

Covid-19 and 5G Radiation are Two Parallel Lines: A Systematic Review

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Abstract:- The rapid dissemination of new coronaviruses worldwide in 2019–2020 has had a significant effect on global economic and social growth. Those exchanges have featured numerous conspiracies spread by patrons on social media. Among them, 5G has been related by a common hypothesis to the dissemination of COVID-19, which has contributed to confusion and the destruction of 5G towers in the UK. Understanding the drivers of false news and swift strategies aimed at isolating and rebating disinformation is crucial to combating it. This paper sought a systematic literature review to save, classify, and interpret the evidence for this research. A total of 95 articles have been successfully reviewed, consisting of 50 Scopus journals and 45 conference papers ranging from the publication years (2014 to 2020). The primary purpose of this study is to investigate the effects of electromagnetic fields on the human body and to clarify health laws in general public and industrial radiation. The knowledge on the electromagnetic field was obtained using instruments to determine the sensitivity amount of some of the home appliances in the magnetic and electric fields.

Keyword:- *Electromagnetic Fields in the Environment, Evolution of Fifth-Generation, Covid-19, and Electromagnetic Radiation.*

I. INTRODUCTION

Since 1960, coronavirus types have been identified that typically induce up to 15 per cent of severe colds in humans per year, often in moderate forms. Initially, two categories of coronavirus caused significant diseases: severe acute respiratory syndrome (SARS) in 2002, with severe acute respiratory distress, generally results in 9.6% death rates; and the 2012 Middle East respiratory syndrome with a 34.4% higher mortality rate [1], [2]. The new coronavirus (SARS coronavirus 2), the seventh coronavirus believed to infect humans, is a positive single-stranded RNA virus that possibly emerged in December 2019 at a seafood market in Wuhan [3], [2], [4]. In March 2020, the World Health Organization (WHO) called the COVID-19 epidemic a pandemic. COVID-19, identical to previous coronaviruses, impacts human respiratory systems and is transmitted from animals to humans, and from primates to primates [5]. Disease signs include dry cough, itchy throat, diarrhoea, and fever [5]. This is a hazardous illness that has caused the deaths of more than 608,911 people, 8,735,298 infected patients that 14,644,360 infections in more than 215 countries across the world as of July 20, 2020 [2], [6].

Any incorrect reports, however, indicated that this deadly disease is triggered or transmitted by the upcoming 5G technology norm that would dramatically boost data rates as opposed to the existing 4G. We discuss this problem in this paper, not only that there is no relation between COVID-19 and 5G, but also that 5G does not trigger or propagate COVID-19 in any way [6].

5G cellular services offer high data speeds (e.g., gigabytes per second) relative to existing 4G networks, provide relatively low latency and improve the base station efficiency and overall coverage consistency [7]. It technology's success grew thanks to the boom of smart electronic devices and the need for portable entertainment, which has generated a strain on traditional networks. A main advantage of 5G is that some of the existing concerns with wireless networks such as low data speeds, power, service quality, and latency should be overcome [7]. While there is little conclusive proof, technology on other social networking platforms is suspected to impact wellbeing adversely. Several social network users found out that 5G was the origin of COVID-19 in the first week of January, and intensified its dissemination [3]. The subject was a topic of discussion and was accessible to all Twitter users throughout the UK. Many images and news stories have also been posted through social media, tying the two together. The plot was of such a significant sort that, according to the British Broadcasting Corporation (BBC), 5G masts were torched at Birmingham and Merseyside in the UK about fears connected with new infrastructure and the transmission of the disease. More specifically, the Birmingham Nightingale hospital (UK) got its phone mast set on fire [3]. This is unwanted harm, especially at a time when hospitals need full efficiency [3].

It technology's success grew due to the boom of smart electronic devices and the need for portable entertainment, which has generated a strain on traditional networks. A primary advantage of 5G is that some of the existing concerns with wireless networks such as low data speeds, power, service quality, and latency should be overcome [7]. The independent fact-checking website full fact noted that the conspiracy was not true and concluded that there were flaws in the theories given to support the 5G claims [8]. In a press conference, National Health Service Director Stephen Powis noted that the 5G infrastructure is vital to the broader general population who are being asked to stay home. He said: "I am completely shocked and disappointed that people are trying to take measures against the services we need to tackle this disaster"[3].

