 94.3% of Korean adolescents used personal music players¹⁴, 66.7% of college students used iPods in USA¹⁵.

Studies on hearing loss and tinnitus have often been based on occupational noise exposure. With increasing media exposure by young people like

undergraduates, more time is spent on listening to devices for entertainment: radios, televisions, iPods, laptops and others¹³. There is dearth of research on the level and nature of usage of PSPs in the youths and the effects of such pleasure sounds on the ear in our environment. This study on tinnitus in students will help to explain any association between recreational noise exposure and tinnitus in our environment. It will also form a baseline data for further research in understanding tinnitus in young people in developing countries.

Objectives

The objectives of this study are to determine the prevalence of the use of ear phone and subjective tinnitus among the students, and the relationship between the occurrence of tinnitus and use of ear phones in these students.

MATERIALS AND METHODS

This is a descriptive, cross sectional study of students of the college of medicine, University of Lagos, Nigeria aged 16-35 years; from January to April 2012. The calculated sample size was three hundred and eighty eight using the Fisher¹⁶ formula at a prevalence rate of 30%^{4,5} with degree of accuracy of 0.05 and non response rate of 20%.

Participants (203 males, 185 females) were recruited by stratified random sampling from 14 student hostel blocks. Inclusion criteria were being resident in medical students' hostel, with no active ear disease and giving informed consent. Ethical approval was obtained from the ethics committee of Lagos University Teaching Hospital (LUTH). A self administered questionnaire was used. Data collected was analyzed using SPSS version 17.0.1 - Dec 2008. The results were displayed as tables and tests of association were done at p value of ≤ 0.05 for significance.

RESULTS

The age range was 16-35 years with a mean age of 21.7 ± 2.6 SD years. The gender and age distribution of the sample population is shown in Table 1. Fifty one point eight percent (51.8%) of the studied population were males and 48.2% were females; giving a ratio of 1.1: 1. The peak age group was 20-23 making up 57.7% of population.

The prevalence of ear phone use was 95.6%, and that of tinnitus was 20.6% in this study. Of those that had tinnitus, 93.8% use ear phones (Table 2). 20.2% of ear phone users and 29.4% of non ear phone users had tinnitus (Table 2). Tinnitus was commonest in students that used both ear insert ear phone and head set (32.5%), though those that used ear insert only recorded higher tinnitus prevalence (19.7%) than those that used only head set (12.2%) - Table 3.

Table 1. Gender and age distribution.

Gender	Frequency (%)	Age Group	Frequency (%)
Male	201 (51.8%)	16-19	76 (19.6%)
Female	187 (48.2%)	20-23	224 (57.7%)
		24-27	79 (20.4%)
Total	388 (100.0%)	28-31	7 (1.8%)
		32-35	2 (0.5%)
		Total	388 (100.0%)

Table 2. Prevalence of tinnitus and ear phone use.

	Presence of tinnitus in last one month (%)		Total
	Yes	No	
Use of ear phones	75	296	371 (95.6%)
Non use of ear phones	5	12	17 (4.4%)
Total	80 (20.6%)	308 (79.4%)	388 (100.0%)

Chi-square $\chi^2 = 0.84$; Degree of freedom (df) = 1; P value = 0.36.

Table 3. Associations of tinnitus with type/loudness of ear phone.

	Tinnitus Present	Tinnitus Absent	χ^2	Fisher's exact
Type of Ear phone				
In the ear/ear insert	57 (19.7%)	233 (80.3%)	5.141	0.082
Head set	5 (12.2%)	36 (87.8%)		
Both	13 (32.5%)	27 (67.5%)		
Total valid	75	296		
Subjective loudness of device				
Whisper	0 (0.0%)	2 (100.0%)	1.281	0.874
Low	11 (18.6%)	48 (81.4%)		
Talking	39 (19.4%)	162 (80.6%)		
Shout	18 (21.2%)	67 (78.8%)		
Car horn	6 (27.3%)	16 (72.7%)		
Total valid	74	295		

While 54.5% listened to PSPs with ear phones at subjective sound level of talking, 23% at shouting level and 6% at car horn level, 19.4%, 21.2% and 27.3% of each group respectively had tinnitus (Table 3). 91.5% of the respondents used ear phones for < 1-6 hours/day while 60.8% used for < 1-3 hours/day. Likewise 90.8% of the study had used ear phones for 1-6 years while 60.1% had used it for 1-3 years (Table 4). There was no statistical significant association between the duration of ear phone use in hours/days and prevalence of tinnitus.

DISCUSSION

A prevalence of subjective tinnitus of 20.6% was found in this study (average age of 21.7 ± 2.6 SD years)

Table 4. Associations of tinnitus with duration of ear phone use.

