Indian Streams Research Journal ORIGINAL ARTICLE ISSN:-2230-7850

THE INFLUENCE OF THE CONTINUOUS CALL WITH A MOBILE PHONE ON HRV IN YOUNG HEALTHY VOLUNTEERS

Sakharam Damu Aghav and Popat Savaleram Tambade

Research Scholar JJTU, Rajasthan & Baburaoji Gholap College, Sangvi, Pune (P.U.).
Prof. Ramkrishna More Mahavidyalaya, Akurdi, Pune (PU).

Abstract:-It is possible that electromagnetic field generated by mobile phones may have an influence on the autonomic nervous system and modulates the function of circulatory system. The aim of the study was to demonstrate the significant effect of continuous talking with a mobile phone on heart rate variability (HRV) in young healthy volunteers. The electrocardiogram analysis was performed to assess the changes in heart rate of 25 healthy students with normal electrocardiogram (ECG) recorded using six channel multi parameter model Caddo 19 B. ECG was recorded after every five minutes for continuous taking for 20 minutes. It had been observed that stress due to geopathic zone affect health parameters. The changes in parameter are statistically significant for p= 0.05. It was shown that the call with a mobile phone may change the autonomic balance in healthy subjects. Changes in heart rate variability during the call with a mobile phone could be affected by electromagnetic field but the influence of speaking cannot be excluded.

Keywords: Autonomic nervous system (ANS), Mobile phone, Heart rate variability (HRV), Electrocardiogram (ECG), Multipara.

INTRODUCTION

The entire universe contains electromagnetic radiation. All human life is engrossed in it. There are various equipments like modern communications devices, medical devices and various electrical equipments which has become integral part of our life. It is impossible to imagine life without these equipments. In fact, all living things on earth depend on the electromagnetic radiation received from the Sun. The continuous exposure to electromagnetic fields (both of extremely low- frequency from power frequency sources like power lines and appliances; and radiofrequency radiation) has been associated to many adverse health effects [1, 2]. This may have significant health consequences. The most severe health problems that have been reported in association with extremely low frequency and/or radiofrequency radiation include childhood and adult leukemia, childhood and adult brain tumors and increased risk of the neurodegenerative diseases and Alzheimer.

In addition, there are reports of increased risk of breast cancer in men and women, genotoxic effects and leakage of the blood–brain barrier. Miscarriage and some cardiovascular effects and altered immune function including increased allergic and inflammatory responses have been also reported. Insomnia (sleep disruption) is reported in studies of people living in very low intensity RF environments with WI-FI and cell tower-level exposures. Short-term effects on cognition, memory and learning, behavior, reaction time, attention and concentration and altered brain wave activity are also reported in the scientific literature. Biophysical mechanisms that may account for such effects can be found in various articles and reviews [3].

There are various instruments such as wireless phones, mobile phone, and various electrical devices etc. which become essential part of our life. Large numbers of these devices produce electromagnetic radiations. The electromagnetic radiations (EMR) are widely used in the modern communication technology and described as radiofrequency (RF) radiation. The first handheld mobile phone was demonstrated by John F. Mitchell and Dr Martin Cooper of Motorola, almost four decades ago, in 1973, using a handset weighing around a Kilogram. In 1983, the Dyna TAC 8000x was the first mobile set to be commercially available.

In the last 20 years In India the first mobile telephone service started on the non-commercial basis on 15 August 1995 in Delhi. During the last 19 years, there has been an exponential growth of mobile telephony in India. Presently, there are 89.4 crores billions of peoples using mobile and nearly 15 companies providing mobile telephoning. To provide better coverage or connectivity nearly more than 7 lakh towers are erected both in the urban, as well as in rural areas including other sparsely populated area of India [4].

With this growth, number of private and government companies is coming in to this financially rewarding and growing sector. At present there are more than 6.57 billion mobile phone subscribers globally. The intensity of electromagnetic radiation from communication devices is increasing continuously. It is recognized as a form of unseen and dangerous pollution that may affect life in several ways. Transmission towers emit electromagnetic radiation continuously which has adverse impacts on human as well as on wild life. However, necessary regulatory policies and their implementation mechanism have not kept pace with the growth of mobile telephoning.

Various studies have shown ill-effects of radio-frequency electromagnetic field on bees, fruit flies, frogs, birds, bats, and humans, but the long-term studies of such exposures are inconclusive and rare and almost non-existent in India [5]. In 2011, International Agency for Research on Cancer (IARC), part of WHO, designated RF-EMF from cell phones as a “possible human carcinogen” Class 2B Cancer, diabetes, asthma, infectious diseases, infertility, neurodegenerative disorders and even suicides are on the rise in India. This invisible health hazard pollution is a relatively new environmental threat [6].

