

# Impact of Electromagnetic Pollution on human health and environment a case study in Pakistan

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## Abstract:

All living things, including people, plants, animals, and, in fact, all of God's creatures, need to connect with one another to maintain their life cycles. They are constrained inside their predetermined realm and have several methods to interact with one another. Technology becomes more engaged in communication over time, and human productivity rises as a result, such as when signals are converted into understandable communications. Since people desire to be involved in whatever they do, Radio Frequency (RF), a form of electromagnetic wave technology, has been developed for communication. RF-based communication technology makes life easier for people, but the exponential growth in demand for the technology has led to high levels of engagement with communication devices—something that is undoubtedly harmful to people and other living things. The participation and prolonged use of RF devices expose people to more live things that have an impact on their health and the environment. In this study, we will assess the direct and indirect effects of heavy electromagnetic pollution on the ecosystem and the health of living things. The Pakistan region has been chosen since it is among the world's most densely inhabited regions in terms of sample size. When Metaverse is made available to everyone, especially in Pakistan, the metaverse starts generating electromagnetic radiation, which will have a significant influence on electromagnetic pollution, although no research has been able to demonstrate the relationship in comparison to the metaverse.

**Keywords:** *Electromagnetic Pollution; Radiation; Radio Frequency; Electromagnetic Force*

## 1. Introduction

Electromagnetic pollution is an increasingly important issue in human health and its environmental impact, currently, we live in a large burst of electromagnetic forces (EMF) from various sources, including high exposure to wireless devices emitting radio frequency (RF) has interacted with living organisms and creatures that affect health and the environment. Lack of knowledge in Pakistan society results in less focus on electromagnetic signals (EMS) due to increases in electromagnetic pollution (EMP) in human lives. Shortage of precautions for electromagnetic pollution results in further

complexity. Harmful effects of electromagnetic waves on humans and the environment. As mentioned above, electromagnetic fields can be dangerous due to possible cancer risks and health problems, including electromagnetic hypersensitivity (EHS). Recently, the implications of (EMP) on health and the environment exposed, and academics have expanded their investigation of the revenue culture. People linked to EMP through the technology that has been extensively utilized in power distribution lines (cables), microwave ovens, computers, television displays, security equipment, radar, and more recently laptops, Wi-Fi, Bluetooth

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systems, wireless smart gadgets (personal computers), tablets, and portable computers.

EMPs, or electromagnetic pulses, are sudden bursts of Electromagnetic Radiation (EMR) that can travel long distances through air and space. They can be generated by both natural and man-made sources and can cause disruptions in electrical systems and power grids. The effects of EMPs on human health can vary depending on the strength of the pulse and the duration of the exposure.

In terms of environmental effects, EMPs can interfere with the migratory patterns of birds and other animals, disrupt the navigation systems of sea creatures, and disrupt the electrical signals of marine and land-based life. EMPs can also damage electronic systems, such as satellites, which can cause further disruption. In the world of professional sports, the revenue culture has been increasingly scrutinized due to its potential negative impacts on athletes and the environment. Many professional sports teams have been accused of using their financial power to manipulate the outcome of games or to secure unfair advantages in recruiting players. Additionally, many teams have been accused of using their financial power to influence the media, which can lead to a false or distorted representation of the sport. The potential environmental effects of the revenue culture in professional sports are concerning, as it has the potential to damage air and water quality.

The World Health Organization (WHO) has noted that many studies have identified a correlation between exposure to electromagnetic fields (EMF) and various health conditions, including cancer, headaches, fatigue, and depression. According to WHO, further research is needed to better understand the impacts of EMF on human health. The environmental effects of electromagnetic pollution are also being studied, with researchers attempting to understand how it impacts animals, plants, and ecosystems. Some of the possible impacts include disruption of the Earth's natural electromagnetic fields, interference with animal migration patterns, and damage to fragile ecosystems.

Given the potential health and environmental risks, governments around the world are attempting to regulate the use of electromagnetic pollution. Some countries have implemented laws to limit the amount of EMF exposure to which people can be exposed. Other countries have implemented laws to limit the amount of EMF that can be released into the environment.

To protect public health and the environment, it is important to continue to research the impacts of electromagnetic pollution and to develop regulations that will ensure safety and sustainability. It is also important to educate the public about the potential risks associated with electromagnetic pollution so that people can make informed decisions about the technology they use in their daily lives.

Addiction and the negative effects and such devices will have bad effects on the people of Pakistani society. During human sleep, these devices are often connected to their server to transmit signals, and this also pollutes the environment and human mental senses if it is near to you. These transmitted signals are slow poisons for humans. RF is related to potential health and living environments. Cell phone stations continue to generate (EMS) that propagates from tower to tower via wireless frequencies. People who use mobile phones and their gadgets at much time. It weakens their intellectual sense by reducing their brain power and critical thinking power. This also affects the people working on the towers who often perform troubleshooting or maintenance strategies etc.

Controversy over several research of electromagnetic pollution has raged for decades over RF interference distraction in the health of the environment. Electromagnetic Fields (EMF) are pervasive in everyday life. 4G mobile communication systems, including 5G both of their cellphone towers, expose much of the human population to radiation at multiple frequencies, particularly RF.