II. METHODOLOGY

To perform a thorough and systematic analysis of Covid-19 and Evolution of the fifth generation in the environment, this study examines parts of the publications obtained that cover their study aims, strategies, perspectives, and outputs. The overall framework of systemic analysis proposed by Lu & Liu [9] has been operationalized previously. The research topics ought to be addressed unambiguously and stipulated structure at the outset of the systematic analysis, the presentation of the topic, or concerns for analysis [10]. Keywords of the research are needed to fit the research's demands. Many patterns of keywords of research are desirable for ensuring the review's research area. Additionally, the adoption of data sources, exhaustive, and thorough review of the related journals and databases is needed [11], [12].

Therefore, the index source from both Google Scholar and Scopus is used to record a broader range of journals and conference proceedings to gain numerous relevant sources, articles, the proper area of study needs identification and scope. Besides, the keywords and search patterns were used by various organizational perspectives to find a broader range of 5G and Covid-19 research, particularly in the environment's electromagnetic fields. A more detailed search background can be conducted by using Scopus to get a goal result. For this work, Scopus uses four collections of keywords (environmental electromagnetic fields, fifth-generation Evolution, Covid-19, and nuclear radiation) [13]. That created 45 slices of paper. In Google Scholar, as has been achieved in the Scopus, fifty parts of the article quest were also carried out. To sum up, as the original collection conducted in July 2020, 95 pieces of paper have been compiled from both Google Scholar and Scopus.

To estimate and variety of papers because the emphasis of our research is on Covid-19 and Fifth Generation Evolution in the climate. Our collecting literature removed the articles that are not based on Covid-19 and fifth-generation evolution in the environment, concept boards. Search results through Google Scholar and Scopus have autonomously narrowed to about 15 and 19 papers after this separation method. Finally, an exact amount of 34 articles is used in this study after discharging the overwhelmed papers from both Google Scholar and Scopus.

III. LITERATURE REVIEW

➤ *Evolution of Fifth Generation (5G)*

5G is the fifth generation cell network, an extension of the 1G, 2G, 3G, and 4G networks already established [14]. The possibilities came with first-generation (1G) mobile communication networks to make the first mobile phone calls. Then came a second-generation mobile network (2G), which allowed text messaging services such as SMS and MMS. After that, the third-generation (3G) cell network

launched video sharing with lightweight and allowed public video calls. The fourth-generation mobile network (4G) then brought us high-definition video streaming services and is the current standard at the time of writing [14]. The next move is the upcoming fifth-generation (5G), which is supposed to extend the boundaries of mobile connectivity. In addition to implementing this revolutionary network infrastructure, there are also additional enhancements that resolve the shortcomings in today's mobile connectivity system. Such limitations have arisen as a consequence of our evolving lifestyles and rising desire for mobile wireless contact [15]. 5G infrastructure would serve as a supplement to and replacing existing networks. This must support and utilize current digital broadband systems (2G, 3G, and 4G), i.e., legacy connectivity [16]. Increasing demand for improved network infrastructure has been generated by the increasing usage of data and the introduction of mobile devices in various industries such as manufacturing, networking, and transport. It will be highly penetrated due to its design, providing high volume bandwidth. It is projected to generate more income for service companies, smoother interactivity with consumers and computers, lower energy usage, more reliable network coverage up to the edges of cells, higher file transfer, enhanced protection and privacy, and, in general, increased data efficiency (QoS-Quality of Operation). As already commonly accepted, the frequently utilized fourth-generation (4G) infrastructure [17], is not adequate to meet the need for the fourth digital revolution, such as low latency, better efficiency, higher bandwidth and power due to the extensive usage of sensors, machine-to-machine connectivity, mobile technology, the internet of things d Therefore, as Bega et al. [17] outlined, 5G is the product of 4G's modernization initiative paired with modern, integrated innovations. 5G will have higher bandwidth and efficiency relative to 4G, reduced latency, and improved coverage [16], [18].

