

# Adherence to Protective Measures against Hearing-Related Hazards of Mobile Phone Users among University Students

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## Abstract

**Background:** Mobile phone is an integral part of the society used by almost all. Youth in Nigerians are recognized as the most active users of mobile phones. There are about 1.1 billion youth people globally at risk of noise-induced hearing loss from unsafe listening. The awareness and adherence to hearing conservation measures against the hearing-related hazards of mobile phones have not been evaluated in our environment. **Aims:** To determine the knowledge and adherence to protective measures against the hearing-related hazards of mobile phones among university students. **Materials and Methods:** The study was a cross-sectional descriptive type, conducted among university students. Ethical clearance was obtained from the institutional review committee, a multistage random sampling technique was used to recruit the participants, and a specially designed and validated questionnaire was used to collect the data. The data were analyzed using Statistical Product and Service Solutions (SPSS) version 20.0. **Results:** The age of the respondents ranged from 16 to 40 years with a mean age of  $23.6 \pm 5.3$  years. Very few of the participants (19.1%) adhere to protective measures to mitigate hearing-related hazards of mobile phones, although about half (52.1%) had good knowledge of hearing conservation measures. There was a statistically significant association between knowledge of hearing-related hazard of mobile phone ( $P = 0.038$ ) and knowledge of protective measures ( $P = 0.000$ ) with the adherence to protective measures, respectively. **Conclusions:** The knowledge and adherence to protective measures against the hearing-related hazards of mobile phones were poor among the respondents.

**Keywords:** Hearing loss, mobile phone, protective measures, university students

## INTRODUCTION

A mobile phone is a communication tool, a personal listening device and a necessary social accessory used almost by all. In recent times, mobile phone usage has increased substantially and has been paralleled by a growing concern about its effects on hearing. Youths are generally more inclined toward excessive use of mobile phone as a communication and listening device, with some authors even reporting mobile phone addiction among the youth.<sup>[1,2]</sup> Acute and repeated exposure to mobile phone noise has been reported to cause hearing loss among university students in Ibadan, Nigeria.<sup>[3]</sup> Several other studies among students reported prolong usage of mobile phones resulted in increased hearing threshold, sensorineural hearing loss, tinnitus, vertigo, and ear pain.<sup>[4-7]</sup> Although the effects of mobile phone on hearing have been a controversial topic,<sup>[8]</sup> some authors reported no measurable changes in

the cochlear function of mobile phone users<sup>[9]</sup> and that the usage of mobile phone does not affect the inner ear or auditory system.<sup>[10]</sup>

The risk of noise-induced hearing loss (NIHL) from mobile phone usage was highlighted as an emerging public health problem.<sup>[5,11]</sup> According to the World Health Organization, there are about 1.1 billion youths globally at risk of NIHL from unsafe listening and over 43 million people aged 12–35 years live with disabling hearing loss.<sup>[12]</sup>

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Fortunately, this type of hearing loss is preventable; thus, the importance of prevention must be emphasized as damage to the cochlear hair cells by loud sound is a cumulative process, and once the injury is sufficiently severe enough to be noticed, the loss is substantial and irreversible. From an employment perspective, NIHL can significantly reduce an individual's ability to undertake job tasks that require the use of auditory signals or verbal communication, causing social isolation in the workplace and impacting upon teamwork and group productivity.<sup>[5,13]</sup>

Some of the protective measures reported to reduce the hearing-related hazards of mobile phone include: reduction in number and duration of calls/listening to music or radio, use of text messaging, use of hands-free mode, reduction of volume of the mobile phone, use of phone in areas with good network signals, use of mobile phone with good sound insulation system, and regular audiometric screening of frequent mobile phone users.<sup>[14-17]</sup>

The study aimed to find and document the awareness and adherence to some of the protective measures against the hearing-related hazard of mobile phone usage among selected university students.

