

Mobile Radiation and its Biological Effects on Human Body

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Abstract— In present scenario it is impossible to imagine life without technology in our daily life we are surrounded by many gadgets cell phone technology is one of them on one hand cell phone has several advantages on other side it has many disadvantages including health hazards in last decade cell phone Technology has many technological Revolution recently India face a great revolution in communication technology India have about 1.2 billion mobile phone subscribers in year 2018 (Economic Times April 25 2019) in India around 4.61 lakh mobile towers are working for various telecom companies as a number of cell phones user are increasing day by day the number of cell phones and cell tower are also increasing rapidly without considering pros and cons.

Keywords: Mobile Radiation, Biological Effects, Human Body

I. INTRODUCTION

Cell phone technology has many advantages and since the last decade, it is widely increasing. India have about 1.2 billion mobile phone subscribers and around 4.61 lack of mobile tower which are currently working, cell phone and cell tower is rapidly increasing without considering its damages cellular phones are made available in early 1990 in United Nation America but at that time it is only meant for entertainment purposes increasing demand of cell phones usage had significantly evolved cell phone tower. The cell tower is also called base station which consists of antenna and other electronic equipment's these antenna accept electromagnetic signals in the form of radiofrequency and transmits wirelessly.

II. WORKING OF CELL TOWER

- 1) Cell phone base station is simply a free-standing tower that is mounted on the high location such as building rooftop, water tanks, land extra, etc. To cover the entire surrounding by the base station antenna should be sufficiently located at High location generally base station is approximately 50 to 200 feet long.
- 2) Cell phone and Cell tower primarily emits Radiofrequency waves, FM Radio waves and in between microwaves electromagnetic spectrum energy is transmitted in the form of energy communicated to nearby cell tower. FM Radio waves, visible light, and heat in the form of non-ionizing radiation. This means that they do not directly damage the DNA inside the cell, like stronger Ionising Radiation such as X rays, Gamma Rays, and UV rays though to be able to cause of cancer.
- 3) At very high-level RF waves can heat body tissues(works in the same manner as microwave oven) but the energy used by cell phones and cell tower are sufficiently very low.
- 4) When a person makes a phone call the cell phone antenna transmit signal request for connection to its nearby base station. The base station antenna receives the signal

request and responds to it by assigning the available radio frequency channel. Then RF waves transmit the voice information to the base station the voice signals is sent to the switching Centre which transfer the call to its destination the voice signals are relays back and forth during the call.

III. ADVANTAGES & DISADVANTAGES OF CELLULAR NETWORK

- 1) Cell phone technology in India has created a new revolution in the field of communication, just because of some advantages. Cell phone technology is widely increasing since the last decade, in order to make the demand of people telecommunication sector have established more than 4.4 lakh of cell tower which is handling about 1.2 billion subscribers without considering its disadvantages, the number of cell phones and cell tower is increasing with a rapid pace the entire nation is facing health issues due to harmful radiation transmitted from cell phone & towers most of the people's are talking about this issue but unfortunately they don't have any alternative. Radiation is divided into two parts thermal effects and non-thermal effects. Thermal effects are similar to cooking in a microwave oven and no thermal effects are not well defined but it is clearly defined that in comparison to thermal, on-thermal effects are three to four times more harmful.
- 2) Cell phone generates 824-849 MHz (CDMA) 890- 915 MHz (GSM 900) and 1710-1780 MHz (GSM 1800) of frequency range that transmits 1 to 2 Watt power. Cell phones have a specific absorption rate(SAR) rating. United Nations America SAR limit of the cell phone is 1.6 watts/kg which is actually for 6 minutes per day, it has a safety margin of 3 to 4, and therefore, a person should not use cell phones for more than 18 to 24 minutes. This information is generally not known to the peoples in India just because of these unknown facts crores of people in India use cell phones more than 1 hour with considering various health issues.
- 3) Cell tower antenna works in the frequency range of 869-894 MHz (CDMA) 935-960 MHz (GSM 900) and 1810-1880 MHz (GSM 1800) also 4G deployed in most of the cities in which base station antenna works in the frequency range of 1800-2500 MHz. Mobile phone operators divide networks into a large number of cells, each cell is further divided into number of sectors basically base station configures and transmit signal based on each sector which communicate with each other in general there may be three sectors with same angular coverage of 120 degrees in horizontal direction and it is a convenient way to divide a hexagonal cell if the finite number of users are distributed unevenly in the surrounded area then these sectors may be uneven, the base station is connected to the directional antenna that are situated on the building rooftops, high-altitude these

antenna are tilted towards the ground in order to direct the signal towards the ground level.

