INTRODUCTION

At present situation i.e. at Covid-19 lockdown situation, people all over the world depend on cell phone or mobile phone enormously. Teacher-student, doctor-patient, shopkeeper-customer, Government/non government sectors-employees make strong network bonding with each others to perform their duties through mobile phones. During the last decade, mobile phone technology has grown up exponentially in India due to its several advantages. But with the rapid development in the field of communication technology, the atmospheric exposure of electromagnetic field emission due to mobile base station antennas generates a tremendous health hazards among the common people. Without considering its disadvantages, a huge number of mobile phone uses increases rapidly in India. Now a days, people have debating about health risk associated with electromagnetic radiation from mobile phone and mobile towers. The effects due to radiation are divided into two types - thermal and non-thermal effects. It is considered that the non-thermal effect due to the radiation is 3 to 4 times more harmful than the thermal effect. The mobile communication antennas are generally built up on the base transceiver station (BTS) to emit radiation into a large surface area. Generally these mobile towers are mounted close to the residential areas to provide good network coverage to the users through 24 hours in a day. The people who live within 10’s of meters from the mobile towers receive stronger radiation frequently. In this paper, we have analyzed the harmful effects of radiation on human health, emitted by mobile phone and mobile towers.

Estimation

Radiation from mobile phone

It is measured that 1 to 2 watt of power is transmitted by a mobile phone which is operated in the frequency range of 824-849 MHz, 890-915 MHz and 1710-1780 MHz. Besides this, a mobile phone has a specific absorption rate. In every 6 minutes usages, a mobile phone has SAR limit of 1.6 watt/kg. So, it is safe for the mobile phone users to use their phone 18 to 24 minutes per day.

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Population covered = population density x Area covered.

Estimation of Emitted Radiation

Generally, base station mobile signal transmitting antennas of GSM 900 band type broadcast signals in the range of 935-960 MHz. This frequency band is divided into several sub-bands each of carrier frequency of 1.2 MHz. Each carrier frequency transmit near about 10 to 20 watts of electromagnetic power.

The emitted power density at any area which is at a distance of ‘r’ from mobile tower can be measured by the formula

$$P_D = \left( \frac{P_T \times g_T}{4\pi r^2} \right) \text{ watt/m}^2$$

Where $P_D =$ Required power density of a place which is ‘r’ distance apart from mobile tower, $P_T =$ Transmitter power in watts, $g_T =$ gain of transmitting antennas, $r =$ distance of the place from the mobile tower in meters.

Now we are trying to calculate the power densities emitted by a single mobile tower at different distances. If we take the value of $P_T = 40$ Watts, $g_T = 50$ (standard reference value) then the values of $P_D$ may be calculated as shown in Table 1.

<table>
<thead>
<tr>
<th>Table 1 Emitted Radiation Profile</th>
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<tbody>
<tr>
<td>Distance r from tower(m)</td>
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<tr>
<td>---------------------------</td>
</tr>
<tr>
<td>1</td>
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<tr>
<td>5</td>
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<td>500</td>
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</table>

The radiated power density values are for a single carrier of a specific mobile operator as shown in table 1. If more than one operator is present on a same tower then the power density values will be multiplied by the number of operators. It is noticed that in cities the mobile towers are constructed very near to the buildings or almost inside the cities even some times it is also noticed that mobile towers are mounted on the roof of buildings. From table 1, it is seen that at a distance of 5m from the tower the emitted power density is 6369426 µw/m². It can cause great health hazards to people who absorb this amount of high radiation for few hours in everyday through out the year.

