

AWARENESS OF HEARING LOSS ASSOCIATED WITH PERSONAL LISTENING DEVICE USAGE AMONG BYARI-SPEAKING UNDERGRADUATE STUDENTS IN KERALA.

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ABSTRACT

Noise-induced hearing loss (NIHL) is a permanent hearing loss (HL) resulting from prolonged exposure to high-intensity sounds. The widespread use of personal listening devices (PLDs) among young adults has increased the risk of unsafe listening habits and hearing-related problems. The present study aimed to evaluate the awareness of NIHL associated with PLD usage among Byari-speaking undergraduate students in Kerala. A total of 45 undergraduate students aged between 18 and 22 years from Kasaragod district participated in the study. A self-developed and validated Yes/No questionnaire was administered to assess listening habits and awareness regarding HL. The findings showed that a majority of participants used PLDs for extended durations and often increased volume levels while listening in noisy environments. Although many participants were aware that loud music exposure could lead to permanent hearing loss and that NIHL is preventable, risky listening behaviours were commonly observed. The overall results suggested a moderate level of awareness regarding NIHL among the participants. The study emphasizes the importance of educational and hearing conservation programs to encourage safer listening practices among young adults. Audiologists play an important role in raising awareness about NIHL, promoting safe listening habits and implementing hearing conservation programs among young adults.

Keywords: Noise-Induced Hearing Loss, Personal Listening Devices, Hearing Awareness, Safe Listening, Undergraduate Students.

INTRODUCTION

Noise-induced Hearing Loss (NIHL) is a permanent form of hearing Loss (HL) caused by prolonged exposure to sound levels above 85 decibels, results in damage to sensory hair cells and irreversible HL (Le Prell & Lobarinas, 2016). NIHL is a type of sensorineural Hearing Loss (SNHL) that occurs after long-term exposure to loud noise. It usually affects both ears, is permanent, and becomes worse with continued noise exposure. It can significantly affect an individual's performance in daily activities and communicate effectively.

Adolescents and young adults are particularly vulnerable to NIHL due to the widespread use of personal listening devices (PLDs), prolonged listening, and a tendency to listen at high volumes. These behaviours increase the risk of auditory damage and highlight the importance of educating young individuals about safe listening practices. PLDs including headphones, earphones, headsets, and AirPods, have become a ubiquitous part of modern life, providing portable and private access to music, videos, online learning, and communication. While they offer convenience and flexibility, their frequent use often at high volumes has raised significant public health concerns due to the risk of NIHL.

Globally, an estimated 0.67-1.35 billion young people are at risk of NIHL due to unsafe listening habits, including excessive PLD use and exposure to loud music (Dillard et al., 2022). The World Health Organisation (WHO, 2019) supports these estimates, stating that over one billion young people worldwide are at risk of hearing damage due to unsafe listening habits, making it a major public health concern. Early high-frequency HL often remains unnoticed because it does not immediately affect speech perception; however, it can progressively impair communication, contribute to tinnitus, and reduce overall auditory performance. Extended exposure to loud audio through PLDs can damage cochlear hair cells, thereby increasing the risk of permanent HL over time.

Variables including device type, listening time, preferred volume levels and overall cumulative exposure are key determinants of risk. Awareness campaigns, educational interventions, and technological innovations in PLDs such as volume limiting and safe listening alerts to mitigate the risk of NIHL among adolescents and young adults.

The popularity of PLDs has led to changes in listening behaviour, with many users especially adolescents and young adults frequently engaging in long-duration, high-volume listening.

The sound levels of PLDs can exceed safe thresholds, some devices can reach output levels of 100–110 dB, can cause irreversible hearing damage with extended exposure. (Portnuff et al,2011). Although modern PLDs now include features such as volume limiting, noise cancellation, and hearing safety alerts, user behaviour remains the key determinant of risk. According to the World Health Organization-International Telecommunication Union [WHO & ITU], (2019) Safe Listening Standard recommends maintaining sound

levels below 80 dB for no more than 40 hours per week, and many smartphones and PLDs now integrate these guidelines through automatic notifications or limits.