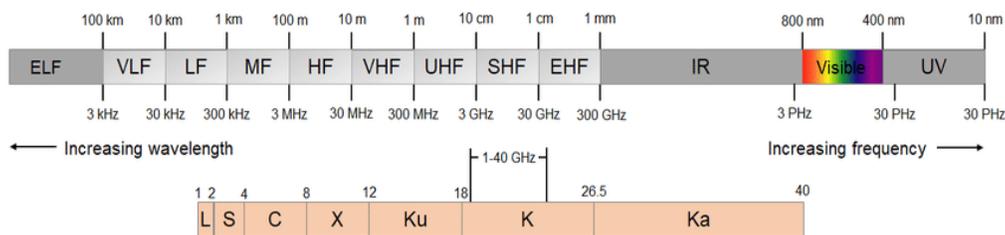
Previous studies in the past decade have described changes in the biological parameters of living organisms after exposure to

electromagnetic fields. Certain segments of the population may be at greater risk occur of potentially adverse effects arising from occupational exposure or individual sensitization. [1] Apposite epidemiological and experimental researchers have attempted to evaluate EMF exposure and its effects on cancer risk. [2], human nervous system [3], the hematology [4], the metabolism, and the endocrine system [5], due to more direct contact, a larger spectrum of human groups may be at higher risk.

Electromagnetic is related to the affinity of electric currents or fields and magnetic fields. Over the years technology has evolved especially in the telecom sector where the demand for mobile devices has increased drastically human interaction is enhanced as well as electromagnetic pollution increased. There was a time when the only way to communicate was through letters which often took several months to reach their destination. Now with just a click, we can make long-distance audio and video calls within seconds. This is because radio frequency signals are sent using different movement patterns from radio waves that are produced by an RF transmitter and picked up, or by a receiver at a different location.

This evolution did not only come with benefits but drawbacks as well with the high exposure of RF levels and with the high intensity of its signal strength. This gave rise to several short-term and long-term diseases that not only affected human health but also creatures living under water such as plants and animals. There is a wide spectrum of frequencies that are provided by nature to be utilized by humans for useful purposes. People use this spectrum for communication of different types within their limits. Some of them are affected Through stringent enforcement of laws in every situation and abiding by the regulation of the authorities, we can try to minimize the negative effects on our health but cannot eliminate them.

The framework is as all these faces creating EMP increases day by day but as about the survey it is confirmed that those peoples which are in houses or any other places which they are not attached to any work for the half pass arise then their emissions become changed, and it can be said as becomes unhappy, the root cause is to focus is that their EM pollution is made and active on here. As shown in Fig 1.



**Fig. 1.** Representation of Electromagnetic Spectrum. Reference of (Electromagnetic-spectrum-in-frequency-and-wavelength-ELF-extremely-low-frequency-VLF\_ppm)

## 2. Literature Review

### 2.1 RF and Health

According to [6] An experiment is conducted on healthy young males and children under conditions in a sound isolated room, having no neurological and

psychological signs and symptoms. To record EEG, each of them is positioned beneath 16 electrodes put over the head following the worldwide 10-20 standard. in such a way that all electrodes have a common reference. With a testing duration of 24 hours via digital telemetry electroencephalogram (EEG) it has

been recorded when the subject was awake and during the call via usual radiophone and cell phone, in which the outcomes demonstrated that the human EEG was impacted by the EMF generated by mobile phones.

As discussed above [7] another hypothetical study conducted in which physiologic impacts of EMF exposures have frequently reported, exposure to EMF can cause this activation by producing more free radicals, there is a broad activation can explain the variety of effects that have been seen, free radicals are important components of phagocytosis as well as natural processes like mitochondrial metabolism, ionizing radiation or phorbol ester therapy can induce the release of free radicals, resulting in chromosomal instability in both. The following are some of the acute and long-term impacts of EMF exposure that are mediated by rising free radical levels. Other cell-specific reactions brought on by EMF result in the formation of free radicals. Direct free radical stimulation is one aspect of EMF-induced cell activation. Lifetime exposure to EMF causes free radical concentrations to remain consistently high, and long-term exposure causes a chronically high level of free radicals, which then inhibits the effects of the hormone produced by the pineal gland, concluded that High chances of DNA damage via EMF induction and having increased risk of tumors development.

Another data [8] provided real-time observation of EMF by power lines which are highly dangerous for physiological disease. An experiment conducted on a female body called magnet therapy aims to break the influence of celestial force, the lady who had episodic convulsions and hysteria also mysterious attacks of uncontrolled and unprovoked vomiting, urinary retention, toothaches, opisthotonos, blindness, melancholy, and paralysis Mesmer believed that he could discern a fixed periodicity in the timing of some of these attacks. As a result, deposits of magnetite field radiation within the human brain lead to physiologic effects with potential danger and harm to the human body.

Likewise, another [9] studies give describes the engineering work that led to the

development of dosimetry for the measurement of the fields appropriate for biological experimentation. People have been exposed to a variety of electromagnetic fields (EMFs) produced by household electrical equipment and mobile communications devices. According to the study Cellular and Molecular Responses to Radio-Frequency Electromagnetic Fields. The following notes can be concluded that there is no direct cleavage of intracellular DNA by RF radiation, while the thermal effect is produced by prolonged exposure to RF fields with high SAR. RF radiation may result in an intriguing biological reaction that alters genes. Studies on this impact have shown mixed findings, possibly because cell lines vary, and microarray research has not produced conclusive proof of how RF radiation affects cellular processes including apoptosis, the immune system, and ROS generation. Since the positive effects give positive effects and negative effects become negative respectively.

