



Attitudes toward noise, perceived hearing symptoms, and reported use of earphones among Amran University students in Yemen

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Abstract

Background: Noise exposure is recognized as a significant risk factor for hearing loss. Understanding the relationship between noise exposures and hearing impairment is crucial for developing effective preventive measures. **Objectives:** The present study aimed to explore the attitudes towards noise, perceived hearing symptoms, and the reported use of earphones among students at Amran University. **Methods:** A survey-based approach was used to collect data from participants. A structured questionnaire assessed demographic information, noise exposure risk factors, and associated symptoms. Descriptive statistics were employed to analyze the data and examine the prevalence of noise exposure and related symptoms. **Results:** The study surveyed 400 individuals aged 19 to 34 (mean age 22.99, SD 2.59). Among the participants, 74.3% did not exhibit hearing impairments, while approximately 45% reported a family history of hearing impairments. Significant risk factors for noise-induced hearing loss included work-related noise exposure (64.5%), earphone usage (62.5%), and frequent exposure to loud noise (≥ 10 sessions weekly; 22.5%). Additionally, a substantial number of participants reported experiencing tinnitus (70.5%), occasional complaints about speaking too loudly (39%), and the need to raise the volume of the television or radio occasionally (70.7%). **Conclusions:** The findings of this study align with previous research on the association between noise exposure and hearing loss. The high prevalence of associated symptoms, such as tinnitus and complaints about speaking too loudly, further emphasizes the potential impact of noise exposure on auditory health. These findings highlight the necessity of implementing preventive strategies to reduce noise exposure and promote hearing health.

Keywords: Noise Exposure, Hearing Loss, Noise-Induced Hearing Loss, Risk Factors, Tinnitus, Preventive Measures, Yemen.

المخلص: الخلفية: تم تحديد التعرض للضوضاء كعامل خطر كبير لفقدان السمع. إن فهم العلاقة بين التعرض للضوضاء وضعف السمع أمر ضروري لتطوير تدابير وقائية فعالة. **الأهداف:** هدفت الدراسة الحالية إلى استكشاف المواقف تجاه الضوضاء وأعراض السمع المتصورة والاستخدام المبلغ عنه لساعات الأذن بين طلاب جامعة عمران. **الطرق والمنهجية:** تم استخدام نهج قائم على المسح لجمع البيانات من المشاركين. تم تقييم المعلومات الديموغرافية وعوامل خطر التعرض للضوضاء والأعراض المرتبطة بها باستخدام استبيان منظم. تم استخدام الإحصاءات الوصفية لتحليل البيانات وفحص انتشار التعرض للضوضاء والأعراض المرتبطة بها. **النتائج:** استطلعت الدراسة 400 طالب تتراوح أعمارهم بين 19 و34 عامًا (متوسط العمر 22.99 انحراف معياري 2.59). من بين المشاركين، لم يُظهر 74.3% ضعفًا في السمع، بينما أفاد حوالي 45% بوجود تاريخ عائلي لضعف السمع. تم تحديد التعرض للضوضاء المرتبطة بالعمل (64.5%)، واستخدام سماعات الأذن (62.5%)، والتعرض المتكرر لجلسات الضوضاء الصاخبة (≤ 10 جلسات أسبوعيًا؛ 22.5%) كعوامل خطر كبيرة لفقدان السمع الناتج عن الضوضاء. علاوة على ذلك، أفاد عدد كبير من الأفراد أنهم يعانون من طنين الأذن (70.5%)، وشكاوى عرضية حول التحدث بصوت عالٍ جدًا (39%)، والحاجة إلى رفع مستوى صوت التلفزيون أو الراديو من حين لآخر (70.7%). **الاستنتاجات:** تدعم نتائج هذه الدراسة الأبحاث السابقة حول العلاقة بين التعرض للضوضاء وفقدان السمع. إن الانتشار العالي للأعراض المصاحبة، مثل طنين الأذن

والشكاوى حول التحدث بصوت عالٍ جدًا، يؤكد بشكل أكبر على التأثير المحتمل للتعرض للضوضاء على صحة السمع. تسلط هذه النتائج الضوء على أهمية تنفيذ استراتيجيات وقائية للحد من التعرض للضوضاء وتعزيز صحة السمع.

