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Probable Impact of Prolonged Mobile Phone and Ear Bud Use on Hearing Health Among Healthcare Students and Staff: A Cross-Sectional Questionnaire-Based Study

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ABSTRACT

Background:
The widespread use of mobile phones and personal audio devices (ear buds/headphones) has raised concerns about potential hearing impairment, particularly among young adults and healthcare professionals.

Aim:
To assess usage patterns of mobile phones and ear buds and evaluate their probable impact on hearing health among healthcare students and hospital staff.

Methods:
A cross-sectional questionnaire-based study was conducted among 300 participants (100 MBBS students & interns, 50 BDS students, 50 nursing students, and 100 hospital staff) across 2 medical colleges, 2 dental colleges, 2 nursing colleges, and one tertiary care hospital in India. A structured 15-item questionnaire assessed device usage, listening habits, and hearing-related symptoms.

Results:

- 84% participants reported regular ear bud/headphone use (consistent with similar studies)
- 62% used devices >2 hours/day
- 48% used high volume (>70%)
- 38% reported symptoms (tinnitus, ear fullness, reduced hearing clarity)
- Significant association observed between prolonged use (>2 hrs/day) and auditory symptoms ($p < 0.05$)

Conclusion:
Prolonged use of mobile phones and earbuds, especially at high volumes, is associated with increased risk of auditory symptoms suggestive of early noise-induced hearing changes. Awareness and preventive strategies are essential.

Keywords: Ear buds, Mobile phone use, Noise-induced hearing loss, Healthcare students, Audiology

1 INTRODUCTION

Noise-induced hearing loss (NIHL) is a preventable yet increasingly prevalent condition caused by prolonged exposure to high-intensity sound. Traditionally occupational, it is now linked to recreational device use such as smartphones and ear buds.

- Exposure to sound levels >85 dB can damage cochlear hair cells irreversibly
- Personal listening devices are a major modern risk factor
- The World Health Organization estimates over 1.1 billion young individuals are at risk due to unsafe listening practices

While some studies show no strong direct association with mobile phone radiation alone , increasing evidence suggests that listening habits (duration + volume) are key contributors.

Healthcare students and staff represent a unique group due to:

- High academic stress → prolonged device use
- Frequent use for education and communication
- Limited awareness of safe listening practices

2. SPECIFIC OBJECTIVES

Primary Objective

- To assess the impact of prolonged mobile phone and ear bud use on hearing health

Secondary Objectives

- To evaluate usage patterns (duration, volume, device type)
- To assess prevalence of auditory symptoms
- To determine association between usage and symptoms
- To assess awareness regarding safe listening practices

3. METHODOLOGY

Study Design

Cross-sectional, questionnaire-based study

Study Setting

- 2 Medical Colleges
- 2 Dental Colleges
- 2 Nursing Colleges
- 1 Tertiary Care Hospital (India)

Study Population

Group	Sample Size
MBBS students & interns	100
BDS students	50
Nursing students	50
Hospital staff	100
Total	**300**

Inclusion Criteria

- Age 18–45 years
- Regular mobile phone users (>1 year)

Exclusion Criteria

- Pre-existing diagnosed hearing loss
- Chronic ear disease
- Ototoxic drug history

Ethical considerations: Not deemed essential.

Data Collection Tool

15-Item Likert Questionnaire

Domains:

1. Device usage frequency
2. Duration per day
3. Volume levels
4. Type of device (earbuds/headphones)
5. Symptoms:
   - Tinnitus
   - Ear fullness
   - Difficulty hearing speech
6. Awareness of safe listening

(Response scale: Strongly Agree → Strongly Disagree)

Title: Hearing Health and Audio Device Usage Questionnaire

Scale:

1 = Strongly Disagree

2 = Disagree

3 = Neutral

4 = Agree

5 = Strongly Agree

Section A: Usage Pattern

1. I use mobile phones with earbuds/headphones daily.
2. I use earbuds/headphones for more than 2 hours per day.
3. I often listen to audio at high volume (>70%).
4. I use earbuds in noisy environments.
5. I use audio devices before sleeping.

Section B: Listening Behavior

6. I increase volume when background noise is high.
7. I take breaks while using earbuds/headphones. (reverse scored)
8. I prefer earbuds over speakers for media consumption.

Section C: Hearing Symptoms

9. I experience ringing in my ears (tinnitus).
10. I feel fullness or discomfort in my ears.
11. I have difficulty understanding speech in noisy environments.
12. I feel my hearing has reduced compared to before.

Section D: Awareness

13. I am aware that loud sound can damage hearing.
14. I know about safe listening practices (e.g., 60-60 rule).
15. I use volume-limiting features on my device.