Another study [10] gives us a brief review of the electromagnetic (EM) spectrum, that summaries the effects of the different radiations on humans specifically causing Extremely Low Frequency and Very Low Frequency (ELF/VLF) to high-frequency electromagnetic radiation are all present in cancer, to radio frequency (RF) and microwaves, through infrared (IR), visible, ultraviolet (UV), X, and gamma rays. No conclusive evidence has been found in a study of employees exposed to high electric and magnetic fields (60 Hz) from power lines that these fields are harmful to DNA or can lead to mutations or cancer. Heating due to RF energy creates the most apparent biological effects. While no effect poses RF radiation that leads to risks to human health. The power level and frequencies are the main factors that human health surely affects while avoiding such wherever feasible, avoid unneeded radiation exposure; X-rays and gamma rays are the main culprits for severe biological harm.

A visible light-based communication proposal [11] was provided to the laboratory in which the dual-hop fusion Visible light-based and radio frequency communication (VLC-

RF) system provides communication between Laboratory and the patient. This solution is for outdoor use to prevent electromagnetic radio frequency communication, although a big challenge is to face the outage, which is carried out with numerical analysis to demonstrate the outage probability. As a result, statistical analysis of end-to-end communication is based on numerical simulations and various parameters on the system's performance.

A survey-based study [12] provides us with information on 12 countries youngster's habit of using cellular phones to analyze their RF exposure. The study was conducted using a specially created software program put on participants' cellphones, data about their voice calls, data use, Wi-Fi usage, hands-free devices, laterality, and network type are gathered. It is observed that of 534 participants 63% were female and the remains are in between the age group of 10 to 24, Nearly half of the participant's moms had completed their schooling at the highest quality standards.

The study [13] is based on the exposures to radiofrequency electromagnetic fields (RF-EMF), noise, and air pollution, as well as the reported levels of non-specific symptoms, sleep disruptions, and respiratory symptoms which served as the foundation for this investigation. The connections between modeled and perceived exposures are provided by the cross-sectional and longitudinal regression models. The reporting of symptoms is significantly influenced by perceived exposure. When environmental determinants of symptoms are examined, there is a chance that health risk assessment will be skewed.

[14] has developed a PLL (Phase Locked Loop) approach for estimating harmonic magnitudes in connection with power system discharges. With the aid of this method, the complexity of computing the harmonic components is reduced, speeding up the detection of power system faults. Furthermore, test results in the field demonstrated that this technique found faults more quickly than the FT-triggering findings. Closed-loop feedback is used in this approach to estimate each harmonic component separately. In addition, compared to conventional signal processing

techniques, it involves fewer mathematical calculations.

[15] Survey-based research in which 31 people and 7 stakeholder groups in Malaysia are interested in the many reasons why telecom providers are not abiding by the rules. Consequently, Malaysian authorities participated in risk communication strategies and created a method for resolving disagreements over RF-EMF emissions and their effects on health that was successfully reproduced across areas.

[16] In covid-19, smartphone usage, and ubiquity were found to be higher during the lockdown time, according to a cross-sectional study at Universiti Kebangsaan Malaysia (UKM) that included 252 medical students. to identify the primary cause of the correlation between smartphone usage and symptom reporting patterns. It concludes that parents must take part in essential early childhood education about how to use smartphones properly and have a support structure for looking for different forms of entertainment.

The study is assessing the impacts of nonionizing radiation and its health risks on the human body by examining its effects on various devices and in various places. It has been concluded from mobile and cell tower data that the exposure limit of RF was lower than the typical RF of Iraq. Although dangerous, the cellphone tower complies with the standards. Additionally, the RF exposure limits are rising along with the number of RF users.

[17] The study conducted at Thi-Oar university Iraq is based upon a questionnaire, where an increased incidence of focusing difficulties (21%), headache (20%) dizziness (13.1%), and sleep disturbances (16.1%) on symptoms to which students are exposed rely on during as to the use of mobile phones. Here researchers are concerned about increasing Radio frequencies in space because it creates health symptoms. For this, they suggested the Government take necessary steps to establish laws that limit radio frequency propagation at random for the proactive prevention of all the mentioned diseases.

[18] According to an experiment that used a portable measurement device to measure RF-EMF exposure from mobile phone base stations in 94 outdoor microenvironments, 18 public vehicles, and while walking, the conclusion was that exposure levels tended to rise with increasing urbanity due to high RF-EMF variability.

## 2.2 RF and Environment

A survey was conducted by [19] in European countries to figure out the radio frequency electromagnetic fields (RF-EMF) emitted in the everyday environments of its inhabitants. The statistics were collected by gathering RF parameters using EM devices and radiating antennas. According to the study, the highest exposure levels were found to be in public transportation (-0.5-1.0 V/m) resulting from the uplink and outdoor levels. This was followed by (RF-EMF) exposures found at homes (0.1-0.4 V/m) brought in by uplink, downlink, DECT, and some exposures from WLAN.

