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EVALUATION OF THE KNOWLEDGE AND AWARENESS OF NON-IONIZING RADIATION AMONG FINAL YEAR STUDENTS OF COLLEGE OF MEDICAL SCIENCE UNIVERSITY OF MAIDUGURI

Luntsi Geofery[1], Muftaudeen Basirat[1], Charles U. Eze[2], Nwobi I.Chigozie[1], Abubakar Auwal[1], Ochie Kalu[2], Nkubli F.Bobuin[1], Njiti Mohammed[1] Alhamdu S. Moi[1], and Abubakar G. Mathew[1]

[1]Department of Medical Radiography, College of Medical Sciences, University of Maiduguri, Borno State.
[2]Department of Radiography and Radiological Sciences, Faculty of Health Sciences and Technology, University of Nigeria, Enugu Campus.

ABSTRACT: *This study was aimed at evaluating the level of knowledge, types, and Potential hazards of non-ionizing radiation among final year students of college of medical science, University of Maiduguri. A prospective cross sectional survey study was conducted among final year students of college of medical sciences, for 6 months periods, March to August, 2014. A total of 335 structured 12 items self-completion questionnaires were randomly distributed to participants and 312 were filled out and returned, with a response rate of 93.1%. Data was analyzed using descriptive statistics, where mean, percentages and frequencies where computed There were about 184, (59%) male participants and 128, (41%) female participants in the study with age ranged from 21 to 45 years with mean age of 28years. Majority of the respondents were within the age group of 21-26 years with 171, (54.8%). The department of MBBS/BDS had 122 (39.1%), BMLS had 61 (19.6%), Radiography had 52 (6.7%), Nursing Science had 38 (12.2%), physiotherapy had 20 (6.4%) and Anatomy had 19 (6.1%) number of participants. Majority of respondent, 162 (51.9%) wrongly thought ultraviolet ray, microwaves, radio waves and Extremely Low Frequency radiation are types of ionizing radiation. While 108 (34.6%) knew they are types of non-ionizing radiation. About 153 (49%) wrongly believed that ultrasonography (USS) and Magnetic Resonance Imaging (MRI) uses ionizing radiation for diagnosis, while 139, (44.6%) knew they do not use ionizing radiation, and 20 (6.4%) did not know. Majority of the respondents 247 (79.2%), knew that excessive exposure to non-ionizing radiation could be hazardous. This study found insufficient knowledge on non-ionizing radiation and their types among final year students of college of medical science, however, participants were seen to have appreciable knowledge on potential hazards of non-ionizing radiation.*

KEYWORDS: Radiation, Non ionizing radiation, Ionizing radiation, Final year, Student

INTRODUCTION

Much emphasis is normally laid on the knowledge and risk of ionizing radiation, the knowledge about non-ionizing radiation is either insufficient or not taken serious by the medical students and our daily exposure to the different forms of radiation both (ionizing and non-ionizing) cannot be overemphasised. Health care professionals are no different from the lay people when it comes to exposure to non-ionising radiation like the sun[1].

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Non-ionizing radiation is relatively low-energy radiations that do not have enough energy to ionize atoms or molecules. It is located to the low end of the electromagnetic spectrum[2]. Non-ionizing radiation originates from various sources; natural origin (such as sunlight or lightning discharges among others) and manmade (power lines, microwaves, radio waves, infrared radiation, visible light and lasers)[3]. Although considered less dangerous than ionizing radiation, overexposure to non-ionizing radiation can cause health issues such as localised heating, or photochemical reactions can occur with possible permanent harm[4].

While Ionizing radiations are high energy radiations that have the ability to ionize an atom or completely break a molecular bound in the body, examples are x-rays, and gamma rays[2].

Since the mid 1970's, when Adey discovered that extremely-low-frequency electromagnetic field (ELF EMF) may affect the calcium ions efflux from various cells, bio-effects of non-ionizing radiation (NIR) have become the subject of growing interest. At present, the fact that NIR exerts both stimulatory and inhibitory effects on different physiological cellular parameters is rather unquestionable. At the same time, some epidemiological studies suggest that exposure to EMF is potentially harmful even if its intensity is very low[5]. Therefore, dependent on the energy and exposure time, non-ionizing radiation can cause localised heating, or photochemical reactions can occur with possible permanent harm. Exposure should therefore be minimised. Inappropriate or incorrect use and a wrong design increase the chances of physical harm[6].

