Otolaryngology online journal

ISSN:2250-0359 **Volume 4 Issue 4 2014**

Manifestations of mobile phone use in young adults

Chander Mohan Prashant Bhardwaj Abhinav Srivastava

Rohilkhand Medical College and Hospital, Bareilly

ABSTRACT

AIM: To determine the physical and functional effect of mobile phone use on ear and to assess the hearing pattern in young adults.
MATERIALS AND METHODS: A total no. of 200 subjects between the age group of 15-25years using mobile phone for at least 5years were selected and screened for otological and other physical symptoms.
RESULTS: In this study, the subjects using mobile phones for less than 1hr daily, 5dB loss was noted in 5% subjects, at speech frequencies. Those using mobile phone up to 2hrs daily, 5dB loss was seen in 10%, 10dB loss in 2.1% and 15dB loss in 3.1% of cases were observed. Whereas 5dB loss in 7%, 10dB loss in 3.8% and 15dB loss in 1.9% cases was seen in those using mobile phone for over 2hrs per day.
Conclusion: Since up to 25dB audiometric hearing loss is taken as normal, so no significant hearing loss was observed in this study. It was observed that a hearing loss of 5–15dB was observed in the subjects using mobile phones from 1-2hrs/day for over 5 years.

Keywords: Mobile Phones, Specific Absorption Rate(S.A.R.), Hearing Loss.

Introduction

India is the fastest growing wireless market, with 867.80 million mobile phone subscribers as of April 2013. It is also the second largest telecommunication network in the world after china.

The country's most populous state, Uttar Pradesh, accounts for the largest number of mobile subscribers in the country i.e. 121.60 millions followed by Tamil Nadu, Maharashtra, Andhra Pradesh and Bihar, which together account for almost half of the total wireless connections.(The Hindu 5th May 2013)

Since 2001, when the number of subscribers in the country were around 5 million, the mobile subscribers have increased in size by a factor of more than 100.

Mobile phones are two way radios that transmit and receive information via radio waves also known as radio-frequency (RF).

Since ear is the closest organ to mobile phones receiving higher energy deposition than other organs, the effects of mobile phone radiation is more on hearing.

Our study was planned to evaluate the impact of prolonged mobile phone use on hearing among subjects of 15-25years age group.

Materials and Methods

The study was conducted in the Department of ENT at Rohilkhand Medical College and Hospital, Bareilly, U.P (West). A total number of 200 subjects of both sexes, in the age group of 15-25 years who are using mobile phones for at least 5 years were selected, and screened for otological or other physical symptoms. The informed consent was taken from all the subjects. The study has clearance from institutional ethical committee.

The subjects using mobile phones with SAR value of less than 1.5W/Kg were included in this study.

The Physical and Otoscopic examination was performed in all the subjects before testing to rule out any external or middle ear pathology that could affect hearing. The hearing levels of subject were tested by ALPS-2100 Pure tone audiometer. PTA was evaluated for type and percentage of hearing loss. Associated symptoms with mobile phone use were evaluated to find out other effects of mobile phone use on general health and well being of the subject.

Following subjects were excluded from the study:-

-Known middle ear disease such as Chronic Suppurative Otitis Media, Tympanosclerosis, Monomeric Tympanic Membrane.

-patients suffering from Meniere's disease, Acoustic Neuroma, Hypertension and Diabetes Mellitus.

-history of Meningitis and Head Injury,

-known family history of Hearing Loss.

-history of Occupational exposure to persistent noise.

-History of exposure to ototoxic drugs.

Results

The study comprises of 200 subjects of 15-25 years age groups of both sexes, using mobile phone with SAR value of less than 1.5W/kg for over 5years. There were 138 males and 62 females making a male to female ratio of 2:1.

On the basis of duration of mobile phone use per day, the average daily use was calculated. The corrected average daily use for 5 years has been calculated using the formula[14].

$$\text{Corrected average daily use} = \frac{\text{duration of mobile phone use} \times \text{average daily use}}{5}$$

In this study (32%) subjects had less than 1 hr of exposure per day, (55%) had 1-2 hrs of exposure and (13%) had over 2 hrs of exposure per day (Table 1,figure 1).

