

A REVIEW

# Impact of mobile phone radiations on public health

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ABSTRACT

Mobile or cellular phones are now an integral part of modern telecommunications, the use of phones is not limited to phone calls only but people are getting various information's and using them for political, civic, health and many more purposes. In many countries, over half the population uses mobile phones. In 2014, there is an estimated 6.9 billion subscriptions globally and this number is going to rise sharply in coming years. In some parts of the world, mobile phones are the most reliable or the only phones available. Due to presence of the large number of mobile phone users, it is important to investigate, understand and monitor any potential public health impact.

**Key Words :** Radiations, Mobile phones, Radio frequency, Cancer

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Energy, frequencies, sounds and vibrations are all around us, even if you can't hear them, see them or sense them in any way and they can have a profound impact on your health. Radiation is energy that's travelling through space in the form of waves or particles. On the basis of increasing wave length the various radiations can be arranged as :

Gamma Rays<X-Rays<UV<Visible<IR<Microwave<Radio waves

**Mobile phones use radio frequency (RF) radiations:**

The mobile phone system works like a two-way radio and includes the individual handset and the base stations. Base station antennae are mounted high off the ground (on a tower or roof) to get the widest coverage. A mobile phone has a radio receiver and a transmitter.

When the power is turned on, cell phones emit electromagnetic radiation – even in stand-by mode and regardless if carried on belts, in pockets or purses, expose other areas of the body to harmful ELF radiation, as well.

During call, phone uses radio frequency (RF) radiation via its antenna to 'talk' to a nearby base station. Once the base station has received signal, call is directed through the landline phone system. Mobile phone base stations emit relatively constant levels of RF radiation. The handsets emit levels of RF radiation that vary depending on duration of use of phone, distance of phone from our body and base station. The levels of RF radiation from the handset, to which your head is exposed, are around 100 to 1,000 times more intense than exposure

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from base stations.

Radio frequency exposure limits for mobile phone users are given in terms of specific absorption rate (SAR) - the rate of radio frequency energy absorption per unit mass of the body. Currently, two international bodies (ICNIRP, 2009 and IEEE, 2005) have developed exposure guidelines for workers and for the general public, except patients undergoing medical diagnosis or treatment. These guidelines are based on a detailed assessment of the available scientific evidence.

Electromagnetic radiation can be categorized into two types: ionizing (e.g., x-rays, radon, and cosmic rays) and non-ionizing (e.g., radio frequency and extremely low-frequency or power frequency). As the mobile phones operate in Radio frequency energy of electromagnetic radiations some researchers believe that these radiations do not have any health hazards (Schuz *et al.*, 2006).

#### Effects of mobile radiations :

The U.S food and drug administration (FDA), which is responsible for regulating the safety of machines and devices that emit radiation (including cell phones), advocates that the majority of human epidemiologic studies have failed to show a relationship between exposure to radio frequency energy from cell phones and health problems.

The U.S. centers for diseases control and prevention (CDC) states that, although some studies have raised concerns about the possible risks of cell phone use, scientific research as a whole does not support a statistically significant association between cell phone use and health effects.

The federal communications commission (FCC) concludes that there is no scientific evidence that proves that wireless phone use can lead to cancer or to other health problems, including headaches, dizziness, or memory loss.

#### Evidences in support of hazardous effects of mobile radiations :

There are certain studies which reveal the harmful effect of mobile radiations.

Among these the International Agency for Research on Cancer (IARC), a component of the world health organization, has recently classified radio frequency fields as "possibly carcinogenic to humans.

Study published in 2011 by the Journal of the

American Medical Association concluded that exposure to radio frequency signal waves within parts of the brain closest to the cell phone antenna resulted in increased levels of glucose metabolism, but the clinical significance of this finding is unknown (Frei *et al.*, 2011 and Benson *et al.*, 2013).

A recent study showed that when people used a cell phone for 50 minutes, brain tissues on the same side of the head as the phone's antenna metabolized more glucose than did tissues on the opposite side of the brain (Volkow *et al.*, 2011).

An early case-control study in the United States was unable to demonstrate a relationship between cell phone use and glioma or meningioma (Muscat *et al.*, 2000).

Some case-control studies in Sweden found statistically significant trends of increasing brain cancer risk for the total amount of cell phone use and the years of use among people who began using cell phones before age 20 (Hardell *et al.*, 2011).

The American Cancer Society (ACS) states that the IARC classification means that there could be some risk associated with cancer

A Swedish scientific team conducted a study (2004) that suggested that regular use of a mobile phone over a decade or more was associated with an increased risk of benign brain tumor. The increase was not noted in those who had used phones for fewer than 10 years (Lonn *et al.*, 2004).

Some researchers have studied the effects of microwave radiation on the rat brain. They found a leakage of albumin into the brain via a permeated blood-brain (Muscat *et al.*, 2000 and Hardell *et al.*, 2011). This confirms earlier work on the blood-brain barrier by Allan Frey, Oscar and Hawkins and Albert and Kerns (Lonn *et al.*, 2005). Other groups have not confirmed these findings *in vitro* cell studies (Aydin *et al.*, 2011) or whole animal studies (Inskip *et al.*, 2010 and Lonn *et al.*, 2005). Prof Leszczynski of Finland's radiation and nuclear safety authority found that, at the maximum legal limit for mobile radiation, one protein in particular, HSP 27, was affected. HSP 27 played a critical role in the integrity of the blood-brain barrier (Little *et al.*, 2012).