The international commission on non-ionizing radiation protection (ICNIRP) recommends a localized specific absorption rate (SAR) limit of $10Wkg^{-1}$ average over any 10g mass of tissue in the head for occupational exposures and $2W\ kg^{-1}$ average over any 10g mass of tissue in the head (0.02 absorbed in any 10g mass of tissue in the head) for hand-held radiotelephones (general public exposure) (ICNIRP, 1996). ICNIRP is a charitable body of independent scientific experts established by the international radiation protection association (IRPA) whose principal aim is to disseminate information and advice on the potential health hazard of exposure to non-ionizing radiation including electromagnetic fields[7].

Mubeen, Qamar, and Bighat[8] carried out a study on the knowledge about ionizing and non-ionizing radiation among medical students of a private medical college of Karachi, Pakistan using self administered questionnaires. They found that nearly 40% of the students accepted that objects in the x-ray room emit radiation after an x-ray procedure, and most of them believe that ultrasound, microwave equipment and MRI emits ionizing radiation. Jerkegren *et al,*[9] carried out a research on Sun-related behaviour and Melanoma awareness among Swedish University Students where a cross-sectional survey was conducted by distributing questionnaires. Their findings reveal that the overall knowledge of melanoma was high, there is excessive sun exposure among University students and a high level of knowledge of risk does not lead to a sun-protective behaviour.

This study was aimed at finding out the final year medical student of University of Maiduguri knowledge about non-ionizing radiation, their types and their possible hazards.

METHODOLOGY

A prospective cross sectional survey study was conducted using self completion questionnaire, administered to the final year student of college of medical sciences,

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University of Maiduguri which include; Anatomy, Dental Surgery (BDS), Medical Laboratory Science (BMLS), Medicine and Surgery (MBBS), Nursing science, Physiotherapy and Radiography Departments. Data was collected using a 12 items self-completion questionnaire that was pilot tested and validated by the project supervisor. The questionnaire contained three (3) sections; section A on demographic data, B on the Knowledge of non-ionizing radiation and C on the benefit and hazards of non-ionizing radiation (Appendix). Data collected was analysed using statistical package for social Sciences (SPSS) version 20.0 and descriptive statistics such as, mean, frequencies and percentages were generated for the study.

RESULTS

A total of 335 questionnaires were distributed and 312 were filled out and returned, giving a response rate of 93.1% within a period of six months (March to August, 2014).

A total of 59% (184) of the respondents were males and 41% (128) were females. About 54.8%, (171) of the respondents fall within the age range of 21 to 25years, 38.8% (121) were within the age range of 26 to 30years and (6.4%) 20 of the respondents were above the age of 30 years, with a mean age of 28 years (Table 1).

The department of MBBS/BDS has the highest number of respondents with 39.1% (122), followed by department of BMLS with 19.6% (61), Radiography with 16.7% (52), Nursing Science Department with 12.2% (38), physiotherapy with 6.4% (20) and lastly Anatomy department with 6.1% (19) respondents. Majority, 162 (52%) of the respondents believed that ultraviolet ray, microwaves, radio waves and Extremely Low Frequency radiation are types of ionizing radiation, while 118 (35%) of the respondents correctly agreed that these were types of non-ionizing radiation, and 42 (13%) say they did not know (Table 2)

About 153 (49%) respondents believed that ultrasound (USS) and Magnetic Resonance Imaging (MRI) emits ionizing radiation, while 139 (45%) said they do not use ionizing radiation and 20 (6%) of the respondents do not know (Table 3).

Majority of the respondents 272 (87%) agreed that we are always expose to radiation in our daily activities while 24 (8%) disagreed, and 16 (5%) do not know (Table 4).

Majority, 293 (93.9%) also agreed that solar radiations are essential for vitamin D and Melanin synthesis, while 13 (4.2%) disagreed, and 6 (1.9%) of the respondents do not know.

Majority, 243 (78%) of the respondents agreed that excessive exposure to non ionizing radiation could have some potential health hazards, and 54 (17%), disagreed, while 15 (5%) do not know (Table 5).

