

Electromagnetic Radiation Effects in Human and Animal Health

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Abstract—Electromagnetic (EM) radiations are the waves of electromagnetic and magnetic field which are generated from electromagnetic devices. These radiations are dangerous to humans as well as animal health. Talking medically, in the human and animal body, these bioelectric signals cause different processes to occur. Exposing to larger EM radiations can cause disrupt in the natural work of the human body. These harmful radiations harm the body at the cellular level. According to the World Health Organization (WHO), the EMF radiations released by mobile phones and other devices are hazardous to humans.

The objective of this review paper is to carry out a survey to know about the usage of mobile phones and laptops by people and will aware about the harmful impact of them.

Index Terms— EM Radiation, ERSD (Electromagnetic Radiation Safe Distance), Human Health, Plants and Animals' health.

I. INTRODUCTION

Electromagnetic field radiation is a wave of the electromagnetic field travelling through space carrying EM energy. EMF radiation has biological effects, according to certain research, making it a potentially harmful energy. Electronic gadgets and equipment, such as cell phones, computers, smart meters, and other wireless communication devices, are sources of it. Baby monitors, for example, have a substantial impact on one's health. EM radiation is hazardous to all living things, including humans, animals, and plants. With the newly emerging technologies and devices, the measure of these radiations are increasing and its impact is seen even on the flying pattern of some birds. Large number of birds are migrating from cities to smaller villages as they are not used to with these radiations and its effect. Previous research and articles [1] show that the plants that were exposed to EM radiations were thinner and light in appearance than those which were not. Hence, we can conclude that the radiations generated, especially through mobile phones, are really harmful to humans, animals and plants. With the advancement in technology, it is nearly impossible for people to give up their smart phones as it does more than making a call. Most of the work irrespective of the individual's field, can be carried out on their light and easy to carry around devices. Keeping in mind the need of these devices we can take few precautionary steps to at least reduce the impact of the radiations on our health and the living things around us. Depending on their frequency and strength, electromagnetic waves can be classified as ionizing or non-ionizing (NIR). The most common electromagnetic wave capable of producing ionization by breaking atomic bonds that hold molecules and cells together is ionizing radiation (X-rays and gamma rays). Non-ionizing radiation is that part of the

electromagnetic spectrum that is too weak to break atomic bonds (NIR). These fields include ultraviolet, infrared, radiofrequency, and microwave radiation. Despite the fact that the NIR cannot generate ionization, it has been found to have various biological effects, such as heating, changing chemical reactions and implanting electrical waves in tissues and cells.

In this review paper we have proposed a solution to the issue which will ultimately reduce the radiations inside our houses. Keeping the mobile phones at an Electromagnetic Radiation Safe Distance (ERSD), we can reduce the impact of these radiations. This safe distance can be achieved in any type of houses, i.e., even in a single room houses.

II. EFFECT OF EMF RADIATIONS ON PEOPLE

EMF radiations cause multiple types of diseases. The most common problems that we encounter are headaches, ears ringing, insomnia, stress broadening in the long term is reduced brain growth in children^[3]. There is a slew of ailments that are somehow linked to this. Among them are memory loss, depression, ADHD, DNA damage, and, finally, cancer. According to the World Health Organization, the International Agency for Research on Cancer (IARC) has classified the EMF radiation emitted by mobile phones as a possible carcinogen to humans (WHO). With the advancement in technology, we now have baby monitors near children, which again is too dangerous for the overall growth of the child. The effects may or may not be seen at that instant but in the long run it could prove to be very harmful for the overall wellbeing of the individual. Exposure to exceptionally high levels of EM fields for a short period of time is undoubtedly harmful to one's health. The public's present concern is on the long-term health effects of exposure at levels below those that trigger biological reactions, as well as how to avoid such risks.

The most powerful method for EMF's impact on organisms is its penetration of certain tissues. Weak EMF has been proven to affect body cells, tissues, and organs in a number of non-inflammatory ways. Other natural factors that occur in a person's environment at the same time cannot be transmitted through symptoms. Electromagnetic fields are dangerous not just because they can cause cancer, but also because they can induce other health problems like electromagnetic hypersensitivity (EHS). EHS is a hallmark of post-exposure prophylaxis, operating as a multipurpose device that encompasses both acute and chronic inflammatory processes. The respiratory, cardiovascular, musculoskeletal, and musculoskeletal systems, as well as the skin and nervous system, are all affected. The WHO defines a disease as one that is defined by a medical diagnostic and symptoms that are associated to a recognized ailment. EHS is not considered an illness by the WHO. A single source of EMF or a combination of sources can cause symptoms. Magnetic field-related symptoms have a disproportionate influence on others, with a wide range of clinical manifestations linked to exposure to one or more EMF sources. Mastocytosis is associated to electromagnetic hypersensitivity, which manifests as a dermatological condition.