## MATERIALS AND METHODS

This was a descriptive, cross-sectional study conducted among 400 students of Bayero University Kano between June 2017 and August 2018. Ethical clearance was obtained from the College of Health Science Research Ethics Committee, and consent was obtained from each participant, in accordance with the Helsinki Declaration of 1975. Participants included were students who used mobile phones daily for at least 1 year. A multistage random sampling technique was used to recruit the participants, and a specially designed and validated questionnaire was used to collect information. Information about the sociodemographic variables, the knowledge and adherence to protective measures, as well as knowledge of the hearing-related hazards of mobile phones were obtained. Questions regarding attendance of health education program on prevention of hearing impairment and hearing screening were also asked.

The data collected were analyzed using the Statistical Product and Service Solutions (SPSS) version 20.0 (IBM Inc. Chicago, Illinois, USA). The data were summarized and presented as qualitative and quantitative variables. Quantitative variables were presented using mean and standard deviation, whereas qualitative data were presented using frequencies and percentages and compared using Chi-squares. Factors found to be significant at bivariate levels were entered into logistic regression to adjust for possible confounding effects. The level of statistical significance was set at  $P \leq 0.05$ , at 95% confidence interval.

The sections of the questionnaire that assessed knowledge of hazards, knowledge of protective measures, and adherence to

protective measures were scored 1 for correct answer and 0 was awarded for wrong answer; each section was then summed up. The respondents who scored 60% were considered to have good knowledge/adherence, and those who scored less than that were considered to have poor knowledge/adherence.

## RESULTS

A total of 388 questionnaires were filled satisfactorily, given a response rate of 97%. The age of the respondents ranged between 16 and 40 years, with a mean of  $23.6 \pm 5.3$  years; most of them (66%) were in the age group of 16–24 years. Majority (64%) of the participants were male and about 81.4% were single [Table 1].

Among the respondents, 77.6% believed that they could protect themselves from hearing-related hazards of mobile phones; however, only 47.2% were aware of a method of protection against the hearing-related hazards of mobile phones [Table 2]. Majority of the students (84.0%) agreed that annual hearing screening of mobile phone users is important, but only 17.5% had hearing screening before [Tables 2 and 3].

About half (52.6%) of the students knew that excessive use of mobile phones can cause hearing loss, but only 38.4% reduced the frequency and duration of mobile phone usage [Tables 3 and 4].

Overall, 202 (52.1%) had good knowledge of protective measures, whereas 186 (47.9%) had poor knowledge of

**Table 1: Sociodemographic characteristics of the respondents**

	Frequency (%)
Age (years)	
16-24	255 (66)
25-34	110 (28)
35-40	23 (6)
Gender	
Male	250 (64)
Female	138 (36)
Marital status	
Single	316 (81.4)
Married	69 (17.8)
Widow	2 (0.5)
Divorced	1 (0.3)

**Table 2: Knowledge of protective measures against the hazards of mobile phones**

	Yes (%)	No (%)
Do you think you can protect yourself from the hazard of mobile phones?	301 (77.6)	87 (22.4)
Awareness of method of protection against the hazard of mobile phones	183 (47.2)	205 (52.8)
Monitoring of exposure to mobile phone noise	116 (29.9)	272 (70.1)
Attendance of health education program on prevention of hearing impairment from noise	48 (12.4)	340 (87.6)
Importance of annual hearing screening	326 (84.0)	62 (16.0)

protective measures. Similarly, 200 (51.6%) had good knowledge of the hearing-related hazards of mobile phone, whereas 188 (48.4%) had poor knowledge of the hearing-related hazards of mobile phone. Figure 1 shows the distribution of adherence to protective measures against the hearing-related hazards of mobile phones among the respondents. Seventy-four (19.1%) respondents had good adherence to protective measures, whereas 314 (80.9%) had poor adherence.