Understanding the relationship between PLDs use and NIHL requires a multidisciplinary perspective encompassing audiology, behavioural science, and acoustic engineering. Continued research is essential to establish evidence-based guidelines, improve device safety design, and promote hearing conservation, particularly among young users who constitute the largest demographic of PLD users.

Although NIHL was originally identified as an occupational condition, it is now recognized as a risk in many non-occupational contexts. The WHO estimates that almost one-third of HL cases globally are linked to long-term exposure to harmful noise level. As reported by the U.S. National Institute on Deafness and Other Communication Disorders (NIDCD, 2025) Prolonged exposure to 85dB of sound level or higher can damage the hearing ability, whereas exposure to below 70dB are considered as safe to an extent. As Sound levels increase, the allowable safe listening time decreases. For example, 80 dB sound level exposure is seen as safe for up to 40 hours per week, while exposure to 90 dB sound 4 hours per week to reduce the risk of hearing damage (WHO, 2025).

HL from such exposures may initially manifest in the higher-frequency ranges (above 8 kHz) and may not immediately affect speech frequencies, making early detection difficult without specialized testing. Over time, the damage can extend, interfering with speech comprehension, leading to tinnitus (ringing in the ears), difficulties in noisy environments, and ultimately impacting communication, learning outcomes, mental health, and quality of life (QoL).

Singh et al. (2020) conducted a study among Indian college students, where nearly half listened to loud or very loud music for over an hour daily, and few had any awareness of safe-listening practices. These studies highlight a general lack of knowledge about safe auditory habits among frequent PLD users.

Alzhrani et al. (2020) conducted a cross-sectional survey with 739 participants from different regions of Saudi Arabia to examine community awareness, attitudes, and practices regarding NIHL linked to PLDs. Results showed that around 75% of participants were aware of the risks of NIHL and also choose to lower the device volume as a preventive way, about 25% reported mild-to-severe hearing problems. These issues were more prevalent among male participants and those who regularly listened at volumes above 80%. The main risk factors identified included the frequency of listening sessions, device volume, and duration of each session. The findings also highlighted a notable gap between knowledge and behavior, showing that despite awareness of NIHL, many individuals continue to engage in unsafe listening practices. This underscores the need for focused public health strategies, educational initiatives, and guidelines to encourage safe listening behaviors, particularly among young adults who frequently use PLDs.

AlQahtani et al. (2021) conducted a cross-sectional study in the Hail region Saudi Arabia involving 1,086 participants aged 18–55 years to assess awareness of NIHL due the usage of PLD: headphone. The study found low awareness about HL, and more than half of the participants had unhealthy listening habits. Hearing

problems were more common among those exposed to workplace noise, those who listened for more than five hours daily, and those who used very high-volume levels. The main risk factors were older age, high volume, and long listening duration. The study emphasized the need to improve awareness and encourage safer listening practices to prevent NIHL.

Dehankar and Gaurkar (2022) analysed existing studies on the effects of long-term PLDs use on hearing and its link to NIHL. Their review found that increased use of personal music players and headphones, especially at high volume levels, has raised the risk of NIHL, particularly among children and adolescents. Drawing on evidence from 23 international studies, the authors emphasized that recreational use of audio devices can negatively affect hearing health and highlighted the need for improved safety regulations, safer device design, and further research in this area.

Gajendran et al. (2024) found that high prevalence of PLD misuse among medical students is a major risk factor for NIHL. The study concluded that PLD misuse in young adults is contributing to measurable cochlear damage, supporting the need for campus-based awareness programs and routine high-frequency audiometry in this population.

Alenzi et al. (2024) did a cross-sectional study in Al Jouf Region, Northern Saudi Arabia, to assess awareness of NIHL and its relationship to PLD: headphone use among the general population. The study found limited knowledge about NIHL, with many participants unsure about its causes, safe noise levels, and the duration of exposure that can damage hearing. Although, over half recognized that NIHL is preventable, gaps in understanding were common. Many participants frequently used earphones for 1-2 hours daily, and a considerable number reported that others were affected by the noise from their devices. Despite these unhealthy practices, most respondents expressed willingness to adopt safer listening behaviors, including using volume-limiting features, if informed about the harmful effects of loud noise.