Introduction:

Noise exposure is a prevalent environmental hazard that poses a significant risk to auditory health. Prolonged or excessive exposure to noise has been recognized as a leading cause of hearing loss worldwide. Noise-induced hearing loss (NIHL) is a preventable yet persistent public health concern that can have profound consequences on an individual's quality of life [1,2]. Understanding the relationship between noise exposure and hearing impairment is crucial for implementing effective preventive strategies and interventions.

Numerous studies have investigated the relationship between noise exposure and hearing loss, highlighting various risk factors that contribute to the development and progression of NIHL. Occupational noise exposure is a well-established risk factor, particularly in industries such as manufacturing, construction, and transportation [3,16]. Additionally, recreational activities involving the use of personal listening devices, such as earphones and headphones, have gained attention as potential contributors to hearing loss, especially among younger populations [4].

In recent years, the widespread use of headphones and earphones has become increasingly prevalent in our daily lives. These devices have revolutionized the way we listen to music, watch movies, and communicate, providing us with convenience and immersive audio experiences. However, the growing popularity of personal audio devices has raised concerns about the potential impact on our hearing health, specifically, about noise-induced hearing loss [1,4,5]. While previous research has provided valuable insights into the impact of noise exposure on hearing health, there is a lack of awareness among the general population regarding the relationship between headphone and earphone use and the development of noise-induced hearing loss [6]. Moreover, data regarding prevalence of hearing loss and awareness of Yemeni people towards NIHL and hearing protection is lacking [7,8]. Therefore, the present study **aimed** to explore the attitudes toward noise perceived hearing symptoms, and reported use of earphones among Amran University students. By assessing various risk factors, including occupational noise exposure, recreational noise exposure through the use of earphones, and associated symptoms such as tinnitus, also the study attempted to shed light on the impact of noise on auditory health and the rising danger facing Yemeni adults. Carrying out such aims will help healthcare professionals, policymakers, and individuals themselves to be better equipped to implement preventive measures, promote awareness, and encourage behavioral changes to protect hearing health.

Materials and Methods:

In October 2023, a survey-based cross-sectional study (i.e. collecting data from a population at a single point in time) [9] was conducted at Amran University by distributing an online questionnaire on social media platforms. The survey aimed to collect data on the study from its participants' responses, as a sample, according to different variables: demographics, history of hearing loss, risk factors, beliefs, and knowledge about noise-induced hearing loss (NIHL), as well as to assess awareness of NIHL from personal listening devices among the university students.

The sample size was decided by using a Raosoft calculator to be 377 subjects, with a confidence interval of 95% and a level of significance (P-value) of 5%. The survey used a validated version of a self-administered questionnaire [10]. Participants from Amran University, who were 19 years old or older and agreed to participate in the survey, were involved. The questionnaire was completed randomly by 400 students.

The questionnaire consisted of 37 items distributed into six categories: personal data, medical history, utilization of personal listening devices (PLDs), symptoms of hearing impairment, knowledge and beliefs regarding NIHL, and the protective measures to stop NIHL.

The data retrieved from the website were imported into an Excel spreadsheet, and all statistics were performed using the Statistical Package for the Social Sciences 26.0 for Windows software package (SPSS 26.0). Categorical variables were represented as frequency (percentage) comprising participants' demographic data, history of hearing problems, risk factors, knowledge, beliefs, and practices related to hearing problems. Only those who agreed to the informed consent answered the anonymous questionnaire. The study was conducted following ethical guidelines and was approved by the Ethical Committee of our department.

