

Mini Review

Volume 16 Issue 1 - September 2020
DOI: 10.19080/AIBM.2020.16.555926

Adv Biotechnol Microbiol

Copyright © All rights are reserved by Fahmida Khatoon

Effect of Mobile Phone Radiation on Human Health



Shimaa M Aboelnaga^{1,2} and Fahmida kahtoon²

¹Deanship of Preparatory Year, University of Hail, Saudi Arabia

²Department of Biochemistry, College of medicine, University of Hail, Saudi Arabia

Submission: July 15, 2020; **Published:** September 09, 2020

***Corresponding author:** Fahmida Khatoon, Department of Biochemistry, College of medicine, University of Hail, Saudi Arabia

Abstract

The communications protocols used by mobile phones often result in low-frequency pulsing of the carrier signal and the biological significance of these modulations has been subject to debate. Mobile phone radiation causes heating in living tissues. This review aims to find other confounding factors and variables, if any, associated health hazard. To address the effect of cell phone radiations on the biochemical serum marker leptin and physical parameter BMI.

Keywords: Body mass Index; Leptin; Mobile Phone

Introduction

In recent years, it has been a subject of interest to study the effects of mobile phone radiations. There have been many studies on this subject, because of the increase in mobile phone usage. Two-third of the world population approximately is using this technology. There were more than 4.3 billion mobile phone users till June 2009. Electromagnetic radiation used in the mobile phone is in the microwave range. The digital wireless systems, e.g. data communication networks also use the same radiations. Radio Frequency electromagnetic Radiation (RFR) is present in the electromagnetic spectrum and has a frequency ranging from 10 KHz-300 KHz which is used in wireless communication and is, therefore, emitted from antennas of mobile phone and their cellular masts. The communications protocols used by mobile phones often result in low-frequency pulsing of the carrier signal and the biological significance of these modulations has been subject to debate [1]. Mobile phone radiation causes heating in living tissues. RFR is absorbed and gets penetrated deep into the tissue which is converted into heat. This rises the temperature of the contact area about 0.3degree. The temperature in the brain fluctuates by one degree and only a rise of approximately five degree can cause cell damage. But radiation affects the biological materials by depositing energy at molecular levels, therefore, hormones and receptors are the prime targets on mobile phone users and their future generations. In 2006 a large Danish study about the connection between mobile phone use and cancer

incidence was published. The study included over 420,000 Danish citizens for 20 years and showed no increased risk of cancer [2]. Radiation absorption: A mobile phone radiation level is measured in Specific Absorption Rate (SAR) which is the rate at which radiation is absorbed when exposed to radiofrequency. Its units are watts/kg. All cell phones emit radiofrequency and SAR level may vary by models. For a phone to receive certification in USA, maximum SAR level must be than 1.6watts/kg whereas in Europe, it can be till 2watts/kg. SAR data for specific mobile phones, along with other useful information, can be found directly on manufacturers' websites [3]. The maximum power output is regulated by mobile phone standards. The cell phone and the base station check quality of reception and the strength of signals in most of the systems. The power level within a certain span of area is lowered or raised accordingly, to accommodate different situations, such as inside or outside buildings and vehicles.

Leptin is a peptide hormone, which maintains energy homeostasis and regulates food intake. Leptin receptors are found in multiple tissues [4]. It is secreted by white adipose tissue cells, which are in proportion to the amount of adipose tissue mass. Leptin affects the regulation of insulin secretion and energy metabolism in skeletal muscles and fat cells. It maintains the energy stores in skeletal muscles and prevents starvation [5]. Use of cell phones has become increasingly popular so more people are likely to be affected by the hazards of cell phone

radiations. Growth in young people has become shunted due to various radiations present in our environment. Cell phone users are seen to have many adverse effects regarding their health e.g. malignancies, infertility, loss of memory, hearing problems and obesity. Aim of this Mini Review is to address effect of Cell phone radiation on body growth, BMI and serum leptin levels and on Hemoglobin.

