

# Pattern of Use and Discomfort caused from the use of Mobile Phone among Staff and Students of Bayero University Kano

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## Abstract

*The tremendous users of mobile phone make concern for its health effects of serious concern especially following the classification of cell phone radiation as a possible carcinogen by the WHO. Recently, animals as well as human studies have implicated this radiation as a possible cause for neuronal and other tissue dysfunction. This study aimed to assesses the pattern of use, awareness of health effects and discomfort caused while using of mobile phone among staff and students of Bayero University Kano. Data were obtained using a semi structured pretested self administered questionnaire. Analysis was done using a statistical package for social sciences (SPSS) version 20.0 and appropriate statistics were used to compare means and proportions of dependent and categorical variables respectively. The results showed that the mean duration of contact with phones among the respondents is 16±8 hours and that they spend approximately 2 hours 30 minutes and 4 hours 40 minutes making/receiving calls and browsing the internet in a day respectively. Females seem to receive more calls than males while staff stays longer surfing the internet than students. Even though, over 75% of the male respondents are aware of the health effects of mobile phone usage, however, 82% of them keep their phones either in their side or breast pockets. This is observed to be commoner among staff (67%) than students (48%). Almost a quarter (24.4%) of the respondents reported ever experiencing a discomfort related to their use of mobile phones. The present study showed high and unsafe pattern of mobile phone useage and related discomfort as well as high awareness of its health effects among our respondents.*

**Keywords:** mobile phone usage, health effect, radiation, cancer, WHO

## INTRODUCTION

In Nigeria, Global satellite of mobile telecommunication (GSM) Mobile phones are replacing the coded or landline telephones to become the only, perhaps the most, reliable modern day telecommunication gadget. Worldwide, there are about 6.9 billion GSM subscribers of which over 259 million of them are in Nigeria (WHO, 2014; NCC, 2019). The GSM phone receives and transmits signals at operating frequencies of between 450 and 2700 MHz with peak powers in the range of 0.1 to 2 watts (Eberhardt *et al.*, 2008; WHO, 2014). This results in

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the generation and transmission of rapidly fluctuating electric and magnetic fields/energy, that passes through space with the velocity of 186, 000 miles per seconds, referred to as electromagnetic Radiation (Eberhardt *et al.*, 2008). Within the GSM bandwidth, the radiations emitted are referred to as radiofrequency (RF) radiation (Redazione, 2015). These radiations are absorbed by the body tissues resulting to biological effects which are measurably related to the degree of absorbed energies or the specific absorption rate (SAR). The SAR is a measure of the rate of energy absorption due to exposure to an RF transmitting source; it is a measure of the rate and relative threshold of tissue absorbance for radiation and biological hazard when using a cell phone (FCC, 1996). Mobile phones constantly vary their power to operate at the minimum power necessary for communications, however, closeness of the phone to the body increases the operating power and hence the radiofrequency exposure as well as the SAR (WHO, 2014). The SAR is regulated to range between 0.08 to 1.6 Watts per Kg of body weight (W/Kg) for any cell phone and is determined using a humanoid model over an average of 30-minute phone call with the cell phone held close to the ear of the humanoid model (FCC, 1996). Interestingly, our modern-day cell-phone use is, in all sorts of manners, not limited to the scenario of determining the SAR above. In addition, it's even getting more dangerous now due to the ubiquitous and exponentially increasing availability and use of electromagnetic polluting devices like lap tops, tablets, cellular towers and broadcast antennas, Wi-Fi routers, Bluetooth sensors, smart utility meters, baby and other monitor devices, structures used in the generation and delivery of electricity as well as other electromagnetic field (EMF) emitting devices such as electric and wireless gadgets which generate the extremely-low frequency electromagnetic field (FCC, 1996; Redazione, 2015). These make the ambient electric smog thicker and more harmful such that these electromagnetic radiations can be characteristically comparable to smoking, and could perhaps, be regarded as a modern invisible toxin with tendency to pose as a serious health threat in this our 21st century. Consequently, more than 220 scientists and 105 NGOs from atleast 41 and 25 countries respectively have signed an appeal to the United Nations requesting the world body to, as a matter of precautionary action, fulfill its role as the preeminent international public health agency to reduce EMF exposure conditions (Redazione, 2015). It is therefore pertinent, to educate the public about the biological effects and the potential health risks of electromagnetic pollution. Consequently, an understanding of the pattern of Phone usage and awareness of its potential health implications among the public is an important starting point.

