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Health Effects Associated with the Usage of Personal Audio Devices and Their Perceived Health Impact in Adults: A Cross-Sectional Study

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ABSTRACT

Introduction

Exposure to recreational sound is an emerging public health problem. Especially in young adults the threat arises from extended and extreme exposure to loud music and other forms of recreational sound including music they listen to through personal audio devices (PAD). The study was undertaken to estimate the prevalence of health effects, to find out the perceived health effects and to determine the factors associated with the usage of PAD.

Materials and Methods

We conducted a cross sectional study in 200 adults using google forms, snowball sampling method was used. We gathered information regarding socio-demographic profile, volume levels and perceived health effect. Data was extracted to MS Excel and SPSS 26 was used for analysis. Descriptive, Chi-square test and Krushkal Wallis test was used. The significance level was considered at p≤0.05.

Results

Out of the 200 adult participants, males constituted 58.5%, graduated graduates around 78.5%, employed 49% and resided in urban areas 79%. Prevalence of health effects was 148(74%). There was significant association between volume levels, hours of usage and health effects on usage of PAD in subjects p≤0.05. It was also found that there was significant difference between marital status H=10.373, p≤0.05 employment H=8.76, p≤0.05 and tinnitus H=7.626, p≤0.05 across different median levels.

Conclusions

Prevalence on health effect on usage of PAD was high. Hence there is a need to increase awareness about the harmful usage of PAD among all the age groups.

Keywords Health effect, Personal Audio Devices, Usage

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INTRODUCTION

Globally around 466 million people have disabling hearing loss which constitutes 432 million adults and 34 million children. majority live in low- and middle-income countries impacting their quality of life. The World Health Organization has brought to light a concerning statistic: approximately 1 billion individuals between the ages of 12 and 35 face a significant threat to their hearing. This threat arises from extended and extreme exposure to loud music and other forms of recreational sound including music they listen to through personal audio devices. This issue, if left unaddressed, could lead to profound negative impacts on various aspects of their lives, including their physical and mental well-being, educational pursuits, and opportunities for employment[1,2]

Numerous factors pose risks to individuals' hearing over their lifetimes, such as rubella and meningitis, preventable factors like noise from modern lifestyle are at peak. Noise-induced hearing loss can arise from a range of environments like frequent visits to venues like discotheques, clubs, sports events, or music concerts. Evidence exists that those exposed to loud sounds in social settings over the past two decades are three times more likely to experience hearing loss compared to those who haven't been exposed. The widespread use of personal audio devices like smartphones and MP3 players has exacerbated this risk. Approximately 50% of individuals listening to music through personal audio devices do so at levels that jeopardize their hearing[3]

In India, WHO estimates suggest that around 63 million people suffer from Significant Auditory Impairment, indicating a prevalence of 6.3% in the Indian population. An NSSO survey indicates that currently, there are 291 individuals per 100,000 population dealing with severe to profound hearing loss. Among these cases, a significant portion comprises children aged 0 to 14 years. This high number of hearing-impaired young individuals translates into substantial losses in physical and economic productivity and can hinder daily activities[4-6]

The primary consequence of hearing loss is impaired communication, straining relationships with family and friends and causing challenges in professional settings. Untreated hearing loss in adults also gives rise to indirect health, psychosocial, and economic implications, leading to social isolation and reduced quality of life[7-9]. There are some immediate side effects on extensive usage of PAD such as headache, tinnitus, otalgia, excessive ear wax, itching and decreased hearing. There is scanty evidence regarding the prevalence of health effects, perceived health effects and the factors associated with the health effects on usage of personal audio devices, hence this study was undertaken.

Methods and Materials

This cross-sectional study was conducted by Google forms from January 2023 to June 2023 in the age group of 18 years and above. Informed written consent by the participants was obtained and confidentiality maintained. The sample size of 200 was calculated by taking into account the prevalence of usage of PAD as 50% [10], 95% confidence interval, 7% absolute precision, it was 196. It was rounded off to 200.The non probability sampling technique, snowball method was used, google form was shared to subjects who in turn shared to other participants. Before sharing the google form, it was pretested in a small group for validation and necessary changes were incorporated.

