Original Research Article

Prevalence and Patternof using Personal Auditory Devices and Assessment of the Health Problems Related with it among Medical Students

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Abstract

Introduction: Personal Audio Devices (PAD) are almost essential to access smartphones and tablets anywhere. Regular and prolonged noise exposure can cause gradual, irreversible damage to the sensory cells and other structures, leading to a permanent threshold shift (permanent hearing loss). The present study was conducted to estimate the prevalence and pattern of using Personal Audio Devices (PAD) and health problems related to them among medical undergraduates of a medical college in Maharashtra.

Methodology: The present cross-sectional study was conducted amongst 413 respondents from June to July 2022. Data was collected using a pre-structured self-administered questionnaire presented in the format of Google Form (Online).

Results: Most of the participants i.e. 176 (42.5%) were using Bluetooth devices for listening. The majority of the participants 148 (35.9%) had been using audio devices for the last 2-4 years. We found that 228 (55.3%) never used AD while driving. The study revealed that 132 (32%) students had started to have some difficulty in hearing, while 36 (8.7%) had pain, 34 (8.3%) had an itchy ear and 21 (5.1%) had mild deafness.

Conclusion: Most of the participants were unaware of the safe use of audio devices and Students had already started experiencing ear-related problems.

Key Words: Audio devices, Bluetooth, Noise-induced-hearing loss, 60:60 rule, Tinnitus

Introduction

Loud noise is a major risk factor for hearing loss, and students are exposed to loud noise by using personal audio devices. With the recent increasing usage of smartphones, tablets and laptops, the usage of personal audio devices has also increased and this increment has led to the population being exposed to

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non-occupational noise. Long-term usage of personal audio devices could induce hearing loss. Studies have suggested that hearing loss occurs from personal audio device overuse regardless of occupational noise exposure.[1] Using personal audio devices also puts users at risk of ear infections, tinnitus and dizziness. The new generation is at risk of developing ear-related problems at a much younger age due to the early use of personal audio devices. [2]

The recreational noise-induced hearing loss has become a new emerging healthcare challenge globally (NIHS)[3] Smartphones and medical education apps are widely used by medical students because they facilitate peer interactions and help in better communication and collaboration. [4] Regular or prolonged noise exposure can cause gradual, irreversible damage to the sensory cells and other structures, leading to a permanent threshold shift (permanent hearing loss). Noise-induced hearing loss initially involves the sensory cells that respond to high-frequency (high-pitched) sounds, specifically 4 kHz. Continued exposure leads to increasing damage in other frequencies and progression of hearing loss, which begins to interfere with the individual's day-to-day activities. Noise-induced hearing loss adversely affects conversation and communication. [3]

The present study was conducted to estimate the prevalence and pattern of using Personal Audio Devices and the health problems related to it among medical students.

METHODOLOGY

The present cross-sectional study was conducted amongst 413 medical students during 15 June to 15 July 2022. Data were collected using a pre-structured self-administered questionnaire using Google forms. The participants were Undergraduate students (MBBS).

Exclusion criteria: Students with a pre-diagnosed hearing loss due to another ear-related disease.

Data collection: The data was collected from medical students using Google Forms after their voluntary consent.

Statistical analysis: The responses were tabulated and graphically presented.

Questionnaire: It was a pre-structured self-administered questionnaire which was used to collect data from the participants on the PAD device: (type of device, duration of device use, average time of PAD: days per week and hours per day). Participants were asked if they experienced any problems immediately after PAD use (tinnitus, hearing loss, earache, or irritability).

Research ethics: Informed consent was given by all the participants, after an explanation of the reasons for conducting the study.

RESULTS

The present study was conducted to study the prevalence and pattern of using Personal Audio Devices in medical students.

Demographic statistical information of survey participants revealed that, out of total 413 participants majority 233 (56.3%) were females and majority 263 (63.8%), were living in hostels.