Results:

The study surveyed 400 individuals, their age range was between 19 and 34 (mean 22.99 ± 2.59), with the majority being males (74.8%), under 30 years old (99%), and (72.3 %) were medical students. The majority of participants were also nonsmokers (95.5%) and had no chronic diseases (99.3%). Of the participants, 74.3% did not exhibit hearing impairments, but a family history of hearing impairments was described by about 45% (Table 1).

Table 1 Demographic Data

N	Demographic data	Response	No	%
1	Age in years	≤20	68	17
		21-25	273	68.25
		26-30	55	13.75
		>30	4	1
2	Gender	Male	299	74.75
		Female	101	25.25
3	Specialty	Medical student	289	72.25
		Nursing	32	8
		Laboratory	28	7
		Pharmacy	41	10.25
		Midwife	6	1.5
		Engineering	4	1
3	Education level	First	46	11.5
		Second	86	21.5
		Third	87	21.75
		Fourth	83	20.75
		Fifth	65	16.25
		Sixth	33	8.25
5	Smoking	Yes	18	4.5
		No	382	95.5
6	Chronic health problems	None	397	99.25
		DM	1	0.25
		HTN	2	0.5
		Cardiac	3	0.75
7	Do you have Hearing Loss	Yes	103	25.75
		No	297	74.25
8	Family history of hearing problems	Yes	180	45
		No	220	55

The study found that exposure to risk factors for NIHL involved work-related noise (64.5%), choice of using earphones (62.5%), and a high frequency of sessions (6 to ≥ 10 ; 16%) where the individual was exposed to a loud noise sound. 22.5 percent of the study participants engaged in more than 10 sessions weekly (Table 2).

Table 2 Frequency of exposure to Risk factors related to noise-induced hearing loss

N	Risk factors related to noise-induced hearing loss	Response	No	%
1	Expose to noise in a work setting or environment	Yes	258	64.5
		No	142	35.5
2	Preferred type of audio device	Earphones	250	62.5
		External PADs	110	27.5
		Car PADs	3	0.8
		Headphones	37	9.3
3	Number of hearing sessions per week	Never	58	14.5
		1–5	188	47
		6–9	64	16
		10+	90	22.5
4	Duration of the listening session/per day (h)	<1	114	28.5
		1–2	150	37.5
		3–5	98	24.5
		> 5	38	9.5
5	How often are the people surrounding me affected by the noise from my PAD?	Never	188	47
		Sometimes	170	42.5
		Usually	35	8.8
		Always	7	1.8
6	Typical level of volume used (%)	0–49	90	22.5
		50–59	119	29.8
		60–69	79	19.8
		70–79	49	12.3
		80–89	26	6.5
		90–100	37	9.3

A considerable number of the individuals in this study also suffered from tinnitus (70.5%), whereas others described that people occasionally complained that they spoke too noisily (39%). Others reported the occasional need to raise the sound of the television or radio (70.7%). (Table 3).

Table 3 Frequency of Signs and Symptoms

N	Signs and symptoms	Response	No	%
1	Ringing in the ears	Never	118	29.5
		Sometimes	213	53.25
		Usually	49	12.25
		Always	20	5
2	People said I talk loud	Never	244	61
		Sometimes	109	27.25
		Usually	32	8
		Always	15	3.75
3	I tend to ask “What?” repeatedly in a conversation	Never	108	27
		Sometimes	217	54.25
		Usually	54	13.5
		Always	21	5.25
4	Increasing the volume of the TV or radio is something I do	Never	117	29.25
		Sometimes	156	39
		Usually	96	24
		Always	31	7.75
5	Time I need to adapt to surrounding environmental sound when exposed to loudness (h)	None	103	25.75
		1 h	262	65.5
		5 hs	24	6
		10 hs	5	1.25
		15 hs	6	1.5

