



Review Article

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ROLE OF AYURVEDA IN THE MANAGEMENT OF MOBILE PHONE RADIATION EXPOSURE: A REVIEW

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ABSTRACT

Mobile or cell phones are nowadays an integral part of modern telecommunications in every individual's life and has been one of the fastest growing industries in modern history. Mobile phones emit a form of non-ionizing electromagnetic radiation, which can be absorbed by tissues close to the phone. This radiation is capable of inflicting the different organs of the body through thermal and non-thermal ways and has also been proved through various experimental studies. As billions of people use mobile phones globally, a small increase in the incidence of adverse effects on health could have major public health implications on long term basis. Ayurveda, one of the most traditional medical systems in the world, continues to come to the rescue of humankind in such complicated situations. Concepts like Asatmendriyarth Samyoga, Prajnaparada are helpful to understand this complex addiction. Therapies exclusively available in Ayurveda like Rasayana should definitely be used to mitigate the impact of mobile radiation over human race.

Keywords: Mobile phones, electromagnetic radiation, Asatmendriyarth Samyoga, Prajnaparada, Rasayana.

INTRODUCTION

Mobile phones have revolutionized the lives of people in the past 15 years. The ability to communicate, compute and access content via mobile phones has redefined connectivity and communication. As billions of people use mobile phones globally, a small increase in the incidence of adverse effects on health could have major public health implications on long term basis. The effect of mobile radiations on various parts of human body is a widely researched subject which we often turn a blind eye to. It is high time we realize and limit its use for a better tomorrow.

Mobile phone is a combination of two technologies, which are telephone, invented by Alexander Graham Bell in 1876 and radio, invented by Nikola Tesla in 1895. The evolution of mobile phone is one of the fastest in the history of innovation of science and technology. The fact that this small piece of technology provides us with numerous functions, among which the most valuable one is communication; puts the mobile phone in the centre of people's world. The total number of mobile phone users has surpassed 4.8 billion, which covers more than two-thirds of the world population¹. The word 'Cell' in 'Cell Phone' was created because in order for the system to work, cities would need to have been divided into 'cells', thus increasing the amount of frequency waves in the air so numerous people would be able to speak on the phone at the same time. This concept was first discovered and developed by Motorola, the first Mobile Phone Company in history². The word mobile comes from the Latin word "Mobilis", which means to move freely or move well.

Mobile phones and cell-phone tower generates electromagnetic field radiation, which became a frequent source of contamination of the human environment by producing non-ionizing radiation³.

DISCUSSION

Electro Magnetic field Radiation

Electromagnetic field (EMF) radiation is the flow of photons through space. Each photon contains a certain amount of energy and the different types of radiations are defined by the amount of energy found in the photons.

Apart from the use in telephony, some other important uses of electromagnetic radiation in our day-to-day life are as follows:

- X-ray used for bone structure imaging.
- X-ray used in Security Scanner.
- Microwave used in microwave ovens and radars.
- Radio waves used in radio and television broadcasts.
- Infra-red waves used in night vision goggles and in TV remote controls.

The most common sources of exposure

The most common sources of exposure include the FM/AM radio, TV transmission, Cellular networks using Global System for Mobile (GSM), Code division multiple access (CDMA), wireless local area network (WLAN), Bluetooth, Wi-Fi technology. The effects due to FM, AM and TV transmissions are localized to the areas around the location of towers and the Bluetooth operate at low power levels.

Types of EMF radiation

Electromagnetic field radiations are divided into two categories, ionizing and non-ionizing, depending on frequency and the power level.

Ionizing radiation is electromagnetic radiation whose waves contain energy sufficient to overcome the binding energy of electrons in atoms or molecules, thus creating ions. E.g., Ultraviolet rays, X-rays, gamma rays and cosmic rays.

Non-ionizing radiation refers to any type of electromagnetic radiation that does not carry enough energy per quantum to ionize atoms or molecules. E.g., low frequency radiations like radio waves, microwaves, and infrared radiations⁴.

Effects of Electromagnetic field exposure on human health

Hazardous effects are inevitable part of any innovative invention. The effect of mobile phone radiations on human health is the subject of recent interest as a result of the enormous increase of mobile phone use throughout the world. It is generally considered that humans are immune to adverse influences of radiation, because it is believed that its intensity is far too low to cause any deleterious degree of body tissue heating, as quantified through the so-called specific absorption rate, or SAR. Specific Absorption Rate is a measure of the rate at which energy is absorbed by the human body when exposed to a radio frequency electromagnetic field⁵. The electromagnetic radiation generated by mobile phones can inflict its results through two ways: thermal and non-thermal effects.

Thermal Effects

Refers to the heat generated due to absorption of EMF Radiation. While using a cell phone, most of the heating effect occurs at the surface of the head, causing its temperature to increase by a fraction of a degree. Prolonged thermal effect may lead to increase in body temperature. In a study conducted by P Wainwrights *et al*, a thermal model of the head had been developed to calculate temperature rises generated in the brain by radiation from cellular telephones and similar electromagnetic devices and it was concluded that the maximum temperature rise found in the brain was about 0.1 degrees celsius⁶.