Table 1. Listening habits

Characteristic		**Frequency (%)**
Type of Audio Devices	Bluetooth devices	176 (42.5%)
	All the devices	162 (39.3%)
	Wired earphones	48 (11.7%)
	Headphones	27 (6.6%)
Duration of use of Personal Auditory Devices	2-4 years	148 (35.9%)
	5 - 6 years	126 (30.6%)
	7 - 8 years	82 (19.9%)
	9 - 10 years	57 (13.6%)
Reason of using personal auditory devices for most of the time	Music	216 (52.4%)
	Educational Purpose	88 (21.4%)
	OTT (Web series and Movies)	66 (16.5%)
	Attending calls	27 (6.5%)
	Gaming	16 (3.2%)
Use of personal auditory devices while driving	Never	228 (55.3%)
	Sometimes	79 (19.2%)
	Seldom	41 (9.7%)
	Usually	35 (8.5%)
	Very often	30 (7.3%)
Duration of use of audio devices in a day	Up to 3 hours	285 (69.2%)
	Up to 6 hours	98 (23.5%)
	Up to 9 hours	17 (4.1%)
	More than 9 hours	13 (3.2%)

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Side of Ear used commonly	Both	239 (57.8%)
	Right Ear	65 (15.8%)
	Nothing as Such	58 (14.4%)
	Left Ear	51 (12.4%)
Preferences while purchasing auditory devices	Good quality voice	360 (87.4%)
	Cool design	27 (6.5%)
	Low price	11 (2.6%)
	No such preferences	15 (3.5%)
Frequency of cleaning the auditory devices	Sometimes	162 (39.3%)
	Usually	136 (33%)
	Very often	77 (18.7%)
	Never	38 (9%)

Table 1 shows that majority 176 (42.5%) of the participants were using Bluetooth devices for listening followed by 162 (39.3%) all the devices. Majority 148 (35.9%) of the participants were using personal auditory devices for last 2-4 years and 126 (30.6%) were using for last 5 - 6 years. It was observed that majority 216 (52.4%) participants were using PAD for listening to music followed by 88 (21.4%) using it for educational purpose and 66 (16.5%) for OTT (Web series and Movies). It was observed that 228 (55.3%) were not using the PAD while driving, while 30 (7.3%) used PAD very often while driving.

Table 2. Awareness regarding safe use of audio devices.

Characteristic		**Frequency (%)**
Ideal rule to use auditory devices	50/60 – Listen at 50% volume for 60 minutes	195 (47.3%)
	60/60 – Listen at 60% volume for 60 minutes	101 (24.5%)
	50/50 – Listen at 50% volume for 50 minutes	110 (26.7%)
	60/70 – Listen at 60% volume for 70 minutes	7 (1.5%)
What is the safe volume for ears?	0 – 50 Db	165 (40%)
	60 – 85 Db	210 (51%)
	85 – 100 Db	34 (8.3%)
	100 – 150 dB	0.7 (4%)

Table 2 shows that duration 1 – 3 hours of use of PAD in a single day was seen in majority 285 (69.2%) of respondents followed by 98 (23.5%) for 4 to 6 hours. Majority 239 (57.8%) students were using both ears to listen the PAD. Majority students 195 (47.3%) said that we should use 50/60 – listen at 50% volume for 60 minutes followed by 110 (26.7%) saying 50/50 – Listen at 50% volume for 50 minutes. 210 (51%) students said that 60 – 85 dB is safe volume which is a correct answer, 165 (40%) said that 0 – 50 dB is safe volume. Good quality voice was the criteria by 360 (87.4%) students while purchasing PAD. It was also observed that 162 (39.3%) cleaned their PAD sometimes and 38 (9%) have never cleaned.

Table 3. Health impact of audio devices use.

