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Cell Phone Tower Radiations And Associated Health Hazards In Hilla City, Babylon, Iraq

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ABSTRACT

Background: The obvious increase in mobile phone base stations in Iraq after the year 2003 has raised worries about potential nonspecific health symptoms affected by electromagnetic radiation produced. Studies on this issue in Iraq were scarce. **Objective of the study:** To identify the possible nonspecific health problems among adult inhabitants who lived for five years or more at a distance of up to 300 meters from mobile phone base stations and towers compared to those who lived far away from cell phone towers (500 meters and more). **Methods:** A cross-sectional descriptive study was conducted in Hilla city, Babylon province, during the period from November 2017 through February 2018. A non-probability (purposive sample) was selected from populations living in AL-Hilla urban regions for more than five years close to four randomly selected base station towers and those who lived in areas more than 500 meters from the same cell towers. A convenience sample constituted 278 adults aged 18 years and above of both sexes who were investigated after obtaining their verbal consent and who had completed a pretested questionnaire that focused on the subjective symptoms they suffered from via in-depth face-to-face interviews. **Results:** The findings of the current study revealed a statistically significant increase in ill-health effects (prevalence of nonspecific symptoms) <0.05 among those living in the locality <300 meters from mobile telephone base stations compared to those who lived far away from the mobile phone stations >500 meters. The strongest associations (<0.01) were fatigue, headache, sleeping disorders, difficulty in concentration, and dizziness. The male-to-female ratio in this study was 1.5:1. The social problems related to this health issue included that only one in five of the participants mentioned that they were informed before setting the stations near their houses, and 75% of inhabitants near the stations reported conflicts with the owner of the building where the cell phone tower was placed. **Conclusion:** The study found significant health-related nonspecific symptoms (headache, fatigue, and sleep disturbance) among adults living close to mobile telephone base stations compared to those who lived far away. It is sensible that mobile telephone base stations be located at least 500 meters from the houses of inhabitants.

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Introduction

The electromagnetic spectrum includes the following: radio waves, microwaves, infrared rays, light rays, ultraviolet rays, X-rays, and gamma rays (Verbeek et al., 2025). Health outcomes of electromagnetic fields from mobile phone base stations are of very high concern (Durusoy et al., 2017). During the last two decades, there has been a great debate and concern about possible health effects related to exposure to radio frequency from cell phone base stations (Ali et al., 2017). A local study conducted in Al Hilla city, Babylon governorate, during the year 2016 found the density of non-ionizing radiation to be higher in Hilla city center compared to the periphery of the city due to an increase in the number of cell phone base stations and towers (Lin, 2025).

Epidemiological studies explored the link between living in the vicinity of base stations and neurobehavioral effects; the findings of these studies identified a significantly high prevalence of non-specific adverse symptoms when living in proximity to mobile phone stations (Khurana et al., 2010). Further evidence showed the association between exposure to this type of non-ionizing radiation and low cognitive performance (Malek et al., 2015). There is evidence that residents living near mobile telephone base stations are at risk for increasing non-specific well-being symptoms, and there is an indication that RF-EMF from mobile locations can influence leukocytes, showing genetic stress and possibly affecting well-being and increasing non-specific symptoms among exposed people living close to the source. A man and woman developed microwave syndrome symptoms (e.g., neurological symptoms, tinnitus, fatigue, insomnia, emotional distress, skin disorders, and blood pressure variability) after a 5G base station was installed on the roof above their apartment (Alazawi, 2011).

Exposure to heat stress due to the effects of non-ionizing radiation could increase oxidative and metabolic stress (Nilsson & Hardell, 2023). The implementation of new technologies such as cell phone base stations should be accompanied by an assessment of the actual threats posed by their use (Laldinpuii et al., 2026). A recent local study demonstrated that males who resided close to the mobile telephone base station are far more susceptible to anxiety (Samimi et al., 2021), mood swings, and sleep disorders (Khorseva & Grigoriev, 2023).

Studies on the epidemiological evidence of health effects of radiation from cell phone base stations in Iraq are scarce (Ibrahim et al., 2023). This study is carried out to shed light on the non-specific unwanted health disorders among people living in the neighborhood of mobile phone base stations compared to those living at distances greater than 500 meters from the base stations and their towers.

