

RESEARCH ARTICLE

Bio-effects of 5th generation electromagnetic waves on organs of human beings

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ARTICLE INFO

Article history:

Received 8 October 2023

Received in revised form 30 October 2023

Accepted 24 November 2023

Available online 28 November 2023

Keywords:

Fifth generation
 Electromagnetic waves
 Mobile phone towers
 Bio-effects
 Human beings tissues
 Organs

ABSTRACT

Objectives: The uses of devices of electromagnetic waves (EMWs) are increasing day by day. Similarly, the generation of the waves is increasing. The frequency spectrum of the generation of waves is also increased. In this manuscript, an analysis of the high frequency EMWs has been made by the electric fields generated due to the exposure of 5th generation (5 G) of mobile phones.

Methods: Due to the emission of waves from the towers, the electric field is generated around the transmission tower of mobile phones. The electric fields are computed by the power of the transmission tower. The electric fields across the biological tissues/cells are also computed when the EMWs penetrate inside the body. The electric fields are made across the organs of different depths inside the body.

Results: The induced electric fields inside the organs of the human beings are responsible for the absorption of energy from high frequency EMWs. The absorbed amount of energy from high frequency waves may become the cause of harmful effects on the life of organs of human beings.

Conclusion: In this manuscript, after analysis of the computed electric fields inside the organs of human beings, it is concluded that the EMWs of 5 G spectrum of mobile phone towers may more harmful for the life of organs as 4th generation (4 G) spectrum of mobile phone waves. The energy absorption by the 4 G spectrum is lower than 5 G spectrum due to the range of frequency of waves. The effects on the pancreas, retina, skin, intestine, spleen, stomach and uterus are more than low water content organs like nails, bone, teeth etc.

1. Introduction

Today, people are living under the umbrella of high-frequency electromagnetic fields. Every person has a mobile phone which is operated by the mobile phone companies. In general, each family carry three to four mobile phones in their house. The mobile phone companies are using 800–2 450 MHz electromagnetic waves (EMWs) in the 4th generation (4 G). Earlier people were live in a natural electromagnetic field as the fields are generated by earth, sunlight, lightning etc. The people were facing natural EMWs. Our body is habitual to these types of natural EMWs or we can say that these types of fields become the requirement of our body.¹

Now the number of mobile phone users is increasing continuously. For better services, the mobile phone companies are increasing the intensities of the signals. The frequencies of the signals are also increasing.² For better communication, the mobile phone companies are installing transmission towers in every colony of the city. The transmission towers radiate the non-ionizing high-frequency EMWs of various

frequencies. These waves have components of electric and magnetic fields.^{3,4}

Many times the mobile phone towers are situated near the thickly populated area. The waves which are transmitted from the towers are incident on the body of people living nearby, the body of animals and on the trees near the towers.⁵ When EMWs incident in the bodies of human beings, animals and trees, it penetrates inside the body. The photons which are available in the waves are absorbed by the tissues/cells of the bodies.^{6–8} The energy of the photons is absorbed by the biological tissues. The frequencies of the waves are varied concerning the various mobile phone companies. People are using android phones for more functions of the phones. The generation of mobile phone signals is increasing continuously. The spectrums which are used by the companies are near 800 MHz, 900 MHz, 1 800 MHz and 2.45 GHz.⁹ In the previous generation, the frequencies of the spectrum are less than 800 MHz.^{10,11} As the frequencies of the signal are increased, the energy of the photons is increased. When these photons are incident with the biological tissues, more energy will be absorbed by the tissues. If the energy ab-

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sorbed by the tissues is under the safe limit, it will not be harmful to the life of tissues/cells.^{12–14}

If the energy of the incident photon becomes greater than the safe limit, it becomes harmful to the life of tissues/cells of the biological body. The safe limit of the energy absorption is given by many international agencies like the International Council of Non-Ionizing Radiation Protection (ICNIRP),⁹ and World Health Organisation (WHO) etc. The high-frequency EMWs are emitted from the transmission towers of mobile phones, radios and other broadcasting devices.^{15–17} The collaboration of EMWs with the tissues of human beings may be harmful. During the interaction of waves with the tissues, the natural tissues and cells of humans/living beings are influenced. Tissue and cellular outcomes may likewise additionally affect organ functions. When EMWs are penetrated inside the body, they produce a potential difference across the tissues and cells.^{18–20} This potential difference depends upon the size of the cells and the frequency of the incident waves. The electric field is also induced around the cells/tissues. The induced electric field is responsible for the absorption of energy of the photon from the radiation.^{21,22} In this manuscript, possible health impacts of EMWs/radiation on living creatures are concentrated. As the recurrence of the waves is expanded, their frequencies are decreased. Nowadays, we are living in an era of different attractive fields.²³