At molecular level these radiations induce thermal and non-thermal damage. The damage may be due to dielectric heating leading to protein denaturation, polar molecular agitation, cellular response through molecular cascades and heat shock proteins, and changes in enzyme kinetics in cells. Short-term studies on the impacts of RF-EMF on frogs, honey bees, house sparrows, bats and even humans are alarming. Long-term studies are non-existent in India due to non-availability of long term data. Identification of the frequency, intensity, and exposure period of non-ionizing electromagnetic fields causing damage to the biosystem and ecosystem would evolve strategies for improvement. It will enable us for the proper use of wireless technologies to enjoy its enormous benefits, while ensuring one's health and that of the environment [6]. Although the non-ionizing radiations are considered less hazardous than ionizing radiation, over-exposure may be able to cause health hazards.

There is an urgent need to fill the gaps and do further research in this field with emphasis on the effects of early life and prenatal RF-EMF radiation exposure in animals, dosimetry studies, cellular studies using more sensitive methods. In the meantime, one can take the precautionary principle approach and

reduce RF-EMF radiation effects of cell phone towers.

METHODOLOGY

All participants (n=25) were healthy and none of them were on pharmacological treatment. The following exclusion criteria were accepted for the study: presence of any serious cardiovascular disease, including arterial hypertension, metabolic and neurological disorders that could influence heart rate variability and serious arrhythmias [7]. Only normal cases were included in the study. All participants had used mobile phones for 3 to 5 year prior to the study. The average number of telephone calls was 150 per month. The average total duration of calls was 500 min per month and average duration of each telephone call was 3 min per each call. The consents were obtained from all students taking part in the study. All subjects were asked to abstain from consuming caffeinated beverages and excessive physical activity including gymnastics within 12 hours preceding data collection. They were also requested not to eat or drink in the morning or take a shower on the experimental day. Students were fully familiar to equipments, protocols and experimenters. The investigation was performed in a semi-darkened, temperature-controlled silent laboratory at room temperature (23°C). Before the experiment, participants had rested in a laboratory room in a sitting posture for about10 min.

Recording was performed between 10:00 and11:00 a.m. under the morning in similar conditions (the same place of the experiment and sitting position) for 20 minutes periods: before the mobile call (period I), after 10 minutes with a cellular phone use continuously (period II) and 20 min after continuous talk on mobile (period III). Throughout the 20 minutes period of the examination the subjects were exposed to a RF field emitted by 1,800 MHz frequency band GSM mobile phone held in the right hand. The GSM KarbonnA1+ was used in all cases. The highest specific absorption rate (SAR) value for this model phone tested by Karbonn A1+ for the ear is 0.633 W/kg (10 g). SAR data information for residents in countries that have adopted the SAR limit recommended by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) is given in watts/kilogram (W/kg) averaged over ten (10) grams of tissue (European Union, Japan, Brazil and New Zealand).

The telephone was switched on during the whole time of the experiment so that the effect of logging into the mobile phone network on the maximal emission of EMF could be avoided. Only neutral, non-exciting topics were discussed during the phone talks so that stress associated with speaking and subsequent over activity of autonomic nervous system should be minimized. The recording of respiratory rate (RR) & SpO2 along with systole blood pressure (SBP), diastole blood pressure (DBP), heart rate (HR), and pulse rate (PR) of a volunteer under observation was done with the help of simple 6 channel multipara monitor-Scientech Model Caddo 19B (Fig.1).

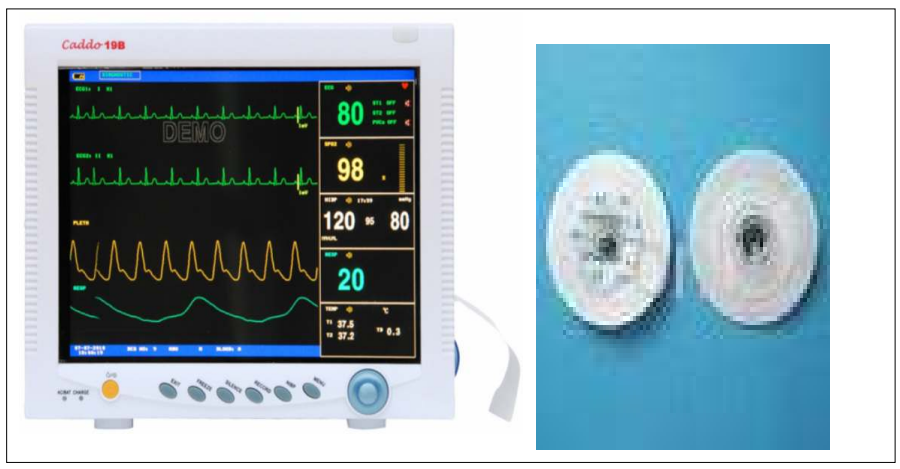

Fig 1 Multipara Caddo 19B unit with disposable electrodes

RESULTS AND DISCUSSION

Following figure 2 shows typical variation in the heart rate (HR) for a period of one hour exposure of mobile phone radiation indicating 10% change in heat rate.

