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Research Article

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Health Related Complications and Perspective of Earphone and Headphone Use

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Abstract

Background: There is an upsurge in the demand, use and production of earphones and headphones due to technological advances and life style changes associated with the Covid-19 pandemic but their prolonged and or improper use can cause diverse health related complications. This study is aimed to ascertain the health related complications associated with the use of these devices and the users' perspective of these complications and how to use these devices safely.

Materials and Methods: This is a questionnaire based study involving patients attending the Ear, Nose and Throat clinic in the Nigerian Navy Reference Hospital that are users of earphones and headphones.

Results: In this study, 37.3% of the participants use earphones and headphones few days in a week while 36.5% use it for an hour daily. Only 73% of them experienced health related complications with ear pain (35.9%) and headache (31.5%) accounting for the most common complications experienced. Most of them (76%) are aware of health related complications associated with the use of earphones and headphones with 94% of the participants in the study taking preventive measures while using these devices.

Conclusion: Though earphone and headphone use has numerous advantages, their prolonged and improper use without protective measures can cause health related complications. We urge that extensive studies on the long term effects of the use of these devices be done and also more awareness created on the proper use of these devices.

Keywords: Earphones; Headphones; Health Related Complications; Hearing Loss

Introduction

Technology has made the world a global village promoting the use of earphones and headphones for communication and leisure activities. The Covid-19 pandemic characterized by isolation, online education, social distancing, working from home, online shopping and virtual interactions has led to the upsurge in use, demand and production of earphones and headphones [1]. State-of-the-art earphones and headphones are produced daily with features like

improved sound quality, diminished size, blue tooth and wireless technology. These devices are portable and isolate individuals from surrounding noise and activities. It also helps individuals to concentrate on the task at hand. The maximal volume limit in these advanced devices are in the range of 105 to 110 decibels but listening to sounds louder than 85 decibels and longer than 2 hours can have adverse health effects [2,3].

Prolonged and or improper use of earphones and headphones may result in health issues like tinnitus, ear infection, hearing loss, vertigo, excess production of ear wax, pain or discomfort in the ear, headache and hyperacusis [4-6]. Accidents could also occur [7,8] with the use of earphones and headphones. Extended use of earphones and headphones at loud volumes can affect the hair cells of the cochlear, causing impaired hearing [9]. This reduced hearing may go unnoticed for a long time thereby hampering corrective measures or treatment when it is eventually discovered [10]. In the United States, the rate of reduced hearing in young individuals is two and a half times more than that in middle aged and elderly people due to chronic exposure to loud sounds with an estimation that in 2050, about 50 million individuals will be hearing impaired [11]. Reducing the volume while using these earphones or headphones are protective and prevent the development of noise induced hearing loss despite duration of use [12] but this does not prevent other health effects caused by improper use, isolation and hygiene factors.

Unfortunately, general awareness of these health related complications and protective measures to be taken when using earphones and headphones is poor. Few studies have been done to document health related effects of the use of these devices in other to promote awareness both to the user and manufacturer.

Aim of the Study

The aim of this study is to ascertain the health related complications associated with the use of these devices, the perception of earphone and headphone users of these complications and ways to safely use these devices.

Materials and Methods

This questionnaire based study was conducted in the Ear, Nose and Throat Clinic of the Nigerian Navy Reference Hospital, Lagos, Nigeria. Patients who presented to the clinic in the month of August, 2021 and use earphones and or headphones were recruited for this study after consent was taken. Data was collected from 126 individuals. The questionnaire which is modified from that used in a previous study [13], contained questions like gender, duration of use of earphones or headphones, health related complications experienced by users, perception of these health effects and preventive measures taken. Data gotten was analysed using Excel software.

Results

The gender distribution of the 126 patients revealed more female participation (59.5%). This is due to the fact that more females presented to the clinic during the study period.

Gender	Number	Percentage
Female	75	59.5
Male	51	40.5
Total	126	100

Table 1: Gender distribution of participants.

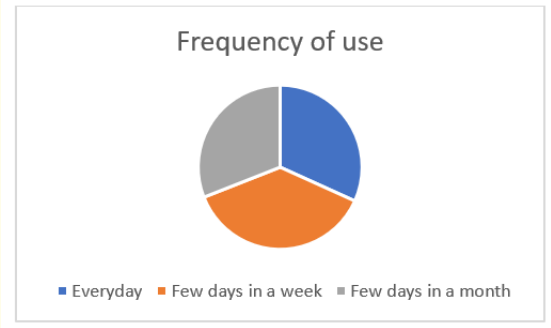

Figure 1: Shows the frequency of use of earphones and or headphones by the participants. 31.8% use this device everyday while 37.3% use it few days in a week and 30.9% use it rarely in a month.

