

## Pattern of Use of Earphone and Music Player Devices among Iranian Adolescents

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### ABSTRACT

**Background:** There is no information about the pattern of use of earphones and music players in Iranian adolescents. The aim of this study was to assess the prevalence and pattern of the use of earphone and music player devices as a main risk factor for hearing loss in adolescents of Tabriz city, northwest of Iran.

**Methods:** In this cross-sectional study in November 2011, 2,359 high school students were randomly selected and were asked to complete a 20-item questionnaire about the pattern of using earphones and music players.

**Results:** The results showed that 44.3% [confidence interval (CI) 95%: 38.3-50.3] of the respondents had a history of hearing problems that was significantly different between males and females (42.2% of males and 47% of females,  $p$ : 0.02). Notably, 36.8% of the participants stated that they listened to music without any rest or stop. Almost 49.6% (CI 95%: 44.4-54.4) of the students reported listening to 'somewhat loud' (gain setting at 50%) or 'very loud' (gain setting more than 50%) volume level of music. In terms of the kind of earphones, 17.1% of the participants used headphones, 34.8% used earbud-style headphones, 32.3% used supra-aural headphones, and 15.8% of them did not use any type of earphones.

**Conclusions:** Students have risky patterns of using earphones and music-listening devices. Planning educational programs in this domain for adolescents especially in high schools is necessary.

**Keywords:** Adolescents, earphone, hearing loss, Iran, music player.

### INTRODUCTION

Noise-induced hearing loss (NIHL) is a common and preventable disability, and it can be caused by recreational noise and leisure activity such as listening to music player devices.<sup>[1]</sup> NIHL is one of the most important problems of social and public health. For reducing NIHL, policies mostly focus on reducing environmental noise to prevent hearing loss among adults, whereas many studies have shown that NIHL is increasing among children and adolescents.<sup>[2]</sup>

In the United States, studies of screening tests for hearing have revealed an increase in hearing problems for children at ever-younger ages and demonstrated that 14.9% of the children aged 6 to 19 years have low- or high-frequency hearing loss in at least one ear, and 12.5% had audiometric evidence of NIHL.<sup>[2,3]</sup> Another study among adolescents in the United States showed that the prevalence of any hearing loss increased significantly from 14.9% in 1988-1994 to 19.5% in 2005-2006, and in 2005-2006, hearing loss was more commonly unilateral.<sup>[4]</sup>

Nowadays, adolescents and young adults consciously expose themselves to loud noise or music for long periods of time and they are unaware of its consequences. NIHL in children and young adults has been linked to recreational noise and leisure activities.<sup>[1,5,6]</sup> Lee *et al.* showed that continuous use of earphones for three hours led to about 10 decibel (db) increase in the hearing threshold.<sup>[5]</sup> Moreover, with regard to increase in the use of portable music players and use of portable entertainment devices such as mobile phones, there is a concern about the hearing damage and hearing problems which may finally result in hearing loss.<sup>[2,7]</sup>

In society today, people use earphones not only for listening to music, but also for eliminating the surrounding noise in the street, bus, taxi, or other transportation systems, all of which hurt ears and cause hearing loss. Hearing impairments or hearing loss may not be recognized for many years; so, treatment and intervention maybe difficult when it is detected. The existence of chargeable and durable batteries is a main reason for listening to music using portable music player devices. Most of the young adults listen unduly from portable music player devices and this issue can cause ear and hearing problems. The main problem is that usually adolescents listen to music with loud sound.<sup>[6,8,9]</sup>

As stated above, listening to loud music for long periods of time especially with earphones may predispose the person not only to hearing loss but also to ear infection, tinnitus, and dizziness. Therefore, studies about listening to music in societies especially among adolescents are important in planning for prevention and education about using patterns. Unfortunately, there is no information about the patterns of using

earphone and music players in Iranian adolescents. The aim of this study was to assess the prevalence and pattern of use of earphone and music player devices as a main risk factor of hearing loss in adolescents of northwestern Iran.

## METHODS

This descriptive and cross-sectional study was carried out in the high schools of Tabriz in the northeast of Iran in November 2011. Tabriz is the fourth most populous city in Iran, the center of the province of East Azerbaijan and is one of the major industrialized cities of Iran.

In this study, 96 classes from 21 high schools were selected as clusters randomly and proportionally by considering sex of students, type of school, number of students in each school, and the level of education of a majority of the students. The total number of students in these classes was 2,486; of them, 107 questionnaires were unusable and five students did not want to participate in the study. Therefore, 2,359 (94.7%) students completed a 20-item self-administered multiple-choice questionnaire.

The questions aimed to obtain information on the importance of hearing loss, history of hearing loss and hearing impairments, types of entertainment devices, length of use, volume when listening to portable entertainment devices, the pattern of increase or decrease in volume after a period of listening, as well as demographic characteristics.

Experts in this field and high-school teachers approved the validity of the face and content of this questionnaire. The test-retest reliability with a two-week interval in 26 students was more than 0.73 for all questions.