Moreover, it's time to switch from a multiservice to services method. The transition would change from LTE to LTE Advanced, introducing enhancements as ubiquitous networks where customers will simultaneously link to and switch effortlessly across multiple cellular communication systems [19], [20]. The 5G internet infrastructure has improved the way for extremely high capacity usage of cell phones. Users had never seen such a high-value system before. 5G innovations provide all sorts of innovative apps that render 5G mobile devices more effective in the immediate future and massive demand [19]. Bluetooth systems and Pico nets have been accessible on the market for children who have fun rocking. Users will even link up their mobile phones with their Desktop to use broadband internet. 5G hardware includes a camera, MP3 storage, video player, large phone battery, dialling pace, audio playback, and even more than you can't imagine [21]. Network Design consists of a consumer interface in the fifth generation (which plays a vital role in the modern design) and many discrete, autonomous radio access technologies (RAT) [22].

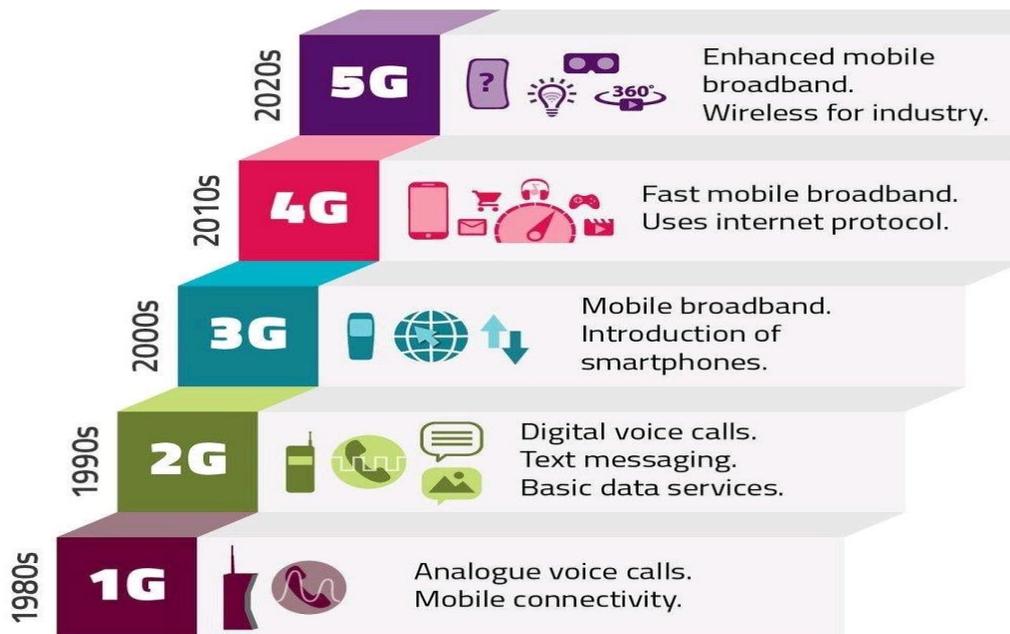


Fig 1:- Technologies from the First Generation to the fifth Generation

Generation	G1	G2	G3	G4	G5
Deployment	1970/1984	1980/1989	1990/2002	2000/2010	2017/2020
Data Bandwidth	2 Kbps	14-64 Kbps	2 Kbps	200 Kbps	1 Gbps
Standards	AMPS	TDMA, CDMA, GPS, GPRS	WCDMA	Single unified standard	Single unified standard
Technology	Analogue cellular	Digital Cellular	Broadband with CDMA, IP technology	Unified IP and seamless combination of broadband LAN, WAN, and WLAN	Unified IP and seamless combination of broadband LAN, WAN and WLAN, and WWW
Services	Mobile Technology (voice)	Digital voice, SMS, Higher capacity packetized	Integrated high-quality audio and video	Dynamic Information Access, Wearable devices	Dynamic Information Access, Wearable devices with AI capabilities
Multiplexing	FDMA	CDMA, TDMA	CDMA	CDMA	CDMA
Switching	Circuit	Circuit and panel	Packet	All Packet	All Packet
Core Network	PSTN	PSTN	Packet network	Internet	Internet
Handoff	Horizontal	Horizontal	Horizontal	Horizontal and Vertical	Horizontal and Vertical

