

STUDY OF EFFECTS OF ELECTROMAGNETIC WAVES AND TODAY'S TECHNOLOGIES

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**ABSTRACT**

*In this modern era of technology, communication technologies, mobile phones, computers have completely engraved into our life. As more and more technologies are emerging, the Effects of Electromagnetic Waves in nature have become a major concern for scientists and researchers.*

*Electromagnetic Waves causes revolutionary changes in term of modern communication system and other technologies too. But it's bad effects on human, animal and other biotics has been addressed among the people all over the world.*

*Through this research paper, researchers represent the effects of Electromagnetic Waves and to which extend today's technologies using EMWs. On basis of primary data and secondary data, the researcher tried to address all the scenarios of various negative effects of Electromagnetic Waves on human health and other things*

*Keywords: Electromagnetic waves, Radio Waves, Cancer, DNA, Specific Absorption Rate, Communication System, Mobile phones.*

*Abbreviations: EMWs: Electromagnetic waves, IF: Intermediate Frequency, RF: Radio Frequency, ELF: Extremely low Frequency, SAR: Specific Absorption Rate, CDD: Colony Collapse disorder*

**INTRODUCTION:**

We live in a global society where Technologies, especially information and communication technology changing the way of our living. Humans are surrounded by thousands of electronic devices which become essential for life now. As technologies are increasing rapidly, Involvement of Electromagnetic Waves become more and more in nature as uses of EMWs in technical field is extensive, we can easily say each and every electronic devices/gadget are using EMWS in some way. EMWs have revolutionary effect in domain of communication system in world wide. But with long term exposure of EMWS on Human body and other microbats become topic of debate for scientist or researchers since last many years. For now, it become necessary for common people to understand EMWS and its effect because it become part of our life.

**Introduction of Electromagnetic Waves:**

Electromagnetic waves are generated by the oscillating electric and magnetic fields. These waves are also called as Electromagnetic radiation, as they are radiated from electrically charged particles. Electromagnetic waves can through anything - be it air, a solid material or vacuum. It does not need a medium to propagate or travel from one place to another. Mechanical waves (like sound waves or water waves), on the other hand, need a medium to travel. EM waves are 'transverse' waves.

Electromagnetic waves can be split into a range of frequencies. Electromagnetic waves at low frequencies are referred to as electromagnetic fields and those at very high frequencies are called electromagnetic radiations

**Ionizing and Non-Ionizing Radiation:**

Ionizing radiations are extremely high frequency electromagnetic waves (X-rays and gamma rays), which have enough photon energy to produce ionization by breaking the atomic bonds that hold molecules in cells together.

Non-ionizing (NIR) is a term for that part of the electromagnetic spectrum which has photon energies too weak to break atomic bonds. They include ultraviolet radiation, infrared radiation, radiofrequency and microwave fields.

NIR cannot cause ionization however have been shown to produce other biological effects, for instance by heating, altering chemical reactions or inducing electrical currents in tissues and cells.

There are four subgroups of electromagnetic radiation fields with frequency and intensity. This electromagnetic spectrum begins at a frequency of 1 Hertz (Hz), which is 1 wave per second.

**1. Static electric:**

Static electric charge that is built up on the surfaces and materials. The Frequency range of static electric is 0 Hz. This type of electromagnetic Radiation is used in Natural Video MRI, Industrial electrolysis.

**2. Extremely low frequency (ELF):**

Radiation frequencies below 300 Hertz (Hz) is termed as Extremely low Frequency. ELF is used in powerline, Domestic distribution, Electric engines in cars, train etc.

**3. Intermediate Frequency (IF):**

Intermediate Frequency is a term to describe radiation frequency between 300 Hz and 100 kHz. Proper evaluation and assessment of possible health effects from long term exposure to IF fields are important because human exposure to such fields is increasing due to new and emerging technologies. Typical examples are: computer and tv screens with use cathode ray tubes. It is also used in electrosurgeries.

