

THE INFLUENCE OF GENDER DIFFERENCES ON EARPHONE USE AND THE INCIDENCE OF TINNITUS COMPLAINTS AMONG MEDICAL STUDENTS IN INDONESIA

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Abstract

Background: The increasing use of earphones among university students may increase sound exposure and contribute to tinnitus. Frequency and duration of use are important behavioral factors, while the role of gender remains uncertain. **Objective:** This study aimed to determine the association between earphone use and tinnitus complaints among 2024 medical students at the Faculty of Medicine, Universitas Muslim Indonesia, and to examine these associations by gender. **Methods:** This quantitative study used a descriptive cross-sectional design. A total of 116 students, comprising 58 males and 58 females, were selected through stratified random sampling. Data were collected using questionnaires and analyzed using the Chi-Square test at a significance level of 0.05. **Results:** Most respondents used earphones 1–2 days per week (56.0%), and 50.9% used them for less than one hour per day. Overall, 65.5% had no tinnitus problem. No significant associations were found between gender and earphone use frequency ($p = 0.344$), duration ($p = 0.398$), or tinnitus risk ($p = 0.160$). However, tinnitus risk was significantly associated with both earphone use frequency and duration ($p < 0.001$ for both). **Conclusion:** Earphone use frequency and duration were significantly associated with tinnitus risk, whereas gender was not significantly associated with earphone use patterns or tinnitus risk. These findings suggest that earphone exposure patterns may be more closely related to tinnitus risk than gender differences.

Keywords: Medical students; Earphone use; Tinnitus risk

Abstrak

Latar Belakang: Meningkatnya penggunaan earphone di kalangan mahasiswa dapat meningkatkan paparan suara dan berkontribusi terhadap timbulnya tinnitus. Frekuensi dan durasi penggunaan merupakan faktor perilaku yang penting, sementara peran jenis kelamin masih belum jelas. **Tujuan:** Penelitian ini bertujuan untuk mengetahui hubungan antara penggunaan earphone dan keluhan tinnitus pada mahasiswa kedokteran angkatan 2024 di Fakultas Kedokteran Universitas Muslim Indonesia, serta menganalisis hubungan tersebut berdasarkan jenis kelamin. **Metode:** Penelitian kuantitatif ini menggunakan desain potong cross-sectional deskriptif. 116 mahasiswa, yang terdiri dari 58 laki-laki dan 58 perempuan, dipilih melalui teknik stratified random sampling. Data dikumpulkan menggunakan kuesioner dan dianalisis dengan uji Chi-Square pada tingkat signifikansi 0,05. **Hasil:** Sebagian besar responden menggunakan earphone selama 1–2 hari per minggu (56,0%), dan 50,9% menggunakannya kurang dari satu jam per hari. Secara keseluruhan, 65,5% responden tidak mengalami masalah tinnitus. Tidak ditemukan hubungan yang signifikan antara jenis kelamin dengan frekuensi penggunaan earphone ($p = 0,344$), durasi penggunaan ($p = 0,398$), maupun risiko tinnitus ($p = 0,160$). Namun, risiko tinnitus berhubungan secara signifikan dengan frekuensi maupun durasi penggunaan earphone ($p < 0,001$ untuk keduanya). **Kesimpulan:** Frekuensi dan durasi penggunaan earphone berhubungan secara signifikan dengan risiko tinnitus, sedangkan jenis kelamin tidak memiliki hubungan yang signifikan dengan pola penggunaan earphone maupun risiko tinnitus. Temuan ini mengindikasikan bahwa pola paparan earphone mungkin lebih erat kaitannya dengan risiko tinnitus dibandingkan dengan perbedaan jenis kelamin.

Kata kunci: Mahasiswa kedokteran; Penggunaan earphone ; Risiko tinnitus.

INTRODUCTION

Noise exposure can cause complaints of tinnitus such as ringing in the ears, hissing, or roaring (Bashiruddin & Sosialisman, 2020; Hamzah, 2021). Tinnitus often becomes an early sign of the occurrence of hearing impairment due to noise (Syah & Keman, 2017). If tinnitus continues continuously without handling, this condition can develop into tinnitus with a level of severity that is more severe. Severe tinnitus can affect the brain's ability to concentrate and to remember. If it is not immediately handled, in the long term it can worsen someone's memory and focus (Velaro, 2021). In Indonesia, cases of tinnitus have reached around 70-80% of the total hearing impairment until the year 2015 (Putra, 2013)^{1,2,3}.