III. EFFECT OF EMF RADIATIONS ON ANIMALS AND PLANTS

EMF radiations poses a great threat to even to animals and birds. A recent paper^[2] claims that the disappearance of species of birds in several regions were due to the mass production of mobile phones and towers that were installed in that region. Naturally the animals and birds are not evolved to defend these man-made radiations and its effects. A real-life situation can also be noticed where certain birds and animals are getting extinct from the city space as they are either not able to reproduce or are being diagnosed with multiple other diseases. There are researchers who have shown that the magnetic fields of migratory birds are disturbed because of the EMF radiations and due to this they are unable to navigate to proper destinations^[4]. With increase in the number of these towers and devices, many animals and insects are getting extinct.

Extremely low levels of EMF are responded to by some organisms that operate from DC to extremely low frequency and have particular receptors. Over a threshold (frequency dependent), these currents are felt as a painful stimulation that rises with current intensity.

Plants perceive stress and respond to it. Pressures such as electromagnetic waves lead to the formation of antioxidant production and changes in plant chemistry. An increase in the number of these compounds reveals the activity of plant cells to reduce or minimize the effects of stress which in turn increases the plant's resistance to stress. Plants like other living things respond to stress. Based on the theory of Hosseinio and colleagues, plants that use the production of active antioxidant compounds are resistant to various stress factors. One of the most important methods of plant protection is to control free radicals by the inclusion of other enzymatic and non-

enzymatic antioxidants. The speculation reveals that many plant metabolic processes lead to the production of ROS or free radicals but there are effective mechanisms similar to antioxidant processes.

IV. OBJECTIVE

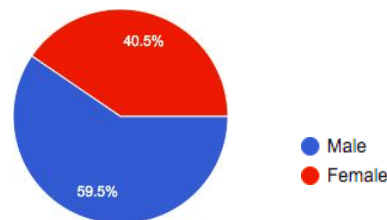
This research aims to reduce the harmful effects of the EMF radiations, on human, animal and plant's health, which are induced by our electronic devices, specifically mobile phones. The main objective of this research is listed below:

- Survey conducted to identify the usage of mobile phones and other electronic devices by people and provide with suitable modifications.
- Give out a solution for an EMF safe zone inside our homes.

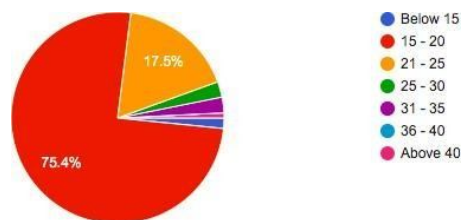
V. SURVEY

We conducted a survey through google forms in which 126 people participated. This survey was done in order to find out the way in which mobile phones and other electronic devices are used. The following were the questions and the responses to them:

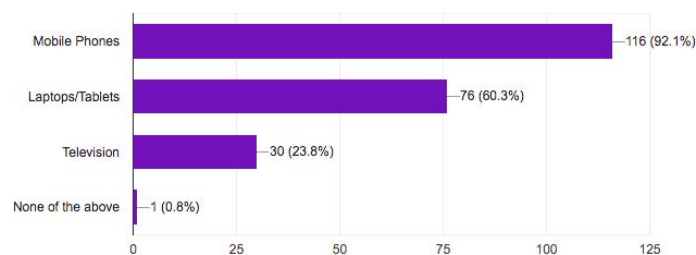
A. Gender



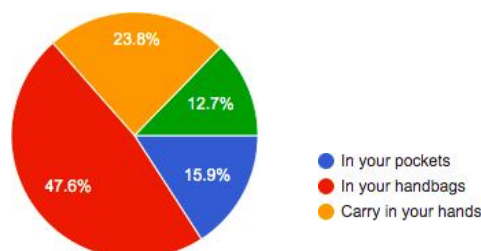
B. Age



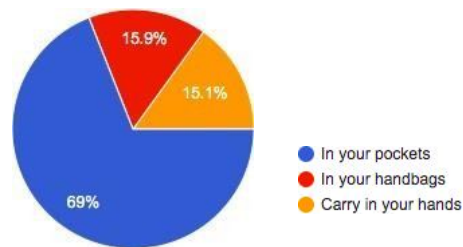
C. Devices you generally use



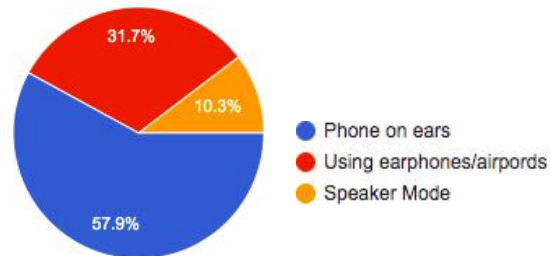
D. Average time you spend on these devices



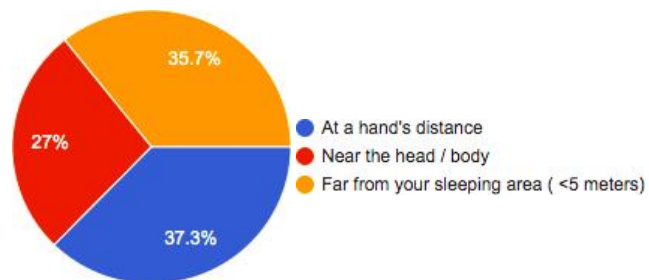
E. Where do you keep your mobilephones while travelling



