

AUDIOLOGICAL FINDINGS IN VARIOUS PERSONAL LISTENING DEVICES USERS AND NON USERS

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ABSTRACT

Introduction - It is observed that our young generation is increasingly being exposed to noisy environment, as they remain engaged in such recreational activities like listening music on mobile phones, personal music players or through laptops,ipads,ipods. They are also attending discotheques, rock concerts and videogames for recreation.Unfortunately not much attention is being given to effect of the increasing trend of prolonged exposure to noisy recreational environment in the younger generation of Indians.

Aim and Objectives: of this study was to find out mean hearing threshold value and hearing acuity in personal listening devices users and Non users.

Materials and Methods – Before commencing pure tone audiometry on total 500 subjects questionnaire was filled by subjects regarding age,sex,self reported hearing problem,duration of usage and type of personal listening devices used by them. Pure tone audiometry was performed on subjects.Statistical data analysis done by SPSS version 19 and chisquare test.

Results- Our results showed that mean hearing threshold level of various personal listening devices were significantly higher than Non users. ($P<0.001$).

Conclusion –Usage of personal listening devices for longer time leads to early hearing loss.

Key words: Personal listening devices, mean hearing threshold, hearing acuity.

INTRODUCTION –Prolonged excessive noise exposure can induce metabolic and mechanical changes in the organ of corti.¹ Occupational noise exposure remains the most commonly identified cause of noise induced hearing loss (NIHL),but leisure time or recreational activities that can produce hazardous noise levels as well Now a days prevalence to occupational noise hazards decreased due to safety measures taken at workplace. Unfortunately not much attention is being given to the increasing trend of prolonged exposure to noisy environment,in the younger generation during recreational activity.Personal listening devices such as MP3 players,ipods and mobile phones with music functions has become increasingly popular among younger generation. These personal lisening devices can produce sounds upto 120dB at maximum volume settings which is further amplified as much as 6-9 dB with the use of headphone².Evaluation of hearing threshold across populationcan be used to observe the difference between people exposed to music from personal listening devices and people who do not use personal listening devices.A study held on korean adolescents who are using personal listening devices, deleterious effect on hearing threshold is observed.³ A recent study in middle and high-income countries analysed by WHO indicate that among teenagers and young adults aged between 12-35 years, nearly 50 percent are exposed to unsafe levels of

sound from the use of personal audio devices⁴ According to the Indian council of medical research, hearing impairment is on the rise in India, According to a research conducted on 3,000 young adults in Mysore by the All India Institute of Speech and Hearing's audiology department, 66% of them listened to music using modern gadgets, 8% reported reduced hearing temporarily, 9.7% reported to have ringing sensation in ear, 4.5% reported blocking sensation in ear, 5.6% reported heaviness in ear, 7% reported irritation in ear and 13.4% reported having headaches after listening to music.⁵The aim and objective of the present study was to assess the hearing acuity of PLD users by measuring mean hearing threshold level by audiometry and compared with Non users.

MATERIALS AND METHODS – Study was carried out in GCS medical college Ahmedabad. Before commencing work ethical clearance was obtained from institutional ethics commiite.It is a comparative study held on.500 subjects selected randomly between age group of 18-40 years. Subjects using personal listening devices more than 2hours included in study and those who are using hearing aids were excluded from the study.Two subgroups were formed. Control group consist of subjects not using personal listening devices and test group consist subjects using personal listening devices more than 2 hours/day. Before commencing audiometry written consent of subjects were taken. Test procedure was explained and questionnaire regarding self-reported history of hearing problem, type of listening device used,and duration of usage per day and per year was taken. Audiometric test: Performed in sound proof room with

(Elkon – Eda – 3n3) pure tone audiometer with headphone. Procedure will be demonstrated to subject & instructions will be given to subjects to indicate whether he/she can hear a certain sound or not. Pure tone audiometry was performed at frequencies of 250,500,1000,2000,4000 and 8000 HZ. And intensity of sound ranges from 10-120dB and audiogram was recorded. Stastical analysis was done by SPSS version 19 and chi-square test.

RESULTS

Table – I
Demographic details of study subjects

Variables	Groups		Total N (%)
	Test n(%)	Control(n%)	
Male	111(22.2)	141(28.2)	252(50.45)
Female	139(27.8)	109(21.8)	248(49.6)
Total	250(50)	250(50)	500(100)

Out of 250 subjects of test group 22.2% were male and 27.8% were female and out of 250 control group subjects 28.2 were male and 21.8 were female.

From data obtained from self reported history of hearing problem it was observed that out of 250 subjects using personal listening devices 40% having no hearing problem 1% having defective hearing,3.8% having complain of ear pain,1.6% have temporary hearing loss and 3.6 % complained about tinnitus.In control subjects only one subject having complain about ear pain.

Figur.1
Type of sound devices used.