The inclusion criteria comprised subjects without active ear disease who provided informed consent. The google form consisted of socio demographic study variables being age, gender, marital status, education, employment, area of residence, no. of days of usage in a week, hours and volume levels. The questions on health effects included decreased hearing, infection or inflammation, decreased concentration, itching, tinnitus in the ear, headache, excessive wax and ear pain.

Data was entered in Microsoft Excel and analysis was accomplished in SPSS 26. Descriptive statistics, percentages were used for socio-demographic characteristics. Between group comparison was accomplished with Chi-square and Kruskal Wallis test, $p<0.05$ was assumed to be statistically significant.

Results

Around 100(50%) were in the age group of 21-30 years, males constituted 117(58.5%), unmarried were 119(59.5%). Around 157(78.5%) were graduates and

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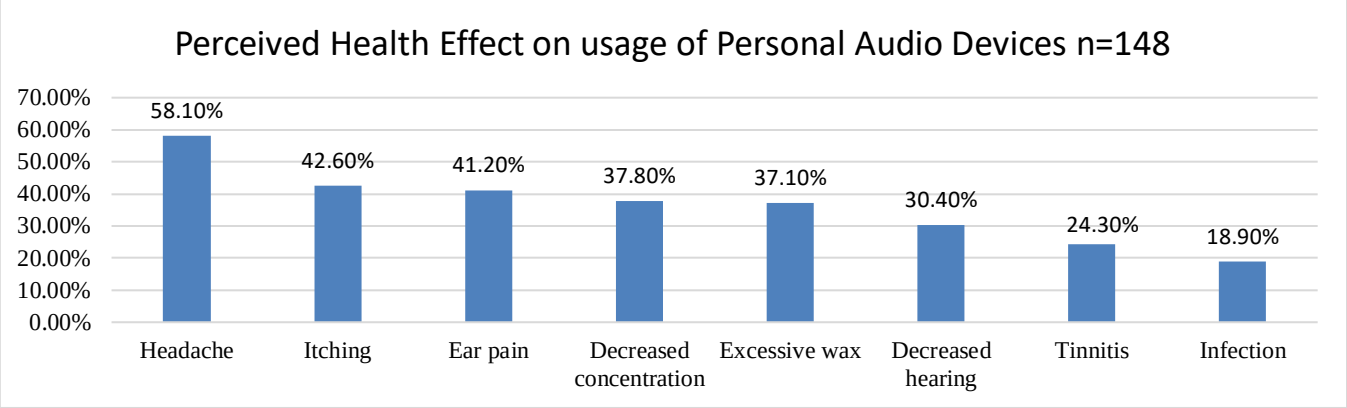
(98) 49% employed and 98(74%) were urban residents. Around 27(13.5%) used the personal audio device in high volume, 153(76.5%) in medium volume, 20(10%) in low volume.Health effects were present in 148(74%) and 52(26%) did not perceive any health effects. Out of 148, majority of study subjects had Headache 86(58.10%), followed by Itching 63(42.6%), Ear pain 61(41.2%), decreased concentration 56(37.8%), excessive wax 55(37.1%), decreased hearing 45(30.4%), tinnitus 36(24.3%) and infection 28 (18.9%) as shown in Graph 1.

Graph:Perceived Health effects on usage of Personal audio devices by study subjects



Health effect which was, ringing in the ear with H=7.626, was found to be statistically significant at p=0.022 across different median volume levels on usage of PAD (Table 1)

Table 1:Kruskal Wallis Test to assess perceived health effect using personal audio devices with volume levels.

Variable	Volume level	Kruskal-Wallis H	df	p value
Decreased Hearing	High volume Medium volume Low volume	1.432	2	0.489
Infection or inflammation of ear	High volume Medium volume Low volume	3.754	2	0.153
Decreased concentration	High volume Medium volume Low volume	0.628	2	0.730
Itching	High volume Medium volume Low volume	2.621	2	0.270
Headache	High volume Medium volume Low volume	4.788	2	0.091
Ringing in the ear	High volume Medium volume Low volume	7.626	2	**0.022**
Excessive wax	High volume Medium volume Low volume	1.020	2	0.600
Ear pain	High volume Medium volume Low volume	1.580	2	0.454

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It was observed that there was significant association with the volume level and the health effects on usage of PAD (χ^2 =2.027 p value=0.04). Similarly, there was significant association with the hours of usage with the health effects. (χ^2=8.94, p value=0.002) (Table 2).

