

Effect of Mobile Phone Raditation on Thyriod Function

Vinita Kumari¹, Mahesh Kumar Goyal^{2*}, Anita Kumari³

¹Tutor, Department of Pharmacology, MGM Medical College, Jamshedpur, Jharkhand, India.

^{2*}Assistant Professor, Department of PSM, MGM Medical College, Jamshedpur, Jharkhand, India.

³Tutor, Department of Physiology, Rajendra Institute of Medical Sciences, Ranchi, Jharkhand, India.

ABSTRACT

Background: Worldwide enormous use of mobile phone has led to a public concern and health professionals about the possible adverse effects on human health. Despite years of research, the controversy still persists about the effects of radiation on human physiology. Radiofrequency waves are emitted by cell phones. They are non-ionising and the effect on the thyroid gland is part of their non-thermal effects. The thyroid gland may be particularly vulnerable to this effect because of its normal anatomical position.

Objective: This study aims to investigate the effects of electromagnetic fields induced by the Mobile phones on the Thyroid functions (T3, T4) and TSH.

Materials and Methods: The study was done to explore the association between radiation exposure and thyroid dysfunction among mobile phone users. It had cross-sectional study method to collect information from the medical students in a medical college in East India. Inclusion criteria included active use of mobile phone prior to and during the study period. Criteria for exclusion were presence of pre-existing thyroid disease, thyroid nodule, thyroid goitre/nodule and altered thyroid function.

Results: The sample size was 116 undergraduate students, which included 58.6% female and 41.4% male participants.

The mean age was 20.19 years. 73.4% of respondents had no family history of thyroid illness. Most of them (32.75%) were using for more than 4 hours whereas only 6.9% were using phone less than one hour/day.

Conclusion: In our study there was no statistical significant relation obtained between total radiation exposure and thyroid functions (T3 and T4) and TSH among all respondents.

Keywords: Mobile Phone Use, Nonionising Radiation, Radiation Exposure, Radiofrequency Waves, Thyroid Dysfunction, Thyroid Gland.


*Correspondence to:

Dr. Mahesh Kumar Goyal,
Assistant Professor,
Department of PSM,
MGM Medical College, Jamshedpur, Jharkhand, India.

Article History:

Received: 26-10-2018, Revised: 16-11-2018, Accepted: 30-11-2018

Access this article online

Website: www.ijmrp.com	Quick Response code 
DOI: 10.21276/ijmrp.2018.4.6.041	

INTRODUCTION

Mobile or cell phones are now a days an integral part of every individual life. In many countries, over half of population use mobile phone and mobile phone market growing rapidly. As billions of people use mobile phone globally, a small increase in incidence of adverse effects on health could have major public health implication on long term basis. Besides the number of cell phone call per day, the length of each call and amount of time people use cell phones are important factors enhance the health related risk.¹

The effect of cell phone on human body can be categorized as thermal and non-thermal effects (Huber et al 2003).² EMF 900 MHZ and its effects on nervous systems and endocrine systems have been studied extensively. It has been reported that exposure of magnetic field increases fat break down and glycogenolysis, it also elevate the level of some hormones such as glucagon, cortisol and thyroxin in mice (Aghdam Shahryar et al, 2009).³ Mobile phone is considered as one of the important sources for

EMF generation. Even though they have internal safety mechanism, but they still present a risk factor.

Short term adverse effect as reported by Bernhardt, 2005⁴ includes decreasing of the area of vision, heavy stress and feeling of tiredness, losing of concentration and attention, voice in the ears, warming of ear, reversible hearing problems, headache, and electrical burn.

The long term effects that are encountered commonly includes irreversible hearing problems, damaging of embryonic development, increasing risk of miscarriage, decrease in the number of sperms, damaging Brain tissue, heart related problems, weakening of the memory, lymphoma and damaging of genetic structure (Siemony et al 1997).⁵ Cell phone radiation also affect thyroid gland metabolism as a part of its non-thermal effects.

The sensitivity of endocrine system i.e pineal gland, pituitary gland, adrenal gland and thyroid gland, endocrine pancreas, testicles and ovaries to EMFs has been investigated.⁶⁻¹⁸

The thyroid gland is one of the most exposed vital organs and may be a target for any type of electromagnetic radiation.¹⁹ Since Cell phones are usually placed near thyroid gland during their use, it is one of the organs most likely to be exposed to cell phone irradiation (Laur et al, 2013; Mortavazi et al 2019).^{20,21} In an investigation of change in thyroid hormones and TSH, decrease T₄ concentration and normal level of T₃ were observed (Mortavazi et al;2009).⁷ It has been established that even a small change in thyroid hormone levels circulating in the blood are sufficient to alter the brain function of subjects.^{22,23}

OBJECTIVE

To assess the effect of mobile phone radiation on thyroid status

METHODOLOGY

The present study was a cross sectional study to examine the relationship between radiation exposure among actively mobile users and thyroid function tests. The participants were recruited among the using medical students of M G M medical college, Jamshedpur. The study was approved from Institutional Ethical

Committee. The study was conducted from July 2018 to September 2018. The detail of the study were explained to all medical students and those were interested to participate were recruited as participant of the study. Informed consent was obtained from all the participants.