Table 4 displays the participants' beliefs and knowledge about NIHL. 82.5% of the participants agreed that high volume levels affect hearing, 82.25% agreed that their living or working environment affects their hearing, and 42% agreed that hearing impairment could worsen with loud sound exposure. Additionally, 18% reported early signs of hearing impairment through low/muffled voices during daily conversations. Moreover, 36.5% knew that ringing in the ear is a sign of hearing impairment, 64% knew that frequent TV or radio volume increase indicates a sign of hearing impairment, and 85.25% knew that NIHL is preventable. Only 33% of participants believed they had enough information about the dangers of loud noises and their impact on hearing ability. Regarding the duration of exposure to loud noises, 30.25% of participants selected 30 minutes, while 13% selected one hour. Additionally, 14% reported that volume levels below 60% could negatively affect hearing, and 9.75% reported it as 20-40% (Table 4).

Table 4 Distribution of beliefs and knowledge about noise-induced hearing loss

N	Beliefs and knowledge about noise-induced hearing loss	Responses	No	%
1	Do high volume levels affect hearing?	Yes	330	82.5
		No	16	4
		Don't know	54	13.5
2	Does living or working in a noisy environment affect hearing?	Yes	329	82.25
		No	32	8
		Don't know	39	9.75
3	Hearing impairment could get worse by listening to loud sound	Yes	172	43
		No	77	19.25
		Don't know	151	37.75
4	Does the hearing of low/muffled voices during daily conversation indicate the early signs of hearing impairment?	Yes	72	18
		No	173	43.25
		Don't know	155	38.75
5	Is the sensation of ringing in the ear a sign of a hearing impairment?	Yes	146	36.5
		No	92	23
		Don't know	162	40.5
6	Does the frequent increase in TV or radio volume indicate a sign of hearing impairment?	Yes	256	64
		No	87	21.75
		Don't know	57	14.25
7	Are noise-induced hearing problems preventable?	Yes	341	85.25
		No	10	2.5
		Don't know	49	12.25
8	Do I currently have enough information concerning the danger posed by exposure to loud noise(s) on hearing ability?	Yes	132	33
		No	195	48.75
		Don't know	73	18.25
9	The minimum duration of listening to a loud noise source that could negatively affect one's hearing is	30 min	90	22.5
		1 h	52	13
		1 and a half h	31	7.75
		2 hours or more	60	15
		Don't know	167	41.75
10	The minimum volume level that could negatively affect hearing is	20-40	39	9.75
		41-60	56	14
		61-80	87	21.75
		81-90	55	13.75
		91-100	33	8.25
		Don't know	130	32.5

Regarding the distribution of practices and attitudes toward NIHL, the most reported source of information about NIHL was social media (42.75%). 72% of the participants preferred to decrease the volume of the device over the total time of listening, and 82.5% recommended that the factory should install a voice-limiting feature on PADs. Additionally, 51.5% of participants reported sometimes changing their behavior due to evidence suggesting loud noise affects hearing, and 31% reported usually doing so. Furthermore, 56.5% sometimes preferred using a program to limit sound levels for themselves and their family, while 20.5% stated that they usually do so (Table 5).

Table 5 Distribution of practices and attitudes toward noise-induced hearing loss

N	Practices and attitudes toward noise-induced hearing loss	Responses	No	%
1	Typically accessed source of information about NIHL	Social media	171	42.75
		Hospitals	69	17.25
		Educational campaigns	117	29.25
		Schools and environment	24	6
		Mass media	13	3.25
		Commercial centers	6	1.5
2	Do I prefer to decrease the volume of my device over the total time of listening?	Yes	288	72
		No	112	28
3	I recommend that the factory should install a voice-limiting feature on my PAD (personal listening device)	Yes	330	82.5
		No	60	15
		Don't know	10	2.5
4	I'm ready to change my behavior if I hear/see evidence that suggests that loud noise/sound levels affect hearing.	Never	0	0
		Sometimes	70	17.5
		Usually	124	31
		Always	206	51.5
5	I recommend putting warning indicators on audio devices to limit volume levels	Yes	391	97.75
		No	9	2.25
6	I prefer using a program to limit sound levels for me and my family	Never	33	8.25
		Sometimes	59	14.75
		Usually	82	20.5
		Always	226	56.5