Methodology: The current study was conducted in Hilla City, the center of Babylon governorate. This was a cross-sectional descriptive study conducted during the period from November 2017 through February 2018. The non-probability convenience sample was selected from residents living in AL-Hilla city areas for more than five years, close to the four randomly selected base stations, and a non-exposed group who lived in areas more than 500 meters from the stations. Four sub-districts near mobile phone base stations were selected by simple random technique. It was decided to select 300 adults from the four sub-districts, but only 278 subjects of both genders responded (response rate = 92.6%). Interviews were conducted after obtaining the verbal consent of the participants enrolled in this study. The questionnaire was adopted from standard questionnaires from other studies (Frank et al., 2025; Röösli et al., 2021; Nakagawa et al., 2017; Frank, 2021; de Vocht & Röösli, 2025; Gómez-Perretta et al., 2013; Hassoy et al., 2013), which included a demographic information domain (general questions pertaining to age, sex, occupation, marital status, level of education, and estimated distances from base stations: less than 300 meters or more than 500 meters). The contact conditions of participants were defined by the duration of time lived in the area of base stations (fewer than 5 years or more than 5 years).

The information included in the questionnaire also focused on symptoms such as headaches, fatigue, sleep disturbances, irritability, feelings of discomfort, loss of appetite, nausea, difficulties in concentration, memory loss, visual disturbances, hearing disturbances, and dizziness, as well as other symptoms they suffered from. The questionnaire was adopted from a review of the scientifically valid available literature.

Exclusion criteria

This study did not include participants with a history of blood illness, asthma, seizures, cancer, or tobacco use. Removed from the study were known instances of anxiety, eyesight issues, attention deficit disorder, skeletal muscle diseases, physical handicap, sedative use, and a history of sleep disturbances (Benito-León et al., 2023; Elatfy et al., 2024). Data were analyzed using SPSS Version 23. A p value < 0.05 was considered statistically significant.

Results

Table 1 reveals the variances in the occurrence of nonspecific manifestations among the exposed and non-exposed groups. Individuals who live near mobile towers, within less than 300 meters, have a higher and more significant frequency of health manifestations such as insomnia, dizziness, headache, and transient loss of memory ($p < 0.05$).

Discussion

Mobile station towers produce electromagnetic wave radiation having health impacts that can be partitioned into

Figure (1) distribution of the study sample by sex

Figure 1 shows that males are predominant, and the male to female ratio is 1.5:1.

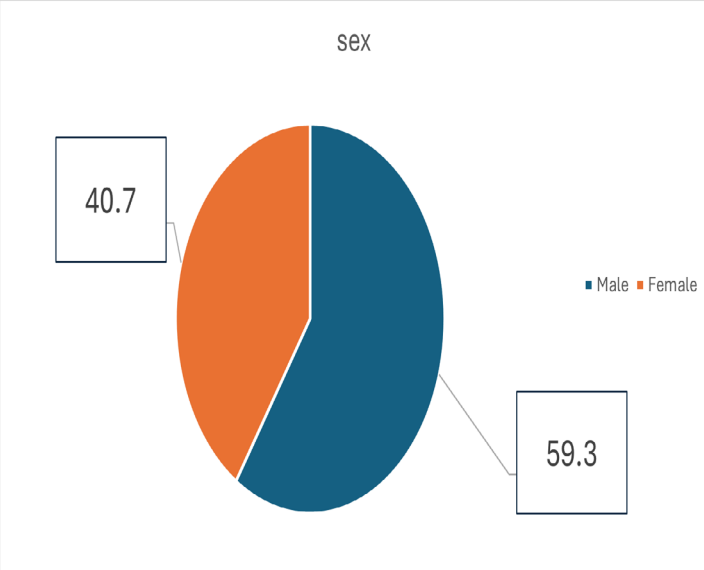

Figure (2) distribution of participants according to the state of conflict and fights with the building or house owner who accept to put the cell phone tower on the roof of his house.

Figure 2 reveals that one quarter of participants enrolled in fights with those who accept to put the tower in their building.

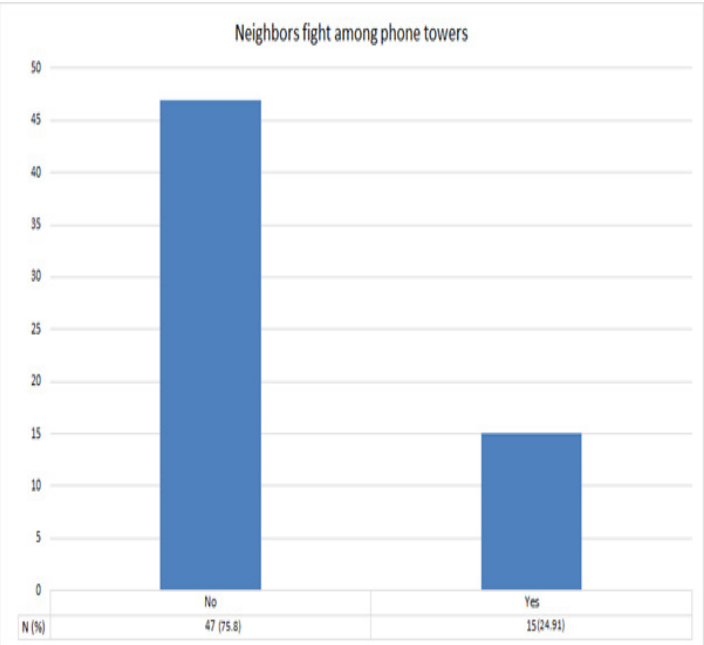

Figure (3) distribution of cell phone towers according to their proximity to schools and kindergartens.