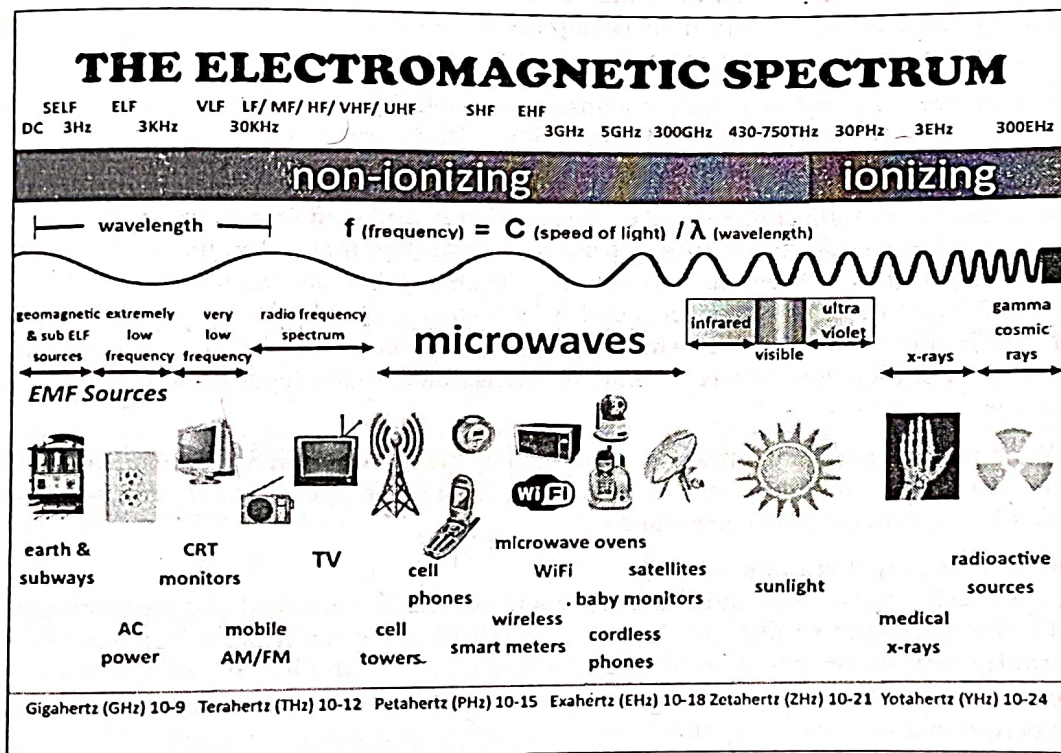
**4. Radio Frequencies:**

Frequency between 100KHz and 300GHz of Electromagnetic spectrum comes in range of RF. RF Sources is widespread used in modern technologies.

**Electromagnetic waves in technologies:**

Modern technologies are based on EMWS on large extends. Some of technologies Using EMWs of different frequencies are:

1. Radio Waves are types of a technology best-known for their use in communication technologies. In modern technology Radio waves are used in fixed or mobile radio communication, Wi-Fi, broadcasting, radar and radio system, wireless computer network, satellites communication and in many more applications.
2. Computer, mobile phone and tv screen uses cathode ray tube, radio transmitters, hand free access control system, card readers, metal detector are application which uses IF. IF is also used in electrosurgery.
3. Point-to-point communication, wireless network, radar, satellite and spacecraft communication, medical diathermy and cancer treatment are example of technologies using Microwaves. Microwaves are also used in cooking purpose (example, in microwave oven)
4. Infrared is widely used in short- range communication: tv remote control, optical fibres, security system, thermal imaging cameras. IR is used by electrical heaters also.



<https://images.app.goo.gl/QSJm5jxEsyLC185G9>

**EFFECTS OF ELECTROMAGNETIC WAVES**

In 2021, there are more than 5 billion mobile users and the counting is increasing every second. The electromagnetic waves surrounded the man in more than the way one can think. In every shake of time thousands of wave are penetrating our body without our knowledge. So, the effect of electromagnetic waves on

microbats and on nature become view of concerns for scientists. Currently there is no evidence that EMWs causes adverse effect on health. So, this topic is under research for clear result.

Many scientists claim through their studies that EMWs have negative effect on human body and many other species.

#### **Effects on Human Body:**

EMWs waves biologically disturb human body system. The exposur of EMWs lead to death of neurons in brain. There is protein named melatonin, exposur to EMWS leads lowering in the level of melatonin which can lead to comma state of mind and blockage leading to the death of person. EMS leads to the damage of DNA strands leading to loss of hereditary characteristics and different body cancer. But still there is conflict among various scientist that whether EWMS causes destruction in DNA or not. According to the American Society for Reproductive Medicine (2006) EMWs have adverse effect on spermatogenesis which leads to Male fertility problem. Cardiovascular problems, Hearing problem, Depression, sleep Disorder, tension, headache, eye sight problem are some other health hazards of EMWs.

#### **Hazards of EMWs on other species:**

EMR from TV, mobile phones and FM towers affect biotic system such as animals, birds, plants etc.in many countries sudden loss of bees was observed a few years back, which is known as colony collapse disorder.