Table 1: Hours of Exposure

Hour's/day	subject	percentage
< 1hr	64	32%
1hr-2hr	110	55.0%
> 2hr	26	13.0%

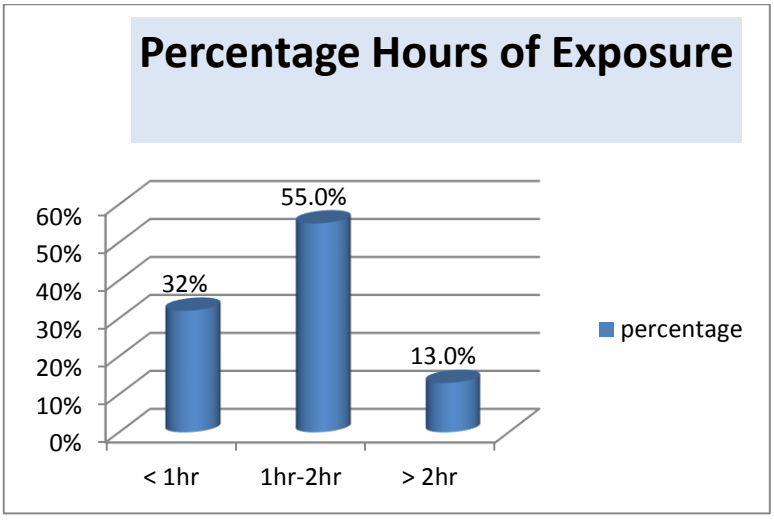

Figure-1

In this study, high frequency hearing loss was observed in all the subjects. The subjects using mobile phones for less than 1hr daily, 5dB loss was noted in 5% subjects. Those using mobile phone upto 2hrs daily, 5dB loss was seen in 10%, 10dB loss in 2.1% and 15dB loss in 3.1% of

cases. Whereas 5dB loss in 7%, 10dB loss in 3.8% and 15dB loss in 1.9% cases was seen in those using mobile phone for over 2hrs per day (table 2,figure 2).

Table 2: Average daily mobile phone use and hearing loss in dB

Hours of Exposure	Hearing Loss		
Hour's/day	5dB	10dB	15dB
< 1hr	5%	0%	0%
1hr-2hr	10%	2.1%	1.3%
> 2hr	7%	3.8%	1.9%

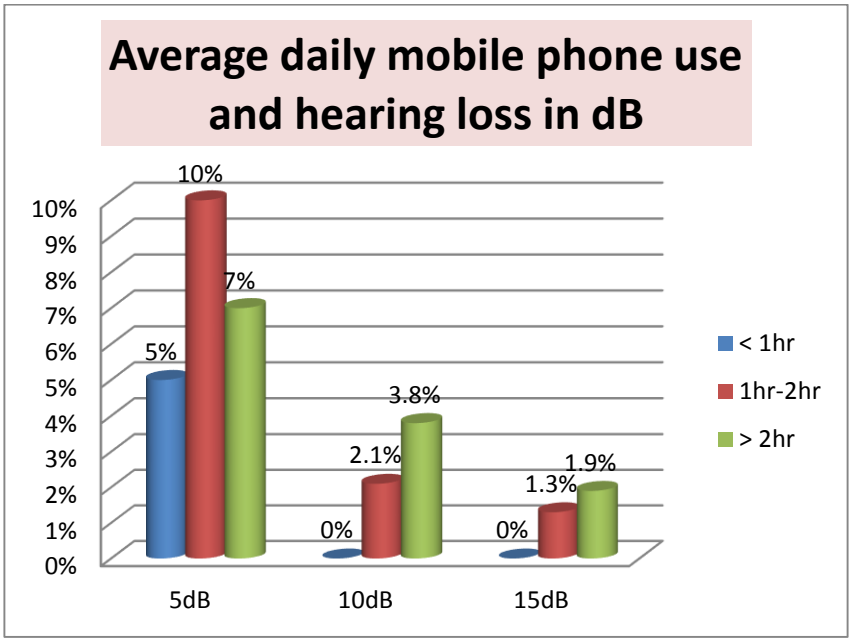

Figure-2

The hearing loss was observed in the dominant ear in those subjects who used mobile phone in one particular ear. It was noted that in right handed persons right ear was the dominant ear.

Headache, Tinnitus, sleep disturbance, Tension/Anxiety, Dizziness, external ear pain and lacrimation were the main symptoms in the study group, whereas no subject reported difficulty in hearing as the main complaint (Table 3,figure 3).