The Authors of [20] research is about the effects of mobile phone base stations that impact the health of people residing near them. This research tried to explore whether residents living near mobile phone base stations were more prone to health conditions or not and compared it with a control group to see the difference. The study considered different demographic data including gender, age, eating habits, alcohol consumption, duration of stay close to the base stations, and daily average mobile phone usage from six densely populated base stations. In these areas, the antenna output power was 20W with a tilt of 20 degrees. The results of this experiment revealed significantly increased levels of RF power density ( $p < 0.0001$ ) in the exposed group as compared to the control group.

Further studies like [21] conducted in the southern region of Nigeria investigated the impact of how the usage of RFID technology can be used to implement environmental sustainability practices. For this study, the authors measured and assessed various environmental variables such as relative temperature, humidity, and atmospheric

pressure over the course of the refractivity gradient in Iyamho-Auchi will be calculated over the course of one year utilizing a lightweight, affordable meteorological monitoring system. To gather the data, this gadget was positioned at a permanent location at the Edo University Iyamho administrative building. According to the study's findings, refractivity gradient values between -20.00 N-units/km and -190.00 N-units/km might be used to forecast local radio propagation. Additionally, it was discovered that when compared to months with higher relative humidity, months with restricted relative humidity had higher refractivity gradient values. Additionally, it was discovered that the refractivity gradient was significantly impacted by the measured climatic factors during the whole year of 2018, with these influences being more obvious in the months with greater relative humidity.

[22] The 29 types of plants were taken into consideration in research that used data analysis from 45 publications and 169 experimental observations to find alterations in plants brought on by RF-EMF radiation from mobile phones. In 89.9% of physiological and morphological impacts, the results paint a clear picture of plant behavior. Although specific frequencies between 800 MHz and 8000 MHz tend to make plants more susceptible to RF-EMFs, the maize, roselle, pea, fenugreek, duckweeds, tomato, onions, and mung bean plants appear to be particularly sensitive to these frequencies.

The research done in [23] focuses on the risks that electromagnetic waves have to human health as well as how they affect the climate directly. This survey paper also analyzes why the levels of radio frequencies are increasing despite work being done to maintain public health standards. The major discovery made by this study was that EMF exposure standards were causing a serious hazard to health.

An interesting study was conducted by [24] that found a relationship between electromagnetic radiation with the decline of insects in the ecosystem. This study aimed to provide a more sustainable and ecologically

friendly solution to improve agricultural productivity for the supply of enough food for the population. The outcome of this survey-based study showed that it is important to consider the negative effects of electromagnetic radiation on insect pollination that acts in synergy with pesticides, invasive species, agricultural intensification, and climatic change. So, it is advisable to resolve these pressing issues before planning to develop new technologies.

A two-part study conducted in [25] in the years 2012 and 2014 aimed to look for mood disorders in 90 volunteers using atmospheric weather-related Electromagnetic Fields. The results of the study proved that humidity, air temperature, and air pressure were not the only triggering factors for inducing negative mood disorders by bio-tropic weather conditions for humans.

Another comparative study [26] was conducted in Bangladesh to estimate the possibilities of next-generation mobile technologies and how they impact its residents and the environment in general. As a low-income country, Bangladesh looks towards mobile technologies to help them. achieve their goal of becoming a middle-income country. Over the years, the growth in mobile technologies in Bangladesh has been tremendous and they are now looking towards 5G. This survey paper uses both primary and secondary data on the effects of the current 4G technology and how it impacts its people. The most significant finding of this study was that most cell phone antennas were emitting limitless radiation. In addition, people were not aware of the number of radiation emissions from these devices and base towers and there was an urgent need to create awareness in society.

The use of Microwave heating was investigated as an alternative method for the disinfection of stored food grains [27]. A major problem that the world faces is a 40% loss of stored food items due to infestation such as ionizing radiation, chemical fumigation, hot air treatments, controlled atmospheres, etc. This study has indicated that microwave treatments can be used as a

replacement for other techniques due to pollution-free environments, selective heating, energy minimizations, etc.

Research conducted in 2015 by [28] tries to create awareness about how cell phones impact human health with their powerful emission of radio frequencies. Currently, where almost everyone possesses a mobile phone, it is very crucial to understand when to use it and when not to use it, especially for young adults. The government of India has been laying down regulations for the safe usage, production, and marketing of cell phones to manage these harmful radio frequency emissions among students and professionals across the country. The potential result of creating this awareness is to minimize exposure levels and become smart decision-makers.

### **3. Methodology**

To identify the most responsive traits, Subjects were introduced to the concept of electricity and with the discovery of the electric force, magnetic fields began to emerge in human life. High frequencies have been used in many regions, most notably for mobile phone communications from the early 20th century to today's radio communications. [29]

The use of electricity in Pakistan has increased rapidly as the standard of living of man has improved. Sources of industrial frequency electromagnetic fields can act as current conductors in high-voltage electrical transformer substations, power lines, solenoids, and power plants. [30] Thus, these rays create pollution in our daily life. According to the World Health Organization, in recent decades, another factor has emerged and systematically exerted significant negative effects on living systems, including the human body. [31] According to the WHO, excessive radiation from cell towers is harmful to public health and the environment. [32] Patients who have self-diagnosed as electromagnetically hypersensitive are increasingly seeking assistance in medical offices. A statistical study of general practitioners was done to determine the occurrence of cases and the opinions of Austrian doctors about the possible

health implications of ambient electromagnetic fields (EMP), with unexpected findings.

