Research Article / Review Article FUPRE JOURNAL 6(4): 100-107(2022)

FUPRE Journal of Scientific and Industrial Research

ISSN: 2579-1184(Print) ISSN: 2578-1129 (Online)

https://fupre.edu.ng/journal

Preliminary Survey of Health Hazard Associated with Telecommunication Mast Installations close to Residencial Buildings in Auchi, Etsako Edo State, Nigeria

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ARTICLE INFO

Received: 08/09/2022

Accepted: 10/10/2022

Keywords

Electromagnetic radiation, Health effects, Mast locations, Pollution, Cell free MIMO.

ABSTRACT

The health effect of Electromagnetic radiations (ERs) from Telecommunication Mast installed in residential area has become subject of debate in Nigeria. This study portrays the effect of Mast installation to Human Health within Auchi Environment. This study evaluates/ investigates the health effect on residents around the Mast. A self-structure questionnaire was administered randomly to resident selected within service to the erected Mast in Auchi Metropolis. Five hundred (500) questionnaires were administered but three hundred and forty (340) were received and analyzed. Analysis indicates that residents close to the study area experience physiological, environmental, and physiological effects and there was significant effects of generator noise, vibration, headache, and others. The study further makes recommendation to National Communication Commission (NCC) to enforce laws related to Mast location in residential neighborhood to reduce to minimal indiscriminate locations. The study established that there are Health effect of Mast radiation and minimizing them will improve healthy living.

1. INTRODUCTION

Advances in wireless communication and cell free MIMO in 5G and 6G networks, has saddled researchers with a task to avail more knowledge about the harmful radiation risks associated with Electromagnetic radiations emanating from sited telecommunication masts within environment in developing nations (Obakhena et al., 2021; Miroslava, 2020). The government through the Nigerian communication commission has over the years made a lot of policies to control the activities of these network providers, however this has done little or nothing to the menace and pollution posed by the cell masts sited within inhabited environments across the country (Samuel et al., 2020). Presently, there are several network providers in Nigeria, notably MTN, Glo, 9mobile, Airtel, and they strive to provide cell coverage to their customers all over the country (Santini, et al., 2013). The increasing need to reduce the effect of downtime, drop calls, and reduce the dead zones to a minimum has led these network providers to site more masts in areas of poor or no network coverage (Onifade et al., 2015). Studies over the years depicted that these base stations and telecommunications towers release radiofrequencies (RF), in form of electromagnetic radiations (ERs) and this can have adverse effect on living organism within that zone and mammals (Kumar, 2010).

Thousands in Nigeria, ignorantly reside very close to telecommunication not knowing the possible adverse effect this can have on their heath. The WHO (world health organization) in 1996, set up the international ER project to

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examine the probable harmful scientific effects of ERs within frequency range of 0-300 GHz (Poljak, 2011). With the imminent introduction of 5G network within the country, more studies about the dangers of having a network of higher frequencies which require a more denser coverage of base stations is explored (Ugwanyi, et al., 2017) Alternatively, Fiber optics would provide a more secure, safe and offer higher speed than 5G as opined by experts, though fiber optics are not wireless (Oluwole and Fajobi, 2015). Research have shown that there are two forms of ERs, namely ionizing and Non-ionizing ERs as shown in figure 1. The ionizing form of radiation fall within the range of mid –high frequency (x-rays, UV rays, gamma rays), these rays can cause damage to human cells and cancer (Akintowula, et al., 2009). But non-ionizing radiations possess lower frequencies and larger wavelengths. Several Scientists are of the idea that this form of radiation releases thermal effects that can cause tissue heating and at higher exposure, temperature – sensitive bio systems, including humans and other methods can be impaired (Hart, et al., 2012).

