

Study on the Effect of Electromagnetic Radiation on Human Health in Kano Metropolis

M.Aderinola, J.S. Kazaure, I. Muhammad

Abstract— *The growing number of Base Transceiver Station (BTS) within residential and commercial building is worrisome due to the fear that Electromagnetic Radiation (ER) from BTS possessed harmful effect to the people living close the BTS. At a very high level, electromagnetic radiation is dangerous to the body tissues; it can heat the exposed body's tissues, it could have the effect on cancer development, influence the function of brain and nervous tissue, causes headache as well as loss of human memory. This has created the need to investigate whether Electromagnetic Radiation (ER) expose to our environment is harmful to the people living close to Base Transceiver Station (BTS). This paper presents a survey study which investigated the effect of electromagnetic radiation from Base Transceiver Station to the people living 50 to 500 meters away from the BTS in some selected areas in Kano metropolis. The methodology employed was quantitative approach in a mixed form with semi structured interviews. Statistical Package for Social Science (SPSS) software version 14.0 was used to analyze the primary data obtained. Investigated result presents that the effect of electromagnetic radiation to the people living close to Base Transceiver Stations in the selected areas is not significant. The Chi-square test of significance revealed that the electromagnetic radiation exposes to the environment has negligible effect to human health. However, the study recommend that residential houses should be build beyond 500 meters from Base Transceiver Stations.*

Index Terms— **Electromagnetic Radiation (ER), Base Transceiver Station (BTS), Environment, Human Health.**

I. INTRODUCTION

Cell phone first become widely available in the United States in 1990s, but since then their use has increased dramatically [1]. The widespread uses of cell phones lead to the many cell phone towers (base station) in most communities. These cell phone base stations or cell phone towers are free standing or mounted on existing structure which is usually from 50-200 feet high [1]. They are equipped with electronic equipment and antennas that receive and transmit radio frequency (RF) signals. All communication that carry out by cell phones are associated with the near base stations through radio frequency (RF) waves. Radio frequency (RF) wave is a form of energy in the electromagnetic spectrum between FM radio wave and micro wave. As people make multiple use of cell phone, the signals are transmitted back to the base station [2]. The radio frequency (RF) waves produce at the base station are given off into the environment, where people around can be exposed to the radio frequency (RF) radiation produced at the process. At a very high level, the radio frequency (RF) radiation is dangerous to the body tissues; it can heat the exposed body's tissues rapidly (thermal effect) [3]. However such high levels

are found only near certain equipment like powerful long distance transmitters, such concern of possible thermal effects arising from exposure RF include the suggestion of subtle effect on cell that could have the effect on cancer development, it could influence the function of brain and nervous tissue, headache and memory loss [4]. Moreover, cell phones tower (base station) and other wireless networks produce radio frequency (RF) but not at levels that can cause a significant heating. Base station have generated much public concern due to the (RF) energy produce in the process of cell phone communication, that attracted government regulatory bodies and independent firm to investigate whether the exposure of RF energy have any health effect to the people living near cell phones towers where it lead to a certain safety standard as the limit of such radiation power. The safety standards of radio frequency radiation is based on the two main exposure guidelines for RF radiation in Europe, which are the National Radiological Protection Board (NRPB) published the first guideline in 1993 and the International Commission on Non-ionizing Radiation Protection (ICNIRP) published the second guideline in 1998 [5].

II. LITERATURE REVIEW

Several researches were conducted on the effect of electromagnetic radiation to human health, among others are the research conducted by [6], where gauss meter were used to measure the radiation of the BTS and power density of electromagnetic radiation on building around BTS, were calculated, the result shows that the radiation exceed the safety limit set by ICNRIP. Similarly, a research conducted by [7], blood samples were collected from human and exposed to RF radiation emanating from GSM phone. The hematological parameters of both the exposed & control blood samples were analyzed, the result indicated that blood parameters are affected by exposure to RF radiation. Also, a research conducted by [8] in Isfahan Iran to find out the psychological and psychobiological reactions of the people who are living around mobile phone base transceiver stations (BTS) antenna. Results showed that most of symptom such as nausea, headache, dizziness, irritability discomfort, nervousness, depressor, sleep disturbance memory loss and lowering of libido were statically significant in the inhabitants living near the BTS antennae (<300m distances) compared to these living for form the BTS antenna (>300m). They suggested that cellular phone BTS antenna should not be closer than 300m to population to minimize exposure of neighbors. On the other hand, [9] carried out a comparative analysis of base transceiver station effects on the human body in the Lagos

environs. The studies were achieved using the measured and calculated values of some electromagnetic parameters such as power density and electric field intensity. Their findings showed that the electric field strength experienced around base stations is within the ICNIRP safety limits, regardless of the position of the exposed person. However, it is not advisable to live close to BTS. Also, a survey carried out by [10], on the people living close the BTS with different health related issues like depression, sleeping disturbances, headache, memory loss, cancer, blood pressure. Finding shows that the people were not affected with the above ailment. However, according to [11], when a cellular mobile network analyzer which can measure power density of a cellular mobile signal was used to measure the received power density from BTS transmitter at residential & commercial area, the power absorbed was calculated to be $348nW/cm^2$ at 210m distance from transmitter & higher as moved closer to the transmitter from BTS. The researcher concluded that the power density measured within 300m distance from BS transmitter is of higher negative health concern & suggested that BS transmitter should be located 300m to 500m distance from human residence. Based on the above results, there is no cogent evidence to conclude that RF radiations from base station are harmful or not harmful to human health. It depends on the location, the system and the service provider's compliance with regulatory bodies and ICNIRP standards.

