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Association of mobile phone radiation with fatigue, headache, dizziness, tension and sleep disturbance in Saudi population

Thamir Al-Khlaiwi, *PhD,* ***Sultan A. Meo,*** *MBBS, PhD.*

ABSTRACT

Objectives: The widespread use of mobile phones has been increased over the past decade; they are now an essential part of business, commerce and society. The use of mobile phones can cause health problems. Therefore, the aim of the present study is to investigate the association of using mobile phones with fatigue, headache, dizziness, tension and sleep disturbance in the Saudi population and provide health and social awareness in using these devices.

Methods: This study was conducted in the Department of Physiology, College of Medicine, King Saud University, Riyadh, Kingdom of Saudi Arabia during the year 2002 to 2003. In the present study, a total of 437 subjects (55.1% male and 39.9% female) were invited, they have and had been using mobile phones. A questionnaire was distributed regarding detailed history and association of mobile phones with health hazards.

Results: The results of the present study showed an association between the use of mobile phones and health hazards. The overall mean percentage for these clinical findings in all groups were headache (21.6%), sleep disturbance (4.%), tension (3.9%), fatigue (3%) and dizziness (2.4%).

Conclusion: Based on the results of the present study, we conclude that the use of mobile phones is a risk factor for health hazards and suggest that long term or excessive use of mobile phones should be avoided by health promotion activities such as group discussions, public presentations and through electronic and print media sources.

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The widespread use of mobile phones has been going sky-high over the past decade and now its use is an essential part of business, commerce and society. The fact that so many people own mobile phones attests to their perceived importance to the general public. The use of mobile phones and related technologies will continue to increase for the foreseeable future. Mobile phones are low power radio devices that transmit and receive radio frequency radiation at frequencies in the microwave range of 900-1800 MHz. Despite repeated horror stories on mobile phones in the media, nearly more than 500 million people worldwide use mobile phones.[1] The extensive use of mobile phones has been accompanied by public debate on the possible adverse effects on human health. The concerns relate to the emissions of radio frequency (RF) radiation from the mobile phones and the base stations that receive and transmit the signals. There are 2 direct ways by which health could be affected as a result of exposure to RF radiation. These are thermal (heating) effects caused mainly by holding mobile phones close to the body and also as a result of possible non-thermal effects.[2] Mobile phones

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may cause adverse health problems such as headache, sleep disturbance, impairment of short term memory and more seriously significant increases in the frequency of seizures in epileptic children, brain tumors and high blood pressure amongst users of mobile phones.[3] In addition, mobile phones can cause discomfort, lack of concentration, dizziness, worm on ear and burning skin.[4] In spite of its effects on different part of the body observed in different countries, its effect in Saudi population has not been reported yet, where mobile phones are excessively used. Therefore, the aim of this study was to investigate the association of the use of mobile phones with fatigue, headache, dizziness, tension and sleep disturbance in Saudi population.

Methods. This study was conducted in the Department of Physiology, College of Medicine, King Khalid University Hospital, King Saud University, Riyadh, Kingdom of Saudi Arabia, during the year 2002 to 2003. The sample consisted of 437 volunteer subjects recruited from College of Medicine, King Saud University and also from the different regions of Riyadh, Saudi Arabia. The sample was predominantly 55.1% male and 39.9% females with age ranging from 18-42 years were participated in this study.

A detailed questionnaire was constructed specifically for this study in Arabic language and was also translated into English. The questionnaire was designed so that it could be used in a structured interview context or by self-completion. It assessed general physical characteristics, occupation of the participants, medical history and different questions regarding the type of mobile phones, duration of possessing and their use, numbers and average duration of outgoing and incoming calls. Subjects with known history of anemia, diabetes mellitus, blood pressure, central or peripheral nerve diseases, hearing and vision problems, subject using any medication or computer professionals were excluded from the study. The analysis was primarily descriptive in nature and was performed by using Statistical Package for Social Sciences program for windows. Comparison was carried out on the basis of percentage values between the groups.