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TABLE 1: Age and Sex Distribution of Respondents

		Gender		Total
		Female	Male	
AGE GROUP	21-25	92	79	171
	26-30	33	88	121
	31-ABOVE	3	17	20
Total		128	184	312

TABLE 2: Respondents' Knowledge on Types of Non-Ionizing Radiation

	UV RAY,MW,RW AND ELF radiation are types of ionizing radiation course of study						Total
	ANATOMY	BMLS	MBBS/BDS	NURSING	RADIOGRAPHY	PHYSIOTHERAPY	
YES	74%	54%	42%	74%	37%	85%	52%
NO	16%	21%	43%	11%	62%	15%	35%
DON'T KNOW	11%	25%	15%	16%	2%		13%
Total	100%	100%	100%	100%	100%	100%	100%

TABLE 3: Imaging Modalities that Emits Non-Ionizing Radiation

	MRI and USS uses Ionising Radiation Course of study						Total
	ANATOMY	BMLS	MBBS/BDS	NURSING	RADIOGRAPHY	PHYSIOTHERAPY	
YES	63%	84%	37%	76%	10%	55%	49%
NO	37%	5%	57%	18%	88%	30%	45%
DON'T KNOW	0%	11%	6%	5%	2%	15%	6%
Total	100%	100%	100%	100%	100%	100%	100%

TABLE 4: Respondents Knowledge about Sources of Non-Ionizing Radiation

	We are always expose to radiation in our daily activities course of study						Total
	ANATOMY	BMLS	MBBS/BDS	NURSING	RADIOGRAPHY	PHYSIOTHERAPY	
YES	95%	93%	76%	89%	100%	90%	87%
NO	5%		16%	5%	0%	5%	8%
DON'T KNOW	0%	7%	7%	5%	0%	5%	5%
Total	100%	100%	100%	100%	100%	100%	100%

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TABLE 5: Potential Hazards of Non-Ionizing Radiation

Excess Solar ray, LASER light, GSM & TV may be carcinogenic							
	COURSE OF STUDY						Total
	ANATOMY	BMLS	MBBS/BDS	NURSING	RADIOGRAPHY	PHYSIOTHERAPY	
YES	89%	74%	78%	79%	71%	95%	78%
NO	11%	25%	13%	21%	23%	5%	17%
DON'T KNOW	0%	2%	9%	0%	6%	0%	5%
Total	100%	100%	100%	100%	100%	100%	100%

DISCUSSION

The result from this study reviled that there were more male 59%, (184) than the female respondents 41%, (128) who participated in the study. There were more female 63%, (24) participants in nursing department compared to other departments; this could be due to the attraction of female gender to the nursing profession as it is regarded as a female profession.

This study found poor knowledge of non-ionizing radiation and their type among the final year students of college of medical sciences with 52%, (162) of the respondents believed that ultraviolet ray, microwave, radio wave and extremely low frequency radiation are types of ionizing radiation and 13% (42) of them do not know. This could be due to inadequate knowledge acquired during the course of their studies on the subject of non ionizing radiation.

However, the study found radiography students to have good knowledge of non-ionizing radiation as 62% (32) knew UV light, Microwave, radio wave and Extremely Low Frequency are types of non-ionizing radiation, while students of physiotherapy department had poor knowledge of non-ionizing radiation with 15%, (3). This could be due to the fact that radiography student are properly taught about ionizing and non-ionizing radiation during their course of study as compared to other departments in the college of medical science.

Over half of the respondents, 49% (153) of the respondents believed that Magnetic Resonance Imaging (MRI) and ultrasound (USS) emits or uses ionizing radiation, while 45%, (139) knew that they do not use ionizing radiation and 6 %, (20) of them do not know. These shows that majority of the students do not know which imaging equipment or modality emits or uses non-ionizing radiation in the radiology. This could also be due to poor curriculum content on the medical sources of non-ionizing radiation as seen among final year students of college of medical sciences, University of Maiduguri. These findings are in agreement with the study of Mubeen, Qamar and Bight[8] which found that most students believed that USS, microwave equipment and MRI emits ionizing radiation. On comparing the knowledge of the modalities that emits non-ionizing radiation among the various department, it is seen that radiography students have the highest knowledge with 89%, (46) followed by the MBBS/BDS students 57%, (70) and the least were the BMLS students with 5% (3), this probably could be due to the fact that basic knowledge of both ionizing and non-ionizing

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radiations are well taught to radiography students during their course of study than any other department in the college of medical sciences.