Figure -3-explains that about half of the cell phone base stations are located near schools and kindergartens.

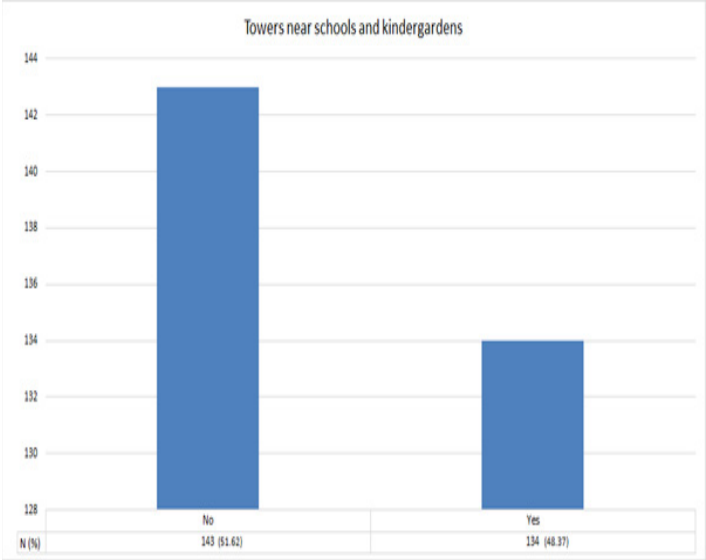

Figure (4) distribution of participants according to their fear status from the health effects of radiation.

Figure 4 shows that the majority of participants have feelings of fear regarding the side effects of base stations.

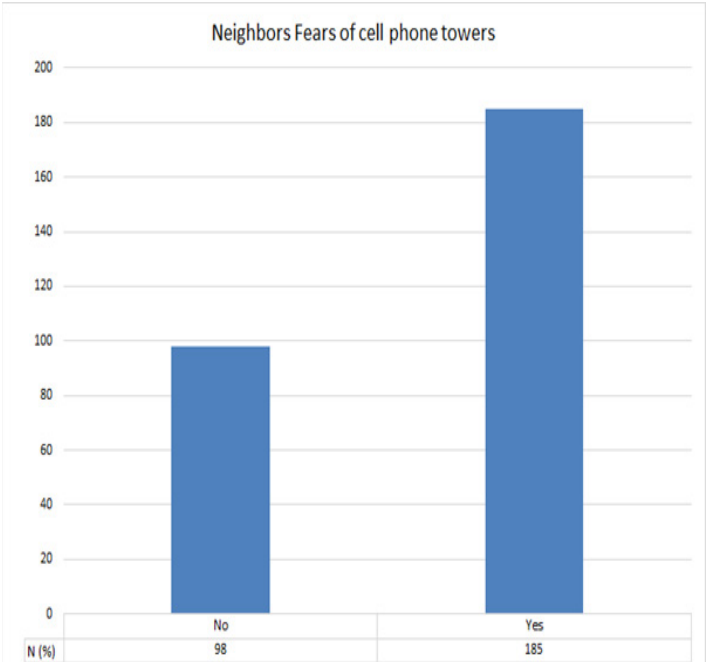

Table (1) comparison between different health disorders among exposed and non-exposed adults to cell phone base station radiation in Hilla city

Manifestations	<300 meters N (%)	> 500 meters N(%)	
	40 (22.22)	20(21.73)	
Forget transient loss of memory	48 (26.66)	21(22.82)	p<0.01
Headache	82 (45.55)	38(41.3)	p<0.05
Insomnia	44 (24.44)	14 (15.21)	p<0.01
Dizziness	33 (18.33)	11(11.95)	p<05
Anxiety	30 (16.66)	21 (22.82)	
Depression	33 (18.33)	22(23.91)	
Loneliness	53 (29.44)	19(20.65)	p<05

Each subject may have more than one symptoms

warm and non-warm (Dhaher, 2025; Frank et al., 2025; Nakagawa et al., 2017; Röösli et al., 2021). This study shows a male-to-female ratio of 1.5:1, indicating a higher participation of males, which aligns with the findings of another Iraqi cross-sectional study carried out on 168 adult participants, both men and women (Frank, 2021). This gender difference may be related to cultural and social factors; males in our society usually represent the family's opinions. In addition, men spend more time outside their houses or in places where cell phone towers are installed, increasing their debates related to tower placement, and they are more involved in environmental health problems.