Table 2:Statistical association to determine the factors associated with the health effect on usage of personal audio device.

Variable	Category	Total (N=200)	Health Effect		Chi square value	p value
			Present n=148	**Absent n=52**		
Employment Status	Employed	98	68(69.4)	30(30.6)	2.027	0.07
	Unemployed	102	80(78.4)	22(21.6)		
Volume level*	High	180	137(76.1)	43(23.9)	4.17	**0.04**
	Low	20	11(55.0)	9(45.0)		
Days of Usage	<3days	78	57(73.1)	21(26.9)	0.40	0.8
	>3days	122	91(74.6)	31(25.4)		
Hours of usage	<4hrs	174	135(77.6)	39(22.4)	8.94	**0.002**
	>4hrs	26	13(50.0)	13(50.0)		

The Kruskal Wallis H test was conducted to assess if there were significant differences in the socio-demographic profile and perceived effect on health for each variable based on the different volume levels. Usage of PAD was more among unmarried (59.5%) than married (40.5%). On applying Kruskal Wallis test to marital status across different median volume levels it was found statistically significant with H=10.373, p=0.006. Among the study subjects using PAD employed were 49%, students were 44% who constituted more than the unemployed 7%. Kruskal Wallis Test revealed that Employment across different median volume levels was found statistically significant at H=8.676, p=0.013. However, it was not significant with the education and residence. Table 3

Table 3:Kruskal Wallis Test to assess socio-demographic factors using personal audio device with volume levels.

Variable	Group	Kruskal-Wallis H	df	p value
Marital	High volume Medium volume Low volume	10.373	2	**0.006**
Education	High volume Medium volume Low volume	4.194	2	0.123
Employment	High volume Medium volume Low volume	8.676	2	**0.013**
Residence	High volume Medium volume Low volume	1.486	2	0.476

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DISCUSSION

Exposure to loud noise for a longer duration leads to Noise induced hearing loss. With the increasing access to mobile phones there is a prolonged use of personal audio devices for recreational purposes. The purpose of the study was to determine the prevalence of health effects and perceived health effects on the usage of personal audio devices. The present study revealed the prevalence of health effects on usage of PAD in adults was 74% which was high. This reveals a serious concern regarding use of PAD in adults as it impairs quality of living, education and employment opportunities if exposed in a longer run.Current study documented the most common symptom was Headache 58.10%, followed by Itching 42.6%, Ear pain 41.2%, decreased concentration 37.8%, excessive wax 37.1%, decreased hearing 30.4%, tinnitus 24.3% and infection 18.9%. These findings may correlate with the studies conducted across different regions in the globe[11-15]. However, contrast results were found in the study conducted in Mangalore[16] where temporary hearing loss, hard of hearing feeling while conversing, suffering from lack of sleep was most common which could be due to different study groups of medical students. It is evident that the majority of participants are using personal audio devices in spite of having health effects which causes them psychological distress and separation. Exposure to longer hours causes ear fatigue and the auditory nerve gets damaged leading to temporary noise induced hearing loss. In a severe case, exposure to loud noise increases the risk of causing a permanent hearing loss[17,18]. Hence, it is crucial to motivate them to change their behaviour as it has harmful effects. The present study revealed significant association between health effects and volume levels where prevalence was high among the subjects who used high volume levels. Similar results were found in the study conducted by Widen S[19] et al, where it revealed some small difference in hearing thresholds between those who listen at loud sound levels and those who listen at lower sound levels.Further, marital status, employment level, had an association on the volume levels where it has to be probed further. The study also shows that there is a relationship between hours of usage and potential health effect on the individual similar to Widen S[19] et al, where it revealed listening for >3hrs reported tinnitus more. There are some limitations of the study. The exposure of sound, time, frequency, sound levels of usage may be inaccurate as it was not quantified. Audiometry and otoacoustic emissions were not used to measure the clinical hearing damage. This study has focussed only on the immediate effects on usage on PAD which was self-reported by the subjects. Further research involving larger population size and long-term effects on usage of PAD is required.

Conclusions & Recommendations

This study reveals that adults have a highly risky behaviour and health effects on usage of personal audio devices. There is a need to implement environmental interventions and training programmes among adults to improve the knowledge and change the attitude towards the usage of personal audio devices. Awareness regarding the harmful effects should be addressed to the population at the large.