Electromagnetic fields are also radiated from the microwave, sandwich toaster oven machine, clothes washer, electric iron, fan, electric switch, electric ginger, electric steer, electric fridge, room warmer, air-condition, blower, electric cooler, TV, cell phone, PC, PC screen, etc. The recurrence of EMWs is diverse as the wellsprings of waves are unique. If the recurrence of waves is expanded, the frequency of waves will be diminished.²⁴ The sorts of waves with various frequencies and frequencies are radio waves, microwaves, infrared beams, electromagnetic radiation, ultraviolet rays, X-ray and gamma beams.²⁰

The radiations from cells and specialized verbal strategies have shown destroying outcomes on the human body as of late. WHO and International Agencies for Research on Cancer announced explicitly for electromagnetic fields discharged by personal digital assistants are “perhaps cancer-causing to people” in a few conditions.²¹ In any case, there is no significant relationship between coordinating with top radiation and vegetation. Notwithstanding, there are rising worries about the effect of different untamed life tops, with three reviews embraced in India showing that awful radiation may have awful results.^{7,14,20} Mobile phones usually alluded to as “pocket telephones” or “telephones”, have become a vital part of present-day life.²² Mobile phones have become more normal, and baser station radio wires have been put on posts and designs. In the 900–1 800 MHz range, Global System for Mobile Communications base stations radiate electromagnetic fields at too high frequencies, length controlled at low frequencies.¹⁸ There has, as of late, been developing public consideration and good examination into the bunch of ways that non-warm openness to low electromagnetic fields may modify an individual’s wellbeing, riches, and conduct.¹⁵

2. Material and methods

2.1. Study design

This study is designed in such a way that the authors calculated the electric field around the transmission towers. It is considered that the transmission tower is a point source. The wave fronts of the EMWs which are transmitted from the transmission towers are spherical.

The external electric fields are obtained around the transmission tower at various distances from the tower. When the transmitted electric field around the transmission tower is penetrated inside the organs of the human beings, the electric fields are induced around the organs. Pancreas, Prostrate, retina, skin, intestine, spleen, stomach, tendon, testis, thymus, thyroid, tongue, tooth, those organs are affected by the induced electric fields. The calculations of electric fields are made by the Maxwell’s equations.

As it is a theoretical study, and the electric fields are calculated near the transmission tower. No instrument or experimental kit is used to determine the electric fields around the 5th generation (5 G) transmission tower and penetrated electric field inside the organs.

2.2. Ethics concern

This study totally depends upon the calculation of electric field around the transmission tower and also inside the tissues of human beings. The computed electric fields are compared with the International safety guidelines. The direct data is not taken from anywhere or any restricted website. Therefore, there are no ethical issues and other conflicts of interest.

2.3. Measurements

The calculation made around the 5 G mobile phone transmission tower. In this arranged work, electric fields around the 5 G transmission towers of cell phones that broadcast the non-ionizing EMWs are discussed. As indicated by Huawei information on RRU/BBU, a single 5 G base station has power consumption of maximum to 11 577 W, while 3 G and 4 G need exclusively 4 808 W and 6 877 W, individually.²⁵

The electric field around the 5 G mobile phone tower is given by:

$$P/4\pi r^2 = 0.5\epsilon_0 E^2 c$$

Where P is the power of 5 G mobile phone towers, ϵ_0 is the permittivity of free space, and E represents the electric field generated around the tower.

In this work, the authors calculated the electric fields around the transmission towers at various distances from the source of 5 G. When the waves incident on the body of a person, it’s penetrated inside the body. The waves affect to the organs of the person. The electric field around 5 G mobile phone tower is given by:

$$E_0 = 9.487 \sqrt{\frac{P}{r}}$$

Where r represents the distance of the observer from the mobile phone tower.

When the EMWs from the 5 G transmission tower are incident on the human beings, the electric fields are initiated inside the natural tissues. The entered electric field becomes the reason for energy ingestion by the tissues. When the EMWs penetrate inside the tissues of human beings, the penetrated electric field at depth z becomes:

$$E_z = E_0 e^{(-z/\delta)}$$

Where z is the penetration depth inside the tissues and δ is the skin depth of the tissues. E_0 represents the external electric field around the 5 G mobile phone tower.