Inclusion Criteria

Participants age between 18 to 24 year and active mobile users.

Exclusion Criteria

Participant excluded from the study having history of pre-existing thyroid disease, thyroid nodule or goitre or altered thyroid function, using drugs that interfere with thyroid function eg.-oral contraceptive, anticonvulsant etc.

Collection of data was obtained from a pre-designed structured questionnaire and it included such as age, sex, family history of thyroid disease, brand & S A R of mobile phone, duration of cell phone use, and years of cell phone use. The participant were clinically examine to find out any sign and symptom of thyroid disease. Blood sample were collected and sent to laboratory for T₃, T₄, and TSH examination. Participants having altered thyroid function were referred to Medicine department for further advice.

Figure 1: Duration of Mobile Phone Use by Participants

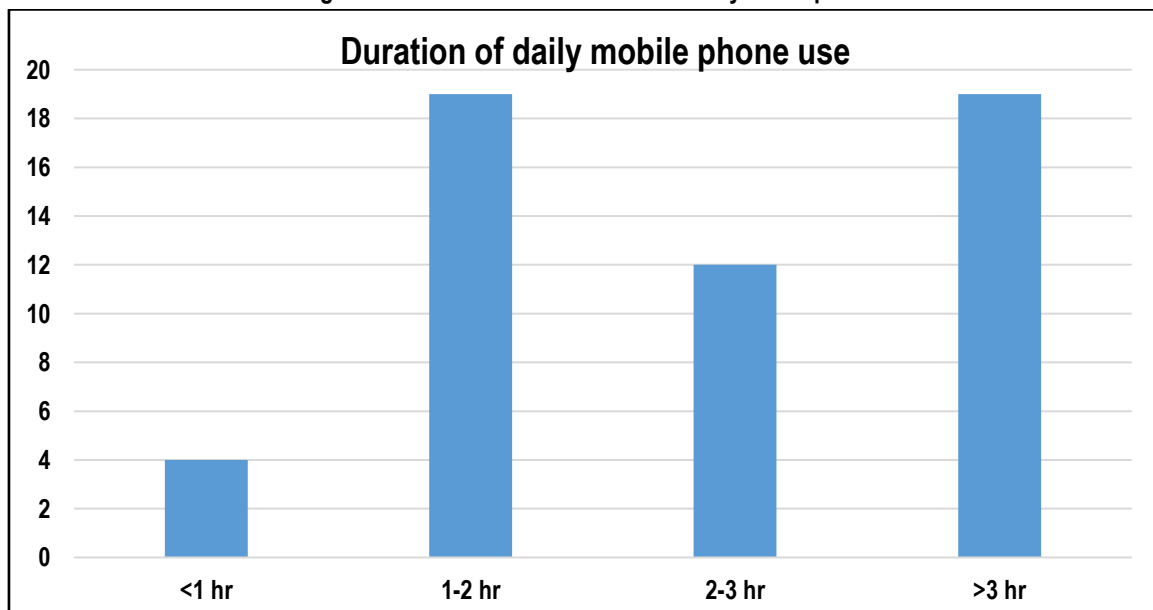


Table 1: Comparison of T3, T4 and TSH and duration of average mobile use (in Hours)

Duration of Average Use	T3 (ng/dl)	T4 (µg/dl)	TSH (µIU/ml)
Group 1 (≤ 1 hour)	125.25±9.032	8.95±1.282	2.39±1.453
Group 2 (1-2 hour)	115.47±15.95	7.85±1.30	2.43±0.92
Group 3 (2-3 Hour)	109.38±21.22	7.68±2.10	2.18±1.31
Group 4 (> 3 hour)	107.57±17.63	7.93±1.13	2.26±1.08
P-value	0.231	0.523	0.931

Table 2: Comparison of T3, T4 and TSH and family history of Thyroid Disorders

Family History of Thyroid Disorders	T3 (ng/dl)	T4 (µg/dl)	TSH (µIU/ml)
Group 1 (1 st Degree)	109.18±17.50	7.95±0.99	2.058±0.96
Group 2 (2 nd Degree)	110.80±28.16	7.72±1.03	1.772±0.68
Group 3 (No FH)	112.60±17.38	7.92±1.67	2.42±1.17
P-value	0.876	0.957	0.337

OBSERVATIONS

A number of 116 medical students took part in the present study. Out of 116 medical student n=68 (58.62%) were female and n=48 (41.37%) were male. The mean age of participants was 20.19±1.9 years. The participants mean age for using the mobile phone first was 15.22 years with a range varying from 10 years to 24 years. The mean age of participants received their personal phone was 17.43 years.