Table 5 shows the association between adherence to protective measures and other variables. There was no statistically

significant association between adherence to protective measures with age or gender ( $P$  values were  $>0.05$ ). On the other hand, there was a statistically significant association between the adherence to protective measures with knowledge of hearing-related hazard of mobile phone ( $P = 0.038$ ) and knowledge of protective measures ( $P = 0.000$ ), respectively.

The two significant factors associated with the adherence to protective measures were further tested using binary logistic regression [Table 6]. The association between knowledge of hazard and adherence to protective measures showed no statistically significant association at the level of logistic regression ( $P = 0.314$ ).

However, the association between knowledge of protective measures and adherence to protective measures showed statistically significant association at the level logistic regression ( $P = 0.000$ ). Hence, this association showed statistically significant association at both bivariate and multivariate levels, meaning that the association between these factors truly exists even after the elimination of confounding effects.

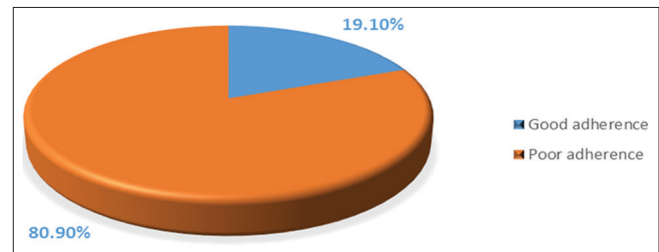
The respondents when they were asked about the source of information regarding the hearing hazards of mobile phone, 191 (49.2%) got the information from social media, 82 (21.1%) from radio/television programs, 47 (12.2%) from health care personnel, 21 (5.4%) from a newspaper, 18 (4.6%) from

**Table 3: Adherence to protective measures against the hazards of mobile phones**

	Yes (%)	No (%)
Avoidance of usage of mobile phone in the area of poor network reception	231 (59.5)	157 (40.5)
Reduction in the frequency and duration you spent on phone calls	149 (38.4)	239 (61.6)
Regular use of hand-free mode while making phone calls or listening to radio/music	80 (20.6)	304 (79.4)
Reduction in volume of mobile phone while calling or listening to radio/music	93 (24.0)	295 (76.0)
Had hearing screening before?	68 (17.5)	320 (82.5)

**Table 4: Knowledge of hearing-related hazards of mobile phones**

	Yes (%)	No (%)
Awareness of any hearing-related hazard of mobile phone usage?	220 (56.7)	168 (43.3)
Do you know that mobile phone usage can cause hearing loss?	204 (52.6)	184 (47.4)
Do you know that mobile phone usage can cause ear pain?	205 (52.8)	183 (47.2)
Do you know that mobile phone usage can cause tinnitus?	206 (53.1)	182 (46.9)
Do you think radiation emitted by mobile phone have risk of brain cancer?	197 (50.8)	191 (49.2)



**Figure 1: Adherence to protective measures against the hearing hazards of mobile phone**

**Table 5: Factors associated with adherence to protective measures**

Factors	Adherence to protective M\measures		$\chi^2$	$P$
	Poor (%)	Good (%)		
Age (years)				
16-24	161 (63.1)	94 (36.9)	4.788	0.075
25-34	56 (50.9)	54 (49.1)		
35-44	14 (60.9)	9 (39.1)		
Gender				
Male	144 (57.6)	106 (42.4)	1.094	0.174
Female	87 (63.0)	51 (37.0)		
Knowledge of hazard				
Poor	118 (62.8)	70 (37.2)	1.579	0.038*
Good	113 (56.6)	87 (43.5)		
Knowledge of protective measures				
Poor	133 (71.5)	53 (28.5)	21.246	0.000*
Good	98 (48.5)	104 (51.5)		

\*Significant association

**Table 6: Logistic regression of adherence to protective measures against the predictors**

Predictors	Crude OR	Adjusted OR	95% CI	P
Knowledge of hazard	0.22	0.81	0.5-1.2	0.314
Knowledge of protective measures	0.97	0.38	0.2-0.6	0.000*

\*Significant association. OR: Odds ratio, CI: Confidence interval

manufacturer's instructions, and 29 (7.5%) from other sources.