■ Phone ■ Phone + Laptop ■ Phone + Computer ■ Phone + Computer + Laptop ■ Others

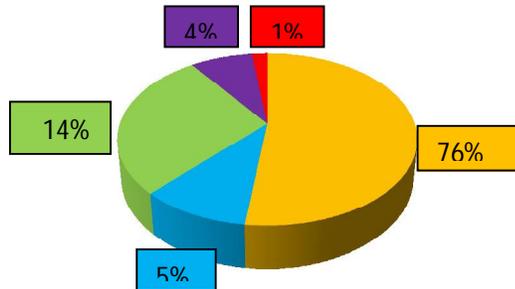
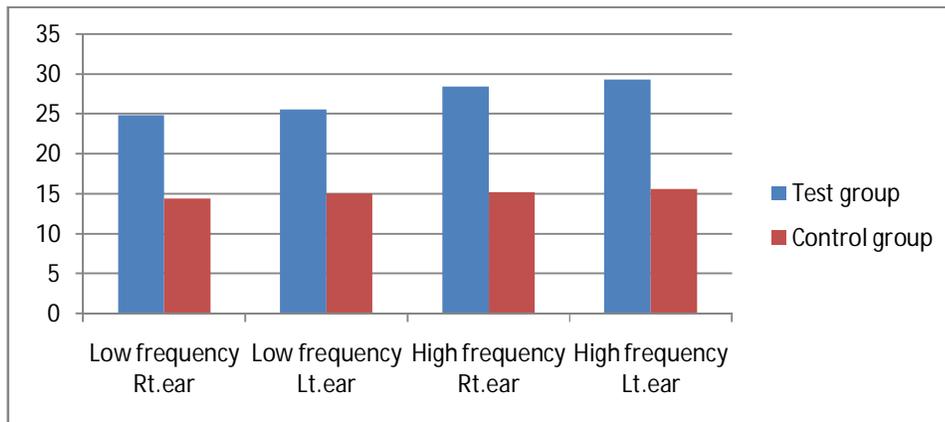


Figure-2
Comparison of mean hearing threshold level in test and control group



.Results show stastically significant difference in mean hearing threshold level between test group and control group . (P<0.001)

Table -II
Audiometric observation regarding hearing loss in Rt.ear.

Observations	Test group n(%)	Control group n(%)	Total (N%)	X2 (P Value)
Normal hearing	116(23.2)	250(50)	366(73.2)	183.06 (< 0.001)**
Minimal hearing loss	61(12.2)	0	61(12.2)	
Mild hearing loss	59(11.8)	0	39(11.8)	
Moderate hearing loss	14(2.8)	0	14(2.8)	
Total	250(50%)	250(50)	500(100)	

Table – II shows degree of hearing loss in test group and control group in left ear. Minimal to moderate hearing loss is present in personallistening devices users and hearing loss is not found in non users. So results are stastically significant.(P<0.001)

Table – III
Audiometric observation regarding hearing loss in Lt.ear.

Observations	Sound devices us n(%)	Sound devices nonus n(%)	Total (N%)	X2 (P Value)
Normal hearing	119(23.8)	250(50)	369(73.8)	173.5 (< 0.001)**
Minimal hearing loss	57(11.4)	0	57(11.4)	
Mild hearing loss	58(11.6)	0	58(11.6)	
Moderate hearing loss	15 (3)	0	15(3)	
Sever hearing loss	1(0.@)	0	1(0.2)	
Total	250(50%)	250(50)	500(100)	

Table –III shows degree of hearing loss in right ear of test group and control group. Results showminimal to sever hearingloss in personal listening devices users and hearing loss is absent in nonusers.So results arestastically highly significant. (P<0.001)

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DISCUSSION-According to the 1990 Noise and Hearing Loss Consensus Conference, “Noise Induced Hearing Loss (NIHL) results from damage to the ear from sounds of sufficient intensity and duration that a temporary or permanent sensorineural hearing loss is produced. The hearing loss may range from mild to profound, may result in tinnitus (unwanted head noise) and is cumulative over a lifetime. NIHL begins with a temporary threshold shift (TTS). A TTS is defined as a temporary neurosensory hearing loss that recovers almost completely, once the stimulus is removed. The extent of TTS depends on intensity frequency, content and temporal pattern of noise exposure.⁶ The importance of TTs is that it is rarely apparent to the subject because of its relatively low magnitude & relatively high frequency. Repeated TTS over weeks, months & years fail to recover & thereby become a permanent threshold shift. TTS are reversible but PTS are not. NIHL starts with selective loss of hearing at around 4000HZ³. This is recognized as a V Notch on an audiogram & it is the characteristic audiometric pattern of early NIHL. In this study characteristic audiometric V Notch obtained in 14% of personal listening devices users (26 subjects out of 250 subjects). The test group shows higher threshold of hearing compared to control group which is similar to the result of the study of Penge et al, carried his work on 120 Chinese students using personal listening devices and obtained statistically significant difference in pure tone audiometry for hearing threshold level. Sulaiman carried his work on 282 PLd users and obtained significantly higher mean audiogram thresholds

compared with non-users⁸ Similar results were also obtained in a study done by Manisha et al. Outer hair cells are more susceptible to noise exposure than inner hair cells. TTS is correlated with decreased stiffness of stereocilia of outer hair cells. The stereocilia become disarrayed & floppy. TTS may be due to metabolic exhaustion & sometimes referred as a auditory fatigue. With loss of stereocilia hair cells die & death of sensory cells¹⁰ can lead to progressive neurodegeneration & loss of primary auditory nerve fibers. In our study we also found out minimal to moderate hearing loss present in 25.8% of the personal listening devices users.

CONCLUSION-our present study has shown that mean hearing threshold frequency recorded is increased in various sound devices users than Non users. From above tables it is also found out that 57(11.4%) subjects having bilateral minimal hearing loss, 58 (11.6%) subjects having bilateral mild hearing loss and 14 (2.8%) subjects having moderate hearing loss in personal listening devices users while in non users all the subjects having normal hearing

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