The results of the bivariate analysis show that there is a correlation between earphone usage habits and the occurrence of tinnitus among students of the Faculty of Medicine, Universitas Sumatera Utara, with a significance value of $p = 0.017$. From the univariate analysis of 148 respondents, it was found that as many as 64.2% of respondents had a risky earphone usage pattern, and as many as 52 people (35.1%) experienced complaints of tinnitus. The severity level of tinnitus in those 52 respondents, based on VAS

assessment, was mostly classified as mild (55.8%), and according to measurements using THI-Q it was also included in the mild category (53.9%). Based on earphone usage patterns, the results showed that the majority of respondents used earphones for 3-4 days in a week (40.5%), with a usage volume level between 60-80% (54.1%), duration of earphone use of more than 3 years (65.5%), and daily usage duration of less than 1 hour (38.5%). Overall, there is a significant relationship between earphone usage patterns and the occurrence of tinnitus among students of the Faculty of Medicine, Universitas Sumatera Utara class of 2017-2019⁴.

Tinnitus is a medical condition in which it is characterized by the presence of a ringing, hissing or buzzing sound in the ear without the presence of a sound source from musical instruments or other instruments (external). This complaint very often interferes with daily activities.^{5,6,7}.

Several factors that can influence the emergence of tinnitus, for example such as using earphones. Students more often use this device to listen to music, watch videos or communicate for a long period of time, so that excessive and improper use of the device can increase the risk of tinnitus occurring.^{8,9}.

Research shows that gender

differences can affect the level of individual sensitivity to tinnitus. Women have higher sensitivity to tinnitus compared to men. Because men tend to use earphones or headsets with a higher sound volume more often compared to women. This difference can affect the risk of tinnitus occurring, considering that sound exposure with high intensity can damage hearing cells and Although there is an indication that gender differences can affect earphone usage and the risk of tinnitus occurring, further research is still needed to ensure this finding consistently. Research whose sample involves students of the Faculty of Medicine, Universitas Muslim Indonesia Class of 2024 that can provide deeper insight into the influence of gender on earphone usage on the emergence of tinnitus complaints.^{11,12}

METHODS

This research is a quantitative research and uses a descriptive research design with a cross-sectional approach. The sampling technique in this research uses the stratified random sampling technique.

This research was conducted in October – November 2025 at the Faculty of Medicine, UMI. In this research, Data were collected using a questionnaire, then analyzed with the Chi-Square test through SPSS. This research has obtained approval

from the Research Ethics Commission of Universitas Muslim Indonesia (KEP UMI) with Number 736/A.1/KEP-UMI/IX/2025

RESULTS

From a total sample of 116 medical students from the Class of 2024 at the Faculty of Medicine, Universitas Muslim Indonesia, data were collected from 58 male students (50.0%) and 58 female students (50.0%).

Table 1. Respondent Characteristics Based on Gender

Gender	Frequency (n)	Percentage (%)
Male	58	50.0%
Female	58	50.0%
Total	116	100.0%

Based on the frequency of earphone use (Table 2), the majority of respondents used earphones 1–2 days per week (n = 65; 56.0%). A total of 24 respondents (20.7%) used earphones 3–4 days per week, 11 respondents (9.5%) used them 5–6 days per week, and 16 respondents (13.8%) used earphones every day.

Table 2. Respondent Characteristics Based on Earphone Use Frequency

Frequency of Earphone Use	Frequency (n)	Percentage (%)
1 – 2 days / week	65	56.0%
3 – 4 days / week	24	20.7%

5 – 6 days / week	11	9.5%
Every day	16	13.8%
Total	116	100.0%

Based on the daily duration of earphone use (Table 3), more than half of the respondents used earphones for < 1 hour per day (n = 59; 50.9%). Respondents who used earphones for 1–2 hours per day accounted for 31 people (26.7%), while 26 respondents (22.4%) used them for 2–4 hours per day.