- 4) Each base station and transmitting power is designed in such a manner that mobile phones can properly make communication with the base station up to a few kilometers, the majority of these towers are situated around residential houses, office buildings to provide good signal strength and better communication services. These towers transmit and receive signals 24*7 the people living in 10-meter distance from the tower will get 10,000-10,000,000 more mobile radiation. In India crores of people residing within these high radiation zones.

IV. WHAT IS RADIOFREQUENCY AND HOW DOES IT AFFECT THE HUMAN BODY

- 1) Radiofrequency radiation is the type of electromagnetic that can be divided into two types ionizing (example X-rays red on Cosmic Rays) and non-ionizing example radio frequency and very low frequency or power frequency.
- 2) Electromagnetic radiation can also be defined according to its wavelength and frequency which is the number of cycles of a wave that passes through a reference point per second. The unit of electromagnetic frequency is hertz(Hz).
- 3) Electromagnetic radiation energy is determined by frequency, ionizing radiation is of very high frequency and high power but non-ionizing radiation is of low frequency and has a very low energy level.
- 4) The frequency of electromagnetic radiation is from 30 kHz (30KHz or 30,000 Hz) to 300 GHz (300 GHz or 300 billion Hz). Electromagnetic fields in the radio frequency range is used for telecommunication application phones, television, and radio transmission. The human body absorbs electromagnetic radiation from the devices that transmit radio frequency, electromagnetic radiation absorption rate (SAR) measures the dose of energy absorbed by the human body which is calculated in Watt per Kilogram(W/Kg) of the body weight.
- 5) Ionizing radiation such as X-rays is also known to increase the risk of Cancer, howsoever many studies have examined, the potential health damages by its exposure although non-ionizing radiation from radars, microwave oven, cell phones, and other sources, there exist no evidence that it increases the risk of cancer. However consistent absorption of high power non-ionizing radiation can create abnormal behavior in human body cells.
- 6) In human the only recognized biological effects of non-ionizing radiation are heating the best example of heating in daily life is a microwave oven that emits radiofrequency radiation. The exposure to cell phones can create heating in that area which is exposed to it (e.g. ear, nose, head) but generally radiofrequency used by mobile phones and cell towers are of extremely low levels which do not cause serious health hazards to humans.

V. HOW TO LIMIT EXPOSURE TO RADIOFREQUENCY RADIATION

To ensure that radiofrequency radiation is within the acceptable range you can ask government agencies or private firm to measure RF strength, However, in ordinary condition, there is no associated health damages found.

VI. SOURCES OF NON-IONIZING RADIATION

- 1) Non-ionizing radiation is transmitted from various sources natural such as sunlight or Lightning, discharges, etc and manmade medical application, wireless communication, industrial and scientific, Non-ionizing radiation is further be split into two regions optical radiation and electromagnetic fields.
- 2) The optical radiation is the form of visible light and those with extremely high radiation are termed as UV radiation and those with low energy are called IR radiation.
- 3) Some of the UV radiation sources are sun lamps, laser (UV), oxy glass welding, sterilization (germicidal) lamps, low-pressure gas discharge lamps.
- 4) Sources of IR radiation, it is from hot processes such as steel making, glass making, welding and also laser (IR).
- 5) The electromagnetic field is further divided into two categories microwave and radiofrequency wave. Microwave is used for telecommunication mobile phones, satellite links/radar, microwave oven, television, transmitter are some of its sources.
- 6) Radiofrequency is used in radio communications, visual display unit(VDU),television sets, electromagnetic field (EMF),home appliances, electric wiring transformers Medical application consists of magnetic resonance imaging (MRI), surgical diathermy, therapeutic, microwave hyperthermia.

VII. SAFETY PRECAUTIONS TO REDUCE MOBILE RADIATION

The WHO has confirmed that prolonged usage of mobile phones may cause serious damages to nerves which can cause even cancer. The WHO advice to take some preventive measures and safety tips to use cell Technology.

A. *Keep distance between you and your phone:-*

Our cell phones also emit radiation through microwave antenna in basically signals are of extremely low levels but there may be chances to increase the signal strength by the operator to provide better services to their subscribers.

B. *Purchase a phone with a low SAR to avoid mobile phone radiation:-*

SAR rating measures the dose of radiation absorbed by the human body. The SAR rating of mobile phones is not greater than 1.6 W/Kg.

C. *Talk less text more or use landline phones:-*

Prevention is better than cure thus to be safe from radiation and its health issues text instead of calling or use landline phones.

D. *Don't call when signal is low:-*

A blocked or weak signal is indicated by few signal bars, forces the mobile antenna to emit more radiation to maintain

a call, make calls during strong signals be careful how you hold your cell phone, holding tightly may block signal strength.

E. Hang up when you are traveling:-

Many of us love to talk while traveling in car or train but when you are in motion your phone repeatedly issues an increased burst of radiation to connect with the tower as it moves in and out of the range.