Most of the study participants (59) are interested in sound quality when they want to get earphones or headphones while 49 participants check for sound quality, affordability and size of the device before purchase (Figure 2).

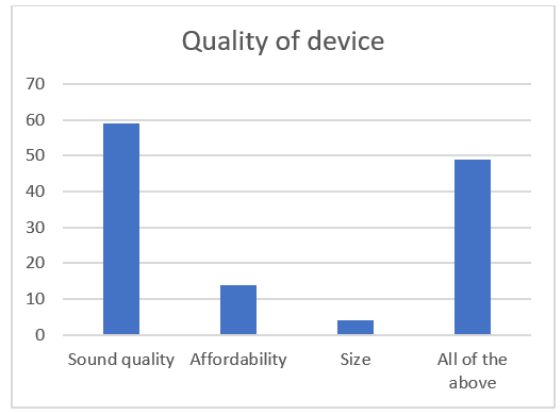

Figure 2: Qualities looked for when buying earphones and or headphones.

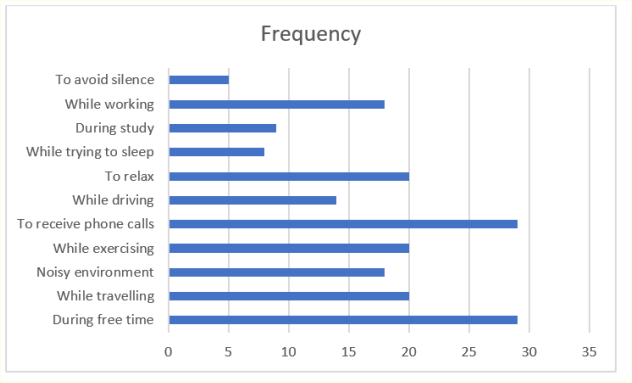

Figure 3: Indications for the use of earphones and headphones.

Most of the participants use earphones or headphones for about an hour daily (36.5%) while only 12.7% of these participants use them for about 3 hours daily.

Duration (Hours)	Number	Percentage
1	46	36.5
2	29	23
3	16	12.7
≥ 4	35	27.8

Table 2: Duration of use of earphones or headphones daily.

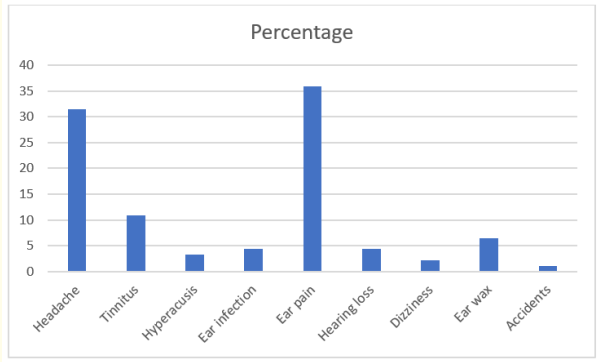

Figure 4: Health related complications of earphone and headphone use.

Among the participants, the most common reasons why earphones and headphones were used are to receive phone calls and to eradicate boredom during their free time (Figure 3). Other common indications are its use while travelling and during exercise.

Thirty four of these participants have not experienced any health related complications while using earphones and headphones. The most common health related complications experienced are ear pain (35.9%) and headache (31.5%) while the least are accidents (1.1%) and dizziness (2.2%).

Most of the participants (96) are aware that earphones and or headphones could cause health related issues. The remaining 30 participants are not aware of this fact. On further probing of those who were aware of the health related complications, ear pain and hearing impairment were found to be the most common known health related complication associated with the use of earphones and headphones (Figure 5).