Table 3. Respondent Characteristics Based on Earphone Use Duration

Daily Duration	Frequency (n)	Percentage (%)
< 1 hour / day	59	50.9%
1 – 2 hours / day	31	26.7%
2 – 4 hours / day	26	22.4%
Total	116	100.0%

Regarding tinnitus risk categories (Table 4), the majority of respondents were in the 'No Problem' category (n = 76; 65.5%). Mild tinnitus problems were reported by 13 respondents (11.2%), moderate problems by 18 respondents (15.5%), and severe (major) problems by 8 respondents (6.9%). Only 1 respondent (0.9%) experienced a very severe (very

major) tinnitus problem, indicating that overall, most respondents did not experience severe tinnitus complaints.

Table 4. Distribution of Respondents by Tinnitus Risk Category

Tinnitus Risk Category	Frequency (n)	Percentage (%)
No Problem	76	65.5%
Mild Problem	13	11.2%
Moderate Problem	18	15.5%
Severe Problem	8	6.9%
Very Severe Problem	1	0.9%
Total	116	100.0%

As shown in Table 5, both male and female respondents were predominantly classified in the 'No Problem' tinnitus category (33 males and 43 females). Bivariate analysis using the Chi-Square test yielded a p-value of 0.160 ($p > 0.05$), indicating that there was no statistically significant association between gender and tinnitus risk among medical students.

Table 5. Distribution of Gender by Tinnitus Risk Category

Tinnitus Risk Category	Male (n)	Female (n)	Total (n)	p-value
No	33	43	76	0.160

Problem			
Mild	10	3	13
Problem			
Moderate	9	9	18
Problem			
Severe	5	3	8
Problem			
Very	1	0	1
Severe			
Problem			
Total	58	58	116

The distribution of earphone use frequency by gender (Table 6) demonstrated a comparable pattern between male and female students, with both groups mostly using earphones 1–2 days per week (31 males and 34 females). Statistical analysis resulted in a p-value of 0.344 ($p > 0.05$), demonstrating no significant association between gender and earphone use frequency.

Table 6. Distribution of Earphone Use Frequency by Gender

Earphone Use Frequency	Male (n)	Female (n)	Total (n)	p-value
1 – 2 days / week	31	34	65	0.344
3 – 4 days / week	10	14	24	
5 – 6 days / week	8	3	11	
Every day	9	7	16	
Total	58	58	116	

Similarly, Table 7 shows the distribution of earphone use duration by gender. The majority of both male ($n = 27$) and female ($n = 32$) students used earphones for less than 1 hour per day. Chi-Square test analysis yielded a p-value of 0.398 ($p > 0.05$), confirming that gender was not significantly associated with earphone use duration.

Table 7. Distribution of Earphone Use Duration by Gender

Earphone Use Duration	Male (n)	Female (n)	Total (n)	p-value
< 1 hour / day	27	32	59	0.398
1 – 2 hours / day	15	16	31	
2 – 4 hours / day	16	10	26	
Total	58	58	116	

Table 8 presents the cross-tabulation between earphone use frequency and tinnitus risk. Higher frequency of earphone use was associated with an increased proportion of moderate, severe, and very severe tinnitus complaints. Specifically, all respondents in the severe ($n = 8$) and very severe ($n = 1$) tinnitus categories were daily earphone users. Chi-Square analysis yielded a p-value < 0.001 , indicating a statistically

significant association between earphone use frequency and tinnitus risk.

Table 8. Distribution of Tinnitus Risk by Earphone Use Frequency

Tinnitus Risk Category	1–2 Days	3–4 Days	5–6 Days	Everyday	Total	p-value
No Problem	57	12	3	4	76	< 0.001
Mild Problem	5	5	3	0	13	
Moderate Problem	3	7	4	4	18	
Severe Problem	0	0	0	8	8	
Very Severe Problem	0	0	0	1	1	
Total	65	24	11	16	116	

Table 9 shows the association between daily earphone use duration and tinnitus risk. Respondents with longer daily usage durations (2–4 hours/day) exhibited higher risks of moderate to severe tinnitus. Notably, all respondents with severe (n = 8) and very severe (n = 1) tinnitus used earphones for 2–4 hours per

day. Statistical testing revealed a highly significant association between earphone use duration and tinnitus risk ($p < 0.001$).