Shah, Vishak and Raja (2024) investigated the awareness of NIHL and unsafe listening practices among undergraduate medical students in South India. The study aimed to assess the knowledge, attitude, and practice regarding NIHL associated with the use of PLDs. A descriptive survey was conducted among 224 medical students using an electronic questionnaire distributed through WhatsApp. The findings revealed that 87.1% of participants were regular PLD users, with earbuds being the most commonly used device. The participants demonstrated fair knowledge regarding NIHL (54.5%) and a good attitude toward hearing conservation (61.8%). However, misconceptions were observed, particularly regarding the reversibility of NIHL. Most students preferred listening at higher volume levels, indicating unsafe listening habits.

De Alwis and Thuduvage (2025) studied awareness of NIHL due to the usage of PLD: headphone among medical students at University Hospital KDU in Sri Lanka. The study revealed that many students had poor knowledge about NIHL, even though most understood that loud noise can cause permanent HL. While many believed HL is preventable and affects communication, unsafe headphone listening habits were common. Most

students had not received formal education on NIHL, highlighting the need for educational programs to improve awareness and promote safer listening practices.

Selvarajan et al. (2025) conducted a cross-sectional study on 139 medical students to assess awareness and practices related to NIHL and associated with the use of PLDs: headphone. Most students preferred earphones and frequently used PLDs, with many listening at moderate-to-high volumes for more than 2 hours per day. While most recognized the risks of loud noise and believed NIHL is preventable, unsafe listening habits were common, and some students lacked knowledge about harmful noise thresholds. Symptoms such as tinnitus and difficulty following conversations were reported. The study highlights that awareness alone does not always lead to safe listening, emphasizing the need for educational programs and preventive strategies to protect hearing health.

Uka-Kalu, Uwazie and Elekeh (2025) studied undergraduate students at Abia State University in Nigeria, to assess awareness of health risks from prolonged usage of PLDs: earphones. They found moderate awareness (63%) and some preventive measures like lowering volume and taking breaks. Common issues included ear pain, headaches, and tinnitus. Awareness and health problems were linked to gender, frequency, and duration of use. Despite knowing the risks, preventive behaviors were inconsistent.

Ambuli et al (2025) conducted a study in Chennai in India, to explore awareness of risks from continues use of PLDs: Bluetooth headphones. Using a survey of 102 students, the study examined preferences for headphone types and brands, duration of use, and related health effects. Results showed that gender influenced headphone type preference and brand choice was linked to price willingness. Prolonged use was associated with health issues such as buzzing in the ears, dizziness, and increased earwax. The study highlights the need for awareness of potential auditory risks from extended Bluetooth headphone use.

Mokhatrish et al. (2025) assessed awareness of NIHL and PLD use among adults in Saudi Arabia. The study found moderate awareness of NIHL, but limited knowledge about its early signs and prevention. High-volume listening habits were associated with increased hearing loss risk, highlighting the need for better hearing conservation awareness.

Srikumar, Iram and Edwin (2026) conducted a cross-sectional study of 406 IT professionals in India to examine PLD use and awareness of hearing health. Most participants frequently used PLDs, with nearly a third listening five or more hours daily and about a quarter using high volumes. Men tended to use higher volumes than women, and awareness of safe listening levels and NIHL varied by age. The study found high-risk listening behaviors and gaps in hearing health knowledge, highlighting the need for targeted workplace wellness programs to promote safer listening practices.

Audiologists play an important role in the prevention and early identification of NIHL. They educate individuals about the risks of excessive noise exposure and unsafe PLD usage, promote safe listening practices and conduct hearing assessments for early detection of hearing problems. Through hearing conservation

programs, awareness campaigns and counselling, audiologists help protect hearing health and reduce the risk of preventable hearing loss, particularly among adolescents and young adults.