Only one-third of respondents claim that patients have never inquired about the effects of electromagnetic pollution on their health. Only 39% of general practitioners have never connected health symptoms with ambient electromagnetic fields (EMP), even though the vast majority (up to 96%) feel that EMP has a function to play concerning health. [33] Self-proclaimed electromagnetic hypersensitive patients consult two-thirds of their patients on an irregular or ad hoc basis. Sound evidence, however, demonstrates to be lacking. There is little understanding of current electromagnetic exposure limits and ambient field levels. It is fascinating that notification of treatment by authorities is mostly insignificant. Only 4% said they had gotten information on "EMP" from one of these sources. [34] Surprisingly, there is such a big difference between medical professionals' judgments and national and international risk evaluations for health. Given how frequently doctors and other healthcare professionals meet this issue, the findings indicate that immediate action is required. [35]

There are both general and specialized difficulties related to low-frequency electromagnetic pollution caused by electrical equipment and power sources. In today's information culture, awareness of the levels of this pollution in metropolitan areas is developing as a means of preventing extended exposure in daily life. It is a thorough method for, first, mapping EMP of large urban regions, and second, using historical data, planning the route to take with the least amount of electromagnetic exposure.

The suggested method decreases the number of measurements required for pollution mapping in the first stage, evaluating their value by utilizing Genetic Algorithms (GAs) to optimize functional criteria and considering the superposition impact of many sources. In the second stage, an ideal trajectory that strikes a balance between travel time and exposure to magnetic fields may be found using a specifically created search space using GA as an optimization technique. The outcomes demonstrate the effectiveness of

thorough mapping with low error rates, ranging from 1% to 2.5%, for medium- and low-voltage (MV/LV) substations and power lines, respectively. The suggested method may be included in mobile applications and determines the best speed for various modes of transportation, including bikes, autos, and pedestrians. Finally, an actual urban area in Malaga was used to evaluate the methodology (Spain). [36]

Base station numbers have increased in tandem with the growth of mobile phone usage. The construction and development of additional base stations were required due to the fast evolution. However, the proliferation of base stations has the potential to be seriously detrimental to human health. To ensure that the base stations are not permanently damaging, it is crucial to examine their radiation output. From a medical standpoint, electromagnetic field (EMF) mapping is crucial since it offers helpful details on, for instance, the diagnosis of illnesses brought on by EMF.

With the help of this information, the distribution of diseases in different regions can be achieved. The electromagnetic radiation levels of base stations were measured at 80 different points in Erciyes University (ERU), Turkey, and detailed information about the measurement tools and measurement method was given. It was observed that no area in ERU exceeded the national and international limits. It is also observed that the effects of base stations vary according to duration and degree of exposure.

Therefore, if people are exposed to a very low-intensity electromagnetic field for a very long time, serious health problems can occur. Info of Healthcare USA. [37]

Because of the electromagnetic fields and radiation, they produce, modern technologies are now a significant source of electromagnetic pollution. Any electromagnetic field or radiation from a natural source cannot compare to the strength of this EMP. Since there is yet no conclusive proof that this pollution has detrimental impacts on people, its toxicity is still debatable. It was determined that low-frequency electromagnetic radiation may be

carcinogenic. These factors account for the tremendous advancements achieved in recent years in the study of the impact of electromagnetic radiation on living things. [38]

The outcomes of environmental pollution are constantly increasing because of technological progress, consumption of electricity generation, and anthropogenic electromagnetic fields, effects of environmental pollution are continuously getting worse. Electricity, a significant source of EMF contamination in the RF or ELF bands, is no longer seen as essential to human life without telecom networks. The creation of bio-electrochemical technologies, as well as preventative and/or mitigation measures for the negative consequences of uncontrolled exposures, may all be thought of via in-depth information. [39]

EMP is a term used to describe an environment with too much alternating and static magnetic and electric fields. Unwanted fields are typically artificial. Even water, noise, and air pollution cannot compare to EMP in terms of visual pollution. First, it is virtually always concealed, and second, it occasionally has therapeutic benefits. on the physiological consequences of electromagnetic in humans. Microwaves and very high frequencies are mentioned, along with less well-known non-thermal physical phenomena. In addition, several Eastern European nations utilize electro-diathermy and electrotherapy, and in the United States, electric fields are used to encourage bone regeneration. [40], [41]

### 3.1 Sample Analysis

The methodology research design for this study is based on exploratory qualitative research. This research study approach uses in-depth interviews with a sample of participants to investigate the experiences of people in the Karachi region. There are two different focus groups, one is those who are working between EMP, and another one is those who are busy in their houses with a peaceful vision but keep connected with EMP. 60 interviews were used as the sample size for the study. Using a 95% expected level of confidence and an assumed error margin of 11%. A multiple-choice survey

based on the qualitative Likert method was created. [42]

The gathered data has been tabulated and evaluated using the Chi-square algorithm. To comprehend the relationship between two or more unidentified components, the data was collated and analyzed using the Chi-square formula and it is utilized as a parametric test, where we used to test the hypothesis about variances of normally distributed population.