Characteristic	Response	No.
Do you find yourself asking people to repeat themselves?	Yes	132 (32%)
	No	242 (58.5%)
	Don't know	39 (9.5%)
Are you suffering from any ear related problem?	Pain	51 (12.34%)
	Itchy ear	28 (6.77%)
	Mild deafness	35 (8.47 %)
	Tinnitus	27 (6.53%)
	Infection/Discharge	4 (0.9%)
	None	267 (64.64%)

Table 3 shows that 132 (32%) students find themselves asking others to repeat them, while 51 (12.34%) had pain, 28 (6.53%) had itchy ear and 35 (8.47 %) had mild deafness.

DISCUSSION

According to our study among 413 respondents, 75.5% of students are unaware of the safe use of audio devices by **60:60 rule** i.e. 60% volume for 60 minutes as suggested by WHO.

In the present study, out of a total of 413 participants, the majority of 233 (56.3%) were females and the majority of 263 (63.8%) participants were living in hostels.

In a Neha Sharma et al (2022) study of 164 students, 96 were male and 68 were female. The mean age of students was 20.04 ± 0.67.[5]

In the present study, the majority 176 (42.5%) of the participants were using Bluetooth devices followed by 162 (39.3%). The majority of 148 (35.9%) of the participants have been using audio devices for the last 2-4 years and 126 (30.6%) for the last 4- 6 years. It was observed that the majority of 216 (52.4%) participants were using PAD for listening to music, 88 (21.4%) educational purposes and 66 (16.5%) for OTT (Web series and Movies). It shows that 228 (55.3%) were aware of not using PAD while driving, while 30 (7.3%) used PAD very often.

These findings were like Valle J et al (2017), who found that the most common personal sound system used was mobile phones (45%). The most common tool used for hearing was earphones. 50 % of students surveyed showed the usage of PSS to be more than 5 years.[4]

Anita Khokhar et al (2017) observed that 67.2% of students listened to Portable Listening Devices every day. Also, students who use Portable Listening Devices during walking, travelling, driving, exercise and sleeping tended to use them for more than 1 hour. [1]

K. Singh et al (2021) noted that more than 90% had a smartphone for more than 2 years and the mean age of the current smartphone owned was 1.5 years. [6]

Sunghwa You et al (2020) found the main reason for using PLDs was to listen to music (95.3%, Q68). Also, they used their devices when feeling bored (77.4%, Q75), to help them relax (59.9%, Q69), to help them concentrate (54.7%, Q72), and to isolate themselves from others (46.2%, Q70). [7]

Saurav Basu et al (2017) found that the principal personal audio device (PAD) for music listening was the mobile phone preferred by 95.6% (239). With regards to the type of earphones, headphones were used by 51.6% (129) and earbuds by 33.6% (84) participants. Among the 250 participants, the duration of PAD usage was > 5 years in 42% (105) and 2-5 years in 33.6% (84). A total of 205 (52.8%) students preferred the ear-type headphones for listening to music on their PAD, 132 (34%) earbuds, 34 (8.8%) canal-type earphones, 11 (2.8%) noise-cancelling earphones, and 4 (1%) used Bluetooth headsets.[8]

In the present study we found that the duration of 1 – 3 hours of use of PAD in a single day was seen in the majority 285 (69.2%) of respondents followed by 98 (23.5%) for 4 to 6 hours. The majority of 239 (57.8%) students were using both ears to listen to

the PAD simultaneously. The majority of students 195 (47.3%) said that we should use 50/60 – listen at 50% volume for 60 minutes followed by 110 (26.7%) saying 50/50 – Listen at 50% volume for 50 minutes. 210 (51%) students were aware that 60 – 85 dB is a safe volume range, and 165 (40%) said that 0 – 50 dB is a safe volume. The good quality voice was the criterion of 360 (87.4%) students while purchasing PAD. It was also observed that 162 (39.3%) cleaned their PAD sometimes and 38 (9%) have never cleaned.