Majority of the participants 87%, (272) knew that exposure to no radiation is not only limited in the radiology department alone, but exposures to other radiation sources (natural background radiation, the use of cell phones and ultraviolet ray from the sun) could occur daily, and excessive exposure poses a risk for the eyes and skin, acute effects are sunburn and cornea inflammation (welder's flash). Long-term effects are skin cancer, skin thickening, premature aging of the skin and clouding vision (cataract)[6].

Majority of the respondents had good knowledge of the potential hazard of non-ionizing radiation with 78% (243) agreed that excessive exposure to solar ray, laser light, cell phones and TV lights posses a potential health hazard. Finding from this study are in agreement with the studies conducted by Latha *et al.*[10] in a Malaysian Medical school and Al-Muhayawi *et al.*[11] among Saudi Arabia Medical Students, who found that most students were aware of the potential risks arising from the use of cell phones to include; headache, loss of mental attention and sleeping disturbances, and at least half of them reported experiencing some of these negative effects. It also agreed with the findings of Jerkegren *et al*[9], who found that the overall knowledge and awareness of melanoma to be high among Swedish University students.

CONCLUSION

This found insufficient knowledge of non-ionizing radiation and their types among final year students of college of medical science, University of Maiduguri and also poor knowledge of modalities that emits non-ionizing radiation, with only radiography students having good knowledge about them; however, participants were seen to generally have good knowledge of potential hazards of non-ionizing radiation.

RECOMMENDATIONS

Based on the findings of this study, the following recommendations were made among others; A general review of the curriculum of all the courses offered in college of medical sciences of University of Maiduguri to include courses on both ionizing and non-ionizing radiation as a means of increasing knowledge among the students.

Students who are not in radiography department should be posted to radiology department so as to know and familiar with the modalities that emits ionizing and non-ionizing radiation.

REFERENCES

[1] Afshar R., Ali N. and Shiva G. Knowledge, Attitude and Behaviour (practice) Toward Sunscreen Use among Hospital Personnel in comparison with Laypeople in Zanjan, Iran. World Applied Sciences Journal [online]. 2013 22 (5). Available at: Idosi Publications. www.idosi.com

ISSN 2055-009X(Print), ISSN 2055-0103(Online)

[2] Bushberg J.T., Seibert J.A, Leidholdt E.M. and Boone J.M. The Essential Physics of Medical Imaging. 2nded. Philadelphia USA: Lippincott Williams & Wilkins. 2002 P. 17 – 19.

[3] Kwan-HoongNg. Non-ionizing radiations-Sources, Biological effects, Emissions and Exposures. In: International Conference on Non-ionizing Radiation at UNITEN, 2003. Available at: www.who.int.com

[4] Debra R. How Radiation Works: Non-ionizing radiation 2008. Available at; www.science.howstuffworks.com/radiation2.htm

[5] Fedorowski A. and Steciwko A. Biological effects of non-ionizing electromagnetic radiation [e-journal] 1998; 49(1). Abstract only. Available at: www.pubmed.com

[6] Foundation for fundamental Research on Matter. What are the risk of non-ionizing radiation? 2013. Available at: www.fom.nl

[7] Health and Safety Executive. Non-ionizing Radiation: mobile phone masts/base stations. 2012. Available at: www.hse.gov.uk

[8] Mubeen S., Qamar A., and Nighat N. Knowledge about ionizing and non-ionizing radiation among medical students. [e-journal] 2008; 20 (1). Available at: www.ayubmed.edu.pk

[9] Jerkegren E., Sandrieser L., Brandberg Y. and Rosdahl I. Sun-related behaviours and melanoma awareness among Swedish University students. [e-journal] 1999; 8(1). Abstract only. Available at: www.pubmed.com

[10] Latha R.K., Kiu D.C., Lye C.W., Yogeeta J. and Veena R. Awareness of mobile phone hazards among University Students in a Malaysian medical school. [e-journal] 2011; 3(7). Abstract only. Available at: http://www.scirp.org/journal

[11] Al-Muhayawi S., Eldeek B., Abubakar H., Benkuddah R., Zahid A. and Abukhashabah H. The Impact of Medical Education on Saudi Medical Students' awareness of cell phone use and its health hazards. Life Science Journal. 2012; 9 (2). Abstract only. Available at: www.researchgate.com

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