Public Health Implications

Health effects in adults on usage of personal audio devices was high. Identifying the factors associated with the health effects helps in reduction of usage of personal audio devices. Health education session regarding the health effects of usage of personal audio devices is crucial in adults hence measures have to be taken.

REFERENCES

1. World Health Organization. Available from: https://www.who.int/news/item/02-03-2022-who-releases-new-standard-to-tackle-rising-threat-of-hearing-loss. Accessed on 2nd Jan 2023.
2. World Health Organization. Available from: https://www.who.int/news/item/12-02-2019-new-who-itu-standard-aims-to-prevent-hearing-loss-among-1.1-billion-young-people. Accessed on 10th Feb 2023.
3. World Health Organization. Toolkit for safe listening devices and systems.
4. Ministry of Health & Family Welfare. National Health Mission. Available from https://www.nhm.gov.in/index1.php?lang=1&level=2&sublinkid=1051&lid=606.
5. Ministry of Health & Family Welfare. Director General of Health Sciences. Available from https://dghs.gov.in/content/1362_3_NationalProgrammePreventionControl.aspx.
6. Dehankar S S, Gaurkar S S (November 12, 2022) Impact on Hearing Due to Prolonged Use of Audio Devices: A Literature Review. Cureus 14(11): e31425. DOI 10.7759/cureus.31425.
7. Bainbridge KE, Wallhagen MI: Hearing loss in an aging American population: extent, impact, and management. Annu Rev Public Health. 2014, 35:139-52. 10.1146/annurev-publhealth-032013-182510.
8. Mick P, Kawachi I, Lin FR: The association between hearing loss and social isolation in older adults. Otolaryngol Head Neck Surg. 2014, 150:378-84. 10.1177/0194599813518021 7.
9. Low WK, Pang KY, Ho LY, Lim SB, Joseph R: Universal newborn hearing screening in Singapore: the need, implementation and challenges. Ann Acad Med Singap. 2005, 34:301-6.
10. Pandey D, Saroshe S, Dixit S, Sabde Y. Estimation of prevalence of headphone usage during driving and awareness about their health hazards among medical undergraduates. Int J Community Med Public Health 2015; 2:167-71.
11. Sunny OD, Asoegwu CN, Abayomi SO. Subjective tinnitus and its association with use of ear phones among students of the College of Medicine, University of Lagos, Nigeria. Int Tinnitus J. 2012;17(2):169–72. doi: 10.5935/0946-5448.20120030. [PubMed: 24333890].
12. Mohammadpoorasl A, Hajizadeh M, Marin S, Heydari P, Ghalenoei M. Prevalence and Pattern of Using Headphones and Its Relationship with Hearing Loss among Students. Health Scope. 2019;8(1): e65901. https://doi.org/10.5812/jhealthscope.65901.
13. Alarfaj AA, AlAhmmed LM, Ali SI. Perception of earbuds side effects among teenager and adults in Eastern Province of Saudi Arabia: A cross sectional study. Clinical Epidemiology and GlobalHealth. Oct 2021; 12:100784.
14. Ramya M R, Geetha M. Headphone/Earphone Usage Practices and its Health Effects among College going Students: A Cross Sectional Study from South India. Healthline. 2022; 13(3): 261-265.
15. Harshitha S, Siddiqua AA. A survey on prevalence and effect of earphone usage among adolescents. International Journal of Applied Research. 2017;3(12):438-42.
16. Rekha T, Unnikrishnan B, Mithra PP, Kumar N, Bukelo MJ, Ballala K. Perceptions and practices regarding use of personal listening devices among medical students in coastal south India. *Noise Health*. 2011;**13**(54):329-32. doi: 10.4103/1463-1741.85500. [PubMed: 21959112].
17. Martin WH, Sobel J, Griest SE, et al. Noise-induced hearing loss in children: preventing the silent epidemic. J Otol 2006;1:11–21.
18. Levey S, Levey T, Fligor BJ. Noise exposure estimates of urban MP3 player users. J Speech Lang Hear Res 2011; 54:263–77.
19. Widen S E, Basjo S, Moller C, Kahari K. Headphone Listening Habits and Hearing Thresholds in Swedish Adolescents. Noise Health. Noise Health. 2017 May-Jun; 19(88): 125–132.doi: 10.4103/nah.NAH_65_16.