

Effects of Mobile Tower Radiations on human health: A case study from Bangalore

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ABSTRACT

The present study was carried out with an aim to emphasis on the effects of radio-frequency electromagnetic radiations from cell towers on human beings. Questionnaire based survey was conducted by means of interviews and general discussions with a population size of 181 inhabitants residing in five different localities (viz., Gangondahalli, Nagarabhavi, Moodalpalya, Chandra layout, Guddadahalli) of Bangalore south taluk. The participants themselves filled the self-administered questionnaire by entering their response data on the health effects faced due to establishment of mobile towers. Exposure assessment was based on the distances from base stations (less than 10 m, 10-50 m, 50-100 m, 100-200 m, 200-300 m, > 300 m) and their location in relation to the antennas (facing, beside, behind, beneath in the case of antennas placed on rooftops). Based on results congregated, it was evident that headache, irritability, nausea, appetite loss, discomfort, sleep disturbance, depression, memory loss difficulty in concentration and dizziness, etc., are more frequently observed symptoms of ill-health in the exposed groups. It is concluded that the cell phones and cell phone tower radiation are a strong risk factor for high exposure to human head and the great sensitivity of brain tissue and brain processes.

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Introduction

In recent past the management of present population by providing a suitable telecommunication infrastructure has become a challenging task. Infrastructure investments can affect growth beyond adding to the capital stock (Maier *et al.*, 2006), controlling the growth of telecommunication services in strengthening the economy. But, with progressive change in the technology starting from analogue to digital systems, mobile phones have been in extensive use for a relatively short period of time for the transmission of sound, data, image, fax, e-mail and Internet access, etc. The signals transmitted and received from analogue and digital mobile phones are usually in the form of waves in the radio frequency (RF) and microwave parts of the electromagnetic spectrum. The frequencies that mobile phones and telecommunication networks use range from 900 MHz to 1.8 GHz and up to 2.1 GHz, although it should be noted that the wavelength of the different types of mobile phones varies (Linde *et al.*, 1997). Mobile phones and base stations continuously emit radio frequency or microwave radiation, and most of the people are not aware of Mobile Phone and Cell Tower Radiations which have harmful effects due to electromagnetic radiation (EMR) exposure. Continuous exposure to such radiations could affect health directly (Eager *et al.*, 2004). A cell phone can transmit up to 2 Watt of power in the frequency range between 824 and 849 MHz (CDMA), 890 - 915 MHz (GSM900) and 1710 - 1780 MHz (GSM1800). In contrast, Cell tower antennas transmit radiations in the frequency range between 869 and 894 MHz (CDMA), 935 - 960 MHz (GSM900) and 1810 - 1880 MHz (GSM1800). In case of 3G the base station, antenna transmits in the frequency range between 2110 and 2170 MHz. A proper design is required to base station and its transmitting power where mobile phone should be able to

transmit and receive the sufficient signal for best communication up to a few kilometers. Most of the towers are mounted close to the residential and office buildings to best coverage to the users. These cell towers transmit radiation every second and people living within 10 m from the tower will receive more radiations with a range between 10,000 to 10,000,000 times stronger signal than normally required for mobile communication. In India, crores of people reside within these high radiation zones (Eager *et al.*, 2004).

Due to lack of awareness about the adverse effects on environment and associated health risks besides neglecting possible safety measures, millions of people use cell phones for more than an hour per day. According to SAR (Specific Absorption Rate) rating, SAR limit value of cell phones should be 1.6 W/Kg which is actually for 6 minutes per day usage (Petersen *et al.*, 1992). Accordingly, one can maintain maximum cell phone usage of 18 to 24 minutes per day as the safety margin for SAR has been fixed in the range 3-4. Hence, the present study aim at conducting questionnaire based survey, focusing mainly on the symptoms of ill health comprising of headaches, fatigue, sleep disturbances, irritability, depressive tendencies, feeling of discomfort, loss of appetite, nausea, difficulties in concentration, memory loss, visual disturbances, hearing disturbances, dizziness, cardiovascular problems.