EMWs effects are slightly high in flying birds, the reason is that their body structure is smaller and lighter in weight.

Growth and synthetically changes in plant as effect of EMWs emitting from towers of mobile phones etc.

#### **REVIEW OF LITERATURE (ROL):**

##### **Benefits and hazards of electromagnetic waves, telecommunication, physical and biomedical: a review**

The telecommunication devices (Mobile Phone, Wi-Fi, Computer, Television, etc.) boomed communication in entire world, as it's available anytime from anywhere. But the EMW that is accomplished by all telecommunication devices hazards in many ways. It can cause several diseases like cancer; mental disorder etc. as human body has ability to absorb harmful radiations emitted from EWMS. biotic system of animals, birds, plants are relatively more affected (than humans) by EMW radiating from long tower of TVs, mobile phones WI-FI etc.

The sudden loss of bees (known as colony collapse disorder-CCD) was observed a few years back in many countries due to increasing influence of EMR pollution. Birds are also affected as their body is lighter in weight, growth and synthetical changes in plant has show in many studies due to EWMS.

##### **Study of Electromagnetic Radiation Effects on Human Body and Reduction Techniques**

As EMR will have indispensable role in fifth-generation technology, increase in this type of technology has also harmful health effects. there is connection between specific absorption rate and hazards of EMR. Human body is concentrated with 70% of water so whenever it comes in contact it absorbs EWMS which produces heat. SAR of EMWs is different in different body parts which is easily noticeable in Ear, brain, eyes etc. Skull has low water concentration so absorption is low, where as brain tissue has more water level, so absorption level of EWMS is high in brain tissue.

Effect of EMW emitted by mobile phones can affect man fertility. American Society for Reproductive Medicine (2006) reported that use of mobile phone is related to decrease in sperm count, quality of semen, motility. Distortion in DNA of sperm can also cause cancer.

##### **Electromagnetic Waves and Human health**

In this modern era technology, more and more electronic devices are invented and electromagnetic radiation of electronic devices is getting more and more aid. Communication system, Mobile, computer etc. uses different types of electromagnetic waves based on of different frequencies (like ELF, IF, RF). Medical application also uses electromagnetic fields in the range of RF and X-rays. therapeutic application such as soft tissue healing appliances, hyperthermia for cancer treatment, X- ray machines are common example of it.

With increase of electromagnetic waves in our daily life, its impairment in microbat's health a became major concern. the general opinion is that there is no direct evidence that EMWs causes changes in DNA. But some researcher claims that there can be many effects of electromagnetic waves on human body or microbats. Some of them are: electromagnetic waves imbalance free radical in body which can promote oxidation stress, thermal effects of EMF cause heat and it can lead to a brain temperature increase. due to carrying mobile phones in

pocket EMWs causes bad effect on reproductive system, depends on SAR EMW can lead to different types of body cancer.

**RESEARCH METHODOLOGY**

**a) Objectives of the Study:**

1. introduction of electromagnetic waves.
2. uses of electromagnetic waves in technologies
3. effects of electromagnetic waves.

**b) Data Interpretation and Analysis**

**Table no: 1 Demography Profile**

Parameter	Category	Frequency	Percentage
Age	Less than 12	0	0
	12-18	74	59.7
	18-50	47	37.9
	More than 50	3	2.4
	Total	124	100
Designation	Student	102	82.3
	Professor	5	4
	Other	17	13.7
	Total	124	100

Table no 1 indicates that out of total 124 respondents, 59.7% respondents were between the age group of 12-18, 37.9% respondents were between 18-50 and 2.4% of the respondents were more than the age of 50. Approximately 82% of respondents were student, 4% of respondents were Professor, and 17% respondents have designation as Other.

**Table no: 2**

Awareness about Electromagnetic Waves and it's Effect	Yes	No	Maybe	Total
	%	%	%	
	79.8	7.3	12.9	100

Table no 2 is showing Awareness related to EMWs and its effect. Approximately 80% of respondents were aware of EMWs, 7% respondents had no Idea and 13% of respondents were responded maybe.

**Table no: 3**

Effects of EMWs	Strongly Agree	Agree	Neutral	Disagree	Total
	%	%	%	%	
EMWs are Dangerous for nature	20.2	53.2	20.2	6.5	100
EMWs have more positive side than negative	8.2	37.7	45.1	9	100

Table no 3 indicates that 20.2% of respondents are strongly agree that EMWs are Dangerous for nature, 53.2% respondents are agreed, 20.2% had no opinion and 6.5% of them disagreed with this statement.

