

THE SOUND DILEMMA: INVESTIGATING EAR INFECTIONS AND HEARING LOSS AMONG HEADPHONE USERS

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Abstract

Background: The widespread adoption of personal audio devices, such as headphones and earbuds, has revolutionized the way we consume audio content. However, this technological convenience has brought about a concerning dilemma: the potential impact of prolonged headphone use on ear health. This paper delves into the intricate relationship between headphone usage and its associated risks, focusing specifically on the occurrences of ear infections and hearing loss among headphone users. **Materials and Methods:** It was Cross sectional study, A total of 100 participants were recruited for this study from the Darbhanga Medical College & Hospital during Feb 2023 to June 2023. The participants were selected using a combination of convenience and random sampling methods. Individuals of diverse age groups, genders, and backgrounds were included to ensure a representative sample. A structured questionnaire was designed to gather demographic information, headphone usage patterns, and any history of ear infections or hearing problems. The questionnaire also included questions about the type of headphones used, average daily usage duration, and preferred volume levels. **Results:** A well-balanced age distribution across the 18-40 years range, as well as a near-equal distribution of male and female participants, underscores the study's ability to capture a broad spectrum of headphone users within the population. The prevalence of regular headphone users in our study (70%) reflects the increasing cultural shift towards personal audio consumption. The preferred moderate volume levels (60%) reported by participants indicate a level of awareness regarding responsible listening practices. The positive correlation between usage duration and ear infections ($r = 0.25$, $p = 0.032^*$) introduces a novel aspect to the discourse on headphone-related health outcomes. **Conclusion:** The findings underscore the significance of responsible listening practices and awareness campaigns to mitigate potential risks associated with prolonged headphone use. The demographic diversity of our study sample, encompassing a range of ages and genders, enhances the relevance of our findings to a broader population. The prevalence of regular headphone users, coupled with reported histories of ear infections and hearing problems, emphasizes the need for continuous monitoring of auditory health in individuals who frequently engage with personal audio devices.

INTRODUCTION

In recent decades, the advent of personal audio devices, particularly headphones and earbuds, has revolutionized the way we engage with audio content. These devices offer unprecedented convenience, allowing individuals to immerse themselves in their favorite music, podcasts, and other auditory experiences virtually anywhere and at any time. However, this convenience is not without its potential drawbacks. As headphone usage becomes increasingly pervasive, concerns have arisen regarding the potential impact on ear health,

specifically the occurrence of ear infections and hearing loss among users.^[1-3]

The human ear is a remarkable sensory organ, finely tuned to perceive a wide range of sounds and frequencies. Its delicate structure and intricate mechanisms, however, make it susceptible to various external influences. Prolonged or improper use of headphones can disrupt the delicate balance within the ear and create an environment conducive to the development of infections.^[4] Additionally, the high sound intensity levels achievable through modern headphones can pose a risk to the delicate structures of the inner ear, potentially leading to irreversible hearing loss.^[5]

This paper aims to investigate the intricate relationship between headphone usage and its potential consequences on ear health. By reviewing existing literature and empirical studies, we seek to uncover the factors contributing to the susceptibility of headphone users to ear infections and hearing loss. Through this exploration, we hope to raise awareness among consumers, manufacturers, and healthcare professionals about the need for responsible and informed use of personal audio devices.

MATERIAL & METHOD

It was Cross sectional study, A total of 100 participants were recruited for this study from the Darbhanga Medical College & Hospital during Feb 2023 to June 2023. The participants were selected using a combination of convenience and random sampling methods. Individuals of diverse age groups, genders, and backgrounds were included to ensure a representative sample.

A structured questionnaire was designed to gather demographic information, headphone usage patterns, and any history of ear infections or hearing problems. The questionnaire also included questions about the type of headphones used, average daily usage duration, and preferred volume levels.

- **Physical Examination:** Participants underwent a thorough ear examination conducted by qualified medical professionals. The examination aimed to identify any signs of current or previous ear infections, as well as anatomical variations that could influence susceptibility to infections.
- **Audiometric Testing:** Pure-tone audiometry was performed to assess participants' hearing thresholds across various frequencies. The audiometric tests were carried out in a controlled sound booth, adhering to established standards for accurate and reliable measurements.
- **Sound Level Measurements:** The sound levels produced by commonly used headphone models were measured using a calibrated sound level meter. This measurement provided insights into the potential sound intensity levels reaching the ear canal during headphone usage.

Data Analysis

Descriptive statistics were employed to summarize the demographic characteristics of the study population, including age, gender, and headphone usage patterns. The relationship between headphone usage patterns and the prevalence of ear infections or hearing loss was analyzed using appropriate statistical methods, as chi-square tests. Correlation analyses were conducted to explore potential associations between specific headphone usage behaviors (e.g., duration, volume levels) and the likelihood of developing ear infections or experiencing hearing loss.

RESULTS

Demographic Information

A total of 100 participants were included in the study, with an age distribution ranging from 18 to 40 years. The sample consisted of both male and female participants, ensuring a diverse representation of the population.

Headphone Usage Patterns and History of Ear Health

Participants were asked about their headphone usage patterns, history of ear infections, and hearing problems. The results revealed a range of behaviors and experiences among the study population.

Average Daily Usage Duration and Preferred Volume Levels

Participants were queried about their average daily usage duration of headphones and their preferred volume levels during listening sessions.

Pure-Tone Audiometry

Pure-tone audiometry tests were conducted to assess participants' hearing thresholds across various frequencies. The results indicated variations in hearing sensitivity among the study population.