Table 1:- The difference between all the five generations LTE's

While considering the LTE scenario, the emphasis was on bandwidth availability. Even when it was above it, the work was aimed at offering omnipresent communication that would enable people to reach the internet quickly and flexibly, irrespective of where they could be in the sea, the underground, or the atmosphere. The LTE standard, however, includes a version for IoT, named Machine Type Communications (MTC) [19], [22]. 5G systems are planned to support MTC-like apps from the ground up. With regard to the latest developments, nearly any device is a requirement for older models. Similarly, 5G would comprise of 2G, 3G, LTE, LTE-A, Wi-Fi, M2M, etc.

➤ *Electromagnetic Radiation (EMR)*

In this age of automation, people are subjected in their everyday lives to Electromagnetic Radiation (EMR) owing to the ever-increasing usage of wireless networking technologies such as cell phones and base stations, which are commonly installed in the human atmosphere. As a consequence, certain machines continuously subject the human body to the EM radiation. Many kinds of literature came to the conclusion that microwave-emitting devices can create health hazards to animals and humans [23]. Whether the energy of electromagnetic radiation communicates with the body depends on many aspects,

several of which include wavelength, signal intensity, duration of exposure, amplification, and the healthy immune system of an individual. The relation between these and other factors makes it extremely difficult to determine precise relationships between cause and effect. This complexity simply adds to the controversy over the carcinogenic effects of high-voltage EM radiation, computer monitors, mobile phones, base stations, and other equipment [23].

For many years, electromagnetic radiation (EMR) has been used successfully in modern applications. The biological effects differ by physical properties [24]. As seen in Figures 2 and 3, the electromagnetic spectrum varies from a frequency below 3GHz (3x10⁹) for Radio waves to over 3EHz (3x10¹⁸) for Gamma radiation. Frequencies are used in systems such as AM radio and tv, at the lower level of the broadcast spectrum. We have radiations, such as microwaves, visible light, ultraviolet rays right up to X-rays and gamma rays, as we move further in the continuum [25]. Frequencies below near-ultraviolet radiation are known to be non-ionizing. They do not have the potential to change the radioactive make-up of products that come into contact with them.

In comparison, wavelengths of near-ultraviolet radiation are known to be ionizing radiation that is extremely dangerous to biological products in which they associate, such as X-rays, gamma rays and also sunlight [25], [26]; This can be shown, the ionizing portion of the electromagnetic spectrum is not comprised of radio waves and microwaves that 5G apply. The electromagnetic range is the complete frequency- and wavelength distribution of electromagnetic radiation [23], [27]. When the electromagnetic pulse moves in a vacuum at a speed of light, and they have a broad spectrum of duration and frequency. The electromagnetic continuum spans the scope of all electromagnetic radiation and is made of several sub-ranges. The entire frequency spectrum includes specific descriptions depending on their activities, including the transfer, including the absorption of pollutants. Figures 2 and 3 demonstrate that the description of the frequency and duration of both ionizing and non-ionizing radiation and the summary of the 5G range. This can often be observed from the electromagnetic spectrum, the greater the wavelength, the more energy it produces, the less the distance it will move, and the harder barriers become to stop it [23].