Discussion:

To evaluate the Attitudes toward noise, perceived hearing symptoms, and reported use of earphones among college students, 400 students responded to the study questionnaire. The majority (74.8%) were males and (99%) were under 30 years old. Medical students were (72.3%) which reflects a higher awareness of the importance of participation. Most participants were nonsmokers (95.5%) and had no chronic diseases (99.3%). Among the participants, 25.75% exhibited hearing impairments, but 45% reported a family history of hearing impairments (Table 1). This differs from a study in Saudi Arabia where 22.1% exhibited hearing problems and 51.8% reported a family history of hearing problems [11] and also, our previous study where 15.8 % reported hearing problems and 41.2 % had

relatives with hearing impairment [8]. The findings of the study highlight several key areas of concern and opportunities for targeted interventions to raise awareness and promote preventive behaviors.

In terms of exposure to risk factors for noise-induced hearing loss, (Table 2), illustrates that the result revealed that; 64.5% of participants were exposed to work-related noise which has been established as a cause of hearing loss. Furthermore, Agrawal et al. (2017) found that occupational noise exposure was a significant risk factor for hearing loss, with 23.5% of participants experiencing hearing loss due to occupational noise exposure [12]. This high percentage of reported exposure in our study is higher than in some previous studies where it was 29.4% [10] and 40.4% [11]. The use of personal audio devices is associated with an increased risk of hearing loss [13,14]. In our study, 62.5% reported using earphones. This result goes with previous studies in Saudi Arabia where 60.5% [10] and 63.5% [11] of them use earphones. In this context, 16% of our participants were exposed to a loud noise sound in 6 to 10 sessions compared to 22.9% [10] and 13% [11] in previous studies in other countries. Furthermore, 22.5% of the participants engaged in more than 10 sessions of loud noise exposure on a weekly basis compared to 24.4% [10] and 49.2 % [11]. In our study, more than 60% of participants use earphones while most of them have no idea about listening safe initiatives as shown in a previous study [8]. The high prevalence of NIHL risk factors, such as work-related noise exposure and frequent use of personal audio devices, suggests the need for targeted interventions and policies to address these issues. Workplace safety regulations, mandatory hearing protection programs, and public awareness campaigns could play a crucial role in reducing the incidence of NIHL.

Regarding the prevalence of associated symptoms, a significant number of participants in the study reported suffering from tinnitus (70.5%). Noise-induced tinnitus can result from long-term continuous noise exposure or a single or repeated sudden loud noise causing acoustic trauma [15]. Although (25.75%) of participants reported hearing loss, the majority had tinnitus which is a cardinal symptom of noise exposure. This is higher than findings of other studies as Johnson and Brown (2019) [4] where the prevalence of tinnitus in their study was 62% and (68%) in Smith et al. (2018) study [3]. Interestingly two more symptoms were reported by the majority namely, they tend to ask "What?" repeatedly in a conversation 73% and 70.7% reported occasionally needing to raise the volume of their television or radio. These results are also higher than previous studies [10,11]. These findings may be attributed to higher exposure to noise (bombing during airplanes and missile attacks on Yemen). The early detection and management of these issues could be crucial in preventing the progression of NIHL and its associated consequences. Healthcare professionals, including primary care providers, audiologists, and general practitioners, should also play a more active role in NIHL prevention and management. Regular hearing screenings, counseling on safe listening practices, and referrals to specialized services could help to identify and address NIHL at earlier stages, potentially mitigating the long-term consequences of the condition.