Auchi is currently experiencing a high pace of urbanization compared to other emerging cities in Nigeria and there is increasing need to service the populace with Telecommunication infrastructure. This had led to proliferation of GSM base station around Auchi, thus prompting the need to carry out a comprehensive review and analysis of many perceived health related problems claimed to be associated with electromagnetic emissions and radiation from GSM base stations in the study area (Robert, 2019). However, the level to which the situation is true in Auchi, Estako West Local Government Area has not been ascertained for 3G, 4G network respectively. To this end, this paper intends to examine the possible effects in Auchi, Etsako West Local Government Area and compare the findings with previously reported findings (Ismail and Khalifa, 2019). Furthermore, the outcome of this study will help to establish the relationship between the location of Telecommunication Mast and its effects on health of residents in Auchi, Etsako West.

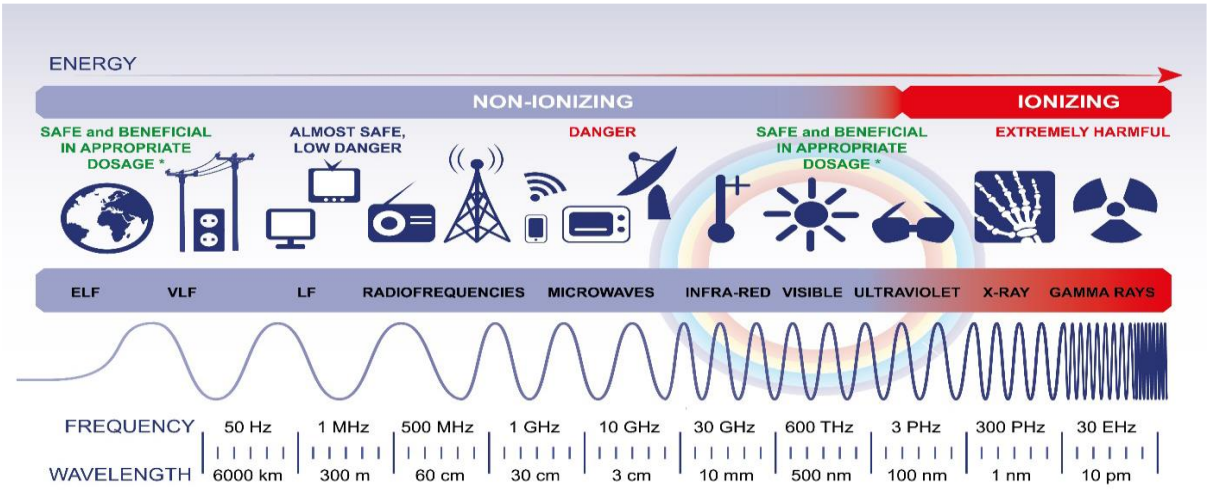

Figure 1: Electromagnetic spectrum

Source: Polina Kudelkina/shutterstock.com (Miroslava, 2020)

Figure 2: Pictorial Diagram of Telecommunication Mast (*Source: Field Survey 2021)*

Bello, (2010) proposed a strategy to mitigate adverse effects of telecommunication masts on the surrounding environment. In the study, various ranges of metals concentration were deployed as a reference for testing and the results showed significant amount of contamination of zinc and cadmium in leave samples. The research recommended measures to reduce its effect and future research challenges and direction were also highlighted. Ofotokun, et al., (2021) highlighted the challenges of low research altitude directed towards the assessment of electromagnetic radiation from telecommunication masts on mammals inhabiting areas close to its site location. To this end, rats were exposed to the electromagnetic radiation and further analysis showed adverse effect of the radiation on the rat. Results obtained showed a dip in the rat's activeness, weight, reproduction rate and increased body temperature. the authors recommended siting of GSM masts should be far away from dwelling places.

The distinctive downtime adjustable identification and examination control of telecommunication mast has been reported by Tajudean, et al., (2020). In the research work, an MTN masts was chosen as a case study within Port Harcourt, meteorological data were also collected from the site and further effect of the downtime both on worst and best scenario for profit in telecommunication industry area are explored. Omijeh and Promise, (2018), analyzed the systematic spatial distribution of telecommunication masts in Mubi town of Adamawa State using international guidelines as checklist for about 23 masts within this location. They reported the challenges posed during this research and recommended ways to reduce the adverse effect of radiation due to clustering siting of the base stations to residential areas.

