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A Review on Impact of Mobile Phone on Human Health

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ABSTRACT: ***Mobile phones have become an integral part of our lives in recent years, and they are now one of the most important means of communication. As a result, numerous movable towers are erected to conceal more regions, especially in densely populated cities and concrete locations. The bottom stations built on these sites now contain transceivers that utilize radio frequency (RF) waves to identify communication among mobile network users. Because of the diversity of base stations required, demand will rise as the number of portable devices grows, market rivalry intensifies, and new technical capabilities emerge. Microwave frequencies used in mobile communication have both thermal and non-thermal impacts on the biological system. The amount of RF-EMW energy absorbed by human tissue is determined by the frequency, intensity, polarization, and exposure time. The EMR is well-known because to the primary cause of cancer. The possible biological and medical consequences of high-intensity portable tower radiation are discussed in this review article.***

KEYWORDS: ***Mobile phone, Radiation, Thermal Effect, Radio frequency, radio waves, Blue Light.***

1. INTRODUCTION

Modern technology has brought comfort and ease to human civilization, but these technical and communication instruments are also accompanied by a slew of other unavoidable elements. Electromagnetic radiation is one of these variables that is employed in mobile phones and wireless devices for signal transmission. EMF radiation has been linked to a variety of negative health, development, reproductive, immune system, growth, sleep, skin, and cognitive impacts, according to a number of studies. The link between mobile phones and memory loss has been investigated in a variety of methods. Due to their smaller heads, thinner skulls, and greater tissue conductivities, children can consume more energy from a given phone than adults. The power levels of wireless devices are restricted by international rules on microwave frequency exposure limits, and exceeding these guidelines is uncommon for wireless equipment. Furthermore, because non-thermal impacts have yet to be demonstrated clearly, these guidelines only take thermal effects into consideration. The topic of whether microwave radiation released by mobile phones (radio-frequency modulated electromagnetic fields: RF-EMF) might cause health problems remains unresolved. RF-EMF has biological impacts, according to several recent evaluations of amended published studies, is important and trustworthy scientific evidence. Earlier in vivo and in vitro research suggested that RF-EMF exposure might affect the permeability of the blood-brain barrier [1].

There are also studies, however, where authors claim that non-thermal RF-EMF radiation levels do not affect the permeability of the blood-brain barrier. Microwaves can cause or encourage

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cancer, and the symptoms associated with its use include sleep disturbance, memory problems, headaches, nausea, and dizziness. There were also records of improvements in the blood brain barrier permeability, electroencephalographic activity, and blood pressure [2], [3].

However, some research suggest that non-thermal RF-EMF radiation levels have no impact on the permeability of the blood-brain barrier. Microwaves have been linked to sleep disturbances, cognitive difficulties, headaches, nausea, and dizziness, among other symptoms. Improvements in blood brain barrier permeability, electroencephalographic activity, and blood pressure were also documented. While mobile phones are meant to function at power levels below a threshold for recognized thermal impacts, radio frequency radiation can have additional, biological consequences. Users of wireless devices have a genuine worry about security, particularly when it comes to possible risks posed by electromagnetic fields (EM). The possible negative health consequences of radiofrequency radiation (RFR), such as those emitted by mobile communications devices, have been a growing source of worry. The signal is conveyed by electromagnetic wave using radio frequency and microwave signals in a mobile contact. This signal emits electromagnetic radiation in the form of thermal radiation, which contains both hazardous ionizing and non-ionizing radiation. When using a mobile phone, electromagnetic waves are transferred to the body, causing health concerns, particularly near the ear skull, where they are known to damage neurons. The electrical impulses that two neurons bind interact with the radiations [4], [5].