Non-Thermal Effects

Non-thermal effects are attributed to the induced electromagnetic effects inside the biological cells of the body which is possibly more harmful⁷.

Much experimental evidence of non-thermal influences of microwave radiation (a form of electromagnetic radiation) on living systems has been published in the peer reviewed scientific literature during the last 30 years. Some *in vitro* studies indicated increased epileptic activity in rat brain as well as impairment of spacing and learning memory in mice as results of increased oxidative stress. Also, increased permeability of the erythrocyte membrane and increased haemolization, effects on blood brain-barrier, increase in calcium ion efflux, reduced efficiency of lymphocyte cytotoxicity and increase of chromosome aberrations and micronuclei in human blood lymphocytes, synergistic effects with cancer promoting drugs such as phorbol ester and impairment of reproductive system were registered.

Various studies conducted *in vivo* have established the detrimental effects on various organs like:

Brain

In a study where animals were exposed to microwave radiation (mobile phones and cell towers emit microwave radiation (MWR)), discrete reduction of grain mass and reduced size, and

number of dendritic spines of Purkinje cells in cerebellum were noticed⁸.

In another study to explore the effects of mobile radiation on brain, the results demonstrated marked effects on behaviour, which could be correlated to physiological as well cellular changes. The brain of exposed animals exhibited intense neurodegeneration in the hippocampus. Cerebral cortex also showed a significant neuronal damage. This change was seen in the form of scattered and asymmetric neurons, and possessed a distorted morphology⁹.

Liver and pancreas

In a study to comprehend the effect on liver and pancreas, it was found that exposure to mobile phone radiation for 30 min/day caused inflammation of the liver in 18.75% of the animals. However, when the duration of exposure was increased to 60 min/day, it was observed that there was inflammation in the liver in 43.75% and in pancreas in 31.25% of albino rats compared to their matched controls¹⁰.

Sperm quality

In another study to learn the effect on testis and sperm, they found a striking reduction in the percentage of motile sperm in rats exposed to mobile radiation, as well as a significantly elevated lipid peroxidation (oxidative degeneration of lipids) and decreased glutathione content (primary function of glutathione is to alleviate oxidative stress) in the testis and epididymis. Thus, electromagnetic radiation from mobile phones results in oxidative stress and decreases semen quality¹¹.

Ovarian follicles

In an experiment where study group of rats were exposed to an Electromagnetic field in the abdominal region for 15 min/d for 15 days, it was found that there was a significant decrease in the number of ovarian follicles in rats exposed to an electromagnetic field, when compared to the test group of rats¹².

Effect of Wi-Fi network

There are many scientific studies demonstrating the detrimental effects of Wi-Fi on the human body. It causes oxidative stress by increasing the production of free radicals. Increased oxidative stress is responsible for oxidative damages to cellular macromolecules, such as proteins, lipids, and DNA.

Some studies regarding the effects of 2.45 GHz Wi-Fi signals on both human and animal health have demonstrated that the radiofrequency electromagnetic radiation emitted by Wi-Fi devices can affect sperm count, motility, and DNA integrity¹³.

Effect of mobile radiation over environment

The widespread increase of the mobile phone usage has not affected the human live but also the environment around us. In a study to observe the effect of electromagnetic radiation over plants (seeds), it was observed that the radiations emitted from mobile phone show considerable increase in the germination percentage, seedling length, proteins, and lipid content in comparison to control seeds. The study concluded that radiations emitted from mobile phone interfere with both morphological and the biochemical processes and affect the growth and nodule formation in the plants¹⁴.

Mobile radiation has generated its noxious effects on birds too. A study was conducted in vicinity of cell phone towers to draw a possible link among avian occurrences, nesting and electromagnetic radiation emitted from the towers. No avian nest was detected near the towers. First natural nest found was at 80 m away from a tower¹⁵. In another study to observe the effect of mobile phone electromagnetic radiation on somitogenesis of birds, it revealed that a statistically significant ($p < 0.05$) increase of abnormalities in exposed embryos (33.33%) as compared with the control (9.68%)¹⁶.

Role of Ayurveda

According to our Acharyas, the cause of any disease is

- Prajnaparada
- Asatmendriyarthasamyoga
- Parinama i.e., kala

Prajnaparada

Prajnaparada (Intellectual Blasphemy) is wilfully ignoring one's inner knowing and going against norms, intuition and common sense which form the root cause for all diseases. When one gets involved in verbal, mental or physical activities which are unfavourable to self, it harms both body and mind.