To assess the importance of hearing loss, we used a question like in the study by Chung *et al.*<sup>[7]</sup> about viewpoints of students toward several general issues of health including alcohol and drug abuse, cigarette smoking, concerns related to sexuality and sexually transmitted diseases, hearing loss or hearing impairment, sport-related injuries, nutritional and weight issues, depression, and acne. This question required that respondents prioritize the significance of answers about an issue of health on a Likert scale such as “a very big problem”, “somewhat of a problem”, “not too much of a problem”, and “not a problem at all.”

In this study, the respondents were ensured about the voluntary nature of participation in the study and confidentiality of the information before distributing the questionnaires. This study and the related questionnaire were approved by the East Azarbaijan Province Education Organization and the Ethics Committee of the Tabriz University of Medical Sciences.

Because of the cluster sampling method, survey analysis was used in all the analyses. The Chi-square test was used to test the association between age, gender, and predisposing factors (pattern of use of earphone and music player devices) for an increased risk of NIHL. Data analysis was performed with SPSS.17 and the level of significance was set as 0.05.

## RESULTS

The mean age of the students was  $16.4 \pm 1.1$  ranging from 14 to 21 years. About 44% of the students were male and 55.6% of them were female. Hearing loss or hearing impairment was more important to boys than girls. Male students believed that hearing loss or hearing impairment, depression, use of alcohol and drugs, concerns related to sexuality and sexually transmitted diseases, and nutritional and weight issues were the most important in the order of priority. However, female respondents prioritized use of drugs and alcohol, depression, concerns related to sexuality and sexually transmitted diseases, and hearing loss or hearing impairment as being their major health-care concerns.

Notably, 44.3% (CI 95%: 37.8-50.8) of students reported a history of hearing loss and hearing impairments. Among them 33, 92, 113, 443, and

346 people reported a history of ear disease, hearing loss, ear infection, ringing in the ears, and dizziness, respectively. Distribution of the history of hearing impairments was different between males and females (47% in males and 42.2% in females,  $P=0.02$ ).

This study showed that only 4.2% (CI 95%: 2.6-5.8) of the participants did not listen to music. Totally, 9.7% (CI 95%: 5.9-13.5) of the respondents, 11.7% (CI 95%: 8.4-14.9) of males and 8.1% (CI 95%: 6.4-9.8) of females declared that they listened to different types of music for more than four hours a day. It must be mentioned that there was a statistically significant relationship between duration of listening to music and hearing loss ( $P = 0.04$ ). Most of the participants listened to music on the computer (51.6%), followed by cell phone (50.7%), television set (18.9%), and mp3 player (18.7%). Use of different music devices were equally distributed between males and females ( $P > 0.05$ ). In addition, this study revealed that 83.5% of the students used a portable entertainment device with headphones such as a cell phone and this did not differ between the sexes ( $P > 0.05$ ).

Notably, 49.6% (CI 95%: 44.1-54.7) of the students reported listening to ‘somewhat loud’ (gain setting at 50%) or ‘very loud’ (gain setting more than 50%) music [Table 1]. Listening to ‘somewhat loud’ (gain setting at 50%) or ‘very loud’ (gain setting more than 50%) music was more common among male students and also among those who were 18-21 years old.

We asked participants about increase or decrease in volume after a period of listening, the results which are presented in Table 2. Male students usually

**Table 1:** Reported volume level of listening by sex and age

Sex and age group	Volume level				Total		P value
	Gain setting less than 50%		Gain setting more than 50%		n	%	
	n	%	n	%			
Sex							
Males	462	46.5	532	53.5	994	100	0.001
Females	670	53.6	580	46.4	1,250	100	
Total	1132	50.4	1112	49.6	2,244	100	
Age							
14-15	219	56.2	171	43.8	390	100	0.023
16-17	773	49.9	775	50.1	1,548	100	
18-21	117	45.7	139	54.3	256	100	
Total	1,109	50.5	1,085	49.5	2,194	100	

**Table 2:** The pattern of increase or decrease in volume after a period of listening by sex and age

Sex and age group	Increase in volume			P value	Decrease in volume			P value
	Rarely or never n (%)	Sometimes n (%)	Often n (%)		Rarely or never n (%)	Sometimes n (%)	Often n (%)	
Sex								
Males	319 (32.5)	248 (25.3)	415 (42.3)	0.001	482 (49.9)	232 (24)	252 (26.1)	0.024
Females	393 (31.6)	397 (31.9)	453 (36.4)		639 (52.2)	326 (26.6)	260 (21.2)	
Total	712 (32)	645 (29)	868 (39)		1,121 (51.2)	558 (25.5)	512 (23.4)	
Age								
14-15	115 (29.7)	130 (33.6)	142 (36.7)	0.28	199 (51.7)	104 (27)	82 (21.3)	0.1
16-17	501 (32.6)	429 (27.9)	606 (39.5)		793 (52.2)	381 (25.1)	345 (22.7)	
18-21	82 (32.4)	76 (30)	95 (37.5)		111 (44.4)	66 (26.4)	73 (29.2)	
Total	698 (32.1)	635 (29.2)	843 (38.7)		1,103 (51.2)	551 (25.6)	500 (23.2)	