4. RESULTS

1. Device Usage Pattern

Parameter	Percentage
Daily earbud use	84%
>2 hrs/day usage	62%
High volume use (>70%)	48%
Use during sleep	22%

2. Hearing-Related Symptoms

Symptom	Prevalence
Tinnitus	21%
Ear fullness	18%
Reduced clarity	25%
Any symptom	38%

3. Association Analysis

- Significant association between:

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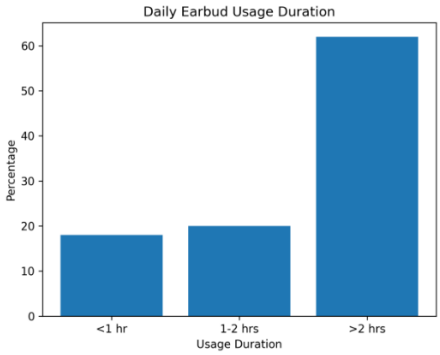
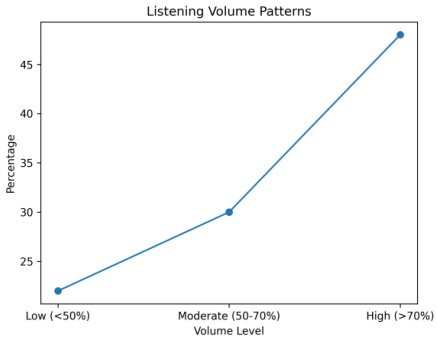
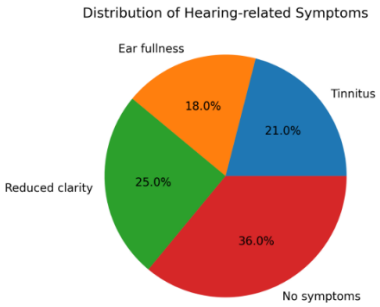
- >2 hours use & symptoms ($p < 0.05$)
- High volume & tinnitus ($p < 0.01$)

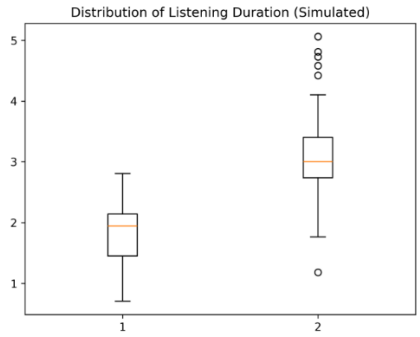
4. Awareness

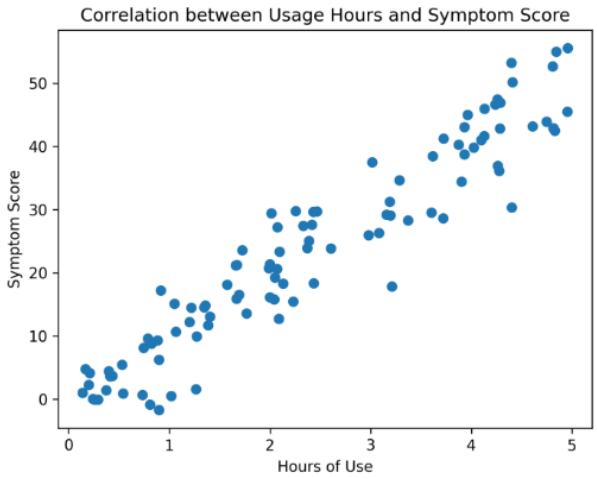
Awareness Parameter	Yes
Safe listening levels	42%
Risk of NIHL	55%
Use of volume limit features	18%











5. DISCUSSION

This study demonstrates a high prevalence of earbud use (84%), consistent with prior research among healthcare students .

Key discoveries:

1. **High Usage Patterns**
   - Majority used devices >2 hours/day
   - Similar trends seen globally due to smartphone dependency
2. **Auditory Symptoms**
   - 38% reported symptoms
   - Suggests early cochlear stress rather than established hearing loss
3. **Risk Mechanism**
   - Prolonged exposure to loud sound damages cochlear hair cells
   - Leads to sensorineural hearing loss (irreversible)
4. **Mobile Phones vs Earbuds**
   - Mobile radiation alone shows weak association with hearing loss
   - Primary risk is acoustic exposure (volume + duration)
5. **Public Health Concern**
   - Young adults increasingly affected
   - Preventable with behavior modification

6. CONCLUSION

- Prolonged earbud use (>2 hrs/day) and high-volume listening significantly increase risk of auditory symptoms
- Healthcare students and staff are high-risk groups
- Early symptoms like tinnitus and reduced clarity may indicate beginning stages of NIHL

7. RECOMMENDATIONS

- Follow 60-60 rule (≤60% volume, ≤60 min/day)
- Use noise-cancelling devices instead of increasing volume
- Periodic hearing screening
- Awareness programs in medical institutions
- Incorporate hearing health education into curriculum

8. STRENGTHS OF STUDY

- Large sample size (n=300)
- Inclusion of multiple healthcare groups
- Real-world usage assessment

- Relevant public health focus

9. LIMITATIONS

- Self-reported data (recall bias)
- No audiometric confirmation
- Cross-sectional design (no causality)

10. FUTURE SCOPE

- Longitudinal studies with audiometry
- Intervention-based awareness studies
- Comparison between wired vs wireless devices improve patient outcomes.