To the best of the researcher knowledge, no work on the effects electromagnetic radiation of GSM mask erecting close to and around residential buildings in Auchi has conducted and reported in literature and these lend credence to this research work. The study is thus aim at assessing the location characteristics of Telecommunication Mast, to examine the appropriateness of the site location of the Masts, in ensuring that the services providers obeys necessary environmental standards and international guidelines. And to estimate the EM radiation effects on the environment and man.

2. MATERIALS AND METHOD

2.1. Study Area

The study was undertaken within Auchi, Etsako West Local Government Area, Edo State, which lies between Latitude 7^0 14 North and 7^0 34 North of equator and Longitude 6^0 14 East and 6^0 43 East of the Greenwich Meridian. Auchi is bounded by Jattu to East, Aviele to the South, Warrake to the west and Iyuku to the North. It is 130 kilometers North to Benin, the capital city of Edo State. The study location is a densely populated being the host town to the first generation Federal Polytechnic in Nigeria with a population of ..? Other features of the city being a conference city that linked the Western part of the Country to the Northern belt of Nigeria include high commercial activities in five districts of Igbei, Iyekhei, Utsogun, Egelesor and Aibotse.

Auchi is located on a slightly undulating terrain with elevation of thirty (30) metres above sea level. There are some spots heights intruding on the slightly low areas where the bulk of the populace is settled. The climate of Auchi is subhumid and the average temperature is about 33^0C in the rainy season and about 42^0C is the dry season. The solar radiation at Auchi area is within the period of study exhibits monthly variation but an average mean of 22.61MJ/m/^{2}/day was obtained. A GPS map showing the study area as presented in figure 2.