Table 3: Symptoms at presentation

Symptoms at presentation	Percentage
Headache/Ear ache	18%
Tinnitus	7%
Sleep disturbance	3%
Tension/Anxiety	2%
Dizziness	2%
Lacrimation	2%
Forgetfulness	1%

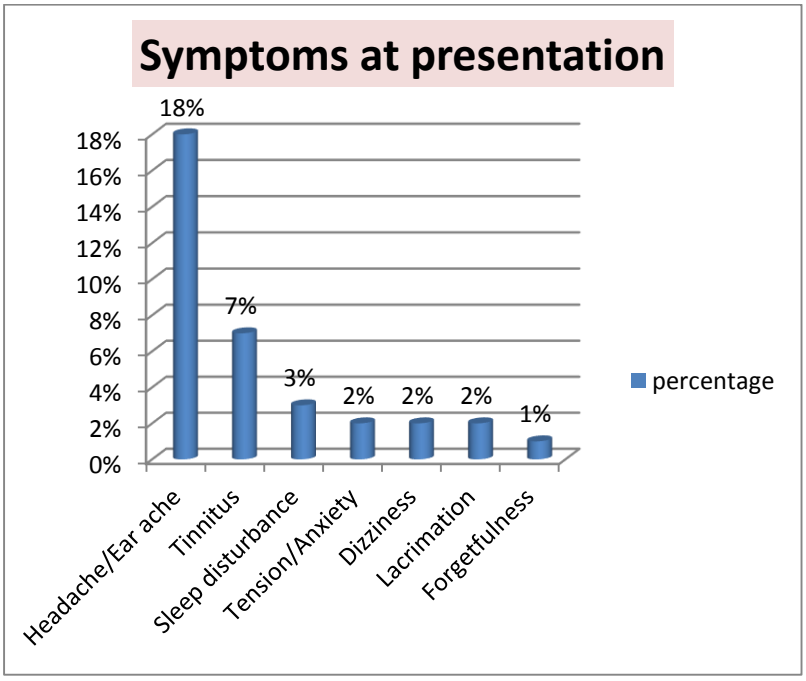

Figure-3

Discussion

The mobile subscribers have increased in size by a factor of more than 100, since 2001 when the number of subscribers in the country were around 5million. Mobile phone is very much popular among young adults i.e between age group of 15-25years because of their perceived importance to the same age group.

Specific absorption rate (SAR) is a measure of the rate at which energy is absorbed by the body, when exposed to a radio frequency (RF) electromagnetic field. It is defined as the power absorbed per mass of tissue and has units of watts per kilogram (W/Kg). The specific absorption rate (SAR) of every mobile phone sold in the country should be less than 2W/Kg.

SAR value of different mobile phone is different, which is notified by each brand and rate of absorption of energy absorbed by the body depends on SAR value.

International commission on Non-Ionising Radiation Protection (ICNIRP) provides information regarding health hazards of exposure of body to *Non-ionising* Radiation. According to ICNIRP the maximum SAR value for mobile phones is 2W/Kg for human head and trunk in the frequency range of 10MHz to 10GHz. It has been debated whether these fields could damage the tissue or not.

The mobile phone radiations have many side effects like different forms of cancers (brain tumours, lymphoma, leukemia), Neurological disease (Alzheimers disease), Sleep disturbances and genotoxic effects etc[8].

Any adverse health effect from the use of mobile phone will be a global concern because of extensive use of mobile phones in developing and developed countries alike. Keeping in view the preponderance of mobile phone use , the present study has been undertaken with a view to establish any ill effects of prolonged mobile phone use in healthy young adults.

The study included 200 young healthy subjects of both sexes between 15-25years of age full filling all the criteria's for enrollment in the study.

The subjects had the symptoms of Headache, Tinnitus, sleep disturbance, Tension/Anxiety, Dizziness, external ear pain and lacrimation.

In our study hearing loss was observed in mobile phone users, though not significantly affecting their day to day activity. Those using mobile phone for 2hrs or more had varying degree of hearing loss.

Subjects using mobile phones for over 5 years and for over 1hr/day had hearing loss, indicating thereby that the hearing loss depends on duration of exposure. The hearing loss was found to be directly proportional to the duration of exposure but no subject had significant disabling hearing loss.

Meo and Dress (2005) found impaired hearing and ear ache in 34.59% of the subjects.

Gracia C et al (2005) noted mild hearing loss in 323 mobile phone users for 3 years, which was not statistically significant.

Oktay MF et al (2006) observed that a higher degree of hearing loss is associated with long term exposure to electromagnetic field generated by mobile phones.

