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Research Paper

# Assessment of Knowledge of Ionizng Radiation Among Medical Students in Bayero University Kano, Nigeria

Medical Science

KEYWORDS : Knowledge, ionizing radiation, medical student, Bayero University Kano

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## ABSTRACT

*Background: The use of ionizing radiation in medical imaging contributes the largest amount of man-made exposure to the public and there is no safe dose of ionizing radiation. Knowledge of ionizing radiation among medical students is critical in clinical practice.*

*Methods and Materials: The study design was descriptive and cross-sectional, conducted between Dec 2015 and Jan 2016. Purposive sampling method was used to select final year medical students that have undergone radiology posting in the course of their training. After intensive literature review, a structured questionnaire was formulated. Using pilot study the validity and reliability were tested and reliability coefficient was found to be .759. One hundred and twenty questionnaires were administered to the consented medical students, one hundred and twelve questionnaires were returned and properly filled. The collected data was analyzed using SPSS version 16.0 software. Knowledge was assessed as good if the score by the respondent is 50% and above or poor if the score is below 50%.*

*Results: Forty eight (42.9%) of the respondents scored 50% and for questions on knowledge of the effect of ionizing radiation on human body. Only forty nine (43.6%) of the medical students have good knowledge of choice of imaging modality for particular radiological procedure.*

*Conclusion: Medical students in Bayero University Kano have poor knowledge of ionizing radiation.*

**Introduction**

The use of ionizing radiation in medical imaging contributes the largest amount of man-made exposure to the public[1]. It has been estimated that about 21% of the total somatic dose and about 10% of the total genetically harmful dose arise from medical procedures, the most important contributor being diagnostic radiology[2]. There is no safe dose of ionizing radiation, as it takes only a single photon or particle to cause damage to DNA resulting in genetic alteration[3]. Being aware of the harmful effects of ionizing radiation, medical procedures using ionizing radiation should only be recommended to individual(s) who should derive maximum benefits from such exposures. Whenever the procedure is justified, it is necessary to keep the total exposure level as low as consistent with other requirements of practice. In this regard, the International Commission on Radiological Protection (ICRP) recommends that medical exposure should be as low as reasonably achievable (ALARA)[4]. In clinical practice ionizing radiation is used for diagnosis of pathological conditions and interventional procedures. In both diagnostics and interventional procedures doctors refer patients to radiology department from different specialties in clinical setting. The radiological equipment that use ionizing radiation include; conventional radiography, fluoroscopy, mammography, computed tomography, angiography, computed radiography, digital radiography, positrons emission tomography, single positron emission tomography and radiotherapy. The equipment that does not use ionizing radiation include; magnetic resonance imaging and ultrasound. The radiation dose differs with different imaging modalities that use ionizing radiation, therefore this has to be considered when requesting radiological procedure due to harmful effect. . A non ionizing radiation is preferred. .

Medical students are the future medical doctors that will be in different clinical specialties referring patients for various radiological procedures, it is therefore necessary for them to have a good knowledge of ionizing radiation. Should medical students have a good knowledge of biological effect of ionizing radiation and choice of imaging modality; it will help in the future in protecting patients, radiation workers and other members of the public from unnecessary exposure to ionizing radiation. The study aims at assessing the knowledge of ionizing radiation among medical students in Bayero University Kano.

**Methods and materials**

The study design is descriptive and cross-sectional, conducted between Dec 2015 and Jan 2016. Purposive sampling method was used to select final year medical students that have undergone radiology posting in the course of their training. All other medical students were excluded in the study. After intensive literature review, a structured questionnaire was formulated. Using pilot study, the validity and reliability were tested and reliability coefficient was found to be .759.

The questionnaire was designed to assess the knowledge of ionizing radiation among medical students in Bayero University Kano. Section A of the questionnaire is the demographic data of the respondents; section B contained questions aimed at assessing the knowledge of the effect of ionizing radiation on human body while section C contained questions aimed at exploring the knowledge of medical students on imaging modalities. Consent form was attached to every questionnaire in order to obtain the consent of the respondents. The questions asked to assess the knowledge of the effect of ionizing radiation includes; the two major effects of ionizing radiation on human body, application of ten day rule in radiological examinations, radiation dose limits for radiation workers, members of the public and pregnant women, the most radio-sensitive organ, the least radio-sensitive organ and then at what stage of development fetal tissue is more susceptible to ionizing radiation. Questions asked under choice of imaging modalities include; modality associated with highest radiation dose, modality associated with lowest radiation dose, the best modality for breast cancer screening, the best modality in assessing head injury, the best modality for cardio-vascular diseases and best modality for spinal cord injuries.

