EFFECT OF CELL PHONE USAGE ON HEARING THRESHOLD

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ABSTRACT: OBJECTIVE: Objective of the present study is to know the effect of cell phone usage on hearing thresholds. **MATERIAL AND METHODS:** Seventy students from 20-30 years of age were divided into two groups. Those using cell phone for more than one hour a day for past 5 years form the test group and those using for less than one hour for less than 5 years form the control group. Pure tone audiometry was done on all the subjects. **RESULTS:** There was a significant increase in hearing thresholds at all frequencies for both air conduction and bone conduction in both right ear and left ear, except for bone conduction at 4KHz. **CONCLUSION:** There was a significant increase in hearing thresholds in mobile phone users associated with duration of usage.

KEY WORDS: Cell phone, hearing threshold, audiometry

INTRODUCTION: The incidence of cell phone usage has increased dramatically in past ten years. Approximately, there are about 4 billion users of cell phone worldwide with a significant proportion in the developing countries [1]. There have been very few reports on the effects of electromagnetic radiation due to cell phone usage. This may be seen particularly in young adults, which may have implications in the later part of life. Mobile phones use electromagnetic radiation in the microwave range, which affects hearing and also causes sensations of burning or warmth around the ear, headache, and disturbance of sleep [2].

In order to determine the hearing threshold of mobile phone users, a cross sectional study was conducted on students of 20-30 years of age at the department of ENT, Govt. General Hospital, Guntur, Andhra Pradesh between August 2011 and October 2011.

MATERIALS AND METHODS: Seventy students aged 20-30 years old, were divided into two groups. Group1 had 35 students who use cell phone for more than one hour a day for more than 5 years. Group2 had 35 students who use cell phone for less than an hour a day and for less than 5 years. Medical history was obtained and questionnaire was filled. Otoscopic examination was carried out and pure tone audiometry was performed to detect hearing threshold differences between the two groups in both the right and left ear in frequencies 500Hz, 1000Hz 2000Hz and 4000Hz using a calibrated MADSEN 0.B.8-22 audiometer. Statistical calculations were done using statistical package for the social sciences (SPSS) version14

RESULTS: Six students from group1 reported headache, ear pain in tests in the used ear and only one in group2 suffered tinnitus and headache. The mean age among the test group was 23.2 ± 1.5 years and among controls was 22.6 ± 2.1 years. Majority of the subjects were right ear dominant with 85% in test group and 65% in the control group. There was significant increase in hearing thresholds at all frequencies in air conduction and bone conduction in right ear in the test group compared to control group. Similarly, there was significant increase in hearing thresholds at all frequencies in air

conduction and bone conduction in left ear also, except for bone conduction at 4 KHz. No significant difference between hearing thresholds on the dominant side compared to non-dominant side was found as shown in Table1.

Table 1

Frequencies	Bone Conduction			Air Conduction		
KHz	Control	Test	P value	Control	Test	P value
Left Ear						
0.5	15.8±3.43	23.1±4.14	0.00	10.08±3.06	14.1±4.82	0.00
1	14.9±3.64	20.2±3.01	0.00	12.4±3.9	16.8±5.41	0.00
2	10.8±4.17	15.7±2.87	0.00	9.4±2.61	13.8±5.42	0.00
4	9.4±3.64	11.8±3.89	0.00	10.1±3.62	12.6±3.93	0.00
Right Ear						
0.5	14.7±2.46	22.4±3.89	0.00	11.1±3.13	15.2±3.83	0.00
1	15.9±3.12	19.3±2.93	0.00	12.9±2.94	17.1±2.48	0.00
2	10.1±5.6	14.9±2.47	0.00	9.72±3.82	13.98±4.63	0.00
4	8.9±3.43	9.78±3.43	0.00	10.8±3.32	14.2±3.45	0.00

DISCUSSION: Mobile phones have become inevitable in our daily lives, but the problems associated with it are also inevitable. They transmit and receive micro waves at frequencies 900-1800 MHz^[3]. The hearing system particularly cochlear outer hair cells are known to be highly sensitive to electromagnetic effects. The radiation given by mobile phones is measured in terms of Specific Absorption Rate (SAR), which is measured using radiation detectors. Being nearest to the mobile phone, ear is the most vulnerable organ of the body for high SAR deposition ^[4]. The results of this study are consistent with results of other studies. A study showed that higher degree of hearing loss is associated with long term exposure to electromagnetic radiation generated by cell phones ^[5]. Another study showed people who use mobile phone for more than one year had increased degree of hearing loss than those who used for less than one year ^[5]. While short term exposure has no effect on hearing, those who use their mobile phones frequently had significant difference in hearing various frequencies compared to those who only use their phone moderately and the non-users ^[6].

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CONCLUSION: The study revealed that there is a significant increase in hearing threshold in cell phone users associated with the duration of usage. But the possible cause of hearing impairment cannot be proved by this study. Further studies in with larger population are needed to evaluate the pathophysiology behind increase in hearing thresholds in air conduction and bone conduction.

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