III. OBJECTIVE OF THE STUDY

The study identified five areas in Kano metropolis to discover the effect of electromagnetic radiation to the people living 50 to 500 meters from the Base Transceiver Stations. The objectives of the study are as follows.

1. To assess the peoples feeling of headache and brain tumor.
2. To assess the peoples feeling of body pain.
3. To assess the peoples feeling of stomach disorder.
4. To assess the peoples feeling of sleep disturbance or hypertension.
5. To assess the peoples feeling of dizziness and body weakness.
6. To assess the peoples feeling of skin cancer
7. To assess the peoples feeling from Nervousness.

IV. METHODOLOGY

In order to meet the objectives of the study, quantitative approach in a mixed form with semi-structured interview was used as the methodology. Survey questionnaire was the primary tool used in data collection. A two pronged approach of self administration and personal interviews was used to maximize the completion of the questionnaire and increase response rate. The survey was conducted between August to October 2015.

V. SAMPLE SIZE

The study has total number of 200 participants comprises of males and females based on gender equality. Forty participants (40) were selected from each area out of the five selected areas which consist of children, youth and old people. The selected areas are as follows:

1. BUK Old Site.
2. Dorayi Babba.
3. Kabuga Housing Estate.
4. Rijiyar Zaki and
5. Rimi Gata

VI. DATA ENTRY ANALYSIS

The data from the questionnaire were assembled in Microsoft Excel Spreadsheet. After the data was cleaned and verified, it was exported to SPSS package version 14.0 for detailed analysis. Chi-square test for testing the significant level was used in the data analysis.

VII. RESULT AND DISCUSSION

Reliability test were carried out to ascertain the suitability of the scale used with reference to the sample size. In this study a scale of 3 was used in the sample size of 200. Table 1 below shows the summary result of the reliability test of internal consistency.

Table 1: Summary of the Reliability Test

Cronbach's Alpha	N of Items
.873	10

According to [12], the Cronbach Alpha coefficient of a scale should be above 0.7. In this study, the cronbach's alpha was 0.873. This indicates a very good internal consistency for the scale with the research sample.

The analysis of the Chi-square test in table 2, Q1, Q2, Q3, Q4, Q5, Q6, Q7, Q8, Q9 and Q10 presents that people living within the study area are not experiencing headache, body pain, stomach disorder, brain tumor, hypertension, dizziness, sleep disturbance, body weakness, skin cancer and nervousness each at Chi-square greater than 150.000^a, differences of 2 at 0.000 significant levels. Therefore, electromagnetic radiation from the Base Transceiver Stations within the selected area has negligible effect to human health with respect to the above mentioned variables.

Table 2: Chi-square test result

Variable	Observed N	Df.	Chi-Square	Significant
Q1. Headache		2	156.130 ^a	0.000
Yes	49			
No	149			
Neutral	5			
Total	200			

Q2. Body Pain		2	180.310 ^a	0.000
Yes	44			
Neutral	153			
Total	200			
Q3. Stomach Disorder		2	281.320 ^a	0.000
Yes	20			
No	178			
Neutral	2			
Total	200			
Q4. Brain Tumor		2	336.730 ^a	0.000
Yes	6			
No	189			
Neutral	2			
Total	200			
Q5. Hypertension		2	228.760 ^a	0.000
Yes	32			
No	166			
Neutral	2			
Total	200			
Q6. Dizziness		2	178.360 ^a	0.000
Yes	38			
No	154			
Neutral	8			
Total	200			
Q7. Sleep Disturbance		2	252.640 ^a	0.000
Yes	24			
No	172			
Neutral	4			
Total	200			
Q8. Body Weakness		2	191.560 ^a	0.000
Yes	46			
No	156			
Neutral	2			
Total	200			
Q9. Skin Cancer		2	300.760 ^a	0.000
Yes	16			
No	182			
Neutral	2			
Total	200			
Q10. Nervousness		2	290.080 ^a	0.000
Yes	16			
No	180			
Neutral	4			
Total	200			

VIII. CONCLUSION

This paper studied the Effect of electromagnetic radiation from Base Transceiver Stations to the people living 50 to 500 meters away from the BTS in some selected areas in Kano metropolis. Survey study was completed in October 2015 and the investigated result showed that none among the 10

suspected diseases caused by Electromagnetic Radiation is significant to the people living in the selected areas. The Chi-square test of significances revealed that electromagnetic radiation exposes to the environment has negligible effect to human health. However, it is recommended that residential houses should be build beyond 500m from Base Transceiver Stations. This is to avoid the risk of BTS components wear-out period and the frequent changes of environmental parameters due to the global warming.

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