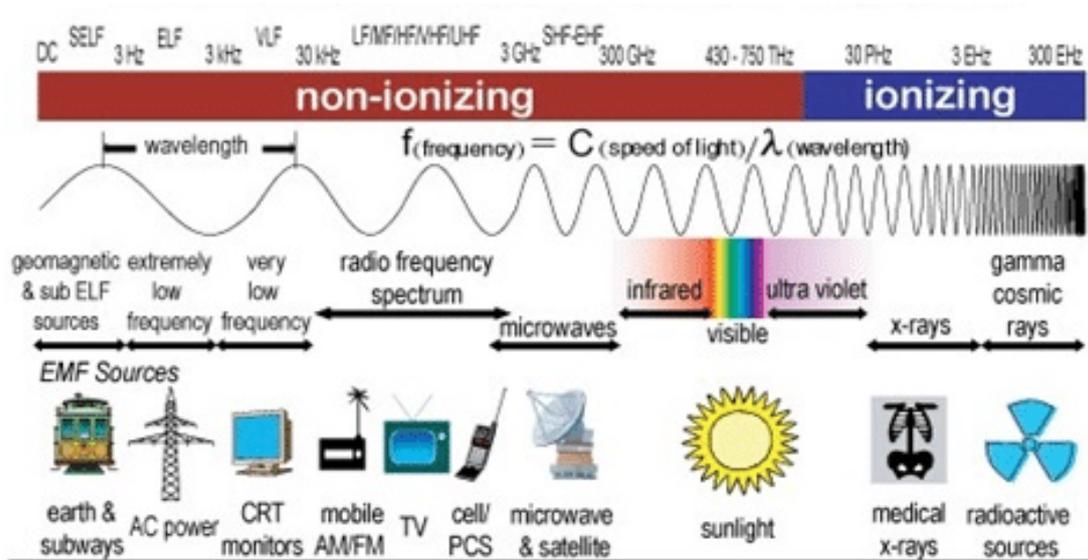


Fig 2:- Electromagnetic Spectrum

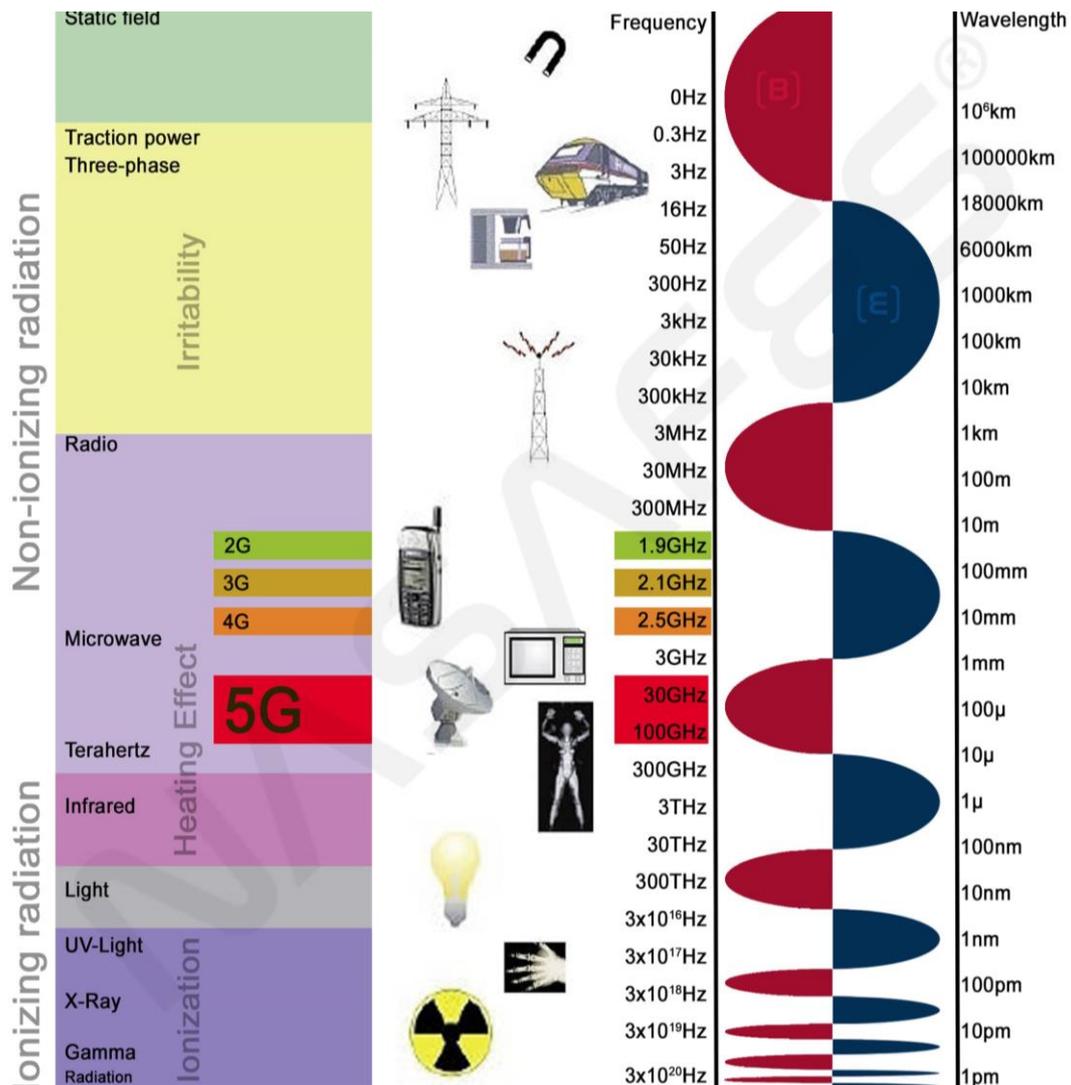


Fig 3:- 5G Frequency Overview (Nasafes)

The International Committee on the Protection of Non-Ionizing Radiation (ICNIRP), founded in 1992, issued recommendations [28] restricting sensitivity to time-varying electric, magnetic and electromagnetic fields to an appropriate degree to prevent adverse health impact. Many requirements are based on the research carried out by IEEE and other national and foreign committees [27]. The recommendations can be meaningless with particular individual characteristics as specific individuals may not feel the effects of non-ionizing EM radiation quite as frequently as some do. Nevertheless, long-term x-ray treatment that does not contribute to acute symptoms will also lead to chronic physiological consequences that may potentially trigger serious illness [23]. EM influences everybody; however, specific individuals are more sensitive, less robust, and thus more prone to health problems.

Our body is a mixture of various mechanisms that function concurrently and often interrelated. The human body comprises structures to be called, such as the muscular system, cardiovascular system, endocrine system, digestive system, nervous system, and some others. The nervous system functions as a coordinate centre controlling

processes inside the human body such that they can operate correctly [23]. The brain is an exceptional component of the nervous system and is so strong that it regulates specific processes within the human body. The so-called nerve fibre makes the system a very sophisticated system in the field of anatomy and physiology in support of the spine and also an extensive mesh network. From the point of view of electrical engineering, the nerve fiber network is suitable for transformation into electrical circuits to facilitate observation and analysis, and results can be logically linked to the actual situation [23].