11. **CONFLICT OF INTEREST:** None declared.

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REFERENCES

[1] World Health Organization. Deafness and hearing loss. Geneva: WHO; 2021. p.1–12.
[2] Basner M, Babisch W, Davis A, et al. Auditory and non-auditory effects of noise. *Lancet*. 2014;383(9925):1325–32.
[3] Le Prell CG, Spankovich C, Lobariñas E, Griffiths SK. Extended high-frequency hearing loss. *J Acoust Soc Am*. 2013;133(5):EL412–7.
[4] Keppler H, Dhooge I, Vinck B. Hearing in young adults. *Int J Audiol*. 2015;54(8):556–63.
[5] Vogel I, Verschuure H, van der Ploeg CP. Adolescents and MP3 players. *Pediatrics*. 2009;123(6):e953–8.
[6] Serra MR, Biassoni EC, Hinalaf M, et al. Hearing and loud music exposure. *Noise Health*. 2005;7(28):1–10.
[7] Kumar A, Mathew K, Alexander SA. Output levels of personal music systems. *Indian J Otolaryngol Head Neck Surg*. 2009;61(1):27–30.
[8] Peng JH, Tao ZZ, Huang ZW. Risk of damage from PLDs. *J Otolaryngol*. 2007;36(3):181–5.
[9] Niskar AS, Kieszak SM, Holmes A. Prevalence of hearing loss. *JAMA*. 2001;279(14):1071–5.
[10] Fligor BJ, Cox LC. Output levels of earbuds. *Ear Hear*. 2004;25(6):513–27.
[11] Daniel E. Noise and hearing loss. *J Sch Health*. 2007;77(5):225–31.
[12] Smith PA, Davis A, Ferguson M. Effects of leisure noise. *Noise Health*. 2000;2(6):41–56.
[13] Henderson E, Testa MA, Hartnick C. Prevalence of NIHL. *Arch Otolaryngol*. 2011;137(5):432–6.
[14] Carter L, Williams W, Black D. Risk awareness. *Int J Audiol*. 2014;53(S2):S34–40.
[15] Widén SE, Erlandsson SI. Self-reported hearing loss. *Noise Health*. 2004;7(25):1–11.
[16] Punch JL, Elfenbein JL. Hearing loss and music. *J Am Acad Audiol*. 1990;1(1):3–17.
[17] Chung JH, Des Roches CM. MP3 player use. *Pediatrics*. 2005;115(6):e679–86.

[18] Portnuff CD, Fligor BJ. Output levels revisited. *Ear Hear*. 2011;32(6):693–700.
[19] Keppler H, Ingeborg D, Bart V. Risk behavior in young adults. *Int J Audiol*. 2010;49(6):382–90.
[20] Sulaiman AH, Husain R. Hearing risk from PLDs. *J Int Adv Otol*. 2014;10(3):237–42.
[21] Hong SM, Park IS. Mobile phone use and hearing. *Laryngoscope*. 2013;123(1):157–61.
[22] Azevedo MF, et al. Cochlear damage mechanisms. *Braz J Otorhinolaryngol*. 2016;82(3):354–60.
[23] Mehrparvar AH, et al. Noise exposure study. *Int J Occup Med*. 2011;24(2):129–36.
[24] Rawool VW. Hearing conservation. San Diego: Plural; 2012. p.89–102.
[25] Clark WW. NIHL mechanisms. *J Am Med Assoc*. 1991;265(7):929–30.
[26] WHO. Safe listening guidelines. Geneva: WHO; 2015. p.5–18.
[27] Twardella D, et al. Personal listening devices. *Int J Hyg Environ Health*. 2017;220(1):172–8.
[28] Jiang W, Zhao F, Guderley N. Daily noise exposure. *Ear Hear*. 2016;37(4):e221–9.
[29] Kim MG, Hong SM. Smartphone and hearing. *Clin Exp Otorhinolaryngol*. 2018;11(2):134–8.
[30] Lee GJ, Lim MY. Earphone usage patterns. *J Audiol Otol*. 2015;19(2):90–6.
[31] Figueiredo RR, et al. Tinnitus prevalence. *Int Arch Otorhinolaryngol*. 2014;18(2):152–7.
[32] Dobie RA. Medical-legal hearing loss. San Diego: Singular; 2001. p.211–25.
[33] Neitzel R, Seixas N. Noise exposure studies. *Ann Occup Hyg*. 2005;49(7):631–40.
[34] Carter NL. Environmental noise effects. *Environ Health Perspect*. 1996;104(Suppl 2):243–8.
[35] Brookhouser PE. Prevention of hearing loss. *Pediatrics*. 1994;94(6):908–18.