NEED OF THE STUDY

The use of PLDs, become increasingly prevalent among undergraduate students for purposes including entertainment, communication, and education. Frequent and prolonged listening at high volumes can lead to NIHL, a largely preventable but irreversible form of hearing impairment.

There is a lack of research examining the awareness, usage habits, and knowledge of undergraduate students, particularly among the Byari-speaking population in Kerala regarding the potential auditory risks associated with PLDs. Assessing students' awareness of HL, their listening behaviors, and their understanding of the relationship between PLD use and hearing damage is crucial to identify knowledge gaps and inform targeted educational interventions. The current study aims to understand where knowledge gaps exist regarding NIHL due to the usage of PLDs. Addressing these gaps through well-targeted awareness programs can help reduce the incidence of NIHL and encourage healthier hearing practices in various age groups.

METHOD

Aim of the study:

The aim of this study is to assess the level of awareness regarding NIHL due to the usage of PLDs among UG-Byari-speaking students in Kerala using a self-developed yes/no questionnaire.

Participants: A total of 45 Byari-speaking students aged 18 to 22 years were randomly selected from Kasaragod district, Kerala.

Inclusion criteria:

- The age group of 18 to 22 years.
- College students in various colleges in Kasaragod district, Kerala.
- Proficient in English.

Exclusion criteria:

- Working professionals were excluded.
- Known history of HL, ear diseases, or exposure to occupational noise
- College students of other districts in Kerala.

The research was conducted in two phases:

Phase 1: A self-developed 10 close-ended Yes/No questionnaire was developed and validated by five Audiologists.

Phase 2: The questionnaire was given to 45 UG Byari-speaking students in various colleges in Kasaragod district of Kerala.

Statistical analysis:

Responses were collected and later analysed using SPSS version 26 software. The obtained data was further statistically analysed for significant differences using Binomial test.

RESULTS AND DISCUSSION

The present study aims to assess individuals’ awareness of NIHL associated with PLD usage.

Table 1: Shows the frequency, percentage and significance regarding the awareness of NIHL due to the usage of PLDs.

	No		Yes		Binomial Test	
	Count	%	Count	%	p	Significance
1. Do you use personal listening devices (such as earphones, ear buds or headphones) for more than 1 hour daily?	12	0.27	33	0.73	0.002	HS
2. Do you frequently use personal listening devices in noisy environments and increase volume to block background noise?	14	0.31	31	0.69	0.016	S
3. Are you aware that loud music on personal listening devices can cause permanent hearing damage?	19	0.42	26	0.58	0.371	NS
4. Do you know that listening at high volumes for long durations increases the risk of hearing loss, even if it feels comfortable at the time?	21	0.47	24	0.53	0.766	NS
5. Do you take regular breaks from listening (for example, 5–10 minutes every hour) when using personal listening devices?	25	0.56	20	0.44	0.551	NS
6. Do you know that Hearing loss from personal listening devices is preventable with safe listening habits?	20	0.44	25	0.56	0.551	NS
7. Do you think your current listening habits are at moderate/high risk for hearing loss?	27	0.60	18	0.40	0.233	NS
8. Have you noticed ringing in the ears (tinnitus), ear fullness, or muffled hearing after long listening session?	25	0.56	20	0.44	0.551	NS
9. If you noticed early signs of hearing difficulty (e.g., ringing in the ears, trouble understanding speech), would you seek an evaluation from an audiologist or hearing health professional?	17	0.38	28	0.62	0.135	NS
10. Have you received any information or education regarding safe listening habits?	27	0.60	18	0.40	0.233	NS

HS-Highly Significant, S-Significant, NS- Not Significant

Figure 1: Shows the percentage of NIHL regarding the awareness of NIHL due to the usage of PLDs.