The following hypotheses have been taken into consideration for this paper:

The first hypothesis is about due to a lack of information, Pakistan culture has less emphasis on (EMS) thus (EMP) rises and represented the impacts on human life and environmental pollution occur. Therefore, the first hypothesis becomes represented as shown below.

**H1:** It will be challenging to regulate electromagnetic pollution in our lives, required as individuals pay attention to the (EMS), that rise so fast.

The second hypothesis is about the shortage of precautions for electromagnetic pollution results in further complexity. Therefore, the second hypothesis becomes represented as shown.

**H2:** Humans do not have the proper technological advancements or SOPs to overcome these radiations with the help of safety measures and precautions. Cancer and other health issues are possible risks of retinal hypersensitivity (EHS) implementation minimized to control human health. Electromagnetic fields (EMF) can be dangerous due to possible cancer risks and health problems including electromagnetic hypersensitivity (EHS).

This data from qualitative research is based on views gleaned from focus groups that were held. The data demonstrates that the development of EMP devices is quick and has undergone significant modification.

The idea behind the massive EMP representation is inspired by the social pollution caused by cell phone use. Therefore,

it is believed that the concept of EMP contamination was unique, and as a result, it was debated and presented below.

## 4. Results

### 4.1 Finding and Analysis

This research study approach uses in-depth interviews with a sample of participants to investigate the experiences of people in the Karachi region. There are two different focus groups, one is those who are working between EMP, and another one is those who are busy in their houses with a peaceful vision but keep connected with EMP. 60 interviews were used as the sample size for the study. Using a 95% expected level of confidence and an assumed error margin of 11%.

The findings of the Chi-square test on the observations that have been gathered for the hypothesis are shown below. For each hypothesis, the data have been provided as seen and projected. Information for Tables 1

through 2 was gathered using the questionnaire that is supplied at the climax.

#### 4.1.1 H1: It will be challenging to regulate electromagnetic pollution in our lives, required as individuals pay attention to the (EMS), that rise so fast.

The hypothesis looks at implementing challenges to regulate electromagnetic pollution in our lives as individuals are required to pay attention to the (EMS).

Therefore, it investigates challenge factors such as Human health (H), Environment (E), Electromagnetic radiation (R), and Social Lives Factors (S). Yes, suggests to the state that paying attention to the EMS will influence how the EMP is implemented while agreeing and disagreeing says that it won't. The outcomes that were seen are as follows:

The outcomes that were seen are as follows:

TABLE I. (A) OBSERVED VALUES FOR AWARENESS OF EMP

	<b>Human Health</b>	<b>Environment</b>	<b>Radiation</b>	<b>Social</b>	<b>Grand Total</b>
<i>Agree</i>	33	53	56	45	187
<i>Neutral</i>	12	3	4	7	26
<i>Disagree</i>	15	4	0	8	27
<b>Grand Total</b>	60	60	60	60	240

These are the predicted outcomes:

TABLE I. (B) Expected results for awareness of EMP

	<b>Human Health</b>	<b>Environment</b>	<b>Radiation</b>	<b>Social</b>	<b>Grand Total</b>
<i>Agree</i>	47	47	47	47	188
<i>Neutral</i>	6	6	6	6	24
<i>Disagree</i>	7	7	7	7	28
<b>Grand Total</b>	60	60	60	60	240

**Equation**

This equation was used  $X^2 = \frac{(O-E)^2}{E}$

Consequently, the Chi-square is =

$$X^2 = \frac{(33-47)^2}{47} + \frac{(53-47)^2}{47} + \frac{(56-47)^2}{47} + \frac{(45-47)^2}{47} \dots = 32.644$$

The table displays the cut at a score of 32.644 with the degree of freedom at 6 and a level of (.05).

Sample size = 60

Alternate hypothesis: Independent assortment (3:4)

Predicted values 3:4

$$12.59 < 32.644$$

Therefore, the Null hypothesis is rejected.

$$x^2_{0.05} = 32.644$$

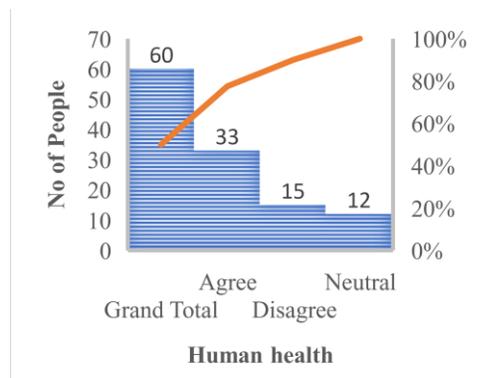
The results demonstrated that respondents thought that the enormous chunk was notably different from what was anticipated, in addition to being more considerable on EMP. Fig 2. *Actual Responses on Human Health*

Due to the public's understanding of society's predisposition for change and the widespread aversion to technology, this was most likely the case. These are connected to the social component. Because these invisible pollutions are irreparable and the requisite

security measures have a direct impact on people, national attention should have been required.

**H2:** Environmental contamination lacks the necessary technology developments to adopt EMP safety measures and the shortage of precautions for electromagnetic pollution results in further complexity.