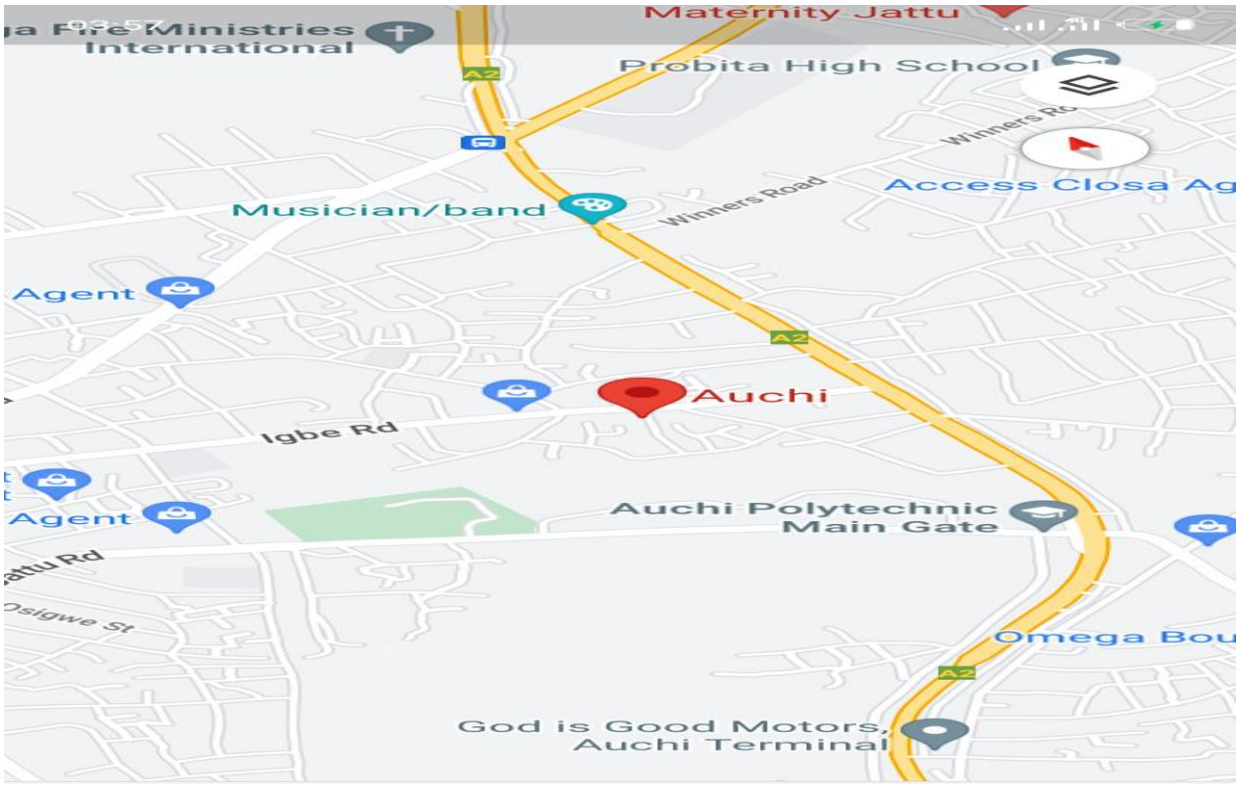

Fig. 2 Google map view of the study area

2.2 Method

Thirty (30) (thirty) masts were surveyed in the study area, of which fifteen (15) belongs to MTN, ten (10) belongs to GLO and five (5) belongs to AIRTEL. The thirty masts were sampled, and primary and secondary data were utilized. The primary data were collected with the aid of questionnaire, personal interview survey. The three services

providers provide services with distribution rate of 3:2:1 for MTN, GLO, and AIRTEL respectively. Questionnaire were administered to respondents within the defined area of each mast. Thus, total of three hundred and fifty-eight (358) were administered in all the mast locations. Secondary data were source from publication relating to the study.

The research was carried out on health hazard of mast installed around residential area. It was divided into three strata according to the density zones namely, high, medium, and low-density zones (see appendix for a sample of the Questionnaire). A total of three hundred and forty (340) questionnaires were retrieved for analysis. The Questionnaire for the occupiers of the residential properties were structured to get information in their level of satisfaction with those living close to GSM Mast, the effect of the GSM Mast on the resident around the area, and factors that motivate residents to locate near GSM Mast

3. RESULTS AND DİSCUSSİONS

3.1 Presentation of Results

The level of awareness of the effect of the radioactive emission from GSM Mast by respondents on human health was relevant as shown in Table 1.

Table 1: Respondents awareness of the effects of GSM Mast on Health

Response	Frequency	Percentage
Yes	290	85.3%
No	50	14.7%
Total	340	

From **Table.1,** 85.3% shows awareness of negative effects of the mast radiation and 14.7% reveals not aware of the effects of the Mast radiation. Further, the demographic data of the area is also analyzed in **Table 2** as follows;

Table 2: Demographic data of respondents

Gender	Frequency	Percentage (%)
Male	200	58.8%
Female	140	41.2%
Total	340	
Age	**Frequency**	**Percentage (%)**
16 – 20	98	28.2
21 – 26	110	32.4
27 – 30	26	7.6
31 – 36	30	8.8
36 and above	68	20
Total	340	

Further, **Table.3** depicts analysis of perceived impact on psychological and physiological well-being of the residents. The psychological well-being is centered on inability to concentrate, inability to speak in low tones, sleep disorder and physiological well-being which include memory loss, fatigue and dizziness as shown as follows;

A = Agree

B = Undecided

C = Disagree D = Strongly Disagree

Table 3: Physiological and Psychological impact of Mast erection on health status

	Health Status	Condition			
		A	**B**	**C**	**D**
1	I always feel tired while studying under noisy environment as a result of generator powering the telecommunication mast	138 40.59%	78 22.94%	68 20%	56 16.47%
2	Feel Headache	140 41.18%	76 22.35%	74 21.70%	50 14.71%
3	I don't feel comfortable studying outside home due to vibration from telecom mast	160 47.60%	56 16.47%	34 10%	90 26.47%
4	Feel depressed, stressful being closely to telecom mast	90 26.47%	160 47%	56 16.47%	34 10%
5	Distraction from noise of telecom mast	120 35.29%	96 28.24%	88 25.85	36 10.59
6	Loss of memory, dizziness, stomach pain	150 44.12%	66 19.4%	98 28.82%	26 7.65%

3.1 Discussion of the Results

The Questionnaires administered were sieved and analyzed, the results revealed that MTN and GLO mast emit electromagnetic wave, radio frequency radiation and infrared with a height above Fifteen metres (15m). This implies that residents living near their masts are at risk of these wave which might have adverse effect on the people health after long period of time. It shows that MTN Mast are located close to the mast violating the minimum standard setback of fifty metres (50m) as specified by National Communication Committee on National Environment Standard Regulation Agency (NESREA).