	Tinnitus Present	Tinnitus Absent	χ^2	Fisher's exact
Duration of ear phone usage (Hrs/day)				
< 1-3	37 (20.0%)	148 (80.0%)	1.159	0.984
> 3-6	21 (22.2%)	74 (77.9%)		
> 6-9	2 (15.4%)	11 (84.6%)		
> 9-12	2 (18.2%)	9 (81.8%)		
> 12-15	0 (0.0%)	1 (100.0%)		
> 15-18	1 (25.0%)	3 (75.0%)		
Total valid	63	246		
Duration of ear phone usage (Yrs)				
1-3	36 (18.9%)	154 (81.1%)	1.564	0.945
4-6	22 (22.7%)	75 (77.3%)		
7-9	2 (15.4%)	11 (84.6%)		
10-12	2 (18.2%)	9 (81.8%)		
13-15	0 (0.0%)	1 (100.0%)		
16-18	1 (25.0%)	3 (75.0%)		
Total valid	63	253		

as shown in Table 2; a similar finding of 22% in Paraná, Brazil¹⁷ of a young population (average age of 29). This finding lies within the limits of global prevalence of tinnitus among adult population of 10% to 33%^{3,4}. A study on tinnitus in the elderly in Nigeria⁵ showed a higher prevalence rate of 41.9% in those aged 80 + years. Aside from the dissimilarity in age of both sample population, this difference could also be attributed to health conditions not found in this study population such as hypertension.

The use of ear phones in this study had a prevalence rate of 95.6%, which is high (Table 2). This finding agrees with a study in Korea, where 94.3% of adolescents were found to use personal music players¹⁴. A population based survey of 18-25 year olds in Nottingham (UK) found a lower prevalence rate of earphone usage of 43.6%¹³. This could be because that study was community based for all ages of randomly selected 5850 households in Nottingham area. However, for teenagers aged 13-19 (mean age of 16.1), a younger group, they found a prevalence rate of 86.1%¹³. In USA, 66.7% of college students used iPods¹⁵.

This study showed that the most common type of earphone used was insert type - "in the ear" (Table 3); as also found in UK¹³ and Korea¹⁴. It could be because of better appearance and cheaper price of the insert type of ear phones. Tinnitus was commonest among users of both "in the ear" and head set types of ear phones (32.5%) but there was no statically significant difference in the prevalence rate of tinnitus among the various usage groups (Table 3). Researchers have found "in the ear" type of ear phones to be more hazardous than the

head set type¹⁰⁻¹². This is attributed to greater coupling of sound to the ear in this kind of ear phones.

A significant difference in prolonged MP3 user listening patterns was found between respondents who had experienced tinnitus and those who had no tinnitus in USA among 28 university students¹⁸. This was not so in this study as most participants used ear phones and at similar durations. As such, no statistical significant association was found between occurrence of tinnitus and either the type of earphones used, or subjective loudness level of used device or duration of earphone use in hours/years (Table 3). Most of the participants in this study used “in the ear” type of earphones at subjective loudness level of normal / talking (60 dB SPL¹⁹) for duration of use of > 1-3 hrs/day or 1-3 yrs (Table 4). This listening pattern, being below 85dB/8hrs per day, explains why tinnitus was not reported more by ear phone users. Researchers in Australia²⁰ also found no significant association between years of use or exposure from personal stereo players and self- reported tinnitus.

Exposure to loud noise is one of the main causes of tinnitus. Loud noise may arise from recreational activity or pleasure, like using music players regularly. Some researchers have found that prolonged exposure to loud pleasure sound over a long period causes hearing related symptoms like hyperacusis, tinnitus and dullness of hearing^{15,21-23}. From this study, it can be inferred that most of the participants did not use earphones long enough or loud enough for such effects; i.e. below 85dB/8hrs per day.

CONCLUSION/RECOMMENDATION

There was a high prevalence of ear phone use (95.6%) among the students. Nevertheless, the prevalence of subjective tinnitus of 20.6% among the students was within limits of global prevalence of tinnitus. Insert/in the ear and head set types of ear phones were commonly used for durations of < 1-6 hours/day or 1-6 years. No statistically significant associations were found between the presence of subjective tinnitus and either the use of ear phones, or the type of ear phone used or duration of use. Further multi-centre cohort studies to fully assess tinnitus in the young population is therefore recommended.