Results. **Table 1** summarizes the number of participants; the sample was predominantly male 55.1% and 39.9% female with an age range of 18-42 years. The mean age was 23.74 $\pm$ 0.5 years (mean $\pm$ SEM) for males and 26.44 $\pm$ 0.64 (mean $\pm$ SEM) for females. **Table 2** shows the duration of incoming or outgoing calls for respondents as a percentage of total numbers. The call duration was 5-10 minutes (59.5%), 10-30 minutes (22.4%), 30-60 minutes (10.5%), 60-120 minutes (4.6%) and greater than 120 minutes (2.5%). However, 0.5% subjects are included in missing systems; they did not mention the duration of calls. **Table 3** demonstrates the health problems associated with duration of incoming or outgoing calls for respondents as a percentage of total numbers. The maximum associated percentage was found for headache, which was 12.6% with duration of calls of 5-10 minutes per day; 4.6% with 10-30 minutes, 2.1% with 30-60 minutes, 2.5% with 60-120 minutes and 0.7% with more than 120 minutes per day. However, the total percentage observed for headache was 22.4%, fatigue 3%, dizziness 2.7%, tension 4.4% and sleep disturbances 4.1%. **Table 4** characterizes the health problems associated with duration of exposure to mobile phones emissions. The associated percentage for headache was 1.8% with <1 year of exposure; 14.9% with 1-5 years of exposure and 4.1% with 5-10 years of exposure to mobile phones. Health problems for fatigue was 0.2% with <1 year, 1.8% with 1-5 years and 0.9% with 5-10 years of exposure to mobile phones.

Table 1 - Distribution of male and female respondents as a percentage of the total number.

Parameters	Frequency	(%)
Male	241	(55.1)
Female	174	(39.9)
Missing system	22	(5)
Total	**437**	**(100)**

Missing system = Subject not responded.

Table 2 - Distribution of duration of calls for respondents as a percentage of the total number.

Time (minutes)	Frequency	(%)
5-10	260	(59.5)
10-30	98	(22.4)
30-60	46	(10.5)
60-120	20	(4.6)
>120	11	(2.5)
Missing system	2	(0.5)
Total	**437**	**(100)**

Missing system = Subject not responded.

Table 3 - Distribution of male and female respondents as a percentage of total numbers.

Duration of calls (minutes)	Headache n (%)	Fatigue n (%)	Dizziness n (%)	Tension n (%)	Sleep disturbance n (%)
5-10	55 (12.6)	10 (2.3)	6 (1.4)	8 (1.8)	10 (2.3)
10-30	20 (4.6)	1 (0.2)	1 (0.2)	4 (0.9)	3 (0.7)
30-60	9 (2.5)	nil	2 (0.4)	3 (0.7)	3 (0.7)
60-120	11 (2.5)	1 (0.2)	3 (0.6)	4 (0.9)	2 (0.4)
>120	3 (0.7)	1 (0.2)	nil	nil	nil
Total	**98 (22.4)**	**13 (3)**	**12 (2.7)**	**19 (4.3)**	**18 (4.1)**

nil - no clinical findings were observed

Table 4 - Distribution of health problems associated with duration of exposure to mobile phones on respondents as a percentage of total numbers.

Duration of exposure to mobile phone (years)	Headache n (%)	Fatigue n (%)	Dizziness n (%)	Tension n (%)	Sleep disturbance n (%)
<1	8 (1.8)	1 (0.2)	nil	nil	1 (0.2)
1-5	65 (14.9)	8 (1.8)	10 (2.3)	14 (3.20	16 (3.70
5-10	18 (4.1)	4 (0.9)	1 (0.2)	4 (0.9)	1 (0.2)
Total	**91 (20.8)**	**13 (3)**	**11 (2.5)**	**18 (4.1)**	**18 (4.1)**

nil - no clinical findings were observed

Tension and sleep disturbances was found in 3.7% with 1-5 years of exposure. However, the total percentage observed for headache was 20.8%, fatigue 3%, dizziness 2.5%, tension and sleep disturbances 4.1%.

Discussion. The operation of sensitive electronic equipment including mobile phones use is prohibited at many places including aircrafts and in hospitals; the reason is that their emissions might adversely interfere with the operation of sensitive electronic equipment and their possible deleterious effect. The well-liked belief is that adverse health effects can be induced mostly by the heating effect of Global System for Mobile Communication (GSM) radiation. The reported adverse health effects and the extensive portfolio of non-thermal effects that have been published in the scientific literature during the last few years, which indicates that the kind of radiation now used in GSM phone can and does affects alive organisms in various non-thermal ways.[2] There is an undeniable consistency between some of these non-thermal influences and the nature of many of the health problems reported[2] such as headache, sleep disruption, impairment of short term memory and more seriously, significant increases in the frequency of seizures in some epileptic children and brain tumor amongst users of mobile phones. Keeping in view the hazards of mobile phones, the present study was designed to investigate the association of use of mobile phones with fatigue, headache, dizziness, tension and sleep disturbance in Saudi population and provide a health and social

