

Patterns of Using Personal Audio Devices and Associated Health Risks in Eastern Region, Saudi Arabia

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Abstract: Hearing loss is the world's fourth leading cause of disability. A limited number of studies in Saudi Arabia assess knowledge of personal audio device use and associated health risks among the general population, particularly on the regional level. Moreover, no study was performed in the Eastern Province about this problem. Thus, this study aimed to measure the pattern of the Use of earphones and Personal Audio Devices (PAD) and assess usage habits, listening beliefs, and knowledge of safe use of a sample of adults in the eastern province of Saudi Arabia. Data were derived in the eastern province of Saudi Arabia and included 483 participants; 33.7% belonged to the age group of 18-25 years old. Data were collected by an online self-administered questionnaire and analyzed with descriptive statistics, a χ^2 test, a Mann-Whitney U test, and hierarchical multiple logistic regression. The assessment of the pattern of PAD usage showed that 53.4% of the participants reported that they had been using it for more than 5 years, and 43.1% used it more than 4 days a week. The assessment of perceptions related to continuous PAD usage showed that 61.7% believed its usage would lead to hearing loss, 79.7% thought it would cause ringing in the ear, 43.1% believed it would cause insomnia, and the majority (90.5%) believed it would cause headache. The knowledge level assessment for PAD use showed that more than half of participants (51.3%) had poor knowledge related to personal audio devices use. Half of the study's participants were unaware of the health risks associated with PAD use. Health officials should use more effective health education strategies to increase public and caregiver understanding of the many aspects of PAD usage.

Keywords: personal audio devices, hearing loss, risk, awareness, deafness.

沙特阿拉伯东部地区使用个人音频设备的模式和相关的健康风险

摘要：听力损失是世界第四大残疾原因。沙特阿拉伯的少数研究评估了普通人群中个人音频设备使用和相关健康风险的知识，特别是在区域层面。此外，东部省也没有对这个问题进行过研究。因此，本研究旨在衡量耳机和个人音频设备的使用模式，并评估沙特阿拉伯东部省份成年人样本的使用习惯、聆听信念和安全使用知识。数据来自沙特阿拉伯东部省份，包括483名参与者；33.7%属于18-25岁年龄段。通过在线自我管理问卷收集数据，并使用描述性统计、 χ^2 检验、曼恩惠特尼U检验和分层多元逻辑回归进行分析。对个人音频设备使用模式的评估显示，53.4%的参与者报告说他们已经使用了5年以上，43.1%的参与者每周使用了4天以上。与持续使用个人音频设备相关的认知评估显示，61.7%的人认为使用会导致听力损失，79.7%的人认为会导致耳鸣，43.1%的人认为会导致失眠，大多数(90.5%)相信会引起头痛。个人音频设备使用的知识水平评估显示，超过一半的参与者(51.3%)对个人音频设备的使用知之甚少。该研究的一半参与者不知道与使用个人音频设备相关的健康风险。卫生官员应使用更有效的健康教育策略来增加公众和护理人员对个人音频设备使用的许多方面的了解。

关键词：个人音频设备、听力损失、风险、意识、耳聋。

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1. Introduction

Because of the widespread nature of loss hearing, it is important to foster worldwide awareness about the need for accessible hearing care in all regions globally [1]. More than 30 million adults in the United States have hearing loss. Hearing loss is categorized as sensorineural, conductive, or mixed. According to the World Health Organization (WHO), approximately 360 million people suffer from hearing loss worldwide, with 1.1 billion young people (aged 12 to 35 years) experiencing hearing loss as a result of noise [2].

Adult hearing loss has the primary effect of poor communication, which can harm relationships with family and friends [3, 4]. Furthermore, hearing loss may negatively influence a child's speech, language, developmental, educational, and cognitive outcomes [5].

According to the WHO, there are rising concerns about the increased exposure to noise from recreational devices, such as personal music players and video gaming consoles, which generate noise at harmful volumes and create unsafe sound levels. In addition, regular participation in these noisy activities can damage an individual's hearing [6, 7].