REFERENCES

1. Roland NJ, McRae RDR, McCombe AW, editors. Key topics in Otolaryngology and Head and Neck Surgery. 2nd ed. Oxford: Bios scientific Publishers Limited; 2001. p.328-30.
2. Coles RRA. Tinnitus. In: Kerr AG, Boot John B, editors. Scott Brown's Otolaryngology. 6th ed. Oxford: Butterworth-Heinemann; 1997.
3. Davis A, Refaie AE. Epidemiology of tinnitus. In: Tyler R, editor. Tinnitus handbook. San Diego: Singular Publishing Group; 2000. p.1-23.
4. Lasisi AO, Abiona T, Gureje O. Tinnitus in the elderly: profile, correlates and impact in the Nigerian study of ageing. *Otolaryngol Head Neck Surg.* 2010;143(4):510-5. PMID: 20869560 DOI: <http://dx.doi.org/10.1016/j.otohns.2010.06.817>
5. Alberti PW. Noise and the ear. In: Kerr AG, Boot John B, editors. Scott Brown's Otolaryngology 6th ed. Oxford: Butterworth-Heinemann; 1997.
6. McFadden D. Tinnitus: Facts, theories and treatments. Washington: National Academy Press; 1982. p.1-150.
7. Murray CJL, Lopez AD. The global burden of disease: a comprehensive assessment of mortality and disability from diseases, injuries, and risk factors in 1990 and projected to 2020. Harvard: Harvard School of Public Health; 1996.
8. El Dib RP, Silva EM, Morais JF, Trevisani VF. Prevalence of high frequency hearing loss consistent with noise exposure among people working with sound systems and general population in Brazil: a cross-sectional study. *BMC Public Health.* 2008;8:151. PMID: 18462490 DOI: <http://dx.doi.org/10.1186/1471-2458-8-151>
9. Clark WW. Amplified music from stereo headsets and its effect on hearing. *Hear Instrum.* 1990;41:29-30.
10. LePage EL, Murray NM. Latent cochlear damage in personal stereo users: a study based on click-evoked otoacoustic emissions. *Med J Aust.* 1998;169(11-12):588-92. PMID: 9887901
11. Meyer-Bisch C. Epidemiological evaluation of hearing damage related to strongly amplified music (personal cassette players, discotheques, rock concerts)--high-definition audiometric survey on 1364 subjects. *Audiology.* 1996;35(3):121-42.
12. Rice CG, Breslin M, Roper RG. Sound levels from personal cassette players. *Br J Audiol.* 1987;21(4):273-8. PMID: 3690066
13. Smith PA, Davis A, Ferguson M, Lutman ME. The prevalence and type of social noise exposure in young adults in England. *Noise Health.* 2000;2(6):41-56.
14. Kim MG, Hong SM, Shim HJ, Kim YD, Cha CI, Yeo SG. Hearing threshold of Korean adolescents associated with the use of personal music players. *Yonsei Med J.* 2009;50(6):771-6. PMID: 20046416 DOI: <http://dx.doi.org/10.3349/ymj.2009.50.6.771>
15. Torre P 3rd. Young adults' use and output level settings of personal music systems. *Ear Hear.* 2008;29(5):791-9. DOI: <http://dx.doi.org/10.1097/AUD.0b013e31817e7409>
16. Fisher A, Laing J, Stoeckel J, Townsend I. Handbook for family planning operations, research and design. 2nd ed. New York: The population council; 1983. p.45.
17. Mazurek B, Olze H, Haupt H, Szczepek AJ. The more the worse: the grade of noise-induced hearing loss associates with the severity of tinnitus. *Int J Environ Res Public Health.* 2010;7(8):3071-9. DOI: <http://dx.doi.org/10.3390/ijerph7083071>
18. McNeill K, Keith SE, Feder K, Konkle AT, Michaud DS. MP3 player listening habits of 17 to 23 year old university students. *J Acoust Soc Am.* 2010;128(2):646-53. PMID: 20707434 DOI: <http://dx.doi.org/10.1121/1.3458853>
19. Dhingra PL. Diseases of ear, nose and throat. 3rd ed. New Delhi: Mosby, Saunders, Elsevier; 2004. p.62-117.
20. Williams W. Noise exposure levels from personal stereo use. *Int J Audiol.* 2005;44(4):231-6. DOI: <http://dx.doi.org/10.1080/14992020500057673>
21. Vogel I, Verschuure H, van der Ploeg CP, Brug J, Raat H. Estimating adolescent risk for hearing loss based on data from a large school-based survey. *Am J Public Health.* 2010;100(6):1095-100. DOI: <http://dx.doi.org/10.2105/AJPH.2009.168690>
22. Hoover A, Krishnamurti S. Survey of college students' MP3 listening: Habits, safety issues, attitudes, and education. *Am J Audiol.* 2010;19(1):73-83. DOI: [http://dx.doi.org/10.1044/1059-0889\(2010/08-0036\)](http://dx.doi.org/10.1044/1059-0889(2010/08-0036))
23. Danhauer JL, Johnson CE, Byrd A, DeGood L, Meuel C, Pecile A, et al. Survey of college students on iPod use and hearing health. *J Am Acad Audiol.* 2009;20(1):5-27. DOI: <http://dx.doi.org/10.3766/jaaa.20.1.2>