F. Wait for the call to connect before putting it to your ear.

Cell phone emits more radiation when they are trying to connect to a base tower.

G. Keep kids away from phones:-

Developing tissues in children are more vulnerable able to mobile radiation health authorities in Britain, Germany, and Russia had issued warning against small children to use phones for a long time.

- 4) Common Health Issues In People's: Diabetics, Asthma, Arthritis, Anemia, Osteoporosis, Etc
- 5) Health Issues To Residents Living 10m From The Base Station: Sleep Disturbance, Complained Of Headache, Irritability, Loss Of Memory, Dizziness, Loss Of Appetite, Stress, Etc

B. Rural Area

- 1) Location of Base Station- Panday Market Village Gahdo Post Office Mall Lucknow.
- 2) Operator:Reliance Jio,Bharti Airtel,Vodaphone.
- 3) Nearby Population (100m)-200 (Approx).
- 4) General Health Problems: Skin Disease, Asthma, Anemia, Arthritis, Heart Disease, Etc
- 5) Health Disorders to Residents Living 10m (Approx) From Cell Site: Sleep Disorders, Loss of Memory, Nervousness, Fatigue, Increased Heartbeat, Visual Perturbation, Heat Anxiety, Infertility, Hair Loss, Etc.

VIII. CASE STUDY SITE SELECTION

A. URBAN AREA

- 1) Location Of Base Station-Anand Vihar Colony Near Desh Bharti Public Inter College Rajajipuram Lucknow.
- 2) Operator- Bharti Airtel.
- 3) Nearby Population (100m)-300 (Approx)

IX. SURVEY REPORT

The following are some statistical data obtained with the help of survey done on 100 people living around 100m from the base station.

Note-The Survey is conducted on 100 people, of urban & rural areas.

Age Criteria	Number Of Persons	How Many Persons In House Use Or Own Cell Phones (Average)	Total Years Of Cell Phone Usage (Average)	Growth Factors (Height Average)	Health Hazard Issues
Age Group (10 Years & Below)	18	3 Cell Phones (Approx)	5 Years (Approx)	Male-4'ft Female-4'3ft	Skin Disease,Tremors,Irritability, Hair Loss,Weakness
Age Group (10 To 18 Years)	30	5 Cell Phones (Approx)	9 Years (Approx)	Male-5'2ft Female-5'ft	Sleep Disorder, Memory Changes,Depression,Inactive
Age Group (18 To 30 Years)	20	6 Cell Phones (Approx)	12 Years (Approx)	Male-5'5ft Female-5'6ft	Osteoporosis, Headache, Hairloss, Blood Pressure.
Age Group (30 To 45 Years)	10	4 Cell Phones (Approx)	14 Years (Approx)	Male-5'5ft Female-5'6ft	Nervousness, Asthama,Increased Heartbeat,Fatigue,Diabetics,Sleep Difficulty,Infertility
Age Group (45 & Above)	22	3 Cell Phones (Approx)	17 Years (Approx)	Male-5'5ft Female-5'6ft	Cardiac Problem,Visual Perturbation,Dizziness,Loss Of Appetite,Stress,Sleep Complained,Arthritis,Diabetics,Blood Pressure

X. OBSERVATION

Mobile Tower was recently banned from school and residential areas to protect people from potential health disorders. From the above case study it has been observed that

cell tower may cause serious health hazards to humans but there is no issue observed when SAR(Specific Absorption Rate) limit is within the acceptable range, In case of rural area cell phone operator install there base station in commercial land as prescribed by TRAI(Telecommunication Regulatory

Authority of India) Guidelines, Due to unavailability of commercial land in rural areas cell phone operators install more than two base station of different companies on same land to make with their subscribers. Thus more radiation is exposed to people living nearby it which is the cause of serious health disorders.

XI. RESULTS & DISCUSSION

It has been concluded that many Neuropsychiatric complaints were observed in the people's living from 4m to 10m from the base station. The following are some statistical data evaluated from the study:-

- 1) Sleep Disorders: 35.6%.
- 2) Head Ache: 12.8%.
- 3) Memory Changes: 21.6%.
- 4) Infertility: 6%.
- 5) Depression Symptoms: 14.2%.
- 6) Fatigue: 6.3%.
- 7) Tremors: 3.5%.

XII. CONCLUSION

According to US Federal communication Commission scientific study call = current level are safe many of the articles and papers are in favour of cell tower and cell phones but most of the research shows that it is dangerous for humans when the radiation crosses the SAR limit it has adverse effect on preadolescent Children and pregnant women's because of thermal heating. Thermographic images have shown the thermal heating effect on humans due to prolonged use of cell phones which create a negative impact on human health.

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