The EM radiation will quickly enter a human body and thus disrupt the system's harmonious work within. The human body's propagating EM energy can cause currents and voltages that will communicate all over the body with APs. The association of disrupting currents and voltages with APs over a long exposure time will bring chaos or misunderstanding to the body's fragile electrical system, which is the nervous system [23], [27]. It may be the start of possible safety risks. Research ought to be done to measure the magnitude of the activity and whether it could jeopardize the harmonious distribution of signals through the human body.

➤ *General Public Exposure*

The International Committee for the Defense of Non-Ionizing Radiation (ICNIRP) has tracked EMF effects on the general public. The European Union, on the other side, has its rules under EU Directive (2013/35 / EU). The risk came in two parts: general disclosure to the media, and occupational exposure. EMF sensitivity cap rates are, therefore, specific in both groups. In transport, development, and distribution, the power frequency EMF is produced [29]. The frequency of alternating current and subsequent EMF in Africa is typically 50 Hz, most sections in Asia, Australia, and Europe. Many nations, including the Philippines and China, Japan, and Saudi Arabia, though, use a frequency of 60 Hz. The Council of the European Union issued a recommendation on exposure limitation, which includes essential restrictions on electrical fields and current, body absorption power, and EMF strength reference level [30]. Based on an empirical understanding of the causal impact of static fields on humans, acute penetration of the general population in no part of the body will reach 400mT [29].