awareness regarding using these devices. The present study results demonstrated that, the health problems are associated with long term exposure to mobile phones emission, incoming or outgoing calls and length of calls per day. The overall mean percentage for these clinical findings in all groups was headache (21.7%), sleep disturbance (4%), tension (3.9%), fatigue (3%) and dizziness (2.4%). This is the first time that mobile phone health hazards have been addressed and studied in Saudi population. Eulitz et al[5] suggested that mobile phones emit a pulsed high-frequency electromagnetic field (PEMF), which may penetrate the scalp and the skull and shows that these electromagnetic fields alter distinct aspects of the brain's electrical response to acoustic stimuli. Reiser at al[6] demonstrated that the extensive exposure to microwave radiation has been found to affect a wide variety of brain functions such as electrical activity (EEG), electrochemistry,[7-8] permeability of the blood/brain barrier[9] and to degrade the immune system.[10] Becker and Marini,[11] and Frhlich et al[12] reported that headache is consistent with the fact that microwaves are known to non-thermally affect the dopamine-opiate system of the brain[11] and to increase the permeability of the blood-brain barrier since both of these have been medically connected with headache.[12] On the other hand, the reports of sleep disruption are consistent with the effect of GSM radiation on rapid eye movement (REM) sleep and on melatonin levels[13] whereas, memory impairment is consistent with the finding that microwave radiation targets the hippocampus.[2] Hermann and Hossmann,[14] reported the adverse health effects of mobile phones and found that the use of mobile can cause sleep disturbance, memory problems, headaches, nausea, dizziness, promote cancer and high blood pressure.[15] The present study is in agreement with the former results observed by Hermann and Hossmann.[14] Hocking,[16] reported that mobile phone use is ubiquitous, although the alleged health effects of low level radio-frequency radiation (RFR) used in transmission are contentious and also observed isolated reports of headache-like symptoms arising in some users. Our results are in conformity with these results. Nakamura et al[17] demonstrated that exposure to high-density microwaves can cause detrimental effects on the eyes, testis and other tissues and induce significant biologic changes through thermal actions. Hocking and Westerman[18] reported a case supportive of a neurological basis for some cases of dysesthesia associated with mobile phone use. Similarly, Weinberger and Richter[19] observed headache and other neuropsychological symptoms in users of cellular telephones. The present study also confirms the results observed by Weinberger and Richter (2002). Khudnitskii et al,[20] studied the influence of ultrahigh frequency radiation caused by cellular phones on functional state of central nervous system, cardiovascular systems and local temperature changes in cellular phones users. The head area near the phone antenna appeared to be under the most intensive heating. Ultrahigh frequency radiation induces significant changes in local temperature and in physiologic parameters of central nervous and cardiovascular systems. Mann and Roschke[21] investigated the influence of high-frequency electromagnetic field of digital mobile radio telephones on sleep in healthy humans. Besides a hypnotic effect with shortening of sleep onset latency, a REM suppressive effect with reduction of duration and percentage of REM sleep was found. Moreover, spectral analysis revealed qualitative alterations of the EEG signal during REM sleep with an increased spectral power density. Schilling[22] reported the accidentally exposure to high levels of ultrahigh frequency radiation and experienced an immediate sensation of intense heating of the parts of the body in the electromagnetic field followed by a variety of clinical sign and symptoms such as pain, headache, numbness, paresthesiae, malaise, diarrhea, and skin erythema. The most notable problem was that of acute than chronic headache involving the part of the head, which was most exposed. The present study is in agreement with the results observed by Schilling.[22] Santini et al[23] reported that cellular phones user women significantly complained more often of sleep disturbance, discomfort, warmth, and picking on the ear during phone conversation in relation with calling duration per day and number of calls per day. Hocking[16] reported a case series of 40 people who complained a burning sensation or dull headache was felt ipsilateral to the side of use of the phone. It occurred within minutes after use and lasted for minutes or hours. Similarly, Hocking and Westerman[24] reported a case of a 72-year-old businessman who had onset of a persistent 'bruised' feeling on the scalp after extensive use of a mobile phone. In addition, Hocking and Westerman[18] have studied a 34-year-old journalist who complained of occipital pain while using mobile phone. The present study supports the results observed by Hocking[16] and Hocking and Westerman.[18] Oftedal et al[25] observed headaches, fatigue, sensations of warmth on the ear and behind/around the ear and burning sensations in the facial skin were experienced in connection with the use of a mobile phone. Our findings are in conformity with these results. Similarly, Sandstrom et al[4] reported symptoms such as headaches, feelings of discomfort, warmth behind/around or on the ear and difficulties concentrating while using mobile phones. The number of complaints was higher for

people using the digital (GSM) system with pulse modulated fields, than for those using the analogue (NMT) system. Our results correlate with the results observed by Sandstrom et al.[4] Keeping in view the findings of the present study, our results are of importance in that they demonstrate the need of taking preventive measures.