Operational Definitions

Mobile phone: A mobile phone is a device used to make and receive telephone calls over a radio link, whilst moving around a wide geographic area. The mobile phone connects cellular network provided by a mobile phone operator, allowing access to the public telephone network. It is also known as cellular phone or cell phone. The first hand-held mobile phone was demonstrated by Dr Martin Cooper of Motorola in 1973, using a handset weighing around 1 kg [6]. **Radiation:** Radiation is a process in which energetic particles or waves travel through a medium or space from a specific source. Two types of radiation are commonly differentiated: ionizing and non-ionizing radiation. Ionizing radiation i.e., radiation having sufficient energy to ionize an atom, but the term radiation may correctly also refer to non-ionizing radiation e.g., radio waves, heat or visible light. Exposure to radiation causes damage to living tissue, resulting in skin burns, radiation sickness and death at high doses and cancer, tumors and genetic damage at low doses [7]. **BMI** Body mass index is defined as the person's body weight divided by the square of height. It is also known as Quetelet Index. BMI can also be determined using a BMI chart, which shows function of weight (horizontal axis) and height (vertical axis) using contour lines for different values of BMI or colors for different BMI categories [8].

BMI calculations using:

Metric System

Weight in kilograms/Height in meters²

English System

Weight (lbs) / [height (in) 2 x 703 (conversion factor)]. Round to the second decimal place.

Weight Regulation: When energy intake correlates with energy expenditure stability of body weight and nutrient balance is achieved. The mechanisms involved in body weight regulation in humans include genetic, physiological, and behavioral factors. Human obesity is usually associated with high rates of energy expenditure [9-10].

Leptin: Leptin is a 16kDa protein hormone which regulates energy intake and expenditure, including functions like appetite and metabolism. In humans, the Ob (Lep) gene is located on chromosome 7 (Ob for obese, Lep for leptin) It is one of the most important adipose derived hormone. The effects of leptin were observed by studying mutant obese mice that arose at random within a mouse colony at the Jackson Laboratory in 1950 [10].

Limitations of Study

- Research topic may focus on specific leptin hormone, BMI.
- The scope of this study was to demonstrate the possible effects of mobile phone radiation on serum leptin levels and BMI. While the study can succeed in this primary objective there are several limitations to the generalization of its results.

Review of Literature

Behari J and Indian J (2010) in their review article noted that now for several decades there is existence of low-level electromagnetic fields in the environment. Mobile phones are used by adults and even children in various positions with respect to their bodies. According to the two authors there has also been a major increase of mobile communication base stations which have led to a serious concern about health effects of radio frequency emissions. There are 2 main issues about health which could be affected as a result of radio frequency field exposure. First, the thermal effects caused by holding a mobile phone close to the body and extended conversations on it for a long period of time. Second, the non-thermal effects from phones and base stations situated near houses, schools etc. [11].

After a thorough search, I identified that there is no study done that has assessed effects of mobile phone radiations on serum leptin level or BMI. However, many studies have taken place to see effects of mobile phone radiation on body. In the studies conducted by Lerchl and colleagues (2008), adult male hamsters were exposed for a period of two consecutive months to a radio-frequency of 383,900 and 1800 MHz. At 383 MHz exposure showed an increase in body weight up to 4% and at 900 MHz the increase was up to 6% while at 1800 MHz no effect on body weight was seen [12-20]. The data showed that absorbed radio frequency energy may result in increased body weight thus causing an increase in serum leptin levels in the exposed animals. Imai and colleagues (2011) conducted another study in which 5-week old animals were used and an exposure of 1.95 GHz for 5 hours per day for 5 weeks was given. No difference was found in the body weight so it can be assumed that there was no significant rise in the serum leptin levels and BMI under the above circumstances. [13] However, long term studies have revealed that no significant alteration in body weight was observed with radio frequency electromagnetic field exposure.

Conclusions

We found no evidence for an association between tumor risk and cellular telephone use among either short-term or long-term users. Moreover, the narrow confidence intervals provide evidence that any large association of risk of cancer and cellular telephone use can be excluded

Author contribution statement FK conceived the idea and drafted the manuscript, SA gave further inputs to this manuscript.

Funding Not funded

Ethics approval and consent to participate Not applicable.

Consent for publication Not applicable

Competing interests, the authors declare that they have no competing interests

Acknowledgement

We are very grateful to forward our appreciation to Hail university. Our thanks also goes to University of Hail and deanship of Hail.