The hypothesis looks as premise examines whether human beings lack the necessary technological advancements, such as Standard Operating Procedures (SOPs), to defeat or minimize these radiations with the aid of safety measures and precautions. The observed values are as follows:



**Fig. 2.** Human Health

TABLE II. (A) OBSERVED VALUES FOR FURTHER COMPLEXITY ARE AS FOLLOWS

	Non-Ionizing Radiation Protection ICNIRP guidelines for safety levels	Compliance through Measurements to follow precautions	Total
Yes	28	31	59
No	17	19	36
Maybe	15	10	25
Total	60	60	120

These are the predicted outcomes:

TABLE II: (B) EXPECTED RESULTS

	Non-Ionizing Radiation Protection ICNIRP guidelines for safety levels	Compliance through Measurements to follow precautions	Total
Yes	30	29	59
No	18	18	36
Maybe	13	12	25
Total	61	59	120

Note: As we conducted the research, which is based target of people’s mindset assumption above, therefore the point values here we applied significant rules to solve this issue because anyone people answer yes or no or maybe but not to show that 45% agree and 55% disobey the situation.

This equation was used  $X^2 = \frac{(O-E)^2}{E}$

Consequently, this Chi-square is =

$$X^2 = \frac{(28-30)^2}{30} + \frac{(31-29)^2}{29} + \frac{(17-18)^2}{18} + \frac{(19-18)^2}{18} + \frac{(15-13)^2}{13} + \frac{(10-12)^2}{12} = 1.02$$

The table displays the cut at a score of 1.02 with the degree of freedom at 2 and a level of (.05).

Sample size = 60

Alternate hypothesis: Independent assortment (3:2)

Predicted values 3:2

$$1.02 < 5.99$$

Therefore, the Null hypothesis cannot be rejected.

$$\chi^2_{0.05} = 1.02.$$

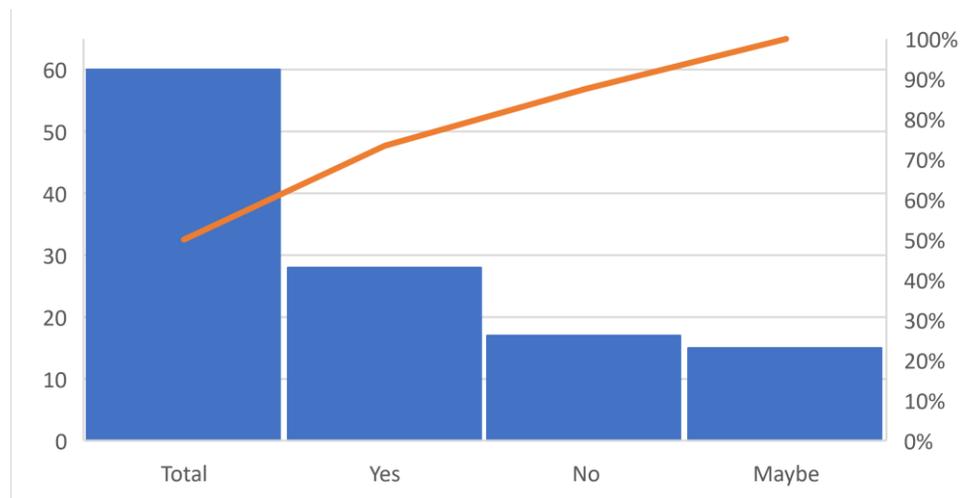
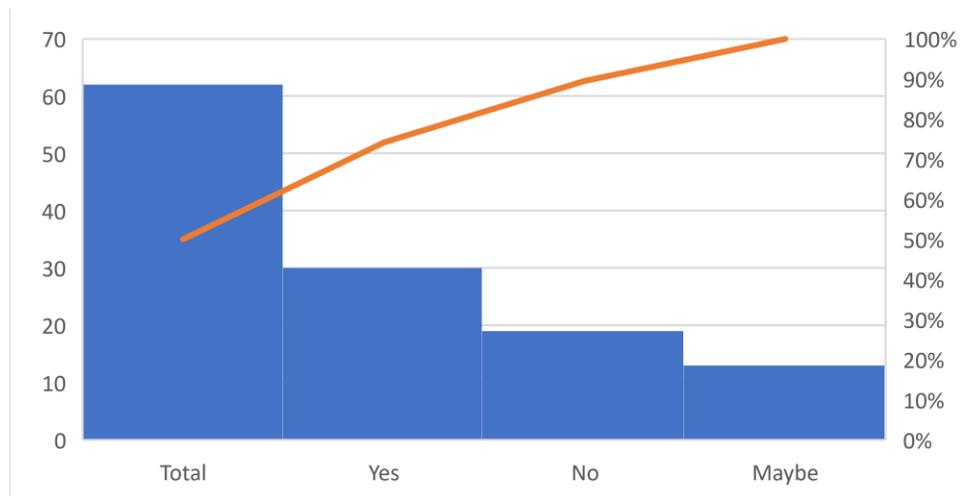


Fig. 3. Hyperledger Fabric Block Diagram



**Fig. 4.** Predicted Responses on precautions and safety factors of EMP

Pakistan, a third-world country, lags behind other developing countries in terms of environmental issues, which are directly related to end users' uneasiness with adopting new technology while taking necessary precautions to limit EMP. Although the exact opposite of what was anticipated—dissatisfaction with the lack of safety regulations—happened. Since the public's perspective often does not consider the safety needs underpinning the deployment of technology, the right legislation is required. The survey's results, however, suggest that citizens of the wireless technology country are confident that an EMP is harmful to the environment and will take measures to deal with it when it ultimately comes.