Table 1

Electric field and percentage change around the 5 G mobile phone tower with respect to distance.

Distance from tower (m)	E_0 (V/m)	E_0 change (%)
1	1 020.80	NA
10	102.08	90.0
20	51.04	95.0
30	34.02	96.6
40	25.52	97.5
50	20.41	98.0
60	17.01	98.3
70	14.58	98.5
80	12.80	98.7
90	11.34	98.8
100	10.20	99.0

E_0 : electric field, NA: not applicable.

Table 2

Electric field inside the tissues of the human body at 1 m away from the 5 G mobile phone tower due to frequency of 3 GHz from 1–5 mm inside the body.

Human tissue	E ₀ (V/m)	Penetrated E ₀ inside the body at depth (V/m)					E ₀ change at 5 mm inside depth (%)
		1 mm	2 mm	3 mm	4 mm	5 mm	
Pancreas	1 020.800	1 018.100	1 015.408	1 012.723	1 010.040	1 007.373	1.315
Prostate	1 020.800	1 018.175	1 015.558	1 012.947	1 010.340	1 007.745	1.279
Retina	1 020.800	1 018.054	1 015.316	1 012.585	1 009.860	1 007.145	1.338
Skin dry	1 020.800	1 020.368	1 019.937	1 019.506	1 019.070	1 018.644	0.211
Skin wet	1 020.800	1 019.211	1 017.625	1 016.041	1 014.460	1 012.881	0.776
Small intestine	1 020.800	1 017.527	1 014.264	1 011.012	1 007.770	1 004.538	1.593
Spinal cord	1 020.800	1 019.595	1 018.392	1 017.190	1 015.990	1 014.791	0.589
Spleen	1 020.800	1 019.367	1 017.935	1 016.506	1 015.080	1 013.653	0.700
Stomach	1 020.800	1 018.172	1 015.550	1 012.935	1 010.330	1 007.726	1.281
Tendon	1 020.800	1 018.651	1 016.506	1 014.366	1 012.230	1 010.100	1.048
Testis	1 020.800	1 018.175	1 015.558	1 012.947	1 010.340	1 007.745	1.279
Thymus	1 020.800	1 018.100	1 015.408	1 012.723	1 010.040	1 007.373	1.315
Thyroid	1 020.800	1 018.100	1 015.408	1 012.723	1 010.040	1 007.373	1.315
Tongue	1 020.800	1 018.618	1 016.440	1 014.267	1 012.100	1 009.936	1.064
Tooth	1 020.800	1 020.293	1 019.786	1 019.279	1 018.770	1 018.266	0.248
Trachea	1 020.800	1 018.716	1 016.636	1 014.560	1 012.490	1 010.421	1.017
Uterus	1 020.800	1 018.298	1 015.803	1 013.313	1 010.830	1 008.353	1.219
Vitreous humour	1 020.800	1 016.522	1 012.262	1 008.019	1 003.790	999.588	2.078

E₀: electric field.

Table 3

Electric field inside the tissues of the human body at 10 m away from 5 G mobile phone tower due to frequency of 3 GHz from 1–5 mm inside the body.

Human tissue	E ₀ (V/m)	Penetrated E ₀ inside the body at depth (V/m)					E ₀ change at 5 mm inside depth (%)
		1 mm	2 mm	3 mm	4 mm	5 mm	
Pancreas	102.080	101.810	101.541	101.272	101.004	100.737	1.315
Prostate	102.080	101.818	101.556	101.295	101.034	100.775	1.279
Retina	102.080	101.805	101.532	101.259	100.986	100.715	1.338
Skin dry	102.080	102.037	101.994	101.951	101.907	101.864	0.211
Skin wet	102.080	101.921	101.763	101.604	101.446	101.288	0.776
Small intestine	102.080	101.753	101.426	101.101	100.777	100.454	1.593
Spinal cord	102.080	101.960	101.839	101.719	101.599	101.479	0.589
Spleen	102.080	101.937	101.794	101.651	101.508	101.365	0.700
Stomach	102.080	101.817	101.555	101.294	101.033	100.773	1.281
Tendon	102.080	101.865	101.651	101.437	101.223	101.010	1.048
Testis	102.080	101.818	101.556	101.295	101.034	100.775	1.279
Thymus	102.080	101.810	101.541	101.272	101.004	100.737	1.315
Thyroid	102.080	101.810	101.541	101.272	101.004	100.737	1.315
Tongue	102.080	101.862	101.644	101.427	101.210	100.994	1.064
Tooth	102.080	102.029	101.979	101.928	101.877	101.827	0.248
Trachea	102.080	101.872	101.664	101.456	101.249	101.042	1.017
Uterus	102.080	101.830	101.580	101.331	101.083	100.835	1.219
Vitreous humor	102.080	101.652	101.226	100.802	100.379	99.959	2.078

E₀: electric field.

