

# MOBILE HAZARDS ON BIOLOGICAL SYSTEMS

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**Abstract**—Mobile have important and integral role in everyday life in terms of domestic, commercial and official use. However, the radiation of mobile is affecting the health of the habitat in various ways. In this paper, we focus on the hazards of mobile to the living organisms.

**Keywords**— Mobile Hazards, Biological Systems

Mobile phone or cell phone are pertinent component of our daily life. It is very difficult to imagine a life without mobile phone. It is popular in different age groups for different use. The different age group persons use mobile phone according to their need: offline/online gaming, online movie watching, surfing on social websites, religious matter, stock exchange, ticket booking, weather forecasting, live news, research etc. It provides essential applications which include Specific Absorption Rate (SAR) indicates the energy absorbed by the human body with exposure to electromagnetic/microwave signals.

Whenever mobile is used, it generates/receives microwave/wireless signals depending upon the incoming or outgoing call. The microwave signal received interacts with our body in addition to the mobile phone. As a result of this, some portion of the microwave signal is absorbed by the human body.

The microwave signal contains AC electric and magnetic fields implying charges are moving inside the signal. These charges are absorbed by the tissue of different organs of the human body. This creates polarization of molecules inside the body tissue. This also raises the temperature of body tissue affecting the thermoreceptors. These receptors are the sensors which are present in our body and their function is to control the temperature of the body.

Whenever the body temperature is increased, thermoreceptors come into action and body sweat in order to lower down the body temperature. Thus unusual rise in the body temperature, due to the absorbed radiation by the body tissue, can malfunction the thermoreceptors, thereby affecting the temperature control mechanism of the body.

The countries and regions have defined this maximum limit of the absorption of radiation by the body tissue. Table 1 lists the safety margin decided

by International Commission on Non-Ionizing Radiation Protection (ICNIRP) to prevent any health hazard to the mankind. For example in case of Europe, SAR value is average 2 W/Kg along the 10 gram tissue which absorbs the wireless signal. Similarly it is 1.6 W/kg for Australia and US.

**Table 1. Permissible Limit of Radiation Absorption By Body Tissue From Mobile Phone**

Region / Country	Limit (W/Kg)
Europe	2.0 for 10 gram of tissue
Australia	1.6 in 1 gram of tissue
US	1.6 in 1 gram of tissue

## Effect on Brain

Figure 1 shows rise in temperature of head for different age groups after exposure of mobile radiation. As evident, small age group children up to 5 years are more affected by the radiation. The neurons in the brain help in memory retentivity. These neurons are small in number in small age and multiply each other like chain reaction with the increase in age.



**Figure 1. Temperature distribution due to mobile radiation in different age groups.**



### Children are more vulnerable to mobile radiation

These neurons are affected after the radiation interaction and affected neurons multiply each other to produce new damaged/affected neurons. Therefore, significant loss of memory or memory retentivity can occur in children.

Thus following severity can happen

- ❖ Neuronal Damage (Dead Brain Cells)
- ❖ Brain Tumor- Glioma, Melningioma

In the studies, occurrence of tumor due to mobile radiation i.e. Glioma, Melningioma has also been reported.

### Effect on Children

Children are less immune than adults due to following reasons:

- ✦ Thinner skulls
- ✦ Weak immune systems: One year old can absorb mobile radiation 2 times than adult
- ✦ Higher levels of cell multiplication
- ✦ Five year old can absorb mobile radiation 60% more than adult
- ✦ Mouth cancer in adults to mobile phone
- ✦ Developing nervous systems

### Blood Brain Barrier

The blood brain barrier in human body allows nutrients to pass from blood to brain while retrain the flow of toxic substances to go inside the brain. This barrier of rats was affected with exposure to mobile radiation.

### Electromagnetic Hypersensitivity

The following problems are also reported associated with electromagnetic hypersensitivity:

- ❖ Slow response time
- ❖ Headaches
- ❖ Arrhythmia
- ❖ Tachycardia
- ❖ Malaise
- ❖ Fatigue
- ❖ Sleep disorder

### Genotoxic effects

The genetic effects are also reported due to mobile radiation.

#### ❖ Increased DNA fragmentation

The group of Dr, Iuliss from and group from Australia found damage in DNA from mobile radiation in 2009.

#### ❖ Damaged DNA

In 2004, 12 research labs from different countries collaborated to study effect of mobile radiation with in-vitro condition. The study concluded with shocking evidence of damage of DNA cells with to 2 watt per kilogram exposure.

**The following associated phenomenon have been found:**

- ❖ DNA degeneration, Cell Destruction
- ❖ Fragmentation and degeneration
- ❖ Fragmentation and Translocation
- ❖ Fragmentation and Inversion
- Mutation- Translocation and Inversion
- Tissue Malfunctioning

### Health hazards of Cell Site and Mobile Telephone Switching Office

Transmitter Antenna generates strong power of 20 to 100 W power than mobile phone. The house of people should be located more than 2 km distance from the cell site tower and switching office. However, people have rented their top roof for placing cell towers which is very dangerous for the people living surrounding the tower.

- Research concluded in France, Spain, Egypt, Poland and Austria:
- ❖ Fatigue
- ❖ Headache
- ❖ Sleep disruption

- ❖ Loss of memory

**Dr. Lennart Hardell conducted research from Orebro University (Sweden) in 2007 and concluded following observations from 16 case studies:**

- ❖ malignant glioma was prevalent in mobile phone users
- ❖ strong correlation between acoustic neuromas and use of mobile phone
- ❖ There is more probability of brain tumor occurrence on that side of head wherein mobile phone is used One hour of cell phone use per day significantly increases tumor risk after ten years or more
- ❖ Risk of getting tumor is more below the age 20

Therefore, we should use mobile phone by taking necessary measures to prevent any kind of hazard to our body. We must look for SAR value before buying mobile phone.

### Precautionary Measures

- ❖ Use head phone with electrical wire
- ❖ Try to keep away the mobile phone from body when not in use
- ❖ Do not give mobile phone to children for any use
- ❖ Avoid excess use of mobile phone you're your children
- ❖ Ensure that there is no cell site/tower you're your home atleast with a distance of 1 km.

Table 2 lists SAR values of different mobile phone supplied by leading manufacturer of mobile phone. Evidently, SAR in all mobile phone is greater than 1 and models mentioned in table 2 comprising of Samsung as well as Motorola are more near towards permissible limit specified Australia and United States of America as mentioned in Table 1.

**Table 2. Different SAR Value Specified by Mobile Manufacturers**

Mobile Phone Type	Specific Absorption Rate (SAR)
Apple I-Phone 8 Plus	1.19
Apple I-Phone 8	1.20
Apple I-Phone 7 Plus	1.19
Apple I-Phone 7	1.20
Samsung Galaxy S8	1.55
Samsung Galaxy S7	1.59
Samsung Galaxy S6	1.25
Motorola Droid Maxx	1.54
Motorola Droid Ultra	1.54