Public discussions of a system's feasibility often take place in a distinct environment. Whether SOP's approach is more practical than the way things now depend on the individual. The educated forecast of both agreement and disagreement frequently differs from the actual results when the interviewee shares personal experiences and compatibility with both new wireless and old antenna technology. People find using these technologies simpler to use or add to their life.

## 5. Conclusion

This case study is the first level of our understanding of those people who are enrolled in construction jobs or dealing with mobile towers or our youth who keep themselves busy in internet mobile games, we are required to make a proper survey and create the rules and regulation regarding the use of smartphone limitation and make proper laws that how much they required to use in these places. EMP power and frequency in our life more chances that radiation leakage occurs in our life. I believe that our government should take the necessary steps to reduce the radiation levels in our country to a safe level. As time goes on and around 2030, there will be approximately 262 million people living in our nation, predicts the Far Eastern Economic Review. Because when people purchase their smart phones or EMP gadgets they do not care of about EMP but if our country companies move forward to control or minimize radiations from these gadgets then it will make good results for us. More 4G, 5G, and as more people use mobile phones, BTS are being constructed to facilitate network growth in various public locations across our city. Contrary to mobile phones, Bluetooth and Wi-Fi systems continuously release radiation that

intensifies in proximity. Based on several research findings, we might not yet be able to say that BTS is directly responsible for the negative impacts on health. However, several studies have found a connection between the health dangers posed by EMF radiation from Wi-Fi and Bluetooth systems and these systems, which should not be disregarded and should be seen as a public health issue. Since it is concealed and only becomes apparent after many years, it is essential to raise awareness and provide preventive measures to reduce the damage caused by these technological advancements. To tackle this issue, it is essential to create an effective strategy to protect the public from the potential risks associated with EMF radiation. This could include the introduction of a monitoring system that measures the EMF radiation levels in public places, and the introduction of legislation to ensure that the radiation emitted by Wi-Fi and Bluetooth systems is kept at a safe level. Additionally, education and information campaigns should be conducted to raise public awareness of the potential dangers of EMF radiation and how to protect oneself from it. Furthermore, alternative methods of communication should be explored and promoted, such as the use of alternative technologies that are less harmful, as well as the use of physical wires for communication systems. It is also important to ensure that the public has access to mobile phone safety guidelines, such as utilizing headphones and hands-free gadgets, to reduce the direct impact of EMF radiation on their health. Finally, the government should provide research grants for further studies on the health effects of EMF radiation, to better understand and address this issue. In conclusion, it is essential to take action to protect the public from. [43]

The results of first hypothesis demonstrated that respondents thought that the enormous chunk was notably different from what was anticipated, in addition to being more considerable on EMP. Due to the public's understanding of society's predisposition for change and the widespread aversion to technology, this was most likely the case. These are connected to the social component. Because these invisible pollutions are

irreparable and the requisite security measures have a direct impact on people, national attention should have been required. Regarding the version to technology, it is a new area about thinking of EMP and their hazards, that's why research is limited to only on these above approaches. In other words, represented as knowledge and belief say, "We human beings have done a wonderful job of contaminating the environment around us."

I believe that our government should take the necessary steps to reduce the radiation levels in our country to a safe level.

## 6. Discussion

When electromagnetic radiation is present in a setting at deemed hazardous levels, it is referred to as electromagnetic pollution. Numerous sources, such as power lines, mobile phones, and other wireless devices, can emit this radiation. More than 5 billion individuals, according to the World Health Organization, are exposed to cell phone electromagnetic radiation, and this figure is growing.

Because it could interfere with the body's normal electrical functions, electromagnetic pollution is potentially dangerous. Numerous health issues, such as fatigue, headaches, depression, and even cancer, may result from this. Although research on the impacts of electromagnetic pollution is still ongoing, the available data point to the seriousness with which it should be treated.

Limiting your usage of wireless technology is crucial to lowering your exposure to electromagnetic radiation.

## 7. Limitation

To prevent the extra electrical current, make sure that all electronic equipment is correctly grounded. Use shielding and filters to stop unauthorized electromagnetic radiation. Keep wireless gadgets at least two feet away from people and use them sparingly. Avoid using cell phones in confined spaces with poor ventilation. By extending the distance between the source and the receiver, electromagnetic

signals like those from cell towers can have a lower frequency. Ensure that the emissions of all electrical devices are appropriately checked. Encourage the use of renewable energy sources rather than conventional energy sources, such as solar and wind. Inform the public of the dangers of electromagnetic pollution and the necessity of taking action to lessen it.

Building digital identities, creating smart contracts, and creating and storing digital assets are all possible on the open-source public blockchain platform known as Metaverse. Above is the metaverse concept but the Metaverse is a virtual world, like a 3D version of the internet, where users can interact and create content in a simulated environment. When it is made available to everyone, the metaverse starts generating electromagnetic radiation, which will have a significant influence on electromagnetic pollution, although no research has been able to demonstrate the relationship in comparison to the metaverse.

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