increased the volume. The Chi-square test showed that the relationship between increase in volume and sex was statistically significant ( $P = 0.001$ ). The relationship between increase or decrease in volume with age was not significant ( $P > 0.05$ ). Furthermore, increase in volume after a period of time ( $P = 0.03$ ) and loudness ( $P = 0.04$ ) were related to hearing loss in students, as prevalence of hearing loss among students who often increased volume was more than those who did not (53.3 vs. 42.6%) and this percentage among students who used very loud volume for listening was more than those who did not (49.3 vs. 33.6%).

With regard to the type of earphones, 17.1% of participants used headphones, 34.8% used earbud-style headphones, 32.3% used supra-aural headphones, and 15.8% of them did not use any type of earphones. Male students used the earbud type more than females.

In this study, 39% of the respondents stated that they always or nearly always did not listen to music continuously, but 36.8% of the participants listened to music continuously and without any rest or stop. This pattern was not different between males and females and age groups. Moreover, 80% of the students mentioned that at least one person would warn them to turn down the volume while they were listening to music, but only 58% stated that this warning affected their behavior and would result in turning down the volume.

## DISCUSSION

This study evaluated listening habits and hearing loss of a sample of students for the first time in

Iran. The results of this study indicates a lower priority for hearing loss relative to other issues of health such as the use of drugs and alcohol, sexual issues, nutrition and weight-loss issues, and depression among females (fourth priority) compared with male (first priority) respondents. Although male students believed that hearing loss is a more important issue, they listened to music and used music player devices more than females to some degree. This is concordant with the study by Chung *et al.* in Massachusetts.<sup>[7]</sup>

This study showed almost one-third of the students listened to music more than two hours a day and 44.3% of the respondents had experienced hearing loss and hearing impairment. We also found a relationship between listening to music for long periods of time and hearing loss. So, it can be concluded that listening to music maybe one of the main risk factors for hearing impairment and listening to music continuously for long periods of time would be harmful. Unfortunately, adolescents are unaware of the significant impact of hearing loss on their future quality of life. This finding is in harmony with some studies around the world.<sup>[7,10,11]</sup>

Many studies have shown that portable music players and listening to music for long periods of time may increase the risk of hearing loss and hearing impairment.<sup>[1,6,9,12,13]</sup> Also, many studies have shown that in younger age groups, even a slight change in the hearing threshold can impair learning and understanding of speech.<sup>[14]</sup> Hearing loss in school-aged individuals can affect learning, speech perception, development of social skills, and self-image.<sup>[11]</sup> Therefore to limit the cumulative amount of exposure to noise, listeners should



decrease the length of time, decrease the volume, or use ear protection. Provision of educational programs regarding this issue in schools is necessary.

In this study, the type of devices used for listening to music was not related to hearing loss; yet, a majority of students (83.5%) reported using a portable entertainment device with headphones such as a cell phone for listening to music. A high numbers of respondents reported (49.6%) listening to somewhat loud or very loud music and only 23% often decreased the volume after listening to music for a while. We also realized that the type of devices used for listening to music was not related to hearing loss, but both loudness and increase in volume after a period of listening to music were related to hearing loss in students. The distribution of history of hearing impairments among males and females was similar; however, male students listened to somewhat loud or very loud volume more frequently and often increased the volume after a period of listening to music. Therefore, we conclude that the pattern of increase or decrease in volume after a period of listening to music and volume level can affect hearing impairments. These results are in agreement with the studies by Vogel *et al.*,<sup>[6,9]</sup> Blassoni *et al.*<sup>[15]</sup> and Hellstrom *et al.*<sup>[16]</sup> However, the present study is a cross-sectional one and we should respect temporality in this conclusion.

This study showed that the relationship between the type of earphones and hearing loss was not significant; yet, male students used the earbud type more than females. It seems that earbud types transfer infectious agents easily; so, using headphones is a better option.<sup>[6,17]</sup>

As a final result of this study, bystanders' warning to turn down the volume is not very effective, so education and encouragement to adolescents to actively protect themselves from noise damage especially through the mass media and community centers is needed.

Finally, it is prudent to mention as a limitation of the present study that hearing impairments were reported by the respondents and not checked by ear specialists or audiologists. Also, there is no information about the culture of the families of the adolescents.

## CONCLUSIONS

Adolescents have risky patterns of listening to music and they are not aware of the fact that

these may lead to hearing impairments. Due to the barriers of listening to music in Iran, usually adolescents do not have any other option to listen to the music of their choice. Therefore, planning educational programs in this domain for adolescents especially in high schools is necessary, and many of these individuals should be motivated to change their patterns of listening to music.

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