## DISCUSSION

In this study, about half (52.1%) of the students had good knowledge of protective measures against the hazards of mobile phones, despite this only 19.1% used the protective measures adequately (such as the use of hand-free mode and avoidance of mobile phone use in the area of poor network reception, etc.). This is comparable to a study from India,<sup>[18]</sup> where 83.8% of the students knew about the harmful effect of loud sound on hearing, but only 2.7% adhere to protective measures.

It was observed that there was low level (20.6%) of usage of hands-free mode among the participants in this study. This is in agreement with a study by Soderqvist *et al.*<sup>[19]</sup> who reported 17.4% usage of hands-free equipment among 2000 Swedish adolescents. In contrast, slightly higher usage of hand-free mode/speaker mode was reported in Saudi Arabia (39.4% from the group 6<sup>th</sup> year medical students and 47.2% from the group of intern doctors).<sup>[20]</sup> This could be due to increased level of awareness of participants in their study. The use of hand-free mode was considered as the safest method of usage of mobile phones because the phone is not in contact with ear and loud sound transmission into the ear is reduced, thereby decreasing the risk of development of hazards such as headache, ear pain, and hearing loss. This is further buttressed by a cross-sectional community study conducted in Singapore,<sup>[21]</sup> which showed that the prevalence of headache among mobile phone users was reduced by more than 20% among those who used hand-free mode.

This study showed that more than half (59.5%) of the respondents used mobile phones in the area of poor network reception. Similarly, Youssef *et al.*<sup>[7]</sup> also reported that more than half of the students (74.6% of the males and 65% of the females) used mobile phones in the area of weak signals. The use of mobile phones in the area of poor signals means that the mobile phone will generate more energy to maintain the connection, thereby producing more side effects.<sup>[22]</sup>

This study also revealed that about half (51.6%) of the respondents had good knowledge of the hearing-related hazards associated with mobile phone use. This is similar to the findings by Kumar *et al.* in Malaysia.<sup>[23]</sup> and Vasudev *et al.* in India,<sup>[24]</sup> where 62% and 60% of the students were aware of the adverse effects of mobile phone usage, respectively. However,

Al-Muhayawi *et al.*<sup>[20]</sup> reported a higher percentage (87.9% from the group of 6<sup>th</sup>-year medical students and 88.2% from the group of intern doctors) of participants with awareness of hearing-related hazards arising from the use of cell phones. This may be due to the fact that the participants in their study had advantage of medical knowledge compared to participants in this study.

The respondents of this study, when asked about the source of information regarding the hazard of mobile phone, very few got the information from the manufacturer's instructions. Similarly, Akande and Ajao in Ilorin, Nigeria,<sup>[25]</sup> reported that none of their respondents mentioned the manufacturer's instructions as a source of information about the hazard of mobile phones. This means that the manufacturers do little in educating their customers about the hazard of mobile phones or users are unmindful to read manufacturers manuals. Other sources of information about the hazard of mobile phones in this study were from radio/television programs, newspaper, and health-care personnel; these findings are similar to a study by Al-Muhayawi *et al.*<sup>[20]</sup> These sources of information could be used as possible outlets for dissemination of knowledge about the hearing-related hazard of mobile phones and methods of protection.

## CONCLUSIONS

The adherence to protective measures against the hazard of mobile phones investigated was poor among the students. The findings of this study also revealed that about half of the respondents had poor knowledge of hearing hazards and poor knowledge of protective measures to mitigate against the hearing-related hazards of mobile phone use. Therefore, it is recommended that health education about hearing conservative measures and awareness campaigns on the hazards of mobile phones should be improved.

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## Conflicts of interest

There are no conflicts of interest.

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