1.1. Radiation From Mobile Phones

Electromagnetic radiation (EMR) is a wave-like phenomenon that emits energy as it moves through space. Both electrical and magnetic fields fluctuate perpendicular to each other in phase and perpendicular to the direction of energy transmission in electromagnetic radiation. Depending on whether it is capable of ionizing atoms and breaking chemical bonds, electromagnetic radiation can be classified as ionizing or non-ionizing. Electrical and biological hazards are the two main dangers connected with non-ionizing radiation. When an induced voltage surpasses the ambient medium's breakdown voltage, extremely high electromagnetic radiation can create electrical currents strong enough to produce sparks (electrical arcs). The sparks can then ignite combustible objects or gases, potentially causing an explosion. When an induced voltage surpasses the ambient medium's breakdown voltage, extremely high electromagnetic radiation can create electrical currents strong enough to produce sparks (electrical arcs).

The sparks can then ignite combustible objects or gases, potentially causing an explosion. The biological impact of electromagnetic fields is to cause dielectric heating. Weak non-thermal electromagnetic fields, such as weak Extremely Low Frequency magnetic fields and modulated Radio Frequency and microwave fields, can have complex biological consequences. Moving currents are caused by magnetic fields, and the intensity of these magnetic fields is exactly proportional to the magnetic field's power. Nerves and muscles are activated by such currents, which impact biological processes. The effect of weak EM radiation on humans can be understood as a series of events that begin with exposure to EM radiation that, when absorbed, modifies the patterns of the biological environment, accumulates energy and information in body fluid, and

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changes the cell's functional activities, all of which eventually lead to disease. The radio frequency energy emitted by the cellular phone must be high enough to reach base stations (antenna towers). There are concerns regarding the technology's health because the energy is created as a microwave in close proximity to the user's head. Cell research and animal studies have suggested that cell phone users have a modest chance of getting cancer tumors, the most of which are brain tumors.

Radiation can have a direct impact on adults and their children, depending on the degree of exposure. Radiation can destroy body cells, raising the chance of cancer or dangerous genetic changes that can be passed down to future generations; alternatively, if the dose is high enough to cause major tissue damage, it can cause death within weeks of exposure [6].

1.2. Specific Absorption Ratio (SAR)

SAR is a watts per kilogram measurement of the amount of radio frequency (RF) energy absorbed by the human body's tissue. This test is performed to see if a cell phone complies with the safety requirements. The exposure limit is considerably below the levels known to have biological consequences and takes into consideration the body's ability to eliminate heat from tissues that receive energy from the mobile phone. The Federal Communications Commission (FCC) of the United States and the International Commission for Non-Ionizing Radiation Protection (ICNIRP) of the International Commission for Non-Ionizing Radiation Protection (ICNIRP) of the International Commission for Non-Ionizing Radiation Protection (ICNIRP) of the International Commission for Non-Ionizing Radiation Protection (ICNIRP) of the International Commission for Non-Ionizing Radiation Protection (ICNIRP) of the International Commission for Non-Ionizing Radi

Some of the radio waves emitted by a mobile phone handset are absorbed by the human skull. A GSM handset's radio waves may have a peak power of 2 watts, while a US analogue phone's average transmission power was 3.6 watts. Other mobile digital technologies, such as CDMA2000 and D-AMPS, utilize less than 1 watt of output power. The maximum power consumption of a mobile phone is controlled by the mobile phone standard and the regulatory authorities in each nation. The cell phone and base station test the reception quality and signal intensity in most systems, and the power level is increased or lowered accordingly [7].

1.3. Effect of Blue Light on Eyes

Light is relayed by smart phones, laptops, and other portable gadgets. However, blue light, in particular, may be harmful to the skin. Macular degeneration is the result of photoreceptor cell loss in the retina. The goal of photoreceptor cells is to gather and transmit visual images to the brain via a substance called retinal. The retinal, which is generated by the eye, is stimulated by blue light, which causes various chemical processes. These processes within the eye can be harmful to the photoreceptor's cell molecules, causing damage. When photoreceptor cells die, they do not regenerate. "The toxicity of blue light to the retina is ubiquitous. It has the ability to kill any sort of cell "Part of this might be due to the fact that blue light has a shorter wavelength than other colors and hence has greater energy. The additional energy might explain the retinal-generated toxicity that this chemical shift has created. Phone [6] Blue Light The combination of blue light and retinal damage can harm cells; however, the studies were done in a laboratory setting

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rather than on human eyes. It's uncertain if cell death is triggered by blue light in the eye itself, according to studies [8].