According to the National Institute on Deafness and Other Communication Disorders, Prolonged exposure to sounds at or above 85 decibels can cause hearing loss [8]. Interdisciplinary long-term analysis has shown that equivalent sound levels in discos range between 104.3 and 112.4 dBA, while personal music players generate between 75 and 105 dBA [9, 10]. Another important source of potential health risk is PADs during such activities as crossing the street, walking, and driving; this can compromise road safety by obstructing required auditory attention and reactions, increasing the risk of road traffic accidents (RTAs) [7].

The current study aims to measure the pattern of earphones and music player devices among adults. Furthermore, data are scarce on this subject in Saudi Arabia's eastern province. Therefore, this study's result will help measure the awareness, risks, and complications of earphones and music player devices.

2. Study Methodology

The study was approved by the Institutional Research Board (IRB). This qualitative, cross-sectional, anonymous questionnaire-based study was conducted in Saudi Arabia. A specially designed Arabic questionnaire was distributed to adults (aged 18 years or above) of both genders in the eastern region of Saudi Arabia. Anyone under 18 or over 55 years and those who did not use earphones and personal audio devices were excluded. The questionnaire was distributed

electronically as an online survey. The applied questionnaire included many questions to investigate the adult's demographical data, such as gender and age. It also contained a section related to the distribution of personal audio device usage characteristics. Knowledge and perceptions regarding risks associated with long-term usage of personal audio devices were also highlighted in the questionnaire.

A sample size of 385 was calculated for our study using the formula:

$$n = \frac{Z^2_{1-\frac{\alpha}{2}} [2Sp^2]}{d^2} \quad (1)$$

3. Results

The analysis included responses from 483 participants who gave consent to participate and completely answered all the items in the questionnaire. The sociodemographic characteristics showed that 33.7% were 18-25 years; 69.5% were females; 49.1% were married, 60.9% and bachelor's or above educational level. The other details of the participants are given in Table 1.

When we assessed the pattern of PAD usage, it was found that 53.4% of the participants reported that they had been using it for more than 5 years, and 43.1% used it more than 4 days a week. The frequency of PAD usage per day showed that 21.3% used it 4 or more hours/day. When we asked the participants about the loudness of their PAD music, 49.9% stated that they use medium or low volume, whereas 7% used very loud volume (Table 1).

The assessment of perceptions related to continuous PAD usage showed that 61.7% believed that its usage would lead to hearing loss, 79.7% thought that it would cause ringing in the ear, 43.1% believed that it would cause insomnia, and the majority (90.5%) believed that it would cause headache. It was found that only 24.2% believed that continuous PAD usage with louder volumes would result in hypertension (Table 2). The perception level of the participants was determined based on the scores obtained for possible correct answers, where each correct answer was given a score of one, and incorrect answers were given no scores.

Table 1: Sociodemographic details (n=483)

		Frequency	Percent
Age (in years)	<18	41	8.5
	18-25	163	33.7
	25-35	98	20.3
	35-45	94	19.5
	45-55	52	10.8
	>55	35	7.2
Gender	Female	335	69.4
	Male	148	30.6
Marital status	Single	232	48.0
	Married	237	49.1
	Divorced	7	1.4
	Widower	7	1.4
Educational level	Primary school and below	19	3.9
	Secondary school	128	26.5
	Diploma	42	8.7
	Bachelors and above	294	60.9
Employment status	Employed	129	26.7
	Self employed	20	4.1
	Retired	53	11.0
	Health practioners	6	1.2
	Unemployed	118	24.4
	Student	157	32.5

The analysis showed that 33.1% (n = 160) had demonstrated 'Good' perception, 33.5% (n = 162) had fair perception and 33.3% (n = 161) had poor perception. When we connected the relationship of this perception level with the age of the participants, it was observed that the age group of 35-45 years (47.9%) and 45-55 years (40.4%) showed comparatively more 'good' perceptions, whereas the age group of 18-25 years (39.9%) had demonstrated more 'poor' perceptions of PAD usage. That showed a statistically significant association ($p = 0.015$). It was observed that male participants had more showed 'good' perceptions (41.9%) than females (29.3), ($p = 0.002$). The relationship of marital status with perception level showed that those who were married had more 'good' perceptions (38.4%) than single (26.3%) ($p = 0.020$). The educational level and employment status of the participants did not show any statistically significant association with perceptions related to PAD usage ($p > 0.05$) (Table 2). The knowledge levels were calculated based on the scores obtained for possible correct and wrong answers for all the knowledge items in the questionnaire. It was found that 36.2% (n = 175) had 'good', 12.4% (n = 60) had fair and 51.3% (n = 248) had poor knowledge related to PAD use.