Most of the participants (118) took measures while using earphones or headphones in other to prevent health related complications. Most engaged in listening at low volumes (39) and then reduced duration of use of these devices (32). The least common

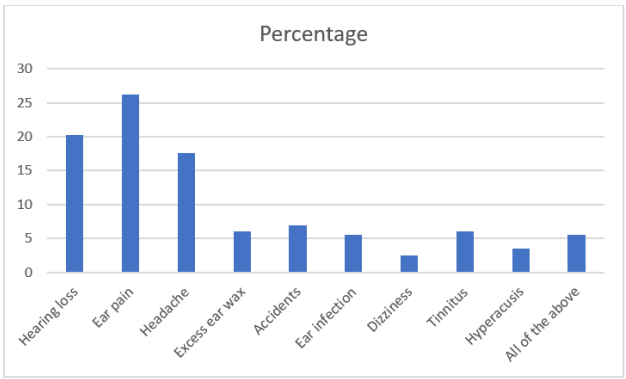

Figure 5: Known health related complications of earphone and headphone use.

preventive measure taken is regular sanitization or cleaning of the earphone or headphone (Figure 6).

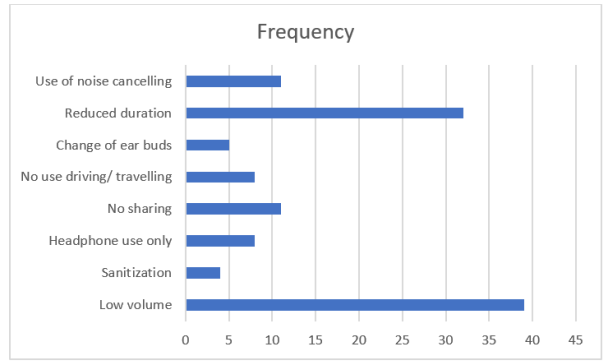

Figure 6: Preventive measures taken.

No linear relationship was found between the daily duration of use of earphones or headphones and the presence of health related complications in these participants (r = 0.3193).

Discussion

Earphone and headphone use is increasing daily due to their work and leisure benefits, enhanced sound quality and portability but their prolonged and or improper use is associated with health related complications. In this study, most of the participants use earphones or headphones few days in a week unlike the finding of Harshita and colleagues (2017), who noted that majority of the study participants use earphones every day. This may be due to the fact that their study focused on adolescents who are more in tune with technological advances and use these devices for school and leisure activities. This present study cuts across all ages and people from all works of life who presented to the clinic for treatment or Ear, Nose or Throat ailments.

Sound quality was found to be the most important factor considered while buying earphones or headphones in this study. This encourages users of earphones and headphones to increase the volume of these devices as the sound produced does not alter despite change in volume. A 2017 study in India noted that most of the adolescents considered sound quality, affordability and size before getting an earphone or headphone [13].

In this study, 36.5% of the participants use earphones or headphones for a maximum of one hour daily while 27.8% use it more than 4 hours daily. The duration of use daily depends on the work and leisure activities engaged by the participants. This differs from findings in other studies. In a 2013 study involving young people, 80% of them spent about 3.2 hours daily using headphones [14] while it is one and a half hours on average in a study done in India [15]. A 2017 study of headphone listening pattern in adolescents in Sweden noted that those with listening patterns of 3 or more hours at every use of the headphone developed tinnitus and those exposed to high decibels developed hearing impairment [16]. Students who are regular users of earphones and who have used them for years were noted to have more cases of hearing impairment [17]. This supports the fact that prolonged use of these devices and especially at high volumes can lead to complications.

Ear pain and headache were the most common complication experienced by the participants of this study. Only 73% of these participants experienced health related complications linked to earphone or headphone use. Health related complications were noted in 60% of students in an Iranian study [17]. This present study involves a mixture of teenagers, young, middle aged and elderly people hence, the variation. Ear pain may be due to use of inappropriate size or prolonged use of earphones or headphones. Some of these earphones have soft ear buds to reduce the pres-

sure effect of these devices on or in the ear. Exposure to very loud sounds can trigger ear pain and or headache. In about 80 percent of people with chronic or recurrent headaches, sounds as low as 50 decibels can trigger headaches [18]. High volume of sound or noise can also exacerbate headaches. Therefore, experiencing headaches while using earphones and headphones should be an indication that the volume of the device is high and should be reduced. Users should also take a break from using these devices.