8.2% respondents responded that EMWs have more positive side than negative, 37.7% agreed, 20.2% respondent had no opinion and 9% respondents disagreed with the statement.

**Table no: 4**

Today's technologies and EMWs	Strongly Agree	Agree	Neutral	Disagree	Total
	%	%	%	%	
Technologies are nothing without EMWs	22.8	49.6	22.8	4.9	100

With Increasing Technologies effect of electromagnetic waves will also increase	18.9	65.6	13.1	2.4	100
Increased use of unguided media will result in DNA misprint in Microbats	14.9	50.4	28.1	6.6	100

Table no 4 is showing Dependency of Technology on EMWs. There are different statement on which analysis has done:

1: Technologies are nothing without EMWs:

22.8% respondents think that Modern technologies are nothing without EMWs, 49.6% of respondents agreed and 4.9% disagreed.

2: With Increasing Technologies effect of Electromagnetic waves will increase:

Approximately 19% respondents strongly agreed, 65% of respondent agreed and 7% of them disagreed with the statement.

3: Increased use of wireless media will result in DNA misprint:

Approximately 64% of respondents believe that EMWs are responsible for DNA misprints in microbats, 28.1% respondents had no opinion and only 6.6% of respondents were not in favour of this statement.

Table no 5 exhibits the various health hazards by EMWs , health problem that can caused by EMWs are cancer , bad eye sights, tension , week immune system etc. Approximately 22.37% of respondents were strongly agreed with the statement , 45 of respondents agreed, 22.2% had no opinion and 10.4 of respondents had not found EMWs are responsible for any kind of disease.

Table no: 5

Today's technologies and EMWs					
	Strongly Agree	Agree	Neutral	Disagree	Total
	%	%	%	%	
Electromagnetic Waves are responsible for Weekend Immune System	21.5	45.5	26.4	6.6	100
EMWs are the leading cause of bad eye sight in Children	26.6	49.2	16.9	7.3	100
EMWs are responsible for Cancers in human	18	43.4	23.8	14.8	100
People feel stressed after using mobile phones/laptops a lot	23.4	41.9	21.8	12.9	100

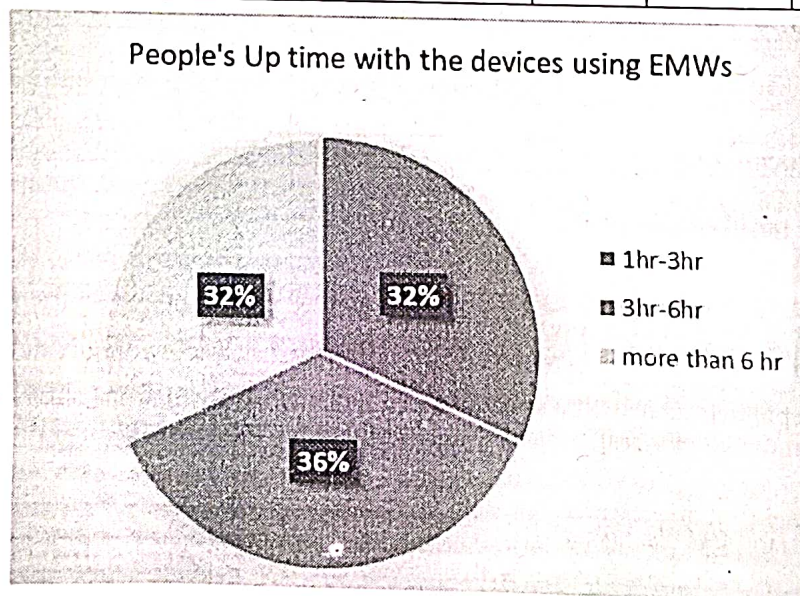


Fig 1: Figure is showing respondents up time with electronic devices.