➤ *Low Frequency*

In the electromagnetic spectrum, the minimum frequency varies from 1Hz to 100 kHz. Low-frequency fields have two major components: electrical forces attributable to electrical charging and a magnetic field connected to this. When humans are subjected to LF fields, they produce electrical fields and currents inside the human body and interact with our own electrical fields and currents that are linked to natural biological functions [29]. Potential long-term consequences of low-frequency fields have been documented over the past decades, and several epidemiological findings have indicated that there could be an elevated risk of childhood leukaemia when people are subjected to low-frequency fields over a long time. However, the formulation of the analysis is skewed, and existing medical research does not indicate that sensitivity to LF is a source of childhood leukaemia [29].

➤ *High Frequency*

High Frequency (HF) is part of an electromagnetic continuum that varies from 100 kHz to 300 GHz. High energy technology, such as handheld base station connectivity and satellite contact. HF damage primarily impacts humans by heating the body of the exposed tissue. HF fields have the ability to infiltrate our bodies and can trigger charged molecules to vibrate [29]. Even so, over a standard point (called a threshold), depending on the period of exposure, our body's temperature increase may cause severe health consequences such as heat stroke and tissue harm.

➤ *Electromagnetic Fields in the Environment*

We are all at risk of being subjected to electromagnetic fields every day because of the electromagnetic fields generated by natural and artificial sources. We cannot prevent being subjected to the electromagnetic field due to the production of goods produced by humans over the past century, which have a magnet and operate through electricity-generating EMF.

Once a child is raised, whether in a hospital or otherwise, he is exposed to the EMF from an early age [29]. Just until he is conceived, when he is in the womb of the mother, he is subjected to EMF as nowadays specific equipment that generated EMF is used to test the baby's condition many times. EMF is often created by the equipment used in the hospital, such as the X-ray machine and the ECG system, among other medical devices. Therefore, humans are at danger of EMF damage every day and anywhere. Cell phones, mobile poles, computing power transmission cables, radar contact poles, and so on are the common causes of EMF in our climate. And the natural atmosphere is packed with electric and magnetic fields. The penetration frequency of EMF can be higher or lower based on its source [29].

In fact, we are still subject to the electromagnetic fields every day from early morning till evening and throughout the night. Once we wake up, we have a range of electrical equipment such as a coffee maker, water kettle, electrical scissors, toothbrushes, microwave, and other technological gadgets that are used in everyday life. You're still subjected to EMF, depending on when you spend your time in your home [29]. When we leave our house to go to work or anywhere else, we're exposed to EMF that mobile phone that we're carrying for the most part. There are also the vehicles, busses, and trains that we use for travel, the power line that might be over us, the mobile towers, the railway lines, and even more EMF outlets we encounter in everyday life. Hospital patients can become exposed to electromagnetic fields. We have common EMF origins in our households, such as hair dryers, refrigerators, Wi-Fi routers, printers, tablets, tv, microwave ovens, electric heaters.

➤ *Overview of Corona Virus (COVID-19)*

Since 1960, the coronavirus strains are identified, which typically induce up to 15 per cent of severe colds in humans per year, mostly in moderate types. Earlier, two types of coronavirus triggered serious illnesses: severe acute respiratory syndrome (SARS) in 2002, with extreme acute respiratory symptoms culminating in 9.6% mortality; and the 2012 Middle East respiratory syndrome with a 34.4% higher mortality rate [1], [31]. The novel coronavirus (SARS coronavirus 2), the seventh coronavirus believed to infect humans, is a positive single-stranded RNA virus that possibly emerged in December 2019 in a seafood industry in Wuhan [2], [3]. Many million people globally have been infected by the coronavirus disease (COVID-19), identified by the World Health Organization, killing more than 600,000 of them. The pandemic COVID-19 coincided with the introduction and growth of the national 5G network [3].

