

**THE HEALTH RISKS OF GLOBAL SYSTEM OF MOBILE COMMUNICATION (GSM):
PERCEPTIONS OF HEALTH PROFESSIONALS AND RADIATION EXPERTS IN OGUN
STATE, NIGERIA**

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Abstract

The use of Global System of Mobile Communication (GSM) is becoming widespread in Nigeria and other parts of the world. The arrival of this sophisticated technology, which has turned the world into a global village, has, however, been greeted with heated debates on its possible health hazards. This study utilizes evidence from literature and responses to questionnaire and in-depth interviews among health professionals, microwave telecommunication experts as well as health radiation experts in Ogun state, Nigeria. The results show two rather opposing schools of thought. On the one hand, there are those who share the view that the radiation emitted from handsets and base stations constitutes serious health hazards, while on the other hand, there are also those who argue that the radiations are so minimal and, as such, do not constitute any health hazards and that there is no proof of any harmful effects of GSM use. While the health radiation experts share the former view, the latter view is shared by the micro-wave telecommunication experts. This controversy calls for more independent investigation on this subject while necessary precautions should be taken in the mean time.

Keywords: Health, GSM, mobile phones, radiation, risks, Nigeria

Introduction

The use of Global System of Mobile Communication (GSM) is becoming widespread in Nigeria as it is also witnessed in most developed countries of the world. Although telecommunication arrived in Nigeria over 100 years ago, it is interesting to note that, as at independence in 1960, Nigeria only had about 18,724 phone lines for use by a population that was not less than 40 million (Wojuade, 2005). However, in 1999, there were roughly 500,000 lines available for a population of about 120 million in Nigeria (Okoruwa, 2004). Hence, one of the major achievements recorded by the Olusegun Obasanjo civilian regime is the advent of a deregulated communication sector. MTN Communication and ECONET wireless as well as NITEL were subsequently awarded full GSM licenses by the Obasanjo administration to operate in Nigeria.

While the ECONET wireless commenced operations on August 6, 2001, MTN Communication opened activities later, with similar packages. On the other hand, Globacom commenced its operation on August 29, 2003 (Audile, 2000). No doubt, GSM operation has come to stay in Nigeria and it is becoming widespread as it has done in most developed parts of the world. This new invention has not only turned the world into a global village, it has also received much applause and ignited a lot of interest from many Nigerians; especially those in the cities. Aside from the highly placed individuals who own their personal handsets, many common people including mechanics, taxi drivers, motorcyclists, students and market women, especially those in the cities either own or have unrestricted access to this world-transforming technology - regardless of its financial implications (Aluko, 2004).

The introduction of GSM by the Nigerian government has a number of benefits. In the first place, it has made telephone communication accessible to the common man. Also, many direct and indirect jobs have been created as workers have been absorbed by individual operators as well as direct and indirect dealers (Balogun, 2000). With the mobile phone in one's pocket, one is always accessible, though sometimes inconveniently. Since the advent of GSM, the number of mobile phones subscribers and users has been growing steadily. In 2005, the number of mobile phone subscribers globally was estimated at 2.14 billion (Usikalu and Akinyemi, 2007). As of June, 2009, the number of users worldwide had increased to 4.3 billion (GSM Association, 2009).

Handling a GSM phone or handset does not qualify for effective usage of same, neither does having it amount to a basic knowledge of the safe and responsible use of it (Adomi, 2006; Al-Shallah and Haddad, 2006). Consequently, a key area of activity of GSM Association is to ensure or promote safe and courteous use of GSM, enhancing responsible environment practices and acting as a clearing house for information for members. It should also encourage customers to use their phones responsibly and obey safety instructions issued by competent bodies including turning off phones in certain locations and encouraging good mobile etiquette (International Engineering Consortium, 2005).

Since the advent of GSM, there has been concern from individuals, companies and some medical professionals, about the effect of its radiation. The rising concern is about the possible link between mobile telephone usage and cancer or other risks to human health. One of the authors of this article, in whose compound a GSM mast tower (base station) was being erected, was personally alerted by a friend on the dangers of its radiation. It is this concern that spurred the authors of this paper into investigating the health implications of GSM.

Theoretical Framework

This paper draws its theoretical strength from Ulrich Beck's (1992) work on the "risk society." Beck's work was actually an offshoot of Anthony Giddens' idea on the subject of risk (Giddens, 1990). In line with Giddens' thought, Beck in his 'risk society' rejected the notion that the modern world has moved into the post-modern age. Rather, he emphasized the fact that we are still in the age which can be rightly referred to as the advanced modernity.