Sivert et al (2005), Davidson and Lutman (2007) reported no effect of mobile phone use on audio-vestibular system.

Panda et al (2007) found high frequency hearing loss in subjects using the mobile phones for more than 4years.

Sahoo GC et al (2011) observed hearing loss in mobile phone users and observed that severity of the deafness seems directly correlated with duration of the mobile phone use.

Kucer et al (2013) noted that users of mobile phones, women significantly complained more often of headache, vertigo/dizziness, fatigue, forgetfulness and tension-anxiety than men.

Conclusion

Since upto 25dB audiometric hearing loss is taken as normal, so no significant hearing loss was observed in this study. It was observed that a hearing loss of 5 – 15dB was observed in the subjects using mobile phones from 1-2hrs/day for over 5years. None of the subjects was using hands free devices during use of mobile phones. For coming to a definitive conclusion, a long time follow-up study in a larger group is required. However, to avoid ill effects of mobile phones use following guidelines are recommended to be observed:-

- Phone should only be used when necessary and calls should be kept short.
- Use of mobile phone should be avoided if the signal strength is low.
- Phone should be kept away from the head, eyes, testicles, breasts and internal organs as far as possible. Hands free device should be used.
- During pregnancy the use of mobile phone should be limited.
- Phone should be switched off when not in use.

References

1. Ozturon O, Erdem T, Miman MC, Kalcioglu MT, Oncel S. Effect of the electromagnetic field of mobile telephones on hearing. *Acta Otorhinol 2002; 122:289-93*
2. Meo SA, Al-Drees AM. Mobile phone related-hazards and subjective hearing and vision symptoms in the Saudi population. *Int J Occup Med Environ Health 2005;18:53-7.*
3. Garcia Callejo FJ, Garcia Callejo F, Pena Santamaria J, Alonso Castnaneira I, Sebastian Gil E, Macro Algarra J. Hearing level and intensive use of mobile phones. *Acta otorinolaringol Esp 2005;56:187-91.*
4. Sievert U, Eggert S, Goltz S, Pau HW. Effects of electromagnetic fields emitted by cellular phone on auditory and vestibular labyrinth. *Laryngorhinootolgie 2007;86:264-70.*

5. Oktay MF, Dasdag S. Effects of intensive and moderate cellular phone use on hearing functions. *Electromagn Bio Med 2006;25:13-21.*
6. Mora R, Crippa B, Mora F, Dellepiane M. Cellular telephone microwave radiation on the auditory system in healthy men. *Ear Nose Throat J 2006;85:160,162-3.*
7. Stefanics G, Kellenyi L, Mohar F, Kubinyi G, Thuroczy G, Hernardil. Short GSM mobile phone exposure does not alter human auditory brain-stem response. *BMC public health-2007;7:325*
8. Davidson HC, Lutman ME. Survey of mobile phone use and their chronic effects on the hearing of a student population. *Int J audiol 2007;46:113-8.*
9. Panda NK, Jain R, Bakshi J, Munjal S. Audiologic disturbances in long- term mobile phone users. *J Otolaryngol Head Neck Surg 2007;137:131-2.*
10. Panda NK, Jain R, Bakshi J, Munjal S. Audiologic disturbances in long- term mobile phone users. *J Otolaryngol Head Neck Surg 2010;39(1):5-11.*
11. Kwon MS, Jaaskelainen SK, Tonivo T, Hamalainer H. No effects of mobile phone electromagnetic field on auditory brainstem response. *Bioelectromagnetics 2010;31:48-55*
12. Hutter HP, Moshammer H, Wallner P, Cartellieri M, Denk-Linnert DM, Katzinger M, Ehrenberger K, Kundi M. Tinnitus and mobile phone use. *Occup Environ Med 2010;67(12):804-808*
13. Panda NK, Modi R, Munjal S, Virk RS. Auditory changes in mobile phone users. *Otolaryngol Head Neck Surgery – 2011;144(4):581-585*
14. GC Sahoo, Honeymol Sebastian. Prevalence of sensorineural deafness in habitual mobile phone users. *Indian J Otol 2011;17:97-100*
15. Chu MK, Song HG, Kim C, Lee BC. Clinical features of headache associated with mobile phone use. *BMC Neurol – 2011;11:115*
16. Küçer N, Pamukçu T. Self-reported symptoms associated with exposure to electromagnetic fields. *Electromagn Biol Med. 2013 june 3.*