## **METHODOLOGY**

A descriptive cross sectional study was therefore designed to explore the pattern of usage, place of keep, discomfort experienced and awareness about a possible biological effect of mobile phone usage among staff and students of Bayero University Kano. The study derived its subjects from across the staff and students of the College of Health Sciences, Bayero University, Kano. Using a semi structured data capturing form, information regarding number of phones and SIMs, place of mobile phone keep, number, type and average duration of daily phone use, awareness about possible adverse effects of phone use as well as discomfort experienced while using of mobile phone were obtained from eighty two (82) consented participants.

## **DATA ANALYSIS**

Generated data were subjected to statistical analysis using the Statistical Package for Social Sciences (SPSS) version 20.0. Discrete and categorical data were summarized using counts and percentages while continuous variables were summarized using mean±SEM. While an

independent samples t-test and Pearson's chi-square were used to compare appropriate statistical variables, 5% margin of error was tolerated for statistical significance and the data was presented using tables.

## **RESULTS**

Out of 100 questionnaires distributed, a total of 94 were retrieved/submitted back among which 12 were partially completed and hence were not included for statistical analysis. This gave us a response rate of 94% and an attrition rate of 18 percent. Students formed the majority (78%), while females constituted a 45% of the respondents. The age (Mean $\pm$ SD) of the respondents is 24.5 $\pm$ 7.4 with a range of 17-57. Male staff (n=15) had a mean age of 36.1 $\pm$ 9.7 while male students (n=30) had a mean age of 23.5 $\pm$ 3.9. On the one hand, female staff (n=3) had a mean age of 21.0 $\pm$ 1.0, while the Mean age  $\pm$ SD of female students (n=34) is 20.5 $\pm$ 1.6.

All the 82 respondents had a functional GSM mobile phone. It was observed that 67% of female staff uses one (1) mobile phone while 60% of male staff uses two (2) mobile phones as at the time of this research. On the other hand, majority of the students (females=56% and males=57%) were using one (1) mobile phone as of the time of data collection (table 1). Smart phones were found to be the dominant phone types used by the respondents. Sixty seven percent (67%) each of both male and female staff reported having a smart phone in their possession, but this figure also stood at 90% and 97% for male and female students respectively (table 2). The highest number of SIM use was found among male staff who had a 66% portion of them using 3 or more SIM cards [female staff=33%, male students=33% and female students=41%] (table 3).

When asked about their awareness on the biological hazards of using mobile phones, higher awareness level were found among females (73%) than males (69%). Male staff appeared more (73%) aware than male students (68%) but female staff were less (33%) aware compared to their students counterpart (77%). Also, emitting dangerous radiation was the modal effect ascribed to mobile phone use among the various strata of respondents (table 4 and table 5). From table 6 and table 7, it could be observed that side pockets were the major place of mobile phone keep among staff (72%) and then males (71%), while females (68%) and students (41%) keep their mobile phones in their bags. It was also noted generally that, staff spent much more time making and receiving calls as well as surfing the internet than students (table 8), females however, receives longer calls and surf the internet more than males (table 9). On the other hand, male staff surf the internet, made and received more calls than the female staff, male and female students respectively (table 10). Total radiation time (a daily sum total of hours spent using the phone and the duration of time the subject stays with his/her phone in an active mode) which amounts to the total time the subject is exposed to the radiofrequency radiations, is however noted to be uniformly distributed among the respondents (tables 8 and 9). On the other hand, 24.4% of our respondents reported one form of phone-use related discomfort or the other, with eye discomfort being the most prevalent discomfort reported by staff and male respondents while students and females generally reported more thermal discomfort than any other phone-use related health effect (tables 11 and 12).