Regarding knowledge and beliefs, the study revealed both positive and concerning findings. A majority of participants (82.5%) acknowledged that exposure to high volume levels can affect hearing, and a similar proportion (82.25%) recognized that living or working in noisy environments affects hearing health [16]. This awareness is an important foundation for promoting preventive behaviors. However, only 42% of participants believed that listening to loud sounds could worsen existing hearing impairment, and less than a third (23.8%) correctly identified the minimum duration of 30 minutes as potentially damaging to hearing when exposed to high noise while 18.2% selected it as 1 h which is lower than other studies [10,17]. These knowledge gaps suggest that more

comprehensive education and awareness campaigns are needed to ensure a better understanding of the mechanisms and timescales by which NIHL can develop.

The participants' recognition of early warning signs of hearing loss, such as low/muffled voices (18%) and ringing in the ears (36.5%), was also relatively low. This lack of awareness could lead to delayed diagnosis and management of NIHL [18], allowing the condition to progress unchecked. Interestingly, a majority of participants (64%) did associate increased television or radio volume with hearing impairment, highlighting the potential for using familiar behaviors as cues for self-monitoring and early intervention [19]. Additionally, the study found that only 33% of participants felt they had enough information about the dangers of exposure to loud noises and its impact on hearing ability. This finding suggests a pressing need for more comprehensive and accessible educational resources to empower individuals to make informed decisions and take preventive measures [20]. Incorporating NIHL prevention into medical and allied health curricula, as well as developing interactive, multimedia-based educational resources, could help to address the knowledge gaps identified in this study.

Regarding practices and attitudes, the study revealed some positive trends, but also areas for improvement. The most commonly reported sources of information on NIHL were social media (42.75%) and educational campaigns (29.25%), indicating the potential effectiveness of these channels in reaching the target population [21]. However, the relatively low proportion of participants who reported receiving information from healthcare providers (17.25%) suggests that the medical community could play a more active role in NIHL prevention and management. The study also found that a majority of participants (72%) preferred to decrease the volume of their personal audio devices rather than reduce the duration of use, and 82.5% recommended that manufacturers install volume-limiting features on these devices [22]. These findings are encouraging, as they suggest a willingness to adopt preventive behaviors and leverage technological solutions to mitigate NIHL risks.

However, the study also revealed that only 51.5% of participants were always willing to change their behavior in response to evidence about the dangers of loud noise exposure, and just 56.5% always used sound-limiting programs for themselves and their families [23]. These findings highlight the need for more effective strategies to motivate and empower individuals to take active steps to protect their hearing health. The observed variation in beliefs about the minimum duration (30 minutes vs. 1 hour) and volume levels (41-60% vs. 20-40%) that can negatively impact hearing further underscores the importance of providing clear, evidence-based guidelines and educational resources to the public [19]. Inconsistent or incomplete knowledge in this area may lead to suboptimal preventive behaviors and a false sense of security among individuals who underestimate the risks of NIHL [24]. Finally, the study's findings suggest the need for better coordination and integration of NIHL-related information and resources across various platforms, including social media, educational campaigns, and healthcare settings. By leveraging multiple communication channels and engaging diverse stakeholders, public health efforts can more effectively reach and empower individuals to take proactive steps to protect their hearing health.

Limitations:

This study is not without limitations. The cross-sectional design limits our ability to establish causal relationships between reported behaviors and actual hearing damage. Additionally, the self-reported nature of the data is susceptible to recall and social desirability bias. Furthermore, the specific population studied limits the generalizability of the findings.

Conclusions:

In conclusion, this study addresses the existing knowledge gap and supports previous research on the association between noise exposure and hearing loss. The high prevalence of NIHL risk factors exposure, coupled with knowledge gaps and inconsistent preventive behaviors, underscores the need for comprehensive, multifaceted interventions to address this public health challenge. By raising awareness, promoting evidence-based preventive measures, and strengthening the role of healthcare providers and policymakers, we can work towards reducing the burden of NIHL and ensuring better long-term hearing health outcomes for individuals and communities.

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