Specific absorption rate (SAR) value of every cell phone model was recorded from the value given by respective manufacturers. The information on the SAR value of the cell phone model used by the participant was collected from various websites maintained by cell phone manufactures. The mean SAR of mobile phones used by participants was 0.8045±0.40295 w/kg. The range of SAR was from 0.16 to 1.77 watt/kg. Two mobile phones were having SAR more than the recommended norms. The exposure to radiation energy for each respondent was calculated by finding out the total radiation exposure. The total radiation exposure of the each respondent (J/kg) = SAR value of the cell phone (W/kg) x duration of time spent talking on mobile phone (in second). The mean radiation of exposure was 6600.38±2803.9 J/kg.

The mean years of use by participants were 3.1293±1.59649 years with a range of one year to eight years. The data was further analysed within four groups based on the duration of use Group 1 with average use less than one hour, group 2 between 1 to 2 hours, group 3 between 2 to 3 hours and group 4 using more than 3 hours. Most of the participants (32.75%) were using cell phone for more than four hours and between one to two hours. A very small participants (6.9%) were using for less than one hour, whereas the use of mobile phone between two to three hours were (20.7%). Duration of mobile phone used by participant is shown in Fig 1.

Family history of thyroid disease was absent in 73.4% of participants. Whereas 27.6% reported thyroid disease in first degree relative and 13.8% in second degree relative. The clinical examination showed that 98.3% of the participating student had clinically normal thyroid function while 1.7% had symptom of thyroid disease.

The mean value of T3, T4 and TSH of the participants were 111.60±18.12ng/dl, 7.91±1.51 µg/dl and 2.30±1.10 µIU/ml.

Analysis of variance test was statistically not significant among the participants regarding the duration of average mobile phone use (Table 1) and the family history of thyroid disorders (Table 2).

DISCUSSION

The question of effect of radiation emitted by mobile phones on human health remains unsolved despite years of use of mobile phones as well as ongoing research on this. In the endocrine system, the thyroid gland has vital and critical effects on practically all physiological processes in the human body. As the thyroid gland lies in the anterior aspect of the neck, it is particularly vulnerable to the deleterious effects of any EMF radiation.

The primary outcome measure of this study was to observe the effect of mobile phone radiation on Thyroid function, measured with the levels of TSH and thyroid hormones T3 and T4. The present study didn't find any significant association with the relationship on use of mobile phone and on thyroid functions. This finding is in contrast to the various researches conducted earlier.

Seyed Mortavazi et al in their study in 2009 in Shiraz University of Medical Sciences showed that there was a significant alteration of TSH level in mobile phone users compared to those who had not used mobiles previously.

The present study didn't find any significant relation between the duration as well as family history of thyroid disorders.

CONCLUSION

Despite popular belief about safety of mobile phone use on human health, it is now of great concern about potential adverse effects on human health due to dramatic increase in the use of mobile phones. Results obtained from this study did not find any significant association between mobile phone use and effect on thyroid phones. Large scale multi centric research is required to clarify the adverse effect of mobile phone use on human health.

LIMITATIONS

The exposure of radiation energy depends on many factors apart from what we have considered in the present study (American Cancer Society). As we have not considered any of following factors due to difficulties associated with measurement. These factors are the mode in which the cell phone is operated (whether handheld or hands free), the distance and path to the nearest cell phone tower and the amount of cell phone traffic in the area at the time. Comparing SAR values between mobiles may be misleading.