3. Results and discussion

Table 1 represents the electric fields around 5 G mobile phone transmission tower which represents that the value of the electric field is very high near the tower. The electric field is continuously decreasing as the distance from the tower increases. It is also observed that the percentage change in electric field is very large near the tower, and it's decreased as the distance from the tower is increased. The percentage change in electric field means when a person moves from the mobile phone tower, how the electric field is varied. In this manuscript, the percentage changes in electric fields after every 10 m distance from the tower are observed.

Table 2 represents the electric field around the transmission tower at 1 m distance and the variation of the electric field. It is analysed that the intensity of the electric field is maximum at a 1 m distance from the tower. Table 2 represents that if the same amount of electric field 1 020.8 V/m incidents on the body, it's become different for tissues inside the body. It is observed that the electric field in some tissues varies from 0.2% to 2%. In this manuscript, the effects of EMWs on some selected organs are made. The main tissues of human beings like the pancreas, prostate, retina, skin dry, skin wet, small intestine, spinal

cord, spleen, stomach, tendon, testis, thymus, thyroid, tongue, tooth, trachea, uterus and virtuous humour are selected for this study.

Electric fields inside the above given selected organs of the human beings due to frequency of 3 GHz at 1–5 mm depth inside the body, are given in Table 3, when any person is at 10 m away from the mobile phone tower. It is observed that when EMWs penetrate inside the tissues from the surface to 5 mm depth inside the body, the minimum change in of the electric field is in spleen tissue. This change represents that the effect due to the penetration of electric field will be minimum. It represents that the maximum change is observed in retina tissue, which representing that retina will be at higher risk during the penetration of EMWs inside the body.

Table 4 shows the electric field inside the tissues of the human body at 20 m around the 5 G mobile phone tower. The maximum and minimum change in electric fields in the vitreous humour and dry skin tissues are observed. The values of electric fields are different for every organ of the human beings. It represents the variation in the electric field at a 20 m distance from the transmission tower. It is observed that the electric field remains maximum in high water content organs and remains minimum in low water content organs. The intensity of

Table 4

Electric field inside the tissues of the human body at 20 m away from 5 G mobile phone tower due to frequency of 3 GHz from 1–5 mm inside the body.

Human tissue	E_0 (V/m)	Penetrated E_0 inside the body at depth (V/m)					E_0 change at 5 mm inside depth (%)
		1 mm	2 mm	3 mm	4 mm	5 mm	
Pancreas	51.040	50.905	50.770	50.636	50.502	50.369	1.315
Prostate	51.040	50.909	50.778	50.647	50.517	50.387	1.279
Retina	51.040	50.903	50.766	50.629	50.493	50.357	1.338
Skin Dry	51.040	51.018	50.997	50.975	50.954	50.932	0.211
Skin wet	51.040	50.961	50.881	50.802	50.723	50.644	0.776
Small intestine	51.040	50.876	50.713	50.551	50.388	50.227	1.593
Spinal cord	51.040	50.980	50.920	50.860	50.800	50.740	0.589
Spleen	51.040	50.968	50.897	50.825	50.754	50.683	0.700
Stomach	51.040	50.909	50.778	50.647	50.516	50.386	1.281
Tendon	51.040	50.933	50.825	50.718	50.612	50.505	1.048
Testis	51.040	50.909	50.778	50.647	50.517	50.387	1.279
Thymus	51.040	50.905	50.770	50.636	50.502	50.369	1.315
Thyroid	51.040	50.905	50.770	50.636	50.502	50.369	1.315
Tongue	51.040	50.931	50.822	50.713	50.605	50.497	1.064
Tooth	51.040	51.015	50.989	50.964	50.939	50.913	0.248
Trachea	51.040	50.936	50.831	50.728	50.624	50.521	1.017
Uterus	51.040	50.915	50.790	50.666	50.542	50.418	1.219
Vitreous humour	51.040	50.826	50.613	50.401	50.190	49.979	2.078

E_0 : electric field.

Table 5

Electric field inside the tissues of the human body at 30 m away from the transmission tower due to frequency of 3 GHz from 1–5 mm inside the body.