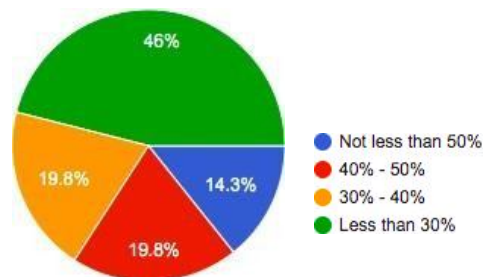
F. Preferred mode of answering a call



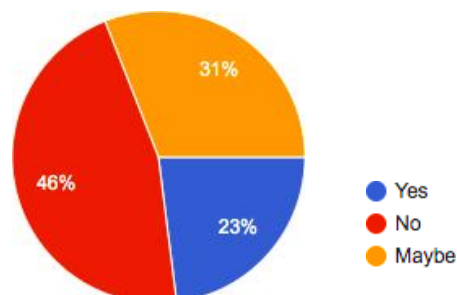
G. At what distance you keep your mobilephones while sleeping



H. At what battery level do you charge yourmobile phone back again



I. Do you keep away your phones while using your laptops/tablets



J. If given a chance, would you avoid using your mobile phones at maximum time

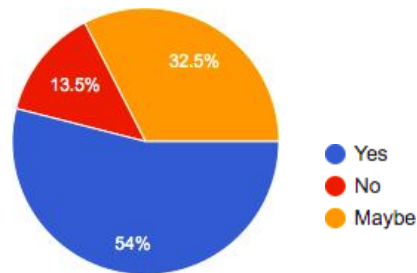


Fig. 1 Survey Results

Our survey contained the following questions(excluding age and gender):

- 1) Devices you generally use? : Mobile Phones, Laptops/tablets, Television, None of the above
- 2) Average time you spend on these devices: Less than 3 hours, 3-6 hours, 6-9 hours, More than 9 hours
- 3) Where do you keep your phones while travelling? : In your pockets, In your handbags, carry in hand
- 4) Preferred mode of answering calls: Phone on ears, Using earphones/air pods, speaker mode
- 5) At what distance you keep your phones while sleeping? : At a hands distance, near the head / body, Far from sleeping area (<5 meter far)
- 6) At what battery level do you charge your phone back again? : Not less than 50%, 40%-50%, 30% 40%, less than 30%
- 7) Do you keep away your phones while using laptops / tablets? : Yes, no, maybe
- 8) If given a chance, would you avoid using your mobile phones at maximum time? : Yes, no, maybe

These questions helped us to understand how people in their day to day life uses the mobile devices and other electronic devices. According to our survey, maximum people (most of them aging between 15-20 years) carry their mobile phones in their pockets, i.e., very close to their body, which is a harmful practice. Similarly, many people use mobile phones while working on other electronic devices like laptops, etc. This in particular can be avoided as most our applications hosted on mobiles can also be easily connected to laptops. The radiations emitted from the laptops are comparatively less than that those emitted by phones.

VI. SOLUTION TO THE PROBLEM

We need to create an Electromagnetic Radiation Safe Distance (ERSD) in our houses. Ideally, we would want to dedicate a small room to store all the EM emitting devices which is insulated and contains all the EM waves. This however, is not feasible. A small dedicated place can be separated for the mobile phones to be kept near the main entrance instead. This place will consist of charging points with it. This will ensure that the remaining rooms in the house will be radiation free. The other devices such as laptops and televisions can be used for accessing the networks as they comparatively have lesser amount of radiations emitted.

The dedicated place is made up of such material which will not only trap most of the radiations inside the box, but also make it much easier for the user to access the area when they are entering the house.



Fig 2. 3-D model of proposed solution

Normally, metals and their alloy are used to shield any particular place from Electromagnetic Radiation. But nowadays, flexible polymer composites are used in their place as they are light weight, corrosion resistant and other mechanical and magnetic properties. This material can be used in our project to maintain Electromagnetic Radiation Safe Distance inside the house. All the other work, excluding phone calls, can be done by connecting



Fig 3. Home with ERSD

the mobile phones with our laptops / tablets. With the emergence of smart TVs, surfing and recreational websites can be accessed through it.

For people outdoors and those travelling long distances, prolonged exposure close to the body is a problem. This can be reduced by carrying an EM insulated pouch. It would consist of the same polymer material as we use in ERSD. A small section can be fixed in the bag packs as well.

Hence the radiations from the mobile phones can be minimized.

VII. CONCLUSION

In this research paper, we have discussed on how the radiations from the electronic device, especially from our mobile phones are harmful and cause many diseases like cancer and other medical complications. We have also proposed a model which would help to reduce the EM radiations inside our houses and make it an Electromagnet free environment.

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