In 2007, Dr. Lennart Hardell, from Örebro University in Sweden, reviewed published epidemiological papers and found that (Benson *et al.*, 2013) phone users had an increased risk of malignant gliomas., Link between cell phone use and a higher rate of acoustic neuromas.,

Tumors are more likely to occur on the side of the head that the cell handset is used. One hour of cell phone use per day significantly increases tumor risk after ten years or more.

A publication titled "Public health implications of wireless technologies" cites that Lennart Hardell found age is a significant factor. The report repeated the finding that the use of cell phones before age 20 increased the risk of brain tumors by 5.2, compared to 1.4 for all ages (Sage and Carpenter, 2009). A review by Hardell *et al.* (2011) concluded that current mobile phones are not safe for long-term exposure (Hardell *et al.*, 2009). International Agency for research on Cancer classified radio frequency electromagnetic fields as possibly carcinogenic to humans (Group-2B).

It has also been proved that children have the potential to be at greater risk than adults for developing brain cancer from cell phones. Their nervous systems are still developing and, therefore, more vulnerable to factors that may cause cancer. Their heads are smaller than those of adults and therefore have a greater proportional exposure to the field of radio frequency radiation that is emitted by cell phones. And children have the potential of accumulating more years of cell phone exposure than adults do. Mobile radiations also have cognitive effects (Luria *et al.*, 2009).

Research published in 2004 by a team at the University of Athens had shown a reduction in reproductive capacity in fruit flies (Ponagopoulos *et al.*, 2004). Australian research conducted in 2009 on samples of human spermatozoa showed a correlation between increasing SAR and decreased motility and vitality in sperm, increased oxidative stress, stimulating DNA base adduct formation and increased DNA fragmentation (De *et al.*, 2009).

Most of studies have found significant effects on sleep (Borbely *et al.*, 1999; Huber *et al.*, 2000; Huber *et al.*, 2002; Huber *et al.*, 2005; Hung *et al.*, 2007 and Andrzejak *et al.*, 2008).

A team led by Dr. Nora Volkow, found that even weak cell phone radiation alters brain activity. They recommend cell phone models that emit low radiation (<http://www.ewg.org>).

A study on mice offspring suggested that cell phone use during pregnancy may cause behavioural problems that resemble the effects of ADHD (Cell phone use in pregnancy may cause behavioural disorders in offspring mouse study suggests, 2012). A number of studies have

shown relationships between mobile telephone use and reduced sperm count and sperm quality. Peer reviewed studies have shown relationships using statistical questionnaire techniques (Fejes *et al.*, 2005; Kilgallon and Simmons, 2005; Wdowiak *et al.*, 2007; Agarwal *et al.*, 2008 and Gutschi *et al.*, 2011) controlled experiments on living humans (Davoudi *et al.*, 2006) and controlled experiments on sperm outside the body (Erogul *et al.*, 2009 and Agarwal *et al.*, 2009).

According to Dr. Blank, there are about 20 different stress proteins in nature, called heat shock proteins (HSP), which are used by cells to counteract harmful stimulus. Whenever a cell is exposed to an unfriendly environment, the DNA separates in certain regions and begins to read the genetic code to produce these stress proteins (HSP).

Therefore, the presence of stress proteins is an indication that the cell has come into contact with something that is detrimental to its wellbeing. Essentially, it's your cells' way of saying, "I've encountered something bad." And, Dr. Blank emphatically claims, "There's *no question* cells react to EMF's as harmful." Research has clearly shown that radiation within the non-ionizing range can cause single- and/or double-DNA-strand breaks, which cells respond to by creating stress proteins.

We the human beings use quite a large number of gadgets which are having electromagnetic radiations of different wave lengths associated with them. The mobile phones operate in radio frequency region of EMF radiations, these radiations are considered to be harmless by most of scientists but still there are evidences which prove that RF (radio frequency) radiations are responsible for the development of (Group-2B) type of cancer. Moreover, it has not been too long back when these phones came into existence. So the detailed, relevant investigations need to be done.

### Conclusion :

As some workers believe that radiations emitted by phone are harmless but there are many evidences given by other researchers that radiations emitted by phone may cause health hazards, so it's better to have precautions to avoid harmful effect of radiations.

While using phones, to reduce the levels of radiation, phone may be held at 20cm away from head, it reduces radiation doses by about 98 per cent. Hands free headsets and text messaging dramatically reduce radiation emissions into the brain. Using the phone in areas of

good reception also decreases exposure as it allows the phone to transmit at reduced power. Exposure is also reduced by limiting the number and length of calls.

Use of phones may be minimized and only those phones (Brands) may be used that reduce the emissions of radiation or allow the body to neutralize the effects. Children may not be allowed to use phones as their developing brains and bodies are far more susceptible to radiation effects than adults, absorbing radiation at three times an adult's rate.

If the option is available between land line phones (fixed) and mobile phones then land line should be preferred.

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