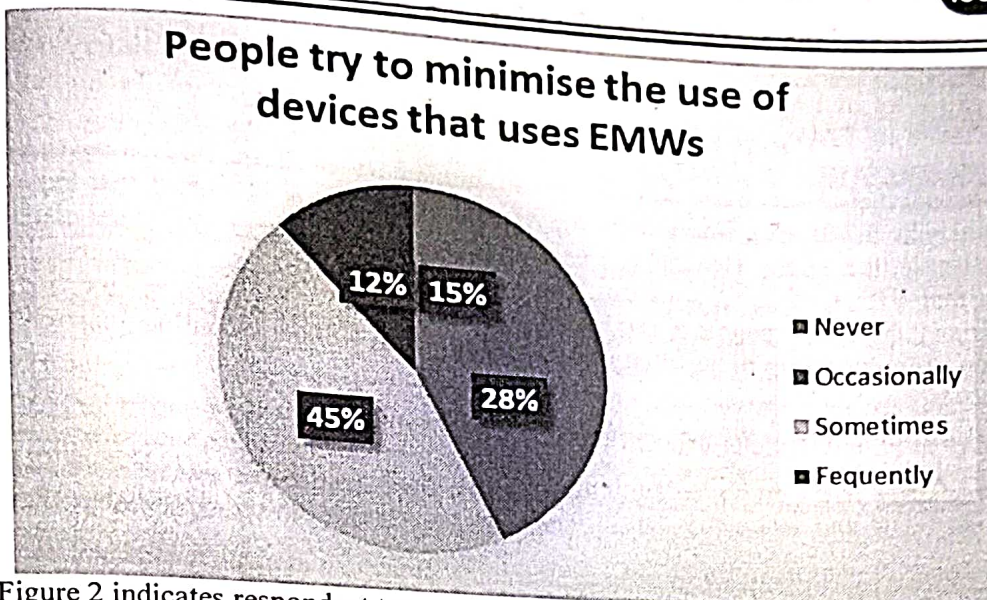


Fig 2: Figure 2 indicates respondent try to distance themselves with the device that uses EMWs

**Finding:**

1. Approximately 30% of respondents were not familiar with Electromagnetic waves. So, it is necessary to aware the people with EMWs and its effect
2. More than 50% respondents were responded that EMWs are dangerous for nature.
3. It was found that approximately 65% respondents believe that Today's technology is

Dependent on EMWs on large extend. Increasing use of unguided media emits EMWS of large range which causes DNA misprints in microbats

4. Approximately 50% respondents are agreed, that EMWs causes various cancer like diseases. But there are number of respondents who didn't find any problem with EMWs

**c) Significance of the study:**

The finding of this will beneficial for society. Considering the importance of EMWs in our life it's become necessary to understand their adverse effects in our life as well as on biotic nature. There are lot of rumour about technologies, the result will overcome this problem.

The result will provide the student with knowledge on EMWs and its effect. Teachers can also use this research paper for reference purpose.

**d) Scope and delimitation:**

This study focuses on the topic of Electromagnetic Waves, its effect, and technologies using EMWs. This Survey is for those who have at least little knowledge of Electromagnetic Waves. Responses are belonging to the public domain (not researchers and scientists). So, responses can be based on anecdotal evidence.

**e) Source of the Data Collection**

**1. Primary Data:**

Researcher has collected the primary data using Questionnaire on Google form. Analysis of data has done on the basis of 124 responses of respondent. Respondents replied on the basis on superficial knowledge.

<https://forms.gle/bfoCr8HFcA6a5cyJ6>

**2. Secondary data:**

Researcher has conducted secondary data analysis on basis of diverse sources of document like books and articles, research reports, General Reports etc.

**Limitations of the study:**

1. Respondents are common people, responses can be based on a lack of knowledge respondents are limitation of research paper.
2. The prejudices of the respondents, on basis of something, can be the limitation of the research paper.

## CONCLUSION

The long-term exposure of EMWs can be dangerous for health. According to Primary data 8% people don't have any Knowledge of EMWs and its effect. The increasing development of Technologies which leads to increase in EMWs may involve negative effects. So, it is important that this problem should be address among common people and they have basic knowledge to prevent themselves from long-term exposure to EM spectrum. By analysis based on primary data and secondary data, it is identified that exposure to EMWs can cause different disease like, stress, Headache, Visual disruption, hearing problem, sleep disturbance. There is no direct evidence that Effect of EMWs causes changes in DNA and these are responsible for cancer. But according to primary data 44% people agreed with statement that EMWs leads to cancer disease. So, there is dissidence among different group of scientist and people. For this Concern Continuous study has been going on for vivid result.

Due to long towers of tv, internet etc. exposure of EMWs to flying birds are increased largely

. EMR has more adverse effect on birds than human beings as their body structure is smaller and lighter weight. On basis of primary data and secondary data it is addressed that EMWs can have negative effects on different species.

Although increased use of mobile phone make life easier, but extreme use of it can cause many health problems. According to primary data 32% people uses mobile phone more than 6 hr, which can be very dangerous for health. So, limited use of Mobile phone and other communication system should be required.

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