Beck also made a distinction between the capitalist society (which is characterized by industrialization) and the 'risk society' which emanates from the capitalist society. According to him, the 'risk society' or advanced modernity is characterized by modern technological advancement. Such technological breakthrough is not without certain risks including environmental, nutritional and technical hazards, as negative outcomes of the industrialized society. Among the most frightening of these uncertainties is the prospect of radiation and other types of toxic contamination. There is at present a universalization of hazards which accompany industrial production, independent of the place where they are produced. Such risks display a social boomerang effect in their diffusion so much that the rich and powerful are not safe from them. Just as there is unequal distribution of resources in the capitalist societies, there is an unequal distribution of risks emanating from the output of modern industrial technologies in advanced modernity. Advanced countries of the world with the abundant tremendous resources at their disposal are better able to cope with such risks than the poor countries.

The agents of modernization themselves are emphatically caught in the web of hazards they unleash and profit from. However, the worldwide equalization of risk position does not erase the new social inequalities within the affliction by risk. As risk position and class position overlap, the resultant effect is the systematic attraction between extreme poverty and extreme risk (Beck, 1992). To worsen the plight of low-wage countries, hazardous industries are being transferred from the industrialized world to them, thus increasing the level of risks they are exposed to. While such poor countries see the installations of chemical factories and other technological facilities in their domain as huge success in technological advancement, their eyes seem to be closed to the possible side effects (risks) of such installations. Owing to the benefits or profit, the producers of such technologies and the governments that back them up tend to conceal or at least neglect the risks associated with such technologies (Beck, 1998). The first priority of techno-scientific curiosity is utility for productivity, and the hazards connected with it are considered only later and often not at all (Beck, 1992).

While it cannot be denied that there is a continuous global diffusion of GSM into developing countries, including Nigeria, with its tremendous opportunities and benefits, there is need for caution as there may be certain accompanying risks to battle with particularly in the area of health.

Methods

Both qualitative and quantitative methods were used in this study. Qualitative materials were sought from the internet in order to bring out up-to-date information on GSM in relation to health. In-depth interviews were conducted among five health professionals (four in Ijebu-Igbo and one in Ago-Iwoye), two microwave telecommunication experts (one in Ijebu-Igbo, one in Ota) and two health radiation experts (health radiation physicists) in Ota, all in Ogun State, Nigeria.

Quantitatively, a questionnaire was administered to medical doctors in both private and public hospitals in Ijebu-Igbo, Ago-Iwoye and Shagamu, all in Ogun state, south western Nigeria. In Ijebu-Igbo, questionnaire was administered to medical doctors in Victory Specialist Hospital, Idunnu Hospital, Life Care Hospital, Dominion Clinic and Adedoyin Memorial Hospital (all of which are private hospitals) as well as the General Hospital in Ago-Iwoye. Questionnaire was also administered to medical doctors in Best Care Hospital (a private hospital) and the Olabisi Onabanjo University Health Center, both in Ago-Iwoye. In Shagamu, questionnaire was administered to medical doctors at the Olabisi Onabanjo University Teaching Hospital (Former Ogun State University Teaching Hospital, (OSUTH).

The questionnaire was divided into two main sections. The first was on the characteristics of the respondents including sex, age, highest qualification, marital status, name of hospital, town of the hospital as well as whether or not respondent used GSM, and frequency of use. The second was on the health implication of GSM. In this section, respondents were expected to indicate their perception regarding whether or not GSM has any effect on the health of the user. They were also to state the specific effects of the GSM handset and how the effects occurred as well as whether or not they considered the effects of GSM harmful. Similar questions were also asked with respect to the GSM mast tower. Finally, the respondents were required to supply information on how the effects (if any) of the GSM handset and mast tower could be minimized. A total 56 health professionals completed and returned the questionnaire.

Results

This section is divided into two parts. The first presents the characteristics of the respondents while the second presents their responses to questions on the health implication of GSM. In discussing the health implications, the responses given by the respondents were supplemented with information obtained from the internet as well as the results of the in-depth interviews.