The data show that houses closer to telecommunication Mast were observed to be experiencing high disturbance due to noise, vibration and fumes of generator which causes disease like sleep disorder, Headache and Respiratory diseases. The major factors responsible for the location of Mast in the study area is unwillingness of landowners to locate the appropriate distance allocated, bribery of planning authorities and political influences of landowners.

The study investigates the vibration of Telecommunication Mast has the highest impact of physiological effect on the residents close to the Mast. The highest respondent to the self – structured questionnaire were people within the ages of 21 – 26 which are about 110 people with a percentage of 32.40%. Those that agree that the erection of mast constitute negative influence on the resident close to the mast have the highest number of respondents. It was deduced that, the closer the distance of mast to residence, the severity the disease and the longer the length of stay, the less the severity of the disease.

The study investigated the positive environmental effect of the Mast both to the

operators and surrounding residents. They include transmitting high volume of data, improving the quality of service and security, increasing data capacity and greater, range of services which provide a step in the way in which individual communicate. The Masts Operators erect Mast in area that will boost their network capacity without minding its implication on the environment. It implies that houses of closer range to this Mast might be of risk of different disease and disturbances.

Conclusions

This study has been able to provide a comprehensive review of previous work related to this field, and also highlighted the future research directions of cell free MIMO 5G and 6G technologies, and probable threat they may pose to human health as they are of higher frequencies and wider wavelength. Further, the results obtained from our analysis confirmed that adults and children exposed to electromagnetic radiation from antennae located close to residential areas and school's premises suffers memory loss, dizziness, nose bleeding, suffered fatigue, stress muscle pains, aches, eye burning, digestive disorders, rashes. These undesirable health crises could combine leading to complications which would worsen the health status of the average citizens of Edo State. Therefore, the practice of erecting telecommunication mask close to residential premises must be discouraged to the minimum or totally.

There is no doubt that GSM technology is very beneficial, however the electromagnetic radiation emanating from its mast Antennae constitute major hazards and environmental pollution as experience by the researchers and respondent in Auchi, Etsako west local government area. Furthermore, the study has been able to establish that there is health and environmental effects in the siting of base stations in residential areas, schools, and health center. The study recommended projects to enhance better health and safe environment for livability. The Nigerian communication commission should follow the global trends on new findings about health effect of siting of GSM base stations around residential neighborhood and ensure that international standard of safety is strictly adhered by the GSM operators in Nigeria. The standard of 50meters setback radius for residential houses close to mast siting should be observed by operators of telecommunication service providers. In conclusion, advances in cell free cell free MIMO should be encouraged as these is the new wave in telecommunication technology and requires no cell tower for its propagation

Recommendations

The following preventives measures were recommended to be adhered in order to make the environment and community safe from the effects of the telecommunication mast:

1. Generally, there is little knowledge about the risk involved in living near mast. Thus, there should be adequate public awareness on this risk.

2. Enactment of laws to control landlord decisions to allow the Telecommunications Operators to locate their mast within residential premises, not minding the side effects of residents.

3. Planning authorities should be notified before any erection of mast made by telecommunication operators. Report in EIA (Environmental Impact Assessment) should be submitted by the operators to ascertain the risk and the importance of the development to the environment

4. Telecommunications Operators should unite to have one base station and each operator can connect with this base station. This reduces clustering of Masts in the society.

5. Planning authorities should respond positively to Telecommunication development proposals while taking account of the advice in the protection of urban and rural areas

6. The physical development control agencies of Edo State Ministry of Physical Planning urban and regional planning board and local planning should be adequately funded staffed and equipped to monitor illegal construction, development so as to promote a virile urban society for sustainable development.

7. Research on Cell Free massive MIMO should be encouraged.

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