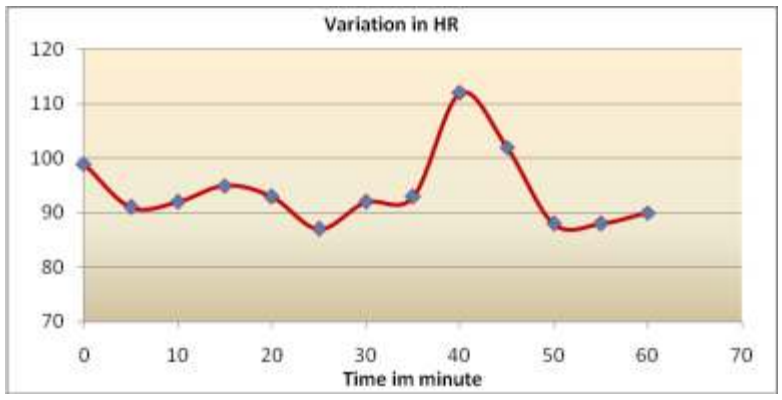

Figure 2. Variation in heart rate in beats per minute

Heart rate variation for first 20 minutes is shown in table 1 with standard deviation (SD) and standard error (SE). Using online students 't, test calculator, statistical significance is determined.

Table 1. Variation in heart rate of 25 volunteers recorded for 20 minutes

Sr. No.	Sex	Age	Heart rate in beats per minutes		
			Normal	After 10 minutes	After 20 minutes
1	M	22	106	120	123
2	M	21	91	93	127
3	M	24	79	99	116
4	F	24	88	103	112
5	F	23	92	103	104
6	M	22	68	103	88
7	M	22	87	92	98
8	F	30	69	77	78
9	F	20	78	83	92
10	M	22	68	78	90
11	M	22	78	89	103
12	M	22	72	83	88
13	M	23	72	91	90
14	F	28	83	88	94
15	F	24	73	77	88
16	F	18	96	79	81
17	F	18	104	113	98
18	F	22	91	106	103
19	F	21	87	95	85
20	F	20	88	84	97
21	F	22	92	101	101
22	F	20	81	67	68
23	F	22	92	88	88
24	F	21	99	92	93
25	F	22	93	86	96
	Mean		85.08	91.6	96.04
	SD		10.98	12.35	13.46
	SE		2.19	2.47	2.69
	p			0.0544	0.0027

A p value is the probability of obtaining the observed effect (or larger) under a 'null hypothesis'. Very small p value indicates that the observed effect is very unlikely to have arisen purely by chance, and therefore provides evidence against the null hypothesis. In particular, p values less than 0.05 are often reported as “statistically significant”, and interpreted as being small enough to justify rejection of the null hypothesis. However, the 0.05 threshold is an arbitrary one that became commonly used in medical and psychological research largely because p values were determined by comparing the test statistic against tabulations of specific percentage points of statistical distributions. A 95% confidence interval is often interpreted as indicating a range within which we can be 95% certain that the true effect lies. Table 1 shows that the effect of mobile phone radiation is significant after 10 minutes and more significant after 20 minutes of continuous talk.

REFERENCES:

1.Christopher J. Portier, Mary S. Wolfe (1998), Assessment of Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields, Working Group Report, NIH Publication No. 98-3981, printed in the USA, www. niehs. Nib.gov/emfrapid/home.htm
2. S. Banik,, S. Bandyopadhyay, S. Ganguly (2003), Bioeffects of microwave—a brief review,Bioresource Technology, 87,155–159.
3. BioInitiative Report (2012), A Rationale for Biologically-basedExposure Standards for Low- Intensity Electromagnetic Radiation, 5-6.
4. TRAI, 2012. Indian telecom services performance indicator report for the quarter ending December, Note to the Press, Press release No. 74/2012, New Delhi, www.trai.gov.in
5. S. A. Reshetnyak, V. A. Shcheglov, V. I. Blagodatskikh, P. P. Gariaev and M. Yu. Maslov (1996), Mechanisms of Interaction of Electromagnetic Radiation with a Biosystem, Laser Physics, 6(4), 621–653.
6. Balmori A (2003), The effects of microwave radiation on the wildlife. Preliminary Results,Valladolid (Spain), http://www.whale.to/b/martinez.pdf
7. Andrzejak, R., R. Poreba, M. Poreba, A. Derkacz, R. Skalik, P. Gac, B. Beck, A.Steinmetz- Beck, and W. Pilecki (2008), The influence of the call with a mobile phone on heart rate variability parameters in healthy volunteers, Ind Health 46 (4),409-417.
8. Komeili G, Nabizadeh Sarabandi S (2012), Studying the Effects of Mobile Phone Waves on Electro Cardiogram Parameters of Students in Zahedan University of Medical Sciences, Int J High Risk Behav Addict , 1(2),75-78.