REFERENCES

1. Electromagnetic field and public health: <http://www.who.int/mediacentre/factsheet/fs/193/en/>.
2. Huber R., Schuerer J. and Graf T. Radio Frequency Electromagnetic Field Exposure in Humans .Estimation of S A R Distribution in the Brain, Effects on sleep and Heart Rate. *Bioelectromagnetics* 2003;24 :262-76.
3. Aghdam Shahyar H, Lofti AR. Effects of 900HZ electromagnetic fields emitted by cellular phone on total cholesterol and triglyceride levels of plasma in Syrian hamster (mesocricetus auratus). *J.Appl. Biol sci* 2009; 2(3);85-8.
4. Bernhardt, J.R 2005. Eletrosmog cellular phones adverse health effects from radiation, Health aspects of non -ionizing radiation; *Health ;48(1):63-75*.
5. Selmaoui B, Lambrozo J and Touitou Y. Endocrine function in young men exposed for one night to a 50 HZ magnetic field. A circadian study of pituitary, Thyroid and adrenocortical hormones. *Life sci* 1997; 61:473-86.
6. Stevens RG. Electric power use and breast cancer: a hypothesis. *Am J Epidemiol* 1987 Apr;125(4):556-61.
7. Löscher W, Mevissen M. Animal studies on the role of 50/60-Hertz magnetic fields in carcinogenesis. *Life Sci* 1994;54(21):1531-43.
8. Brainard GC, Kavet R, Kheifets LI. The relationship between electromagnetic field and light exposures to melatonin and breast cancer risk: a review of the relevant literature. *J Pineal Res* 1999 Mar;26(2):65-100.
9. Graham C, Cook MR, Gerkovich MM, Sastre A. Examination of the melatonin hypothesis in women exposed at night to EMF or bright light. *Environ Health Perspect* 2001 May;109(5):501-07.
10. Ossenkopp KP, Koltek WT, Persinger MA. Prenatal exposure to an extremely low frequency-low intensity rotating magnetic field

and increases in thyroid and testicle weight in rats. *Dev Psychobiol* 1972;5(3):275-85.

11. Zagorskaya EA. Endocrine responses to low frequency electromagnetic fields of continuous and intermittent generation. *Kosm Biol Aviakosm Med* 1989;23:4-14.

12. Picazo ML, Miguel MP et al. Long-term effects of ELF magnetic fields on the mouse testis and serum testosterone levels. *Electro-Magnetobiol* 1995;14:127-34.

13. Zagorskaya EA, Klimovitsky VY, Melnichenko VP, Rodina GP, Semyonov SN. The effect of low frequency electromagnetic fields on physiological systems: a review. *Kosm Biol Aviakosm Med* 1990; 24:3-11.

14. Forgács Z, Thuróczy G, Paksy K, Szabó LD. Effect of sinusoidal 50 Hz magnetic field on the testosterone production of mouse primary Leydig cell culture. *Bioelectromagnetics* 1998;19(7):429-31.

15. Burchard JF, Nguyen DH, Block E. Progesterone concentrations during estrous cycle of dairy cows exposed to electric and magnetic fields. *Bioelectromagnetics* 1998; 19(7): 438-43.

16. Feria-Velasco A, Castillo-Medina S et al. Neuronal differentiation of chromaffin cells in vitro, induced by extremely low frequency magnetic fields or nerve growth factor: a histological and ultrastructural comparative study. *J Neurosci Res* 1998 Sep;53(5):569-82.

17. Uscebrka G, Zikic D et al. Electromagnetic field effects on the morphometrical characteristics of rat adrenal glands. In: Bersani, F. (Ed.), *Electricity and Magnetism in Biology and Medicine*. Kluwer Academic/Plenum Publishers, New York 1999; 485–88.

18. Matavulj M, Rajkovic V, Uscebrka G, Lukac T, Stevanovic D, Lazetic B. Studies on the possible endocrinological effects of an 50 Hz electromagnetic field. *Centr. Europ. J. Occup. Environ. Med* 2000; 6:183-88.

19. Sinha RK. Chronic non-thermal exposure of modulated 2450 MHz microwave radiation alters thyroid hormones and behavior of male rats. *Int J Radiat Biol* 2008 Jun;84(6):505-13.

20. Laur O ,Frei P, Gosselin MC, Joseph W ,Rosli M, Frolich J (2013).Combining near and far-field exposure for an organ – specific and whole –body RF-EMF proxy for epidemiological research; A reference case. *Bio electromagnetics* 34(5); 366-74.

21. Mortavazi S, Habib A, Ganj-karami A, Babaie (2009). Alteration in TSH and Thyriod Hormones following mobile use. *Oman Med J*. 24: 274-78.

22. Bauer M, Goetz T, Glenn T, Whybrow PC. The thyroid-brain interaction in thyroid disorders and mood disorders. *J Neuroendocrinol* 2008 Oct;20(10):1101-14.

23. Bernal J. Thyroid hormone receptors in brain development and function. *Nat Clin Pract Endocrinol Metab* 2007 Mar;3(3):249-59.

Source of Support: Nil.

Conflict of Interest: None Declared.

Copyright: © the author(s) and publisher. IJM RP is an official publication of Ibn Sina Academy of Medieval Medicine & Sciences, registered in 2001 under Indian Trusts Act, 1882.

This is an open access article distributed under the terms of the Creative Commons Attribution Non-commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

Cite this article as: Vinita Kumari, Mahesh Kumar Goyal, Anita Kumari. Effect of Mobile Phone Raditation on Thyriod Function. *Int J Med Res Prof*. 2018 Nov; 4(6):195-98.

DOI:10.21276/ijmrp.2018.4.6.041