**Table 1: Number of Functional Mobile Phones in Use Across the Respondents**

VARIABLES	STAFF			STUDENTS				
	MALES (%)	FREQ	FEMALES (%)	FREQ	MALES (%)	FREQ	FEMALES (%)	FREQ
NO. OF PHONE IN USE BY RESPONDENT								
ONE (1)	5 (33)		2(67)		17(57)		19(56)	
TWO (2)	9(60)		1(33)		10(33)		15(44)	
THREE (3)	1(7)		0(0)		3(10)		0(0)	

**Table 2: Type of Mobile Phone in Use Across the Respondents**

VARIABLES	STAFF			STUDENTS		
	MALES (%)	FREQ	FEMALES (%)	MALES (%)	FREQ	FEMALES (%)
TYPE OF MOBILE PHONE IN USE BY RESPONDENTS						
SMART ONLY	6 (40)		1(33)	14(47)		20(59)
NON-SMART ONLY	5(33)		1(33)	3(10)		1(3)
SMART AND NON-SMART	4(27)		1(33)	13(43)		13(38)

**Table 3: Number of Functional SIM Cards in Use Across the Respondents**

VARIABLES	STAFF			STUDENTS		
	MALES (%)	FREQ	FEMALES (%)	MALES (%)	FREQ	FEMALES (%)
NO. OF SIMs IN USE BY RESPONDENTS						
1-2 SIMs	5 (33)		2(67)	20(66)		20(59)
3-4 SIMs	8(53)		1(33)	6(20)		11(32)
5-6 SIMs	0(0)		0(0)	2(7)		3(9)
≥7 SIMs	2(13)		0(0)	2(7)		0(0)

**Table 4: Awareness on the Health Effects of Mobile Phone-Usage Across Gender**

EFFECTS OF MOBILE PHONE-USAGE	MALES	FREQ (%)	FEMALES	FREQ (%)
Emits dangerous radiation		17(38)		9(24)
Causes cancer		11(24)		6(16)
Affects the ear		2(4)		6(16)
Affects the eyes		3(7)		4(11)
Affects the heart		2(4)		1(3)
Affects the reproductive organs		2(4)		0(0)

**Table 5: Awareness on the Health Effects of Mobile Phone-Usage Across Staff and Students**

EFFECTS OF MOBILE PHONE-USAGE	STAFF	FREQ (%)	STUDENTS	FREQ (%)
Emits dangerous radiation		6(33)		20(31)
Causes cancer		4(22)		13(20)
Affects the ear		3(17)		5(8)
Affects the eyes		1(6)		6(9)
Affects the heart		1(6)		2(3)
Affects the reproductive organs		1(6)		1(2)

**Table 6: Place of Mobile Phone Keep Across Staff and Students**

PLACE OF MOBILE PHONE KEEP	STAFF FREQ(%)	STUDENTS FREQ(%)
Breast pocket	2(11)	4(6)
Side pockets	13(72)	23(36)
Hand held	1(6)	5(9)
In the bag	2(11)	26(41)

Table 7: Place of Mobile Phone Keep Across Gender

PLACE OF MOBILE PHONE KEEP	MALES FREQ(%)	FEMALES FREQ(%)
Breast pocket	5(11)	1(3)
Side pockets	32(71)	4(11)
Hand held	2(5)	4(11)
In the bag	1(2)	25(68)

Table 8: Pattern of Phone Usage Across Staff and Students

PATTERN OF MOBILE PHONE-USAGE	STAFF Mean±SEM	STUDENTS Mean±SEM
Daily received calls (mins)	124±37	85±21
Daily dialed calls (mins)	74±32	53±12
Daily internet use (hrs)	5.7±1.6	4.3±0.7
Total daily phone usage (hrs)	9.0±2.2	6.6±0.9
Daily contacts with phone (hrs)	13.8±1.9	16.5±1.0
Total daily radiation time (hrs)	22.8±3.6	23.1±1.5

Table 9: Pattern of Phone Usage Across Gender

PATTERN OF MOBILE PHONE-USAGE	MALES Mean±SEM	FEMALES Mean±SEM
Daily received calls (mins)	79±19	111±34
Daily dialed calls (mins)	73±20	39±8
Daily internet use (hrs)	4.4±0.8	4.9±1.0
Total daily phone usage (hrs)	4.9±1.2	7.4±1.1
Daily contacts with phone (hrs)	16.3±1.7	15.5±1.4
Total daily radiation time (hrs)	23.2±1.9	22.9±2.1