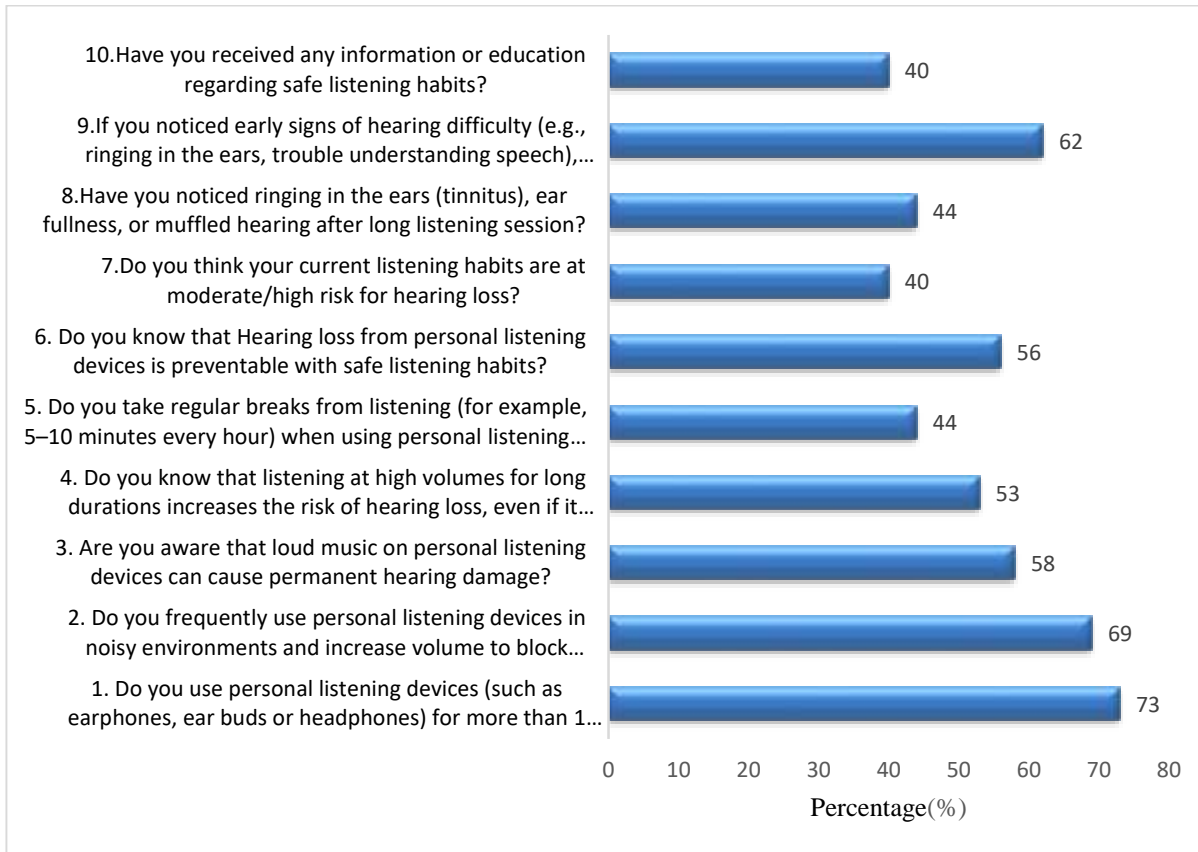


Table 1 and Figure 1 present the responses and percentage distribution related to listening habits and awareness of NIHL among PLD users. A highly significant difference was observed for Question 1, indicating that a significantly greater proportion of participants reported using PLDs for more than one hour daily. Question 2 showed a significant difference, suggesting that many participants frequently used PLDs in noisy environments and increased the volume to mask background noise.

Specifically, 73% of participants reported using earphones or headphones for more than one hour per day, while 69% reported increasing the volume when listening in noisy surroundings. More than half of the participants were aware that loud music and prolonged exposure to high-volume listening can result in HL and 56% recognised that such HL is preventable through safe listening practices. However, only 44% reported taking regular listening breaks while using PLDs. Additionally, 44% experienced symptoms such as tinnitus, ear fullness or muffled hearing following extended listening sessions. Encouragingly, 62% indicated that they would seek professional evaluation if they noticed signs of hearing difficulty.

