Editorial

Effect of Mobile Phone Radiations on Oral Health

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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. The fact is that 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.[1]

The effects on health by mobile radiations have been subject of debate for a long time. Mobile phones emit electromagnetic radiations in the microwave range (300 MHz [0.3 GHz] and 300 GHz). According to 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.[1] At the same time, WHO has stated that "to date, no adverse health effects have been established as being caused by mobile phone use."[2]

Part of the radio waves emitted by mobile phone is absorbed by the human body. The effects of these radiations can be classified into thermal and non-thermal effects. The heating caused by the mobile phone mainly occurs in the head and neck region which is neutralized by the brain's blood circulation, but cornea of the eye does not have any temperature regulation and as a result, an exposure of 2-3 h can be harmful. However, further research is required in this field.[1]

The longitudinal studies carried out have shown that there is no risk of meningiomas and gliomas in the head and neck region associated with mobile phone usage.[2]

A study conducted in Sweden suggested that by using a mobile phone for more than 10 years had an increased risk of acoustic neuromas, which is a type of benign brain tumor.[3]

Dr. Lennart Hardell compiled the results of two cohort studies and 16 case control studies and concluded that cell phone users had an increased risk of malignant gliomas, acoustic neuromas and tumors. It was also stated that tumors are more likely to occur on the side of the head the cell phone is used. Later, in a report by Dr. Lennart Hardell, it was found that age is a significant factor in the occurrence of brain tumours.[4]

In a meta-analysis conducted in 2009 on 23 studies, it was found that mobile phones can cause an increased risk of tumors.[5] However, in a systematic review published in 2012, no statistical significant increase was found for adult brain cancer or other head tumors from mobile phones.[6]

The various symptoms associated with mobile phone usage are burning and tingling sensations in the skin of head and extremities, headaches, fatigue, dizziness, sleep disturbances, loss of mental attention, reaction times and memory retentiveness, malaise, tachycardia and disturbances of the digestive system. Many studies have shown effects on behavior, sleep, electroencephalograph, sperm count and quality. However, reports have also stated that these symptoms can also be as a result of stress.[1]

There have been many studies conducted on oral health as well. A study was carried out by Dasdag *et al*.[7] to investigate the effect of radio frequency (RF) radiation emitted from 900 MHz mobile phones on the enamel micro hardness of rat teeth. 21 Wistar Albino adult male rats were taken, which were divided into two groups - control and experiment groups. 14 rats were included in the study group which were exposed to the radiations, 2 h/day (7 days in a week) for 10 months. The seven rats included in the control group were put in a carousel and underwent the same procedure with generator being put off. At the end of the study, it was found out that a frequency of 900 MHz RF radiation did not alter the enamel micro hardness of rat's teeth ($P > 0.05$).

Hintzsche and Stopper[8] carried out a study to investigate the effect of mobile phone use on genomic instability of the human oral mucosa's cells. A total of 131 individuals donated their buccal mucosa cells extracted by slightly scraping the oral cavity with a cotton swab. The data on mobile phone usage i.e. duration of weekly use, the overall period of exposure and headset usage was collected by means of a questionnaire, which was filled by each participant. Information on age, gender, body weight, smoking status, medication and nutrition was collected. 13 individuals did not use mobile phones at all, 85 reported using the mobile phone for 3 h/week or less, and 33 reported use of more than 3 h/week. Alpha-tubulin-antibody and chromomycin A was used for staining of cells. It was concluded from the study that mobile phone use did not lead to a significantly increased frequency of micronuclei.

According to a study carried out by Abu Khadra *et al*.;[9] evaluation of biochemical status of saliva was done after usage of mobile radiations. RF signals of 1800 MHz were used for 15-30 min. It was found that there was a significant increase in the superoxide dismutase enzyme in the initial phase followed by a drop later. The other enzymes showed no change in their levels. Thus, it was concluded that electromagnetic radiations exert an oxidative stress on human cells.

Bhargava *et al*.[10] carried out a study to check the functional and volumetric changes in the parotid glands among mobile users. Modified Schirmer test was used for heavy users and control groups, and ultrasonography was performed to check the gland volume. It was found out that there was a significant increase in the salivary flow rate and blood flow, especially on the side where the mobile phone was placed. A significant enlargement in the parotid gland volume was also seen on the affected side.

Many countries such as Austria, France, Germany and Sweden have recommended measures to minimize the 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 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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