Table 9. Distribution of Tinnitus Risk by Earphone Use Duration

Tinnitus Risk Category	< 1 Hour/Day	1–2 Hours/Day	2–4 Hours/Day	Total	p-value
No Problem	51	17	8	76	< 0.001
Mild Problem	3	7	3	13	
Moderate Problem	5	7	6	18	
Severe Problem	0	0	8	8	
Very Severe Problem	0	0	1	1	
Total	59	31	26	116	

DISCUSSION

Differences in Earphone Use Patterns Between Male and Female Students of the Class of 2024 at the Faculty of Medicine, Indonesian Muslim University

Based on the data analysis of this study, the distribution of earphone use between male and female students of the Class of 2024, Faculty of Medicine, Indonesian Muslim University showed no statistically significant difference. This is indicated by the association between sex and earphone use frequency, which yielded a $p\text{-value} = 0.344$, and the association between sex and earphone use duration with a $p\text{-value} = 0.398$. A $p\text{-value}$ greater than 0.05 indicates that the difference in earphone use patterns between male and female students is not statistically significant.

Descriptively, both male and female students mostly used earphones with a frequency of 1–2 days per week. Male students tended to use earphones with a slightly higher frequency (5–6 days and every day) compared to female students; however, the difference was not large enough to indicate a statistically significant difference. Similarly, for use duration, the majority of respondents from both gender groups used earphones for less than 1 hour per day.

These results indicate that gender is not the main factor determining earphone use patterns in this study population. The similarity in respondents' backgrounds as medical students with comparable academic demands and environments is thought to contribute to

the homogeneity of earphone use patterns between the two gender groups. This finding is consistent with the study by Velaro and Zahara (2022), which stated that in student populations, differences in earphone use patterns based on gender do not always show significant differences, especially in young age groups with similar academic activities.

Several previous studies have mentioned that males tend to use earphones at a higher volume compared to females, thus being at greater risk of hearing impairment and tinnitus. However, Kim et al. (2015) explained that these differences are highly influenced by environmental factors, individual habits, and other noise exposure outside of earphone use. In this study, the similarity in respondents' backgrounds as medical students with relatively similar academic workloads and lifestyles may have contributed to the absence of a significant difference in earphone use patterns between the two gender groups¹².

In addition, the increasing awareness of medical students regarding hearing health may also be a factor influencing more controlled earphone use patterns, in both male and female students. This is supported by theory which states that health knowledge can influence the behavior of using audio devices, including limiting the duration and frequency of

earphone use.

Differences in the Risk of Developing Tinnitus Complaints Among Male and Female Earphone Users

Based on the analysis of the association between gender and the risk of developing tinnitus complaints among students of the Class of 2024, Faculty of Medicine, Indonesian Muslim University, a p-value of 0.160 was obtained. This value indicates that there was no statistically significant difference between male and female students in the risk of developing tinnitus complaints. Thus, gender did not have a significant influence on tinnitus risk among respondents who used earphones.

Clinically, these findings can be explained by the fact that tinnitus is more influenced by noise exposure than by biological sex alone. Gender serves as a demographic factor but is not a direct exposure factor to the auditory system. Therefore, although descriptively there were differences in the number of respondents across several tinnitus risk categories, these differences were not statistically strong enough¹³.

The findings of this study are consistent with those of Kim et al. (2015), who stated that after adjusting for other

factors such as noise exposure patterns and individual health conditions, the association between gender and tinnitus became non-significant. This indicates that the risk of tinnitus is not solely determined by sex, but is more strongly influenced by behavioral and environmental factors, including the duration and frequency of earphone use¹².

However, several other studies in the literature review reported a tendency for differences in the perception and sensitivity to tinnitus between males and females. Boecking et al. reported that females tend to be more sensitive to tinnitus complaints and their impact on quality of life, whereas males are more often exposed to risk factors such as high-intensity noise. These differences may influence the subjective reporting of tinnitus but are not always reflected as a statistically significant difference in risk.

In this study, the relatively homogeneous characteristics of the respondents, namely medical students with nearly uniform ages and the same academic background, likely minimized the influence of gender on the development of tinnitus complaints. In addition, most respondents used earphones for less than one hour per day, which is still within the relatively safe limit for noise exposure. As a result, the

risk of tinnitus in both gender groups became nearly comparable¹⁴.