Human tissue	E_0 (V/m)	Penetrated E_0 inside the body at depth (V/m)					E_0 change at 5 mm inside depth (%)
		1 mm	2 mm	3 mm	4 mm	5 mm	
Pancreas	34.020	33.930	33.840	33.751	33.662	33.573	1.315
Prostate	34.020	33.933	33.845	33.758	33.672	33.585	1.279
Retina	34.020	33.928	33.837	33.746	33.655	33.565	1.338
Skin dry	34.020	34.006	33.991	33.977	33.963	33.948	0.211
Skin wet	34.020	33.967	33.914	33.861	33.809	33.756	0.776
Small intestine	34.020	33.911	33.802	33.694	33.586	33.478	1.593
Spinal cord	34.020	33.980	33.940	33.900	33.860	33.820	0.589
Spleen	34.020	33.972	33.925	33.877	33.829	33.782	0.700
Stomach	34.020	33.932	33.845	33.758	33.671	33.584	1.281
Tendon	34.020	33.948	33.877	33.806	33.734	33.663	1.048
Testis	34.020	33.933	33.845	33.758	33.672	33.585	1.279
Thymus	34.020	33.930	33.840	33.751	33.662	33.573	1.315
Thyroid	34.020	33.930	33.840	33.751	33.662	33.573	1.315
Tongue	34.020	33.947	33.875	33.802	33.730	33.658	1.064
Tooth	34.020	34.003	33.986	33.969	33.952	33.936	0.248
Trachea	34.020	33.951	33.881	33.812	33.743	33.674	1.017
Uterus	34.020	33.937	33.853	33.771	33.688	33.605	1.219
Vitreous humor	34.020	33.877	33.735	33.594	33.453	33.313	2.078

E_0 : electric field.

Table 6

Electric field inside the tissues of the human body at 40 m away from the transmission tower due to frequency of 3 GHz from 1–5 mm inside the body.

Human tissue	E_0 (V/m)	Penetrated E_0 inside the body at depth (V/m)					E_0 change at 5 mm inside depth (%)
		1 mm	2 mm	3 mm	4 mm	5 mm	
Pancreas	25.520	25.453	25.385	25.318	25.251	25.184	1.315
Prostate	25.520	25.454	25.389	25.324	25.259	25.194	1.279
Retina	25.520	25.451	25.383	25.315	25.247	25.179	1.338
Skin dry	25.520	25.509	25.498	25.488	25.477	25.466	0.211
Skin wet	25.520	25.480	25.441	25.401	25.362	25.322	0.776
Small intestine	25.520	25.438	25.357	25.275	25.194	25.113	1.593
Spinal cord	25.520	25.490	25.460	25.430	25.400	25.370	0.589
Spleen	25.520	25.484	25.448	25.413	25.377	25.341	0.700
Stomach	25.520	25.454	25.389	25.323	25.258	25.193	1.281
Tendon	25.520	25.466	25.413	25.359	25.306	25.253	1.048
Testis	25.520	25.454	25.389	25.324	25.259	25.194	1.279
Thymus	25.520	25.453	25.385	25.318	25.251	25.184	1.315
Thyroid	25.520	25.453	25.385	25.318	25.251	25.184	1.315
Tongue	25.520	25.465	25.411	25.357	25.303	25.248	1.064
Tooth	25.520	25.507	25.495	25.482	25.469	25.457	0.248
Trachea	25.520	25.468	25.416	25.364	25.312	25.261	1.017
Uterus	25.520	25.457	25.395	25.333	25.271	25.209	1.219
Vitreous humor	25.520	25.413	25.307	25.200	25.095	24.990	2.078

E_0 : electric field.

Table 7

Electric field inside the tissues of the human body at 50 m away from the transmission tower due to frequency of 3 GHz from 1–5 mm inside the body.