The popular pneumonia phenomenon emerged in the South China seafood market in Wuhan, Hubei Province, China, in December 2019 [32]. The National Commission on Health sent experts to study Wuhan. A novel coronavirus (hereafter COVID-19 for CoronaVirus Disease 19) was discovered on Jan 7, 2020, at the Virology Laboratory, the Chinese Centre for Disease Control and

Prevention (The People's Republic of China 2020 State Council). The number of pneumonia virus patients has skyrocketed and distributed across China, and exported internationally unintended. All of Wuhan 's Outlets were briefly closed on Jan 23, 2020 [33], [34]. The daily estimates say that as of Jul 20, 2020, the reported global cases currently identified are at 14,644,360, with 608,911 fatalities. These figures would certainly have risen dramatically before this paper is released [33].

Coronaviruses are viruses that circulate in animals, some of which are also known to infect humans. Bats are deemed natural hosts of viruses, although it is also recognized that many other animal species serve as vectors [5]. E.g., the Middle East Respiratory Syndrome Coronavirus (MERS-CoV) is transmitted from camels to humans, and Severe Acute Respiratory Syndrome Coronavirus-1(SARS-CoV-1) is transmitted from civet cats to humans [6]. The novel coronavirus identified in China in 2019 is strongly genetically linked to SARS-CoV-1, which originated in China in late 2002. In eight months, this triggered more than 8,000 incidents in 33 countries, and around one-tenth of those who acquired SARS died [6]. While it is known that livestock is the root of the infection, the transmission is now from person to person. One human is expected to infect two or three. The virus is spread primarily by tiny droplets by sneezing, coughing, or when people have been communicating with each other nearby for some time, typically less than a meter. Such droplets may be inhaled, or they can fall on objects of which people can come into contact as they reach their nose, mouth, or eyes [6].

5G cellular services offer fast data speeds (i.e., gigabytes per second) relative to existing 4G networks, provide reduced latency, and improve base station efficiency and perceived coverage consistency [7]. It technology's success grew thanks to the boom of smart electronic devices and the need for portable entertainment, which has generated a strain on traditional networks. A main advantage of 5G is that some of the existing concerns with wireless networks such as low data speeds, power, service quality, and latency should be overcome [7]. Though there is no conclusive evidence, it is proposed that technology impacts wellbeing adversely on different social networking platforms [3], [35]. Many social network users referred to 5G as the catalyst of COVID-19 or to boost the propagation in the first week of January. The subject was a hot topic and was apparent to all Twitter users around the UK. Many images and news stories have also been posted through social media, tying the two together. The plot was of such a significant sort that, according to the British Broadcasting Corporation, 5G masts were torched in Birmingham and Merseyside, the United Kingdom over fears connected with this system and the transmission of the disease [3].

IV. CONCLUSION

This research works on examining electromagnetic field penetration and its human impacts. The bulk of this article is the product of analyzing numerous articles and accounts from different newspapers and organizations. This article deals with the direct and indirect impact caused by EMF. A lot of reports by checked authority and definition of some person and organization have been analyzed in detail to accomplish this article. Their observations and results of those reports were analyzed and compared. The frequency depends on the influence of an electromagnetic field. Long-term electromagnetic field exposure to higher frequencies can have some consequences, such as increased body temperature and tissue damage, whereas long-term low-frequency exposure can cause anxiety headaches. As a result, EMF's general consumption has no harmful impact on humans, but ads may have inevitable health consequences over a prolonged period of time. Many adverse health consequences have been researched for the possible impact of extremely low frequency (ELF) that may influence depression of childhood leukaemia and cancer as well as a human developmental disorder. The final finding is skewed, and yet it's in a controversy over whether the EMF exposer is harmful to health. This research investigated both the direct and indirect effects of EMF exposure and the control thereof. They can use this report for a specific reason. This report stated the degree of limit thresholds and their impact on different frequencies. This article will help people understand the extent of sensitivity from various sources to the electrical and magnetic fields.

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