The word Prajna literally means understanding, sagacity or cognitive acuity.¹ It is the wisdom that is able to extinguish afflictions and bring about enlightenment. The word Aparadha means offence, fault or misuse.² Thus, the words Prajna and Aparadha together constitute the term Prajnaparada, which means faulty conception. Dhi (intellect), Dhriti (retention) and Smriti (memory) are the three components which constitute Prajna.

Prajnaparada aggravates all the three Sharirika and Manasika Doshas resulting in various disorders¹⁷. Similarly, although we humans are very much aware of the consequences of the over use of mobile phones, we still deliberately choose to ignore it and continue its over use, thereby committing Prajnaparada.

Asatmendriyarthasamyoga

A thing which is not conducive to body is regarded as Asatmya (unwholesome). Indriyas include both Jnanendriya (sense organs) and Karmendriya (motor organs). Artha implies object of senses. Therefore, the Asatmya (imbalance) occurring due to the improper bondage of sense organs with its objects can be termed as Asatmendriyarthasamyoga. They are of three varieties – Heena yoga, Mithya yoga and Atiyoga. Indriyarthasamyoga means less contact of sense organs with its objects. Indriyarthasamyoga Mithya yoga means incorrect contact of sense organs with its objects and Indriyarthasamyoga Atiyoga – excessive contact of sense organs with its objects¹⁸.

In the context of mobile phone usage, the most used sense organs are Chakshurindriya and Srotrendriya among the five. According to Acharya Charaka, excessive gazing at highly luminous substance would constitute excessive utilisation of visual objects (Atiyoga of Chakshurindriya)¹⁹. Now this explains the current scenario in our daily lives and also the reason for most of the vision impairments. Usage of mobile phones during late night also becomes relevant here, which in turn can cause Nidrapata or even Nidranasha. A research study among students even proved that mobile phone usage for playing/surfing/texting in bed before going to sleep was positively associated with insomnia and

chronotype, and negatively associated with morningness²⁰. Similarly hearing loud voice, noises coming out of thunder and kettle drum, etc come under Atiyoga of Srotrendriya²¹. This explanation throws light on the increasing number of ear issues and the inevitable plight of the humans in the near future.

According to Sushruta, Manas (mind) is also one of the Indriyas which acts as both Jnanendriya and Karmendriya, known as Ubhayendriya²². So, considering Asatmendriyarthasamyoga, there is also the Atiyoga of Manas in case of excessive usage of mobile phones. The Karma (action) of Manas in the gross body occurs through the functional faculty of the body by Tridosha and our Acharyas have also reiterated the relation between Manas and Vata Dosha. Hence, when there is Atiyoga of Manas, there is also vitiation of Vata Dosha which can result in Shoka, Chinta, etc.²³ And thus, this may also lead to mental disorders like anxiety, stress, sleeplessness, depression, etc and also explains the spike in the number of cases of the same in the recent times.

Our Acharyas have also explained the concept of the Dharaneeya vegas. The notion of Dharaneeya vegas are connected to the emotional states of mind. Dharaneeya vegas like Lobha, Krodha, Irshya, Shoka, Bhaya, etc are broadly classified under Iccha (desire) and Dvesha (hatred)²⁴. Iccha referred here is nothing but Raga, which is also called attachment. Acharya Vagbhata has very clearly mentioned that Ragadi, which includes the Dharaneeya vegas, is the root cause for all the diseases²⁵. Hence, the inescapable attachment of human beings towards the mobile phone can lead to various Psychosomatic manifestations.

Ayurveda, being one of the most scientific medical systems that the whole world looks up to, has always proved its mettle in treating degenerative diseases and advocating healthy lifestyles. Rasayana therapy of Ayurveda is a dedicated stream of medication for immune promotive, anti-degenerative and rejuvenative health care and is known for improving the quality of life of healthy as well as diseased individuals. Numerous drugs like Ashwagandha, Yashtimadhu, Amalaki, etc have been attributed as Rasayanas and such drugs or medicines containing these drugs can be used appropriately. Similarly, various Medhya drugs like Brahmi, Shankhapushpi have also been mentioned, which are already proved to be a nootropic²⁶. Intake of the medicinal formulations containing these drugs can also help us to maintain the status quo without further damage. Importance of following Sadvritta in daily life also becomes very relevant in this current scenario.

There are a few ways to limit the effect of radiation. Some of them are – limiting body contact with mobiles, using speaker mode or wired headset, switching sides of the head while talking, avoiding usage of mobile on low battery, keeping the mobile phone away from head and body while sleeping. Hence, along with the conscious decision to reduce the screen time, if the solutions from Ayurveda are also adopted, we can definitely create a huge change.

CONCLUSION

Mobile phones are one of the few devices that have become an integral part of our lives. The exposure of humans to electromagnetic fields is increasing with the widespread use of technologies, such as mobile phones and wireless communication. Thus, it is highly recommended that we realize the health hazards due to overuse of mobile phones and strictly limit its use in every form as much as possible and turn towards natural system of medicines like Ayurveda for the greater good.

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