The topic of whether blue light from mobile phones and digital screens cause's similar degrees of toxicity remains unresolved, and it is presently being investigated. Although age-related macular degeneration affects people of all ages, it is more common after the age of 60. Experts believe that, with the growing usage of blue light technology, this will happen sooner. According to the Bright Focus Foundation, as many people as ever suffer age-related macular degeneration. By 2050, this number is anticipated to reach 22 million. Blue light is emitted not just by our electronic devices, but also by natural sunshine. Certain circumstances, such as utilizing night gadgets, might exacerbate the blue light.

In reality, the produced blue light filters the light into a very small region within the pupil in the dark. This impact is likened by one of the study's authors to using a magnifying glass in the sun, which may produce light so intense and focused that it can burn the eyes. The blue light from such screens gadgets can also cause dry eyes.

"Studies have indicated that increased usage of iPhones, iPads, and laptops has resulted in an increase in dry eye development owing to a decreased blink rate." The less individuals blink, the more they engage with their gadgets over time. A number of technological firms have already proposed potential counter-measures to this tendency. Apple has a "night shift" setting, while Samsung has a "blue light filter" that reduces the amount of blue light reflected on the device's screen. Former suggests "considering decreasing the time spent on these devices" and "providing your eyes a break while performing long activities on the screen." To assist relax eye muscles and relieve unneeded strain, he recommends closing your eyes for a short time or looking into the distance. Although this study is useful for people who are at risk of developing degenerative eye diseases, it is another reason for everyone else to restrict their screen time, especially after sunset.

1.4. Harmful Effect on Health

The effect of radio waves released by mobile phone contact can be characterized as thermal, non-thermal, or nontoxic in terms of handsets, especially when it comes to human health. The thermal effect occurs when the electromagnetic field of radio waves induces polar molecules to release dielectric heat, which kills tissues. When processing the message from radio waves, for example, any area of the brain may have injured nerve fibers if the temperature rises.

The non-thermal effect, which occurs when the temperature created by radio waves flows through the cell constantly, is next to the thermal effect (only the electrical current). Membrane, while Trans gets messages, and then the nontoxic effect, which includes chromosomal damage, alterations in the function of some genes, and a faster rate of cell division. Non-ionizing radiation and ionizing radiation are two kinds of electromagnetic radiation that have different biological consequences. Non-ionizing radiation includes radio waves, microwaves, infrared, and visible light waves, which lack the energy to break apart atoms and molecules and transform them into ions, which are electrically charged particles. This indicates that non-ionizing radiation in molecules does not cause cancer or any other illness in people since it does not particularly destroy genetic material (DNA).

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Ionizing radiation such as X-rays and gamma rays can raise the risk of cancer, birth abnormalities, and genetic disorders by causing DNA mutations as a result of atomic and molecule ionization, especially at high doses. There is no such thing as totally safe ionizing radiation. Dielectric heating is a well-known phenomenon of microwave radiation, in which the rotation of polar molecules caused by the electromagnetic field warms any dielectric substance (such as living tissue). When a person uses a mobile phone, the majority of the heating impact may occur on the head's surface, increasing the temperature by a fraction of a degree. The level of temperature rise in this scenario is an order of magnitude lower than that achieved after head exposure to direct sunshine.

The brain's blood circulation is able to rid of excess heat through local blood flow. Nonetheless, the cornea of the eye lacks this temperature-control mechanism, and a 2-hour exposure was found to cause cataracts in rabbits' eyes at SAR values of 100-140W/kg, resulting in lenticular temperatures of 41 ° C. There were no cataracts in the eyes of monkeys who were subjected to comparable circumstances. The carrier signal is commonly pulsed at low frequency due to the signaling methods employed by mobile phones.

The biological relevance of these modulations has been questioned. Some studies suggested that so-called "non-thermal effects" may be reinterpreted as a typical biological reaction to temperature increases. For example, German biophysicist Roland Glaser proposed that cells have multiple thermos receptor molecules that activate a cascade of second and third messenger systems, gene expression mechanisms, and heat shock protein production in order to protect the cell from heat-induced metabolic cell stress.