The Centre for Disease Control and Prevention in 2019 pointed out that sounds louder than 70 decibels for a long period may affect hearing while that above 120 decibels has the potential of causing instant hearing impairment. Using these devices at volumes of 100 decibels has been noted to lead to irreversible hearing impairment after 4 years of continuous use [14]. This is due to injury to the hair cells of the cochlear that converts sound to electrical messages that are sent to the brain. A study done in Zaria, Nigeria [9] discovered significant reduced hearing in the participants who use headphones compared to those who do not. This finding differs from that of Mazlan and colleagues (2002), who noted no increase in hearing threshold following prolonged use. This occurred because the headphones were used at low volumes (mean finding of 58 decibels). Taking short breaks while using these devices protects the ear from damage to hair cells. The 60/60 rule is advocated [19]. In this rule, the volume of the earphone or headphone should not exceed 60% of the device volume and duration of use should not exceed 60 minutes daily. If use must exceed 60 minutes, short and multiple breaks should be taken.

Though it has been suggested that the use of earphones and headphones can cause ear infection based on the fact that infection can spread in those that share these devices and also that these devices are likely to increase the temperature and moisture in the ear canal. These devices can also be infected if not properly and regularly cleaned because in some cases, they are dropped or kept in unsanitary conditions. The presence of ear infection was not noted in a study of 118 customer service workers who used headphones daily [12]. This supports the study by Cooper who noted no statistical difference in ear infection when he compared ear infection in workers that use ear plugs and those that do not use ear plugs [20]. 27% of the participants in this present study did not experience any complication despite using earphones and or headphones.

76% of participants in this study are aware that prolonged and or improper use of earphones or headphones can cause health related issues with ear pain and hearing loss being the most common known complication. A 2019 Global Hearables Report noted that most of the 6,012 participants are conscious of the health related risks of using earphones and headphones in the open. Ninety six percent of them acknowledged the harmful use of these devices when driving, 91% when cycling and 86% while running. Therefore, accidents while driving, exercising or walking in a busy street can be avoided if these devices are not used in this conditions. A retrospective case series (2004 - 2011) noted 116 cases of morbidity and mortality involving pedestrians using headphones. Warnings were sounded in 29% of this cases but this went unheeded [8]. This highlights that these are all preventable complications.

About 94% of the participants took preventive measures while using earphones or headphones but the type of preventive measure taken varies. The most common preventive measures taken are listening at low volumes and reducing the duration of use of these devices. This shows that they are aware of the measures to take when using these devices to prevent or reduce the incidence of hearing impairment. This may also account for the low incidence of hearing impairment among them. Only 6.8% of the participants in this study use headphones only while others use earphones alone or alternate between earphones and headphones. This finding is similar to that noted by Mohammadpoorasl and colleagues in 2018 of 6.5%. Earphones are preferred more than headphones especially by younger people because of their small size and portability [14]. They can also be inconspicuous. The downside is that they do not eradicate environmental sounds making users of earphones to increase the volume of their device to drown the external noise [21]. Using earphones at loud volumes can affect hearing as it conducts the sound directly to the ear. Headphones have the advantage of eradicating environmental sounds so the need to increase the volume is diminished. Their disadvantage is their cost and their size which reduces their portability and increases their visibility. Noise cancelling headphones and earphones eradicate environmental sounds which helps users to listen to sounds at low volumes and therefore are protective.

The least preventive measures taken by the participants in the study are regular change of ear buds and sanitization of these de-

vices. This is quite appalling especially in this period of Covid-19 pandemic with different variants emerging. These viruses can survive on the surface of objects or articles for a few days so as part of protective measures in this pandemic, this device should be sanitized regularly and disposable ear buds should also be changed regularly. Most importantly, sharing of earphones and headphones should be avoided to reduce the spread of the Covid-19 virus.

No relationship was noted in this study between the duration of daily use of earphones and headphones and the presence of health related complications. This may be due to several reasons. The duration of use of these devices in years were not investigated. As earlier said, long term use can lead to complications but some health related complications like accidents, ear infection and hearing loss due to exposure to very loud sounds do not depend on long term use of these devices. Many participants in this study also used these devices at low volumes which is in keeping with the rule of reduced volume with extended period of use of these devices to protect users. Though the findings of this study cannot be generalized due to the small sample size, the fact that pattern of use of these devices varied with different age groups and devices used by the participants are not the same in size and feature specifications, these findings can be used as a template for other studies and to create awareness of the proper use and health complications that may occur. They can also be used by manufacturers as a guide for the production of new devices that can be used with minimal complications.

Conclusion

Earphone and headphone use has its numerous advantages prompting the surge in use and production but prolonged and improper use without protective measures can cause health related complications. These health related complications can be prevented if the right steps are taken. It is recommended that extensive studies on the long term effects of the use of these devices be done and also more awareness created on the proper use of these devices in other to avoid health related complications.

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