Thus, they have responded highly to surveys investigating environmental health problems like the adverse social and health effects of cell phone towers. Besides the findings related to health complaints attributed to exposure to RFR from cell phone towers, the current study revealed important social consequences associated with the location of cell phone base stations in residential areas. In this study, only twenty percent of people living near the cell phone towers were informed before the installation of towers near their homes, indicating a lack of transparency and poor community participation in addressing the problems of social tension and conflicts (de Vocht & Röösli, 2025).

About three-quarters of residents living near the towers reported occurrences of conflicts with the owners of buildings hosting the mobile towers (Ashraf et al., 2024). These conflicts relate to disagreements regarding the placement of the tower and its potential health effects. These social problems are similar to the findings of other reports from developing countries (Gómez-Perretta et al., 2013). It has been discovered that RF-EMF can cause alterations in nerve cells, including ion channels, neuronal cell death, and altered myelin and nerve cell function (Hassoy et al., 2013). The impact on the antioxidant state and DNA damage in human circulating blood cells from individuals who reside near cell phone station bases was contrasted with healthy controls (Benito-León et al., 2023; Elatfy et al., 2024). The increase in the frequency of nonspecific symptoms among participants enrolled in this study who lived < 300 meters from the mobile towers is in line with an Iranian study conducted in Isfahan, which shows that most of the symptoms, such as headache, dizziness, irritability, discomfort, nervousness, depression, sleep disturbance, and memory loss, were statistically significant in the inhabitants living near the mobile base stations (within <300 m distances) compared to those living more than 300 meters away from the base station (Ramirez-Vazquez et al., 2024).This finding also aligns with the results reported by a local small-scale cross-sectional study conducted in Diyala governorate, which concluded that men who lived close to mobile telephone base stations are particularly susceptible to electromagnetic radiation-induced sleep disorders, anxiety, and mood swings (Elatfy et al., 2024).

Martin S et al. reported in their descriptive cross-sectional study that self-reported insomnia and sleep disorders were high among dwellers living in the vicinity of antennae of cell phone stations in French urban areas; this aligns with the findings of the current study. Another study reported a strong association, with accuracies of "85.3%, 82%, 84%, 82.4%, and 65.1% for headache, sleep disturbance, dizziness, vertigo, and fatigue," respectively, among those living in the vicinity of cell phone towers. In contrast, a study conducted in Turkey, Izmir, revealed limited associations between proximity to base stations and some general symptoms among residents. At the same time, studies emphasize that the evidence is still poor and limited by cross-sectional design, self-reported symptoms, and imperfect exposure assessment; a 2023 study concluded that the epidemiological studies are insufficient for firm causal associations and called for better analytic epidemiologic studies, exposure characterization, and stronger analytic designs to find the best evidence-based approach (Ilori & Adeleye, 2019; Kim et al., 2019; Lim et al., 2023; Martin et al., 2021; Parsaei et al., 2026; Pradhan et al., 2022; Shahbazi-Gahrouei et al., 2014; Zothansiama et al., 2017).

In another similar study conducted in Nigeria on non-ionizing radiation, absorbed dose rates from mobile phone base stations revealed that the values vary according to distance, showing that the strength of the radiation field is greatest at and near the source (cell phone towers) and diminishes quickly with distance.The World Health Organization established safety guidelines, but debate continues about their adequacy and the interpretation of health effects regarding oxidative stress, cellular genetic alteration, and neurological symptoms associated with exposure to non-ionizing radiation for long periods, especially for susceptible individuals (Jazyah, 2024; Khalil & Hassan, 2024; Ubhenin et al., 2024; Wei et al., 2025).

Limitations

This study carries some limitations, such as a relatively small sample size. The cross-sectional design cannot measure the causal relationship between the dependent and independent variables, and confounders such as the duration of daily exposure through mobile use and the density of radiation were not measured. However, this descriptive cross-sectional study can formulate a hypothesis to be tested by further analytic studies or interventional ones.

Conclusion

The results of this study depicted that adult men and women living close to mobile cell base stations report a high occurrence of non-specific health symptoms associated with significant social tensions related to tower placements. This study found significant health effects related to symptoms among adults living closely (300 meters or less) from mobile phone base stations compared to those who lived far away (more than 500 meters).

Recommendations

Minimization of exposure to radiation within the limits of technical feasibility is necessary to guarantee a significant reduction in radiation exposure from cellular phone towers in residential areas. Further large-scale cohort studies should continue to detect possible health changes in the population exposed to such hazards and determine causality after rigorously controlling for a wide range of confounders. Finally, clear information about the intensity of exposure and the degree of environmental pollution should be distributed to the local community. To reduce neighbor exposure, cell phone BTS antennas should not be placed more than 300 meters from populated areas.

Competing interests

No competing interests.

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