Table 10: Duration and Gender Specific Patterns of Mobile Phone-Usage

PATTERNS OF MOBILE PHONE-USAGE	STAFF		STUDENTS	
	MALES Mean±SEM	FEMALES Mean±SEM	MALES Mean±SEM	FEMALES Mean±SEM
Daily received calls (mins)	129±44	97±65	54±17	112±36
Daily dialed calls (mins)	84±38	23±14	67±23	41±9
Daily internet use (hrs)	6.2±1.8	3.3±2.8	3.5±0.8	5.0±1.1
Daily contacts with phone (hrs)	15.3±2.0	6.3±2.3	16.8±1.5	16.3±1.4

Table 11:Phone-Use Related Discomfort Experienced Across Staff and Students

DISCOMFORT EXPERIENCED	STAFF FREQ (%)	STUDENTS FREQ (%)
Thermal discomfort	1(6)	28(44)
Eye discomfort	2(11)	5(8)
Ear discomfort	2(11)	0(0)
headache	1(6)	3(5)

Table 12: Phone-Use Related Discomfort Experienced Across Gender

DISCOMFORT EXPERIENCED	MALES FREQ (%)	FEMALES FREQ (%)
Thermal discomfort	2(4)	7(19)
Eye discomfort	5(11)	2(5)
Ear discomfort	2(4)	0(0)
headache	3(7)	1(3)

## DISCUSSIONS

It could be observed that exposure to phone-related radiations among our subjects, as a result of background and active phone usage, is high. In addition, higher rates of unsafe use and positioning of phones closer to the sensitive parts of the body; like the eyes, ears, gonads and the brain, is also evident from our findings. By implication, this demonstrates that large amount of radiations are absorbed by these body tissues. Kept closer to the body, 50 to 70% of all the radiations emitted by a phone are absorbed by the body (Slesin, 2000). Therefore, the observed keeping and using of phones continuously closer to the body by our subjects, might have allowed for continuous tissue absorption of large amount of radiations thereby resulting in the higher biological effects observed. Apart from the 'obvious' phone-use related discomfort we reported, there could be other non-obvious effects that may be of allostatic importance. These includes oxidative injury via lipid peroxidation (Ozgun *et al.*, 2010), decrease body's antioxidant defense systems (Esmekaya *et al.*, 2011), brain alpha wave disturbances (Curcio & De Gennaro, 2005), memory impairments (Nittby *et al.*, 2008) and induction of DNA breaks and Impairment of its repair mechanisms (Belyaev *et al.*, 2009). More recently, accumulating doses of mobile phone related radiation has been reported to affect the plasticity of the nervous system via a significant reduction in number, size and relative percentage of differentiation in neural stem cells (Eghlidospour *et al.*, 2017).

Our findings of high and unsafe pattern of phone use corroborates the findings of Zulkefly and Baharuddin (2009), Sri Nkhita *et al.* (2015) and Raju Srijampana *et al.* (2014), whom reported an average of 5 hours and 3.3 hours of mobile phone usage as well as 3 hours of daily internet use amongst medical students, secondary school adolescents as well as University students respectively. On the other hand, Aggarwal *et al.* (2012), reported 2 hours of phone usage among German resident doctors. Notwithstanding these differences, phone ownership and regularity of usage, is in either case, noted to be highly prevalent as has similarly been reported by Mezei *et al.* (2007). Of utmost concern, phone addiction disorder seems proximally eminent, because mobile phone addiction has been reportedly linked to two or more hours of daily mobile phone use (Choliz, 2012), and our reported pattern of phone usage is likely going to increase due to the increasing number of phone types, sales promotion and lower prices. Of greater note, our 24.4% observation of self reported phone-related discomfort is far lower than the 77.9% observed among Iranian elementary and Junior High School children (Mortazavi *et al.*, 2011). The higher percentages observed by Mortazavi *et al.* (2011), is likely because children and adolescents are more indulged with devices usage due to their less commitment compared to adults. Children are also significantly more hypersensitive to radiation exposure than adults (Fazel *et al.*, 2009), hence the observed differences.

## **CONCLUSION**

The present study indicated that our respondents are highly exposed to phone-related radiations as a result of prolonged close background contacts as well as long active phone usage and similarly caused phone-use related discomfort as well as high awareness of its health effects among our respondents.

## **LIMITATIONS**

Although the self-declaration of usage and biological discomfort experiences obtained from our respondents may not objectively reflect their true occurrences. This small sample, preliminary finding should be viewed in the light of such limitations.

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