Table 2: Relationship of perceptions regarding PAD use and sociodemographic (n=483)

		Perception			Total	p value*
		Good (n, %)	Fair (n, %)	Poor (n, %)		
Age	<18	8 (19.5)	20 (48.8)	13 (31.7)	41 (8.5)	0.015
	18-25	41 (25.2)	57 (35.0)	65 (39.9)	163 (33.7)	
	25-35	33 (33.7)	32 (32.7)	33 (33.7)	98 (20.3)	
	35-45	45 (47.9)	24 (25.5)	25 (26.6)	94 (19.5)	
	45-55	21 (40.4)	15 (28.8)	16 (30.8)	52 (10.8)	
	>55	12 (34.3)	14 (40.0)	9 (25.7)	35 (7.2)	
Gender	Female	98 (29.3)	128 (38.2)	109 (32.5)	335 (69.4)	0.002
	Male	62 (41.9)	34 (23.0)	52 (35.1)	148 (30.6)	
Marital status	Single	61 (26.3)	78 (33.6)	93 (40.1)	232 (48.0)	0.020
	Married	91 (38.4)	81 (34.2)	65 (27.4)	237 (49.1)	
	Divorced	4 (57.1)	2 (28.6)	1 (14.3)	7 (1.4)	
	Widower	4 (57.1)	1 (14.3)	2 (28.6)	7 (1.4)	
Educational level	Primary school and below	5 (26.3)	4 (21.1)	10 (52.6)	19 (3.9)	0.095
	Secondary school	38 (29.7)	52 (40.6)	38 (29.7)	128 (26.5)	
	Diploma	20 (47.6)	9 (21.4)	13 (31.0)	42 (8.7)	
	Bachelors and above	97 (33.0)	97 (33.0)	100 (34.0)	294 (60.9)	
Employment status	Employed	56 (36.1)	48 (31.0)	51 (32.9)	155 (32.1)	0.179
	Retired	21 (39.6)	17 (32.1)	15 (28.3)	53 (11.0)	
	Unemployed	45 (38.1)	36 (30.5)	37 (31.4)	118 (24.4)	
	Student	38 (24.2)	61 (38.9)	58 (36.9)	157 (32.5)	

*p value for chi-square test ($p < 0.05$ is considered statistically significant)

Table 3: Relationship of knowledge regarding PAD use and sociodemographic

		Knowledge			Total	p value
		Good	Fair	Poor		
Age	<18	5 (12.2%)	2 (4.9%)	34 (82.9%)	41 (8.5)	0.010
	18-25	62 (38.0%)	22 (13.5%)	79 (48.5%)	163 (33.7)	
	25-35	31 (31.6%)	15 (15.3%)	52 (53.1%)	98 (20.3)	
	35-45	39 (41.5%)	9 (9.6%)	46 (48.9%)	94 (19.5)	
	45-55	24 (46.2%)	6 (11.5%)	22 (42.3%)	52 (10.8)	
	>55	14 (40.0%)	6 (17.1%)	15 (42.9%)	35 (7.2)	
Gender	Female	132 (39.4%)	45 (13.4%)	158 (47.2%)	335 (69.4)	0.002
	Male	43 (29.1%)	15 (10.1%)	90 (60.8%)	148 (30.6)	
Marital status	Single	75 (32.3%)	22 (9.5%)	135 (58.2%)	232 (48.0)	0.020
	Married	91 (38.4%)	37 (15.6%)	109 (46.0%)	237 (49.1)	
	Divorced	5 (71.4%)	0 (0%)	2 (28.6%)	7 (1.4)	
	Widower	4 (57.1%)	1 (14.3%)	2 (28.6%)	7 (1.4)	
Educational level	Primary school and below	1 (5.3%)	5 (26.3%)	13 (68.4%)	19 (3.9)	0.032
	Secondary school	40 (31.3%)	13 (10.2%)	75 (58.6%)	128 (26.5)	
	Diploma	16 (38.1%)	2 (4.8%)	24 (57.1%)	42 (8.7)	
	Bachelors and above	118 (40.1%)	40 (13.6%)	136 (46.3%)	294 (60.9)	
Employment status	Employed	57 (36.8%)	23 (14.8%)	75 (48.4%)	155 (32.1)	0.452
	Retired	24 (45.3%)	4 (7.5%)	25 (47.2%)	53 (11.0)	
	Unemployed	42	17	59 (50.0%)	118 (24.4)	
	Student	52 (33.1%)	16 (10.2%)	89 (56.7%)	157 (32.5)	