Characteristics of respondents

The socio-demographic characteristics of the respondents are presented in Table 1. The majority of the respondents (77 percent) were males and three fifths were below the age of 40. Ninety three percent were qualified medical doctors with at least an M.B.B.S. or

Table 1: Distribution of Respondents by Socio-demographic Characteristics

Characteristics	N	%
Sex of respondent		
Male	43	76.8
Female	13	23.2
Total	56	100.0
Age		
Below 40 years	33	59.0
40 years and above	23	41.0
Total	56	100.0
Qualification		
M.B.B.S/M.B.Ch.B	52	92.9
Other	4	7.1
Total	56	100.0
Religion		
Christianity	49	87.5
Islam	6	10.7
Other	1	1.8
Total	56	100.0
Marital Status		
Single	19	33.9

Married	39	66.1
Total	56	100.0
Town of Practice		
Shagamu	37	66.1
Ijebu-Igbo	11	19.6
Ago-Iwoye	8	14.3
Total	56	100.0
Hospital		
Teaching Hospital	38	67.9
Private Hospital	18	32.1
Total	56	100.0

M.B.Ch.B degree, while others had other qualifications like B.Sc Nursing. They were mainly of the Christian Faith (88 percent), and with two-third married, while the rest were single. The distribution of respondents by town where they practiced medicine showed that two-thirds were from Shagamu, 20 percent were from Ijebu-Igbo and 14 percent were from Ago-Iwoye. On the basis of hospital affiliation, two-thirds were from the teaching hospital in Shagamu, while the rest were mainly from private hospitals in Ijebu-Igbo and Ago-Iwoye. More than nine in every ten of the respondents used GSM phone on a daily basis, suggesting the fact that the use of mobile phones was widespread in the study group.

Health Effects of GSM

Is GSM harmful to health? Does GSM have any effect on the health of the users? When this second question was posed to the health professionals in our study, half of the respondents answered in the affirmative, 11 percent answered otherwise while the rest 30 percent had no idea. When those who answered in the affirmative were asked to mention the ways in which the GSM handset affects health, the following were the specific effects mentioned: “exposure to radiation or radiation hazards” and “emissions of radioactive rays affect the heart,” “electromagnetic waves can cause distortion (or affect the growth) of cells.” Other effects mentioned are “mutation,” “neoplastic changes,” “neurological damage of the brain,” “increased risk of brain tumour,” “predisposition to cancerous cells,” “radiation leading to malignant changes of cells in the body,” “emission of gamma radiation which is an associating factor with cancer or tumour” and “placing handset close to the ear which can damage the eardrum.”

Similarly, specific responses given as to the effects of the GSM mast tower (base station) include the following: “atmospheric ‘pollution’ with electromagnetic waves,” “emission of radioactive rays into community,” “and possible contribution to the depletion of earth’s ozone layer thereby leading to heat generation.” Also, the GSM mast tower is said to be able to “affect the pulse rate,” “has long-term consequences still being investigated,” “is potentially carcinogenic,” “leads to restlessness,” “can cause neurosis” and similar phrases were used to capture the effects of the mast tower.

In contrast, responding to an in-depth interview, radio-wave telecommunication experts admitted that GSM handsets and mast tower emit radiation but that the radiation is so insignificant that it does not constitute health hazard. It thus appears that the question as to whether or not GSM is harmful cannot, as yet, be answered with an unqualified ‘yes’ or ‘no’.

On the other hand, interviews with health radiation physicists tended to indicate the possible health hazards of GSM. The following response by a health radiation physicist in Ota, Ogun State, drives home the point:

There is nothing that is good that does not have its own bad side. That is just how life is. GSM has its implications. While it is good for communication, it is not very health friendly.... Theoretically, mobile phones should not have health effects since they emit non-ionizing radiation. However, experiments that I carried out show that just 10 minutes of this radiation can cause some alterations in our DNA. For example, when I exposed rats to 10 minutes micro-wave radiation, there was alteration in their DNA pattern compared to the ones that were not.... In another study I carried out at base stations, I observed traces of ionizing radiation. This implies that the base stations are even more harmful to our health than the mobile phones.

In their study: “Monitoring of radio-frequency radiation from selected mobile phones”, Usikalu and Akinyemi (2007) observed that the mobile phones handsets emitted radiations beyond background radiation levels and therefore concluded that mobile phone handsets have health effects. The more

sophisticated phones emitted higher radiations just as radiations were higher when the phones were being charged.

From the literature, attempts have been made to understand how GSM affects the body. However, little is known as yet about the biological mechanism involved. The psychological effects arise principally through the induction of small current in the case of lower frequencies, and principally through heat in the case of higher frequencies (carrier wave), so that both mechanisms may apply. Amplitude, frequency and modulation together determine which biological effects occur. Pulse modulation is the most crucial in this regard. In other words, a weak pulse modulated signal such as that of mobile phones has a greater biological effect than a strong frequency-modulated signal (such as that of FM transmission masts) (Maes, 1995, cited in Dutch monitoring network, 1998).