Study Area

The present work aims at the effects of electromagnetic radiations among the mobile users especially from base stations considered from Gangondahalli (GG), Nagarabhavi (NG), Moodalpalya (MP), Chandra layout (CL), Guddadahalli (GD) located in the southern part of the Bangalore. Gangondahalli area with a longitude of 77.467°E and latitude of 13.02°N.

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Nagarabhavi area with a longitude of 77.513"E and latitude of 12.97"N. Modalapalya area with a longitude of 77.525"E and latitude of 12.97"N. Chandra layout area with a longitude of 77.527"E and latitude of 12.959"N. Guddadahalli area with a longitude of 77.55"E and latitude of 12.958"N.



Fig 1. Location map of the study area.

Material and Methods

The prevalence of health effects among randomly selected inhabitants living in areas for more than one year near to selected base stations were opted for the present study. A total of 181 were interviewed covering different localities of Bangalore south taluk like Gangondahalli (n=37), Nagarabhavi(n=25), Moodalapalya(n=36), Chandra layout (n=37), Guddadahalli (n=46). Completed standardized questionnaires that focused on the relevant parameters (headaches, fatigue, sleep disturbances, irritability, depressive tendencies, feeling of discomfort, loss of appetite, nausea, difficulties in concentration, memory loss, visual disturbances, hearing disturbances, dizziness, cardiovascular problems).

A questionnaire was interviewed to people wishing to participate in the study. Symptoms about the existence of a study people living near cellular phone base stations. The questionnaire was filled out by symptoms with the presence of peoples in the study areas. General questions pertained to age, gender and estimated distances from base stations (less than 10 m, 10-50 m, 50-100 m, 100-200 m, 200-300 m, more than 300 m) and their location in relation to the antennas (facing, beside, behind, beneath in the case of antennas placed on rooftops). The results obtained concerning the frequency of the complaints experienced in relation to responses with 0= never, were analyzed and shown with graphical representation (Fig.2).

Results and Discussion

A study is carried out in randomly selected inhabitants living in Bangalore south urban areas on health effects of mobile phone towers has been performed. All of them focused of unspecific symptoms of ill health. The data of symptoms were collected based on self administered questionnaire filled in by the study participants. Exposure assessment was based on self estimated distance to the base station. The numbers of people exposed to various health disorders in five different localities of Bangalore are being discussed below and their order of occurrence was listed.

1) Among 181 members participates, 92 members experienced frequent headache problem due to exposure to radiation from mobile tower. Among the five different localities, the occurrence of Headache was in the order GD > MP and CL > GG > NG, illustrating that people from Nagarabhavi area are less exposed.

2) Similarly, 89 members experienced frequent fatigue and its occurrence was in the order GD > CL > MP > GG > NG in among five different localities.

3) 109 members opined that they were experiencing Sleep Disturbances regularly and its occurrence was in the order GG > MP > NG > CL > GD in among five different localities

4) Among five different localities, occurrence of Irritability was common in 109 members, and its occurrence was in the order GG > MP > NG > CL > GD.

5) Depressive Tendencies was in the order GG & MP > NG > CL > GD among five different localities and 99 members faced this kind of disorder.

6) Feeling Discomfort was faced by 95 participants and was in the order of MP > GG > NG > CL & GD.

7) 97 members faced loss of appetite in them due to mobile radiation and it was in the order GG & MP > NG > CL & GD.

8) The occurrence of Nausea was reported by 98 members and was in the order GG > MP > NG > CL & GD in the study area.

9) Difficulties in Concentration was witnessed by 103 members and was in the order GG & MP > NG > CL > GD.

10) 104 members opined that they had memory loss due to mobile radiation, which was in the order GG > MP > CL > GD > NG.

11) 117 members noticed Visual Disturbances in them and was GG & MP > NG > CL > GD.