Human tissue	E_0 (V/m)	Penetrated E_0 inside the body at depth (V/m)					E_0 change at 5 mm inside depth (%)
		1 mm	2 mm	3 mm	4 mm	5 mm	
Pancreas	20.410	20.356	20.302	20.249	20.195	20.142	1.315
Prostate	20.410	20.357	20.305	20.253	20.201	20.149	1.279
Retina	20.410	20.355	20.300	20.246	20.191	20.137	1.338
Skin dry	20.410	20.401	20.393	20.384	20.376	20.367	0.211
Skin wet	20.410	20.378	20.347	20.315	20.283	20.252	0.776
Small intestine	20.410	20.344	20.279	20.214	20.150	20.085	1.593
Spinal cord	20.410	20.386	20.362	20.338	20.314	20.290	0.589
Spleen	20.410	20.381	20.353	20.324	20.296	20.267	0.700
Stomach	20.410	20.358	20.305	20.253	20.201	20.149	1.281
Tendon	20.410	20.367	20.324	20.281	20.239	20.196	1.048
Testis	20.410	20.358	20.305	20.253	20.201	20.149	1.279
Thymus	20.410	20.356	20.302	20.249	20.195	20.142	1.315
Thyroid	20.410	20.356	20.302	20.249	20.195	20.142	1.315
Tongue	20.410	20.366	20.323	20.279	20.236	20.193	1.064
Tooth	20.410	20.400	20.390	20.380	20.370	20.359	0.248
Trachea	20.410	20.368	20.327	20.285	20.244	20.202	1.017
Uterus	20.410	20.360	20.310	20.260	20.211	20.161	1.219
Vitreous humour	20.410	20.325	20.239	20.154	20.070	19.986	2.078

E₀: electric field.

the electric field is minimum in vitreous humour tissue while becomes maximum for retina tissue in the eye and tooth tissue in the mouth.

Table 5 reveals the electric field inside the biological organs when humans are present at 30 m distance from the tower. The electric field are varied for every organ as each tissue's conductivity, and density is different. It shows the variation of the electric field inside the selected organs when EMWs are penetrated inside the body. The electric fields in tissues have also become different at different depths inside the body. The induction of electric field inside the tissue depends upon the skin depth of the tissues.

Table 6 shows the intensities of the electric field inside the above-selected organs at a 40 m distance around the mobile phone transmission towers. The electric fields are continuously decreasing as the waves are penetrated inside the body. It reveals the variation of the electric field in selected tissues.

Table 7 represents the electric field inside the selected organs at a 50 m distance from the transmission tower. It is observed that the variations in electric fields are the same as the other distance from the tower. The maximum and minimum changes in electric fields are in the vitreous humour and tooth tissues, respectively. From Table 2 to Table 7, it is observed that the natures of generation of the electric field in tissues are the same at all distances from the mobile phone towers. It is also observed that the electric field remains more in tissues with a greater depth of penetration. Skin dryness and tooth have a higher depth of penetration. Thus the electric field induction becomes more in these organs.

4. Conclusion

From the above discussion and analysis, it is concluded that the effects of 5 G EMWs on the organs of human beings are possible as the frequency of these waves are very high. These photons of these waves will directly transfer their energy into organs of the human beings. The effects of EMWs are more near the 5 G mobile phone towers as the induction of electric fields are more. The energy absorption by the highly water content organs like pancreas, prostate, retina, skin wet, small intestine, Spinal Cord, Spleen, Stomach, tendon, testis, thymus, thyroid, tongue, are more. These types of organs are affected more by the 5 G waves of mobile phones. The energy absorption by the low water content organs like skin dry, tooth, trachea, uterus and virtuous humour are low and affected less by the 5 G EMWs. The energy absorption by the organs may become the cause of cancer, childhood leukaemia, brain tumour, headache, hypertension, adult leukaemia, and adult brain tumour etc. This work on the possible health effects of 5 G EMWs is an

important factor in bio-electromagnetic research. Thus it is concluded that 5 G EMWs of mobile phones will produce more harmful effects on the health of organs of human beings than 4 G waves. It is suggested that the people should keep away from the 5 G mobile tower and the towers should install away from the thickly populated areas of the society.

Ethical approval and consent to participate

This study totally depends upon the calculation of electric field around the transmission tower and also inside the tissues of living beings. The computed electric fields are compared with the International safety guidelines like WHO, ICNIRP etc. The direct data is not taken from anywhere or any restricted website. Therefore, there are no ethical issues and other conflicts of interest. In this manuscript, no experiment has done on the human beings. The electric fields have been calculated around the 5 G transmission tower and inside some selected organs of the body. So, there is no need of experimental procedure.

CRedit authorship contribution statement

Amit Verma: Resources, Conceptualization, Methodology, Software, Data curation. **Vijay Kumar:** Visualization, Project administration, Supervision, Writing – original draft. **Shipra Gupta:** Investigation, Software, Validation, Formal analysis, Writing – review & editing.

Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

We thank Graphic Era Hill University, Dehradun (Uttarakhand), India, for their constant support and guidance.

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