In the present study, we found a relationship between headache, fatigue, dizziness, tension and sleep disturbances in subjects exposed to mobile phones emissions. It is advisable therefore; that the use of mobile phones is a risk factor for health hazards and suggest that excessive use of mobile phones should be avoided by health promotion activities, such as group discussion, public presentations and through electronic and print media sources. In addition, we also suggest more research is required to observe the effects of mobile phones with different systems of the human body along with clinical examination.

References

1. Editorials. The health hazards of mobile phones. ***Br Med J*** 2000; 320:1288-1289.
2. Hyland GJ. Physics and biology of mobile telephone. ***Lancet*** 2000; 25: 1833-1836.
3. Michael M, Colin B, Mika K. The health hazards of mobile phones. ***Br Med J*** 2000; 320: 1288-1289.
4. Sandstrom M, Wilen J, Oftedal G, Hansson MK. Mobile phone use and subjective symptoms. Comparison of symptoms experienced by users of analogue and digital mobile phones. ***Occup Med*** 2001; 51: 25-35.
5. Eulitz C, Ullsperger P, Freude G, Elbert T. Mobile phones modulate response patterns of human brain activity. ***Neuro Report*** 1998; 9: 3229-3232.
6. Reiser H, Dimpfel W, Schober F. The influence of electromagnetic fields on human brain activity. ***Eur J Med Res*** 1995; 1: 27-32.
7. Dutta SK, Subramoniam A, Ghosh B, Parshad R. Microwave radiation-induced calcium ion efflux from human neuroblastoma cells in culture. ***Bioelectromagnetics*** 1984; 5: 71-78.
8. Frey AH. Electromagnetic field interactions with biological systems. ***FASEB J*** 1993; 7: 272-281.
9. Salford LG, Brun A, Sturesson K, Eberhardt JL, Persson BR. Permeability of the blood-brain barrier induced by 915 MHz electromagnetic radiation, continuous wave and modulated at 8, 16, 50, and 200 Hz. ***Microsc Res Tech*** 1994; 27: 535-542.
10. Youbicier-Simo BJ, Boudard F, Cabaner C, Bastide M. Biological effects of continuous exposure of embryos and young chickens to electromagnetic fields emitted by video display units. ***Bioelectromagnetics***1997; 18: 514-523.
11. Becker RO, Marino AA. Electromagnetism and Life. Albany (NY): Suny Press; 1982.
12. Frhlich H. Advances in Electronics and Electron. ***Physics*** 1980; 53: 85-152.
13. Bawin SM, Kaczmarek LK, Adey WR. Effects of modulated VHF fields on the central nervous system. ***Ann N Y Acad Sci*** 1975; 247: 74-81.
14. Hermann DM, Hossmann KA. Neurological effects of microwave exposure related to mobile communication. ***J Neurol Sci*** 1997; 152: 1-14.
15. Braune S, Wrocklage C, Raczek J, Gailus T, Lucking CH. Resting blood pressure increase during exposure to a radio-frequency electromagnetic field. ***Lancet*** 1998; 351: 1857-1858.
16. Hocking B. Preliminary report: symptoms associated with mobile phone use. ***Occup Med*** 1998; 48: 357-360.
17. Nakamura H, Matsuzaki I, Hatta K, Nobukuni Y, Kambayashi Y, Ogino K. Non-thermal effects of mobile-phone frequency microwaves on utero-placental functions in pregnant rats. ***Reprod Toxicol*** 2003; 17: 321-326.
18. Hocking B, Westerman R. Neurological changes induced by a mobile phone. ***Occup Med*** 2002; 52: 413-415.
19. Weinberger Z, Richter ED. Cellular telephones and effects on the brain: the head as an antenna and brain tissue as a radio receiver. ***Med Hypotheses*** 2002; 59: 703-705.
20. Khudnitskii SS, Moshkarev EA, Fomenko TV. On the evaluation of the influence of cellular phones on their users. ***Med Tr Prom Ekol*** 1999; 9: 20-24.
21. Mann, K, Roschke, J, Effects of pulsed high-frequency electromagnetic fields on human sleep. ***Neuropsychobiology*** 1996; 33: 41-47.
22. Schilling CJ. Effects of acute exposure to ultrahigh radiofrequency radiation on three antenna engineers. ***Occup Environ Med*** 1997; 54: 281-284.
23. Santini R, Seigne M, Bonhomme-Faivre L, Bouffet S, Defrasne E, Sage M. Symptoms reported by mobile cellular telephone users. ***Pathol Biol*** 2001; 49: 222-226.
24. Hocking B, Westerman R. Neurological abnormalities associated with mobile phones. ***Occup Med*** 2000; 50: 366-368.
25. Oftedal G, Wilen J, Sandstrom M, Mild KH. Symptoms experienced in connection with mobile phone use. ***Occup Med*** 2000; 50: 237-245.