If a person stands 5m apart from a mobile tower and if we consider the amount of exposed surface area of that person is 1.5 m² (for standard height), the amount of radiated power absorbed per second by the person is

(6.369426 watt/m² × 1.5 m²) = 9.554139 watts (using table-1)

In one hour he absorbs (9.554139 × 3600) = 34394.9 watts and through out a day he will absorb (34394.9 × 24) = 825468 watts. This amount of high radiation can cause even cancer like disease [7-8].
Radiation Guideline

A proper guideline is prepared by International Commission On Non-Ionizing Radiation Protection which is a group of Independent Scientific Experts. The current radiation exposure limit from mobile towers in India will lower the level to one tenth of the prevailing standard from 9.2 watt/m² to 0.92 watt/m² which is higher than Russia (0.2 watt/m²) and China (0.4 watt/m²). As per ICNIRP guidelines of 1998, In India, we have restricted the radiation norms for safe power density as (n=200), where n is the frequency measured in MHz.

Generally, for transmitting frequency range of 935 MHz to 960 MHz, the permissible power density is 4.7 watt/m² and for higher frequency transmitting band of frequency range of 1810 MHz to 1880 MHz, it is 9.2 watt/m². But in the vicinity of Base Station antennas where radio frequency signal can go above the International exposure restrictions limits [9-10].

Radiation associated health hazards

Human body consists of almost 70% of fluid so our body can easily absorb electromagnetic radiations emitted from mobile phone and towers when exposed to the radiation. Among the body parts, brain which consists of 90% of fluid can absorb the radiation most and as a result the blood brain barrier which protects our brain is damaged and albumin leakage can start. Sometime our brain may loss its protection. In other research it is revealed that even in a single two hour exposure to electromagnetic radiation, we can loss our blood brain barrier permanently. It is the time to think about the excessive use of mobile phone during this Covid-19 situation. A further study will be done in next article regarding this.

Excessive use of mobile phones will lead health problems related to eyes and neck. Dry eye is the most common problem found in people who are addicted to mobile phones. People suffering from dry eye syndrome will have headache, redness on eyes and sensitivity to light. The electromagnetic radiation emitted from mobile phones is responsible for different types of health hazards. Present statistics shows that excess use of mobile phones increases several times the probability of brain tumors. This radiation can alter WBCs in children, leukemia, disorder in sensory motor function, memory loss, fatigue ness, loss of appetite etc. [11].

Scenario in COVID situation

As India has entered lockdown mode due to Covid-19 in March, 2020, a large number of people has logged into smart phone applications for their daily purposes like online classes, shopping, gaming, video calls, online conference and work from home. It is reported that monthly downloads of video meeting applications like Zoom, Microsoft teams, Google meet etc increased 17 fold from 500,000 in Feb, 2020 to over 8.7 million in March, 2020. Similarly, different house party which is being used friends and family to play games and talk to each other has seen the Number of Monthly Active Users (MAUs) increased about 16 times to 328,000 in the same period. The average time being spent increasing eight fold to 24 minutes, indicating that it is being used multiple times. The lockdown is going to make step change and significantly accelerate the trend of adoption of digital services by the consumers in India especially during lockdown period and upcoming new normal.

DISCUSSIONS

a) We have to avoid mobile phone use in dark room or in a room of insufficient light
b) We have to keep safe distance between our eyes and mobile screen
c) If we have to do some important works on mobile phones for a long time, we have to take some rest for eyes frequently
d) We have to restrict mobile companies not to build mobile towers in a crowded area
e) Aware the common people about harmfulness of electromagnetic radiation emitted from mobile phones and towers
f) Strict guidelines should be introduced.

CONCLUSION

In this paper we have analyzed the radiation emitted from the mobile towers in our close vicinity and also discussed about the harmfulness of these radiations. It is found that the power density of the radiations emitted by the towers gradually decreases with the increase of distance from the tower. So, It is obvious that BTS should be installed outside of the dense population area to minimize the health hazards. As of now, in the COVID situation, the use of mobile phone is increasing more rapidly so this issue must be addressed seriously. A more detailed study on regional basis is highly solicited to get a clearer picture of this danger and proper steps should be taken accordingly from all the stakeholders.

References


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