Recent research on the possible impact of GSM on health has shown that GSM pulse-modulated radiation can cause various psychological effects, such as alteration of the calcium balance in the nerve tissue of rats and also inhibition of cell growth in the human amniotic epithelium. Changes in the EEG (electroencephalogram, graphic representation of the general electrical activity of the brain, identifying characteristic wave patterns) have been observed. These sub-clinical effects do not always have to lead to disease but do call for alertness. It is assumed that GSM has no mutagenic characteristic (investigated in yeast cells) but can further the development of tumour (in rats) (Dutch Monitoring Network, 1998).

Verschaeve of the VITO (Flemish Institute for Technological Research) carried out other biological investigations into possible genetic (carcinogenic) effects of electromagnetic field on human beings. He is a member of the European Group of Experts on danger connected with mobile phones and representative at the European Cost 224(a) Campaign and at the World Health Organization (WHO). They had been carrying out research on the VITO for over ten years into the biological effects of non-ionized radiation and especially into radio frequencies. The conclusion was that there are no clear indications that these waves can be harmful under normal circumstances. However, there were alarming reports which necessitated further investigation.

If there was a genetic effect, it would prove that the development of cancerous cells could be possible but in no way whatsoever certain. On the other hand, if this effect could be possible, then it could be said that, there is no direct carcinogenic effect. By the use of cytogenetic techniques (chromosome research, direct research into DNA), research was carried out on human blood cells into the damage caused to hereditary materials (DNA). The results showed that sometimes there is a genetic effect, but only in circumstances differing from normal exposure. This confirmed an earlier investigation, which showed that this effect only occurs in the case of exposure with thermal effects, or in the case of frequencies which have nothing to do with the use of mobile phones. It is also claimed that effects in other experiments on mammals are due to either exposure higher or for instance stress situation.

Discussion and Conclusion

Although a lot of apprehension has been expressed by the public on the likely health hazards of mobile phones, especially the possible links between its use and cancer or other risks to human health; the existing scientific evidence found in the literature, as regard a public health hazard from the use of mobile phones or living near a base station is not sufficiently convincing. Most of the health professionals in our sample allude to the possible health effects of GSM because, theoretically speaking, exposure of the body, especially prolonged exposure, to electromagnetic radiation could predispose the body to future cancerous growth. It is a known fact that illness from other types of low-level radiation exposure typically take 10-15 years to develop. This implies that studies that could actually verify the health effects of GSM are those conducted on people who have had 10-15 years of mobile phone usage.

Majority of research (both epidemiological and experimental) on non-human animals and humans shows no definite causative relationship between exposure to mobile phones and harmful biological effects in humans. However, a number of individual studies suggest such relationship exists. For example, Khurana *et al* (2009) in a meta-analysis of eleven studies from peer-reviewed journals concluded that cell phone usage for at least ten years “approximately doubles the risk of being diagnosed with brain tumor on the same (‘ipsilateral’) side of the head ... preferred for cell phone use.” It is also suggested that young children are at a greater risk from any ill-effects (Sage and Carpenter, 2009). Similarly, findings from an epidemiological study by Lonnet *et al* (2004) suggested that regular use of mobile phone over a period of a decade or more was associated with an increased risk of *acoustic neuroma*, a type of benign brain tumour. There were similar findings by Hardellet *et al* (2007), Khurana (2008), Hardellet *et al* (2009).

In spite of the fact that industry has not yet found risks from mobile phone radiation, US-based health experts warn that more independent research is needed. The telecom companies and the government, both profit enormously from mobile phone revenues and have vested interests in the existing systems being declared safe. It is not surprising that any health hazard has yet to be proven when most research to date has been industry funded. There is need for more independent research on this subject. In the mean time, every possible precaution against radiation dangers should be taken, including sitting of transmitters or base stations not just away from school grounds but also away from all inhabited areas. If we ignore this warning and act without common sense or prudence, the proliferation of network masts may turn out to be our own undoing health-wise. In the same vein, electromagnetic radiation absorbers may be attached to handsets and the use of earphones may help keep the handset not too close to the head while making calls. Similarly, call time should be reduced to minimize the amount of exposure to radiation. This implies shorter conversations on cell phones. In the alternative, speaker options or texting may be adopted. Also, handsets should also not be kept too close to the heart in breast pockets. Since young children may be at a greater risk of any ill-effects, parents should encourage their children to limit their exposure by adopting all the aforementioned precautionary measures.

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