Thus, the findings of this study indicate that there was no significant difference in the risk of developing tinnitus complaints between male and female earphone users in the Class of 2024, Faculty of Medicine, Indonesian Muslim University. These findings suggest that factors related to earphone use itself, such as duration and frequency of use, play a more dominant role than gender in influencing the risk of tinnitus.

Association Between Earphone Use and Tinnitus Complaints Among 2024 Medical Students at the Faculty of Medicine, Indonesian Muslim University, Based on Gender Differences

Based on the analysis of the association between earphone use and tinnitus complaints among students of the Class of 2024, Faculty of Medicine, Indonesian Muslim University, a statistically significant relationship was found. This was demonstrated by the analysis of the association between tinnitus risk and frequency of earphone use, which yielded a p-value of < 0.001 , as well as the association between tinnitus risk and duration of earphone use, which also showed a p-value of < 0.001 . These results indicate that the

more frequent and the longer the use of earphones, the higher the risk of developing tinnitus complaints.

Descriptively, the majority of respondents in the “not a problem” tinnitus category used earphones with low frequency (1–2 days per week) and for less than 1 hour per day. In contrast, respondents with moderate to severe tinnitus complaints were more commonly found in the group that used earphones daily and for 2–4 hours per day. Moreover, all respondents in the “big problem” and “very big problem” tinnitus categories were in the group with daily earphone use and the longest duration. This indicates a dose-response relationship between earphone use and the severity of tinnitus.

The findings of this study are consistent with the research by Velaro and Zahara (2022), which reported a significant association between earphone use patterns and both the occurrence and severity of tinnitus among students, where high duration and frequency of earphone use increased the risk of developing tinnitus. In addition, the study by Pohan et al. (2023) also demonstrated that risky earphone use habits are an important factor in the development of tinnitus complaints among medical students.

When related to gender factors, the findings of this study indicate that although there was no significant difference between sex and the risk of tinnitus or earphone use patterns separately, the association between earphone use and tinnitus complaints was observed in both gender groups. This suggests that earphone use is a primary risk factor for tinnitus, regardless of sex differences. In other words, both male and female students have the same risk of developing tinnitus if they are exposed to high frequency and duration of earphone use.

These findings are supported by theory which states that exposure to high-intensity sound through earphones can cause damage to hair cells in the organ of Corti in the inner ear, which initially can cause temporary tinnitus and in the long term has the potential to cause permanent hearing loss. The sound intensity produced by earphones can reach more than 85 dB, and even up to 110 dB, so that uncontrolled use increases the risk of tinnitus in both males and females^{15,16}.

Thus, the findings of this study confirm that there is a significant association between earphone use and tinnitus complaints among students of

the Class of 2024, Faculty of Medicine, Indonesian Muslim University, and that this association is not significantly influenced by gender differences. The main factor contributing to the development of tinnitus is the pattern of earphone use itself, particularly the frequency and duration of use.

This study has several limitations related to the cross-sectional design used, such that the association between earphone use and tinnitus risk only demonstrates a relationship at a single point in time and cannot be interpreted as a causal relationship. Measurement of sound exposure did not include sound intensity or volume in decibels, but was based solely on the frequency and duration of earphone use. This condition may lead to inaccurate classification of sound exposure levels. The research data were obtained through self-administered questionnaires, thus relying on the subjects' memory and perception, which may introduce recall bias and reporting bias. This study did not include direct ENT examination, so conductive hearing disorders such as cerumen obturans could not be objectively confirmed and may act as confounding factors. In addition, the study subjects came from a relatively homogeneous population, namely 2024 medical

students at the Faculty of Medicine, Indonesian Muslim University, so the findings have limited generalizability to broader populations. The analysis was limited to bivariate analysis, therefore other potential confounding factors could not be controlled simultaneously. Assessment of tinnitus severity using the Tinnitus Handicap Inventory (THI) was also subjective and did not objectively reflect hearing status.

CONCLUSION

Based on the findings, sex is not significantly associated with earphone use frequency ($p = 0.344$), duration ($p = 0.398$), or tinnitus risk ($p = 0.160$). Conversely, earphone use frequency ($p < 0.001$) and duration ($p < 0.001$) are significantly associated with increased tinnitus risk. Future studies should utilize larger, more diverse samples, objective sound exposure measurements, longitudinal designs, and multivariate analyses to establish causality and control for confounding factors.

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