Due to the apparent stability of thermal equilibrium in their cell cultures, investigations like REFLEX are unable to detect the temperature changes that induce these alterations. Because stress proteins exist for both very low frequencies (ELF) and radio frequencies (RF) with very differing amounts of energy, some researchers believe they are unrelated to thermal effects. Using fluorine ox glucose injections and positron emission tomography, researchers discovered that radiofrequency radiation waves enhanced glucose metabolism in regions of the brain nearest to the mobile phone antenna, although the clinical relevance of this finding is uncertain [9],[10].

2. DISCUSSION

According to early study from the University of Toledo, the blue light emitted by our devices may cause macular degeneration. When the photoreceptor cells in our eyes die, macular degeneration occurs. According to a statement from the University of Toledo, blue light from our phones activates a molecule in our eyes called Retinal, which causes chemical processes that damage and destroy photoreceptor cells. Our blue light may not be powerful enough to harm our eyesight severely. The Sun also produces a lot of blue light and is by far the most common cause of macular degeneration. Smartphone-related health issues may extend beyond eye strain. Spending time on your phone before bed might lower the synthesis of melatonin, making it more difficult to fall or sleep, according to research. Cell phone usage has also resulted in back and neck issues, as well as regular stress injuries in the hands.

For many individuals, the benefits of smartphones outweigh the hazards to their health. Taking the correct actions now, on the other hand, will drastically minimize the chance of future smartphone vision issues. If you are not actively avoiding eye strain, consider taking these easy

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actions to decrease the risk of smartphone-related eye damage: Reduce the amount of glare: The brightness on your smartphone is probably set far higher than it needs to be. Reducing screen glare makes it simpler for eyes to operate the phone while also preserving battery life. Simply go into your phone's settings and reduce the brightness to a lower, more comfortable level. Adjust Text Size: If you have to squint to read on your phone, increase the default font size to make the on-screen text larger and easier to view. Remember to Blink: It may seem counterintuitive, but remembering to blink when using your smartphone will minimize the amount of stress you put on your eyes.

Cell phone usage is skyrocketing, but the majority of the world's population has no idea how cell phones influence human health. Globalization has become the new slogan. In this day and age, it's nearly impossible to live without technology. However, as this study demonstrates, any technology created to assist humans comes with some risks. Only a new, enhanced technology will be able to overcome these disadvantages of modern technology. Electromagnetic radiation may be found everywhere. Increasingly wireless communication services are predicted as artificial electromagnetic radiation becomes more prevalent.

There seemed to be no way to break this cycle. Scientists and engineers must build better and safer wireless networks and gadgets. Future mobile phones would be able to emit far less power because to smaller cell sizes, better antennas for base stations, and other sophisticated technologies, making technology a true blessing. Mobile phones emit a lot of near-field microwave radiation since they are so close to the user's head. Never before in history has such a huge section of the population been exposed to such high quantities on a regular basis.

3. CONCLUSION

There is worry that exposure might have long-term negative health consequences, including an increase in the risk of cancer. Despite the lack of scientific proof, the state, society, and business are obliged to cope with the relatively new mobile phone technology and its possible health concerns in a blameworthy manner. The fact that commercial interests are involved further complicates the matter. Any risk assessment and measures, however, should be based on systemic considerations. There is no other option for gaining public support of the final policy but to communicate these systemic principles to the public in a completely transparent manner. Cell phone usage is increasing at an exponential rate, but most people are unaware of how cell phones influence human health. Cell phone radiation has been linked to a variety of illnesses, including brain tumors, migraines, short-term memory loss, and several forms of heart disease, according to research. This new technology and human health has become a serious concern for safety due to the availability of different RF sources, such as mobile phone handsets and broadcast antennas that contribute to total ambient exposure. Nonetheless, additional efforts should be made to transform mobile radio communication into an effective, safe, and convenient system that benefits both India and the rest of the world.

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