References

1. Foster, Kenneth R, Repacholi, Michael H (2004) Biological Effects of Radiofrequency Fields: Does Modulation Matter? *Radiation Research* 162 (2): 219-25.
2. Schüz, J, Jacobsen R, Olsen JH, Boice JD, McLaughlin JK, et al. (2006) Cellular Telephone Use and Cancer Risk: Update of a Nationwide Danish Cohort. *Journal of the National Cancer Institute* 98 (23): 1707-1713.
3. Qian L, Cao F, Cui J, Huang Y, Zhou X, et al. (2010) Radioprotective effect of hydrogen in cultured cells and mice. *Free Radic Res* 44(3): 275-282.
4. Bluher S, Mantzoros CS (2009) Leptin in humans: lessons from translational research. *Am J Clin Nutr* 89(3): 991S-997S.
5. ZebaHaque, Darakshan J Haleem the interaction of serum serotonin, cortisol & leptin in stress related obesity in working men at educational institutions of Karachi. *Karachi University Journal of Science* 38: 23-27
6. Heeks, Richard (2008) Meet Marty Cooper - the inventor of the mobile phone. *BBC* 41 (6): 26-33.
7. Kwan-Hoong Ng Non-Ionizing Radiations - Sources, Biological Effects, Emissions and Exposures. *Proceedings of the International Conference on Non-Ionizing Radiation at UNITEN ICNIR2003 Electromagnetic Field*.
8. bmi.emedtv.com/bmi/how-to-calculate-bmi.htmlE.g., the Body Mass Index Table from the National Institutes of Health's NHLBI.
9. Eric J, Luc T (1999) Regulation of Body Weight in Humans. *Physiol Rev* 79(2): 451-480.
10. Ingalls AM, Dickie MM, Snell GD (1950) Obese a new mutation in the house mouse. *J Hered* 41(12): 317-318.
11. Behari J (2010) Biological responses of mobile phone frequency exposure *Exp Biol* 48(10): 959-981.
12. Lerchl A, Krüger H, Niehaus M, Streckert JR, Bitz AK, et al. (2008) Effects of mobile phone electromagnetic fields at nonthermal SAR values on melatonin and body weight of Djungarian hamsters (*Phodopus sungorus*). *J Pineal Res* 44(3): 267-272.
13. Imai N, Kawabe M, Hikage T, Nojima T, Takahashi S, et al. (2011) Effects on rat testis of 1.95-GHz W-CDMA for IMT-2000 cellular phones. *Syst Biol Reprod Med* 57(4):204-209.
14. Jin YB, Lee HJ, Seon Lee J, Pack JK, Kim N, et al. (2010) One-year, simultaneous combined exposure of CDMA and WCDMA radiofrequency electromagnetic fields to rats. *Int J Radiat Biol* 87(4): 416-423.
15. Otsuka R, Yatsuya H, Tamakoshi K, Matsushita K, Wada K, et al. (2006) Perceived psychological stress and serum leptin concentrations in Japanese men. *obesity* 14(10): 1832-1838.
16. Panagiotaropoulos T, Papaioannou A, Pondiki S, Prokopiou A, Stylianopoulou F (2004) effect of neonatal handling on basal and chronic stress induced corticosterone and leptin secretion. *Neuroendocrinology* 79: 109-118.
17. Kovalszky I, surmaecz E, Scolaro L, Cassone M, Fera R, et al. (2010) leptin based glycopeptides induces weight loss and simultaneously restores fertility in animal models. *Diabetes ObesMetab* 12(5): 393-402.
18. Zhang Y, Scarpce PJ (2006) The role of leptin in leptin resistance and obesity. *Physiol Behav* 88(3): 249-256.
19. Green ED, Maffei M, Braden VV, Proenca R, DeSilva U, et al. (1995) The human obese (OB) gene: RNA expression pattern and mapping on the physical, cytogenetic, and genetic maps of chromosome 7. *Genome Res* 5(1): 5-12.
20. Jobgen W, Cynthia J Meininger, Scott C Jobgen, Peng Li, Mi-Jeong Lee, et al. (2009) Dietary L-Arginine Supplementation Reduces White Fat Gain and Enhances Skeletal Muscle and Brown Fat Masses in Diet-Induced Obese Rats. *J Nutr* 139(2): 230-237.



This work is licensed under Creative Commons Attribution 4.0 License
DOI: [10.19080/AIBM.2020.16.555926](https://doi.org/10.19080/AIBM.2020.16.555926)

Your next submission with Juniper Publishers will reach you the below assets

- Quality Editorial service
- Swift Peer Review
- Reprints availability
- E-prints Service
- Manuscript Podcast for convenient understanding
- Global attainment for your research
- Manuscript accessibility in different formats
(Pdf, E-pub, Full Text, Audio)
- Unceasing customer service

Track the below URL for one-step submission
<https://juniperpublishers.com/online-submission.php>