Correlation Analysis

Correlation analyses were performed to explore potential associations between headphone usage patterns, duration, volume levels, and the prevalence of ear infections or hearing problems. Statistical significance was determined using appropriate tests.

Table 1: Demographic Characteristics of Participants

Age Group	Male Participants	Female Participants
18-25	20	25
26-32	15	18
33-40	12	10
Total	47	43
Statistical inferences		Chi-square-0.6524, P Value- 0.721

Table 2: Headphone Usage Patterns and Ear Health History

Usage Patterns	Participants (%)
Regular Headphone Users	70 (70.0%)
Occasional Headphone Users	30 (30.0%)
History of Ear Infections	15 (15.0%)
History of Hearing Problems	8 (8.0%)

Table 3: Average Daily Usage Duration and Preferred Volume Levels

Usage Duration (hours)	Preferred Volume Level (%)
< 1	20 (20.0%)
1-2	45 (45.0%)
> 2	35 (35.0%)
Low	15 (15.0%)
Moderate	60 (60.0%)
High	25 (25.0%)

Table 4: Pure-Tone Audiometry Results

Frequency (Hz)	Average Hearing Threshold (dB)
250	10
500	15
1000	20
2000	25
4000	30
8000	40

Table 5: Correlation Analysis Results

Variables	Correlation Coefficient (r)	p-value
Usage Duration and Infections	0.25	0.032*
Volume Levels and Hearing Loss	-0.18	0.096
Age and Hearing Thresholds	-0.12	0.223
Variables	Correlation Coefficient (r)	p-value
Usage Duration and Infections	0.25	0.032*
Volume Levels and Hearing Loss	-0.18	0.096

DISCUSSION

Demographic Information

The diverse representation of age and gender in our study sample enhances the generalizability of our findings. A well-balanced age distribution across the 18-40 years range, as well as a near-equal distribution of male and female participants, underscores the study's ability to capture a broad spectrum of headphone users within the population. Similar demographic diversity has been observed in studies focusing on headphone usage and auditory health (Smith et al., 2017; Martinez et al., 2020).^[6,7]

Headphone Usage Patterns and Ear Health

The prevalence of regular headphone users in our study (70%) reflects the increasing cultural shift towards personal audio consumption. Our findings align with a growing body of research that highlights the popularity of headphone usage among individuals seeking immersive auditory experiences (Zogg et al., 2019; Portnuff et al., 2016).^[8,9] The reported history of ear infections (15%) and hearing problems (8%) among participants echoes concerns raised in other studies regarding the potential risks associated with prolonged headphone use (Salthouse & Matthews, 2021; Wu et al., 2018).^[10,11]

Average Daily Usage Duration and Preferred Volume Levels

The preferred moderate volume levels (60%) reported by participants indicate a level of awareness regarding responsible listening practices. These findings resonate with recommendations from health organizations such as the World Health Organization (WHO), which advocates for safe listening levels to prevent noise-induced hearing loss (WHO, 2015).^[12]

However, the substantial percentage of individuals reporting daily headphone usage of 1-2 hours (45%) highlights the need for continued education and awareness campaigns to reinforce safe listening habits.

Pure-Tone Audiometry

The observed variations in hearing thresholds across different frequencies mirror established patterns associated with noise-induced hearing loss. Lower thresholds at lower frequencies and higher thresholds at higher frequencies align with the characteristic notch-shaped audiogram indicative of noise exposure (Niskar et al., 2001).^[13] While our study did not directly assess noise exposure, these audiometric results underscore the potential implications of prolonged and high-volume headphone usage on hearing sensitivity.

Correlation Analysis

The positive correlation between usage duration and ear infections ($r = 0.25$, $p = 0.032^*$) introduces a novel aspect to the discourse on headphone-related health outcomes. This finding suggests a potential link between extended headphone usage and increased susceptibility to ear infections, which warrants further investigation. Similar studies exploring the relationship between listening habits and auditory health have reported correlations between exposure to loud sounds and ear-related issues (Marozeau et al., 2013; Fligor & Cox, 2004).^[2,4]

In contrast, the lack of significant correlation between volume levels and hearing loss ($r = -0.18$, $p = 0.096$) underscores the complexity of factors influencing hearing sensitivity. While volume levels play a crucial role, other variables such as genetic

predisposition, environmental noise exposure, and individual susceptibility contribute to the overall auditory health profile (Le Prell et al., 2017; Morata & Meinke, 2016).^[3,5]

Comparison with Other Studies

Comparisons with existing literature further underscore the significance of our findings. Our study aligns with research emphasizing the importance of safe listening levels (Marozeau et al., 2013), as well as the need for ongoing awareness campaigns regarding responsible headphone usage (Salthouse & Matthews, 2021).^[10] The observed positive correlation between usage duration and ear infections expands upon existing knowledge by suggesting a potential relationship between prolonged headphone use and ear health outcomes.

CONCLUSION

The findings underscore the significance of responsible listening practices and awareness campaigns to mitigate potential risks associated with prolonged headphone use. The demographic diversity of our study sample, encompassing a range of ages and genders, enhances the relevance of our findings to a broader population. The prevalence of regular headphone users, coupled with reported histories of ear infections and hearing problems, emphasizes the need for continuous monitoring of auditory health in individuals who frequently engage with personal audio devices. The study's correlation analysis, revealing a positive association between usage duration and ear infections, presents a novel insight warranting further exploration. This emphasizes the necessity for future research to delve deeper into the mechanisms underlying this relationship and to identify potential preventive measures.

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