*p value for chi-square test ($p < 0.05$ is considered statistically significant)

When we assessed the relationship of the age of the participants with knowledge level, it was found that those aged 45-55 years (46.2%) and 35-45 years (41.5%) showed comparatively more 'good' knowledge

than others ($p = 0.010$).

At the same time, female participants demonstrated more 'good' knowledge (39.4%) than males (29.1%), which also showed a statistically significant relationship ($p = 0.002$). It was also found that participants who were married (38.4%) and those who had an education of bachelor's or above (40.1%) had demonstrated comparatively more 'good' knowledge than others, which showed a statistically significant association, $p < 0.05$ (Table 3).

4. Discussion

This study measured the pattern of earphones and music player devices in a sample of adults in the eastern province of Saudi Arabia. According to the results, more than half of the participants believed that the continuous usage of PDA would lead to hearing loss, headache, and ringing in the ear.

Although 45.3% of the participants listened to music and used personal audio devices for less than 1 hour/day, the knowledge level assessment for PAD use showed that more than half the participants (51.3%) had poor knowledge related to personal audio device use. However, as Timon Hussain et al.'s study indicates, knowledge regarding the use of PADs plays a significant role in solving and preventing many health issues [11].

The current study shows that more than half of the participants had poor knowledge regarding risks associated with long-term usage of personal audio devices, at 51.3%, whereas only 36.2% had good knowledge. Such findings are consistent with Abeer et al., who found that 64% of participants had inadequate knowledge [12]. In contrast, in S. Basu et al.'s study, most participants had good knowledge about PAD use [13].

In the current study, there was a relationship between gender and level of knowledge. Men appeared to have a higher level of knowledge than women, which contradicts the findings of S. Basu et al.'s study [13]. In contrast, in terms of PAD usage, the current study's findings are consistent with those of H. Alenezi et al. [14]. They found a strong relationship between gender and PAD usage, with women having a higher prevalence [14].

In this study, the assessment of perceptions showed that 61.7% of the respondents believed that PAD usage would lead to hearing loss, 79.7% thought it would cause ringing in the ears, and 90.5% believed it would cause headaches. Furthermore, according to a study conducted by Shim H et al., the sound level might affect hearing capacity, and wearing louder earphones can induce more hearing loss [15].

The safe use of PADs is essential for preserving people's health, particularly in developing countries. According to the current study's findings, 51.1% of respondents knew the safe limit for PAD use at average

volume, and 59.5% were aware of the safe limit for PAD use at "high" volume. In addition, most participants (64%) in the Dhanya VJ et al. study exhibited a proclivity to listen to music at a high level. However, the remaining participants (36%) did not recognize that loud sounds hurt hearing, indicating a lack of knowledge of the safe PAD limit, consistent with the current study [16].

5. Conclusion

- Approximately half of the participants in the study had poor awareness of PAD usage and its health risks.
- Health authorities should consider such an important finding since this lack of awareness will impact the health of the general population.
- More effective health education strategies should be used by health authorities to raise public and caregiver understanding of the many elements of PAD usage.
- Increased knowledge and understanding of their PAD use would assist the community in becoming more aware of and compliant with the safe use of PAD and disseminate the appropriate information to their family and friends.

5.1. Limitations

As with most cross-sectional studies, studies find association but not causation. As a result, the authors recommend that this study be utilized as a basis for future prospective cohort studies to determine the root cause of these difficulties. In addition, aside from the fact that direct communication may be difficult in such settings, the study would be better if it was framed around an interview to improve data quality.

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Statement of Ethics

This study protocol was reviewed and approved by King Faisal University, approval number KFU-REC-2021-OCT-EA00031. Informed consent was obtained from all participants. The authors have no conflicts of interest to declare.

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