Similarly, Valle J et al (2017) found that the 29% students surveyed used PSS between one to three hours, 18% between three to five hours & 8% for more than 5 hours. Though the majority was using a low volume of one to three (77 %), most tinnitus-positive patients (61%) were using a high volume in their PSS.[4]

Anita Khokhar et al (2017) noted that 61.2% used them for more than an hour. Regarding the frequency of cleaning earphones used with Portable Listening Devices, 149 (37.3%) cleaned their earphones when they looked dirty, 99 (24.8%) admitted to having never cleaned their earphones, while 88 (22.1%) and 63 (15.8%) cleaned their earphones after every use and daily respectively.[1]

Jiban Das et al (2020) in his study observed that more than 50% of the students of both groups use earphones at a volume level of more than 50% of the device volume level. [9]

Sunghwa You et al (2020) in their study of 1009 respondents, 72.2% reported that hazardous noise could cause secondary hearing loss for those who already had hearing loss. Of these respondents, 66.2% knew that hearing loss might be preventable. Of the college student respondents, 77% had used a PLD for more than two years. Also, the average use time of the PLDs in a day was rather widely distributed, ranging from 0.5 to 4 h. Regarding the frequency of PLD use for more than 4 h in one place during a year, 1 to 3 times was the highest response (37.6%, and followed 21 or more times (23.4%). Additionally, they agreed that the '60–60 rule' (62%) was not a violation of the public's privacy (59.4%). [7]

Neha Sharma et al (2022) found that the daily use of the internet was 3–6 hours/day by most of the medical students (n = 123) followed by <2 h (20 students). Thirteen students used mobile for 7–10 hours but the maximum use of the internet >10 h/day was done by eight students. [5]

Saurav Basu et al (2017) noted that music at medium and low volumes was preferred by 59.2% (148) participants. [8]

From table 3 we observed that 132 (32%) students started to have difficulty in listening, while 36 (8.7%) had pain, 34 (8.3%) had an itchy ear and 21 (5.1%) had mild deafness and tinnitus in 17 (4.1%).

Similarly, Valle J et al (2017) in their study found that all 100 subjects were found to be using personal sound systems and the prevalence of tinnitus was found to be 33%. It was found that 11 % had bilateral conductive hearing loss, 2 % had unilateral conductive hearing loss and 2% had unilateral sensorineural hearing loss.[4]

Anita Khokhar et al (2017) found that28.2% of students reported headache, 25.3% lack of concentration, 22.3% buzzing sound in the ear, and 17.8% behaviour change.[1]

Sunghwa You et al (2020) during their study observed that, 53.5% reported having no difficulty in hearing. In detail, about 80% of the respondents agreed that increasing the volume of television (TV) or radio was a sign of hearing loss; 75% also knew that experiencing tinnitus was possible after exposure to high levels of noise.[7]

Saurav Basu et al (2017) found that the hearing loss and ringing in the ears (tinnitus) which persisted for at least 3 days within the previous 6 months was reported by 9.6% (24) and 5.6% (14) participants respectively. The PAD usage reported by the students in at-risk situations included crossing the road in 45 (11.6%), driving a motorbike in 36 (9.2%), cycling in 117 (30.5%), driving in 140 (36%), and walking on the street in 128 (33%) students.[8] Also, similar results were observed by T Rekha et (2011).[10]

CONCLUSION

Most of the participants were unaware of the safe use of audio devices and most of the respondents' used earphones for more than 4 years. Half of the respondents were not aware of the proper volume level with the usage of earphones and headphones.

Half of the students who participated in this study were not cleaning audio devices. Some of the students had already started experiencing ear-related problems.

LIMITATIONS:

The number of participants, which requires a larger population when in order to generalize our findings. As data were collected through self-report questionnaires, the main limitation of the study is the possibility of providing invalid answers.

ETHICAL CLEARANCE: Taken from Institutional Ethics Committee: MGM-ECRHS/2022, Dated- 26.2.2022

SOURCE OF FUNDING: Self

CONFLICT OF INTEREST: NIL

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