Overall, the findings suggest a moderate level of awareness regarding NIHL among participants. Despite having some knowledge of the risks associated with PLD use, unsafe listening behaviours remain prevalent, highlighting the need for increased education and awareness regarding safe listening practices.

Figure 2: Presents the overall level of awareness about NIHL associated with personal listening device usage.

Overall Awareness Regarding Hearing Loss Associated with Personal Listening Device Usage Among Participants

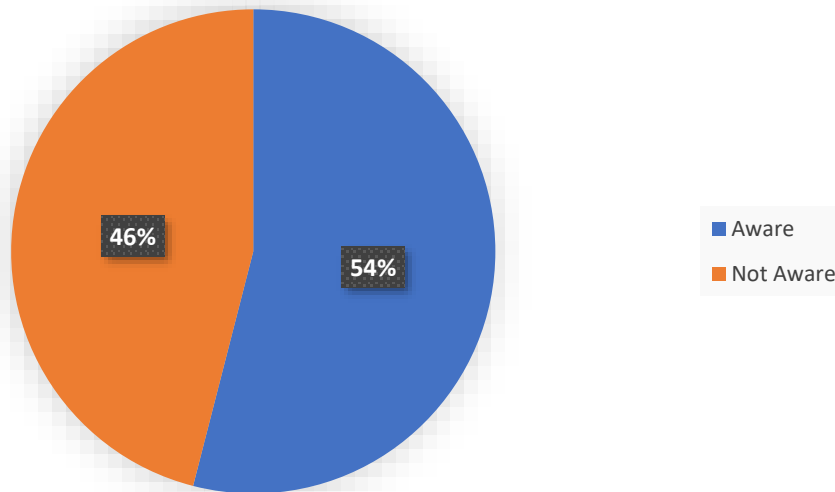


Figure 2 shows that 54% of participants were aware of NIHL, while 46% were not aware. Overall, the findings suggest a moderate level of awareness among the participants.

DISCUSSION

The present study assessed the awareness of noise-induced hearing loss (NIHL) associated with personal listening device (PLD) usage among Byari-speaking undergraduate students in Kerala. The findings revealed a moderate level of awareness regarding the harmful effects of loud music and prolonged PLD use, although unsafe listening practices such as prolonged usage and increasing volume in noisy environments were common. More than half of the participants were aware that loud music can cause permanent hearing damage and that NIHL is preventable with safe listening habits. However, only a few participants practiced preventive measures such as taking regular listening breaks. The findings of the present study correlate with the study by Mokhatrish et al. (2025), which also reported moderate awareness regarding NIHL among PLD users in Saudi Arabia, despite the persistence of unsafe listening behaviors. Overall, the study highlights the need for awareness programs and hearing conservation strategies to promote safe listening habits among young adults.

SUMMARY AND CONCLUSION

NIHL is a preventable but permanent hearing impairment caused by prolonged exposure to loud sounds, with PLDs being a major risk factor among young adults. The present study aimed to assess awareness of NIHL associated with PLD usage among Byari-speaking undergraduate students in Kerala. A total of 45 students aged 18-22 years participated in the study using a self-developed and validated 10-item Yes/No questionnaire. The results revealed moderate awareness regarding NIHL as many participants were aware that loud music and prolonged high-volume listening can damage hearing. However, unsafe listening practices such as long-

duration PLD use and increasing volume in noisy environments were common. Some participants also reported symptoms such as tinnitus and muffled hearing after listening sessions. The findings are similar to those reported by Mokhatrish et al. (2025), indicating moderate awareness despite risky listening behaviours. Overall, the study highlights the need for hearing conservation programs and awareness initiatives to promote safe listening habits among young adults.

Limitations of the study

- Limited sample size
- Study was conducted only in Kasargod districts of Kerala

Future Directions

- Include a larger sample size.
- Study can be expanded to other districts and states.
- Include audiological assessments along with questionnaires.

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