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Do 5G and Cell Phone Radiofrequencies affect Oro-facial tissues?

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ABSTRACT

BACKGROUND:Over the past ten years, there have been more wireless communication sources available. Mobile phones, often known as smart phones, are among the most widely used wireless communication devices. These smart devices release electromagnetic radiation that is bad for the body and have a greater radiofrequency level than older mobile phones.

OBJECTIVE:As the use of wireless mobile telephones has skyrocketed around the world, health concerns have been highlighted. The general public is concerned about the debate over whether radiofrequency fields have an impact on biological systems. The purpose of this is to describe the findings of the few research that have been done so far.

DISCUSSION:The findings of investigations on the impact of Radiofrequency radiation (RFR) on humans and animals suggested that mobile phones are not completely blameless. RFRs are consequently categorized by the World Health Organization as a 2B (Possible carcinogen) substance in 2011. Brain tumors and other disorders were the main focus of the majority of studies typically conducted on RFR and health. The oral tissues and teeth, which are the first parts of the skull to be exposed to this electromagnetic pollution, may suffer health repercussions that go unnoticed. Even though there has only been a few research on oral tissues, the findings are nevertheless important.

CONCLUSION:The results of many investigations show that additional animal, human, and epidemiological studies are required. The studies that are currently accessible don't offer sufficient or acceptable data to make a meaningful safety assessment. Our quality analysis demonstrates that design and implementation must be much enhanced for future research to be helpful for safety evaluation.

KEY WORDS:cell phones;electromagnetic radiations;5G;health risks;tumors

I. INTRODUCTION

The modern world has been completely transformed by smartphones, and it is now impossible to imagine life without one. Over the past 20 years, there has been a significant increase in the number of mobile phone users worldwide. Since cell phones have become so popular, many people have questioned whether using them while being exposed to non-ionizing Electromagnetic radiation (EMR) in the range of 300–3000 MHz is safe.[17]

The impact of mobile radiations on health has long been a topic of discussion. Microwave-frequency electromagnetic radiation is produced by mobile phones (300 MHz [0.3 GHz] and 300 GHz). The mobile radiations are categorized as Group-2B - possibly carcinogenic radiations by the International Agency for Research on Cancer, meaning that there "may be some risk" of carcinogenicity.[15]

There have been a variety of symptoms reported, including headaches, weakness, palpations, tingling on the head and extremities, weariness, sleeping issues, vertigo, mental fuzziness, increased reaction time, deteriorated memory, and digestive system abnormalities.[9]

At exposure levels below the existing regulatory limitations, radiofrequency exposures alter the metabolism, signaling, and function of cells as well as activate proto-oncogenes and cause the synthesis of stress proteins. Reactive oxygen species are also produced, which result in DNA damage, chromosomal abnormalities, and the death of nerve cells.[22]

The term "Specific Absorption Rate" refers to the rate at which the body absorbs radiation from smartphones. The effect of RF-EMW on the human body is measured by this defined unit. It's measured in Watt/kg. The maximum allowable SAR for any hand-held cell device has been set by the Federation Communication at 1.6 W/kg.[14]

A stratifying squamous epithelium covers every soft tissue in the human oral cavity. A keratinizing epithelium matching that of the skin's epidermis covers the gingiva and hard palate, which are areas exposed to mechanical pressures brought on

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by chewing (i.e., the jaw). The keratinized epithelium in these masticatory mucosae is closely connected to the underlying tissues by a collagenous connective tissue called lamina propria. A nonkeratinizing epithelium covers the oral cavity's floor, the buccal areas, and the esophagus, which need flexibility to allow for chewing, speech, or swallowing a bolus. Compared to the connective tissue of the masticatory mucosa, the connective tissue of lining mucosa is more elastic and flexible. A specialized epithelium, which can be visualized as a mosaic of keratinized and nonkeratinized epithelium, covers the dorsum of the tongue. The tongue muscle is firmly connected to this epithelium.[24]

The impact of these radio frequencies on the oral cavity is of particular concern, in addition to any impacts on general health. The oral tissues are also a source of concern because of their proximity to handheld mobile devices and their susceptibility to environmental changes. Despite the fact that the available data is inconclusive, scientific evidence points to various biological changes and potential negative health effects that call for further study.[9]

The goal of this review paper is to establish a cause-and-effect relationship by better understanding the cytotoxic effects of radiation on gingiva and oral cavity.

II. DISCUSSION

According to the WHO, Over the last few decades, the increased use of cell phones has led individuals to get exposed to electromagnetic radiation raising questions regarding health effects, especially its long- term effects.[11]

The number of mobile users worldwide is above 6,800,000,000 which are further increasing at a very fast rate. India stands second with over 900 million users in the world.[8]

The rapid growth in the number of cell phone users has raised questions about possible biological effects of the radiation emitted by these appliances.

Mobile phones emit electromagnetic radiations in the microwave range (300 MHz [0.3 GHz] and 300 GHz). According to the International Agency for Research on Cancer, the mobile radiations are classified as Group-2B - possibly carcinogenic radiations i.e. there "could be some risk" of carcinogenicity.[15]

The oral mucosa is located within an area exposed to radiation emitted by cell phones; therefore, it is important to investigate its effects on oral mucosal cells.