12) 101 members experienced hearing disturbances in them. GG > NG > MP > CL > GD

13) Dizziness was faced by 99 members and was in the order MP > GG > NG > CL > GD

14) Cardio Vascular Problems was faced by 96 members and was in the order GG > MP > NG > CL > GD

15) Painful Texting thumb was recorded for 100 members and was in the order MP > GG > NG > CL > GD

16) 78 members faced Joint Pain in them and the joint pain in different localities was in the order GD > CL > MP > GG > NG

17) 97 members opine that that they were exposed to Nervous Disorders due to mobile radiation and was in the order MP > GG > NG > CL > GD

18) 104 members opine that that they were facing skin related problems due to exposure to mobile radiation and was in the order GG > MP > NG > CL > GD

19) 84 members experienced hair loss due to exposure to mobile radiation and was in the order GD > MP > CL > GG > NG

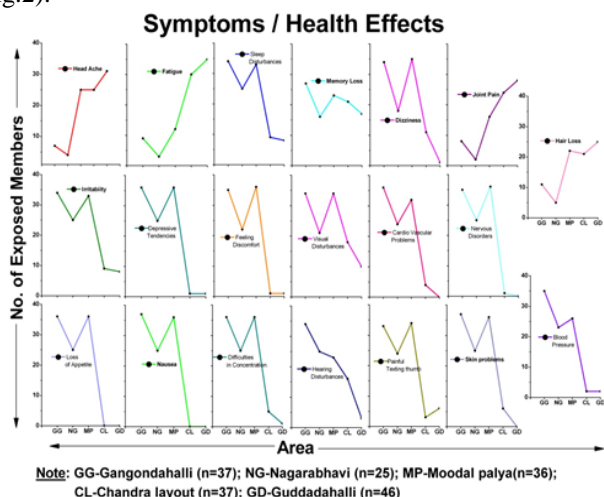


Fig 2. Variation in health symptoms in different localities of Bangalore.

20)88 members witnessed Blood Pressure in them due to exposure to mobile radiation and was in the order GG > MP > NG > CL & GD

Symptoms such as fatigue, headaches, and sleep disturbances, which are experienced significantly at considerable distances from base stations, exhibit no notable decrease in the percentages of complaints experienced with increased distance. But, Mild *et al.*, (1998) opine that the measurements of electromagnetic fields in the neighborhood of cellular phone base stations show a reduction in strength over distance. The present results are in agreement with the results of Mild *et al.*, (1998) in that symptoms such as fatigue, Headaches, Sleep disturbances are Experienced significantly at distances close to mobile phone base stations as the distance increases the effects of symptoms in people is reduced. This study shows that for some symptoms especially for distances of < 100m from mobile phone base stations. This result is related to the fact that mobile phone tower antennas emits microwaves at a high level in the front direction of mobile tower than in other directions Peterson and Testagrosa (1992). Further, among the exposed people, health symptoms reported by people at distances up to 200 m to 300 m from mobile phone are more evident than those at the base stations. The significant increase in the frequency of complaints in relation to the reference group (people exposed at >300 m or not exposed) goes in the direction of the observation found in an Australian governmental report, which had signaled that at 200m from a base station, some people exposed in their homes are complaining of chronic fatigue and sleep disturbances (Bielski *et al.*, 1994). Apparently the number of reported symptoms is higher close to base stations, and that number decreases with increased distance from them, in relation to the fact that some symptoms such as nausea, loss of appetite, visual disturbances, and are no longer experienced in a significant way beyond 10 m.

From the above results, it is very much evident that the inhabitants living opposite the base stations are exposed to symptoms such as Head ache, fatigue, memory loss, joint pain and hair loss than the inhabitants living under the base stations.

Conclusion

Most of the symptoms were statistically significant, more frequently observed in the exposed group (headache, irritability, nausea, appetite loss, discomfort, sleep disturbance, depression, memory loss difficulty in concentration and dizziness). The results have clearly showed that cell phones and cell phone tower radiation are a strong risk factor for all the adverse health effects identified for EMR because they share the same biological mechanisms. The greatest risk is to cell phone tower radiations because of the high exposure to human head and the great sensitivity of brain tissue and brain processes.

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