

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قال تعالى في محكم التنزيل:

سَأْرِیْهِمْ ءَايَاتِنَا فِی الْأَفَاقِ وَفِی أَنْفُسِهِمْ حَتَّىٰ یَتَبَيَّنَ لَهُمْ أَنَّهُ الْحَقُّ
أَوَلَمْ یَكْفِ بِرَبِّكَ أَنَّهُ عَلَىٰ كُلِّ شَیْءٍ شَهِیدٌ ﴿٥٣﴾

صدق الله العظيم

سورة فصلت الاية / (53)

DEDICATION

To soul of my father in the paradise ...

To my kind mother Fatima Hamad Elneel ...

To my brother Ahmed ...

To my sisters, Aziza, Jayda, Fayza, Nafisa ...

To my wife Nada Osman ...

To my daughters, Rafa, Rawan, and my son

Mohamed Osman ...

For their patience, constant encouragement and support.

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ABSTRACT

Electromagnetic radiation is a form of energy emitted and absorbed by charged particles; electromagnetic radiation is characterized by its biological effects on human cells. Mobile phone towers which emit electromagnetic radiation are intensively distributed in cities and towns. This requires studying their biological hazards.

The study was designed and conducted on the basis of selection of the three major telecommunication companies towers in Sudan, namely ZAIN, SUDANI and MTN. Three different geographical locations were also selected including Khartoum state, red sea state and river Nile state. Number of (120) towers from each company was randomly selected in each of the three previously mentioned States (40 towers for each company in particular state) for this study. The levels of the electromagnetic radiation emitted by these towers were measured at different distances (5m ,10m , 15m , 20m ,25m, 30m) using the radiometer measurement . The results obtained indicated that increase in the horizontal distance from the tower is associated with gradual decrease in the electromagnetic radiation levels. This decrease of intensity with distance conforms to the theoretical relation. It was also observed that the height of towers affect the radiation intensity, where the radiation intensity increases as the height increases. This relation also agrees with the theoretical relation. Also the results obtained showed that the electromagnetic radiation levels measured from towers belonging to SUDANI Company is higher than those from towers of ZAIN and MTN companies in each state. However all electromagnetic radiation levels are still safe and within the permissible range of international allowed doses. It was also noted that electromagnetic radiation level measured from all

these towers collectively are higher in Khartoum state as compared to red sea and river Nile state.

This might possibly be attributed to the higher number of these towers distributed in Khartoum state as compared to other states.

Generally, the measurements employed showed that the level of electromagnetic radiation is not that significant and still safe with reference to the recommendation of world health organization (WHO) and international telecommunication corporation (ITC). Therefore a non-adverse obvious effect on the biological system is expected. However a ware should be taken for the long exposure time for these low doses.

This study highlighted the levels and effects of the electromagnetic radiation emitted by the towers in three states, thus, we recommend another future study should be carried out to include more states and other sources of electromagnetic radiation emissions, etc. cell phones, electricity lines and other electronic devices.

مستخلص

الاشعاعات الكهرومغناطيسية عبارة عن صورة من صور الطاقة و يتم امتصاصها بواسطة جسيمات كهربائية مشحونة، و تتميز هذه الاشعاعات بتأثيرها الاحيائي على خلايا الانسان، و تنتشر أبراج الاتصالات التي تصدر هذه الاشعاعات الكهرومغناطيسية داخل المدن و القرى الامر الذي يستوجب دراسة أخطارها الاحيائية.

صممت هذه الدراسة على اختيار عشوائي لعدد من ابراج شركات اتصالات (زين وسوداني وام تي ان)، حيث تم اختيار عدد (360) برج من الشركات الثلاثة موزعة على ولايات الخرطوم، نهر النيل و البحر الاحمر، بواقع عدد (120) برج في كل ولاية موزعة على الشركات الثلاثة (40 برج لكل شركة داخل الولاية الواحدة).

تمت عملية قياس لمستوى الاشعاعات الصادرة من تلك الابراج من ابعاد مختلفة (5 متر، 10 متر، 15 متر، 20 متر، 25 متر، 30 متر) و تم ذلك باستخدام اجهزة قياس الاشعاع الكهرومغناطيسي (الراديومتر)، و قد اوضحت الدراسة ان الزيادة في المسافة الافقية من البرج يتبعها نقصان ملحوظ في كمية الاشعاعات وهذا يتوافق مع العلاقة الفيزيائية النظرية، كما تلاحظ أيضا أنه كلما زاد ارتفاع البرج تزيد كمية الاشعاعات المنبعثة منه وهذا يتوافق أيضا مع العلاقة الفيزيائية النظرية.

و كذلك بينت النتائج ان كمية الاشعاعات المنبعثة من ابراج شركة سوداني اعلى من الاشعاعات المنبعثة من ابراج شركة زين و كذلك من تلك المنبعثة من ابراج شركة ام تي ان، ولكنها ما تزال داخل الحدود الموصى بها دوليا.

كما بينت الدراسة ايضا ان مجموع كمية الاشعاعات المنبعثة من الشركات الثلاثة داخل ولاية الخرطوم اكبر من مجموع كمية الاشعاعات المنبعثة من الشركات الثلاثة في ولايتي نهر النيل و البحر الاحمر، ومن المرجح ان تعود الاسباب للعدد الضخم من الابراج المنتشرة داخل ولاية الخرطوم.

عموما فقد أوضحت النتائج المتحصل عليها من الدراسة أن مستوى الإشعاعات الصادرة من هذه الابراج ما يزال داخل الحدود الموصى بها من قبل منظمة الصحة العالمية و الهيئة الدولية للاتصالات و بالتالي ليس لها اثر سالب واضح على النظام الاحيائي, و في كل الأحوال يجب أخذ الحيطة و الحذر حال التعرض لفترات طويلة لهذه الإشعاعات.

و بما ان الدراسة قد اوضحت بعض الملامح العامة للأثر الاحيائي لتلك الإشعاعات في ثلاث ولايات فقط، لذا ينبغي ان تمتد هذه الدراسة لتشمل بقية ولايات السودان بالاضافة لدراسة مصادر اخرى لهذه الإشعاعات كأجهزة الهاتف المحمول و اسلاك التيار الكهربائي و شاشات الاجهزة الالكترونية المختلفة.

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