A range of symptoms has been reported varying from burning sensation, tingling of the skin on the head and extremities, fatigue, sleeping disorders, vertigo, mental distraction, increased reaction time, diminished memory, headaches, weakness, and palpations to digestive system disturbances.[9]

Long-term exposure to cell phone radiation can slightly increase the frequency of cytogenetic abnormalities, such as micronuclei, broken eggs, and exfoliated oral mucosal binucleated cells.[23]Daroit NB et al collected cells from various locations, including the lower lip, the border of the tongue, and the floor of the mouth and discovered that people who used cell phones more than one hour per week for eight years had more nuclear abnormalities.[9] Appreciable changes in micronucleus frequencies were also found. In respect to respondents' age, gender, body mass index, or smoking habits, Ros Lior et al study found no appreciable changes in micronucleus frequency.[20] Additionally, Hintzsche and Stopper could not discover any appreciable variations in the frequency of micronuclei and other nuclear abnormalities in 2010.[14]

Exposure to electromagnetic radiation emitted by cell phones may interfere with the development of meta nuclear alterations in individuals who use a cell phone for more than 60 minutes per week and for over eight years.[9] Khurana et al. found an increased ipsilateral susceptibility to brain cancer.[18] People who used mobile phones for more than ten years had a higher risk of developing auditory neuromas.[19]

Prolonged wifi use has negative effects, including neurodegenerative disorders, as evidenced by a significant change in the expression of the Ache(Acetylcholine) gene and several neurobehavioral indicators of brain injury.[3]

Electromagnetic radiations subject human cells to oxidative stress. According to a study by Abu Khadra et al, RF waves at 1800 MHz for 15-20 minutes, increased superoxide dismutase enzyme initially before declining subsequently.[1]

Also a highly significant increase in buccal cell anomalies has also been found. Aydogan F et colleagues discovered histological alterations in the parotid gland as a result of both short- and long-term exposure to cell phone radiation.[4] Bhargava et al. examined the volumetric and functional alterations in the parotid glands among mobile users. For heavy users and the control group, a modified Schirmer test was administered, and ultrasonography was used to assess the gland volume. Blood flow and salivary flow rates were shown to have significantly increased, particularly on the side where the cell

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phone was positioned. On the affected side, there was also a noticeable volume increase in the parotid gland.[6]Shivashankara AR et al tested for amylase, lactate dehydrogenase (LDH), malondialdehyde (MDA), and glutathione (GSH) and discovered significant changes in salivary amylase and MDA, as well as that increased cell phone use has a negative effect on cell death.[21] In contrast, Hardell L et al discovered that using cordless phones was not associated with salivary gland tumors.[13]

In a 25-minute experiment, Acar GO et al. placed a mobile phone over the ipsilateral ears of a rabbit and discovered that exposure to the radiation from mobile phones causes transitory facial nerve dysfunction.[2] Radiation exposure by Kaya FA et al for 10 months at a rate of two hours per day resulted in focal areas of bleeding on periodontal tissues of rats.[17]

The most widely accepted mechanism of interaction between radiofrequency radiation (RFR) and biological systems is based on tissueheating that occurs when tissue or total body temperature increases for more than 1 °C overloading cell thermoregulatory capacity. Radiofrequency has the potential to affect periodontal ligaments andalveolar bone. It may have caused abnormal histological changes such as vasodilatation and focal bleeding in periodontal ligament, alveolar bone, gingiva and pulp.[10]

Thus, Radiofrequency has the potential to alter histological structure of oral tissues and teeth. Radiofrequency exposures cause changes in cell membrane function, metabolism, and cellular signal communication, as well as activation of protooncogenes and triggering of the production of stress proteins at exposure levels below current regulatory limits. There is also a generation of reactive oxygen species, which cause DNA damage, chromosomal aberrations and nerve cell death.[22]

The introduction of the fifth generation (5G) of mobile networks is now underway. It's important to note that 5G is an advancement of the G1 to G4 technologies rather than a brand-new technology.[12]

It is becoming widely known that 4G and 5G technologies cause many harms to human health. Cancer is not the only one problem, and one that is not easily solved. 4G and 5G cause 720! (factorial) different maladies in human beings, and can kill everything that lives but some forms of microorganisms[7]. According to Peter Tocci, known ICMR effects include endocrine disruption (host of illnesses), breakdown of blood-brain barrier, DNA strand breaks, inhibition of DNA repair, sperm damage, reproductive problems, autism, Alzheimer's – and many more.[8]

The broadcasts can be controlled to give selected individuals selected maladies. All this needs to be stopped. There are other ways to communicate that do not require radio waves, nor wires, which cause no damage to any form of life. We need to make those methods available to the public, while all the RF systems are being phased out.

III. CONCLUSION

Mobile phones are used at an enormous number by all the age-groups in today's scenario. It has been noted that the average person spends 90 min a day on their phone. Mobile phones emit electromagnetic radiation in the microwave range and part of the radio waves emitted by mobile phones are absorbed by the human body. Cell phone emitted radiations had their adverse effect on salivary glands and facial nerves. Studies showed that cell phone emitted radiations had effects on oral mucosal cells and caused changes in salivary flow rate.

Many countries such as Austria, France, Germany and Sweden have recommended measures to minimize mobile radiation exposure. The various steps taken to achieve this are: Use hands-free to decrease the radiation to the head, keep the mobile phone away from the body and not to use the telephone in a car without an external antenna. Several nations have also advised moderate use of mobile phones for children.

Therefore, it can be concluded that though there have been no clear cut effects of mobile radiations on teeth and buccal mucosa but changes in the saliva and parotid gland have taken place. Hence, further research is required in this field to bring into the light the harmful effects of these radiations and also to make the people aware of possible oral health problems that can arise as a result of over - usage of mobile phones.

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