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One hundred and twenty questionnaires were administered to the consented medical students within the first week of data collection. One hundred and twelve questionnaires were returned and properly filled. The collected data was analyzed using SPSS version 16.0 software. Knowledge was assessed as good if the score by the respondent is 50% and above, or poor if the score is below 50%.

**Results**

The age of the respondents ranged from 23 to 35 years (mean = 28 ±9.3). The respondents consist of 63.4% (n = 71) males and 36.6% (n = 41) females.

**Table 1: Percentages of correct answers to questions on knowledge of ionizing radiation on human body**

| Questions | Two major Effects of ionizing radiation | Application of ten day rule | Radiation dose limits for health workers & pregnant women | Most radio-sensitive organ | Least radio-sensitive organ | When fetal tissues are more susceptible to ionizing radiation |
|---|---|---|---|---|---|---|
| Scores (%) | 67 | 40.2 | 25.9 | 33 | 50.9 | 40.2 |

**Table 2: Percentages of correct answers to questions on knowledge of choice for imaging modality**

| Questions | High dose Modality | Low dose modality | Best modality for breast cancer screening | Best modality for head injury | Best modality for cadio-vascular diseases | Best modality for spinal cord injury |
|---|---|---|---|---|---|---|
| Scores (%) | 36.6 | 32.1 | 64.3 | 50 | 41.1 | 43.6 |

**Table 3: Percentage of medical students who have a good knowledge of ionizing radiation**

| Knowledge | Effect of ionizing radiation on human body | Choice of imaging modality |
|---|---|---|
| Percentage (%) | 42.9 | 43.6 |

**Discussion**

Final year medical students that participated in the study are just about to graduate and join various specialties where they will take part in requesting radiological procedures for patients. Therefore having knowledge on the effect of ionizing radiation on living tissue and the knowledge of the choice of imaging modality for a akin to particular radiological procedure is critical. Good knowledge of the effect of ionizing radiation among medical students will help them in future to uphold one of the basic principles of radiation protection which is justification. Knowing the harmful effects of ionizing radiation will enable them to ensure that a particular procedure must be justified before requesting it. Knowledge of choice of imaging modality for a particular radiological procedure is very important because that will enable them to uphold two of the basic principles of radiation protection when they start practice which are justification and optimization. Having knowledge of different types of imaging modalities will enable the medical students to justify the execution and prevent unnecessary repeats of imaging investigations that border on ionizing radiation, when they start to practice. Optimization could also be achieved with a good knowledge of ionizing radiation thereby using low-dose instead of high-dose imaging modality. Good knowledge of ionizing radiation among medical students is also critical in achieving radiation protection.

The findings of the study as shown on table 1 above show that seventy five (67%) of the respondents out of one hundred and twelve (100%) know the two major effects of ionizing radiation. All the medical students ought to have known the major effect of ionizing radiation, this is very important because the effect is dose related. The results of the study as shown on table 1 above shows that only forty five (40.2%) of the respondents are aware of the application of ten day rule in radiology practice. This concept is important because it will avoid the abortion of early pregnancy and intra-vasation of contrast agent as a result of certain radiological procedures[5]. As indicated on table 1 above only 29 (25.9%) of the respondents have knowledge on radiation dose limits to radiation health workers, pregnant women and other members of the public. Medical students should know radiation dose limits because that will enable them uphold the concept of optimization of radiation dose when they start to practise. Knowledge of radio-sensitivity of various organs in the human body among medical students is critical because exposing a very radio-sensitive organ to ionizing radiation has to be highly justified to avoid or minimize non-stochastic effect to the tissues. As shown on table 1 above fifty seven (50.9%) of the respondents know the most radio-sensitive organ while only forty five (40.2%) have knowledge on the least radio-sensitive organ in human. Exposing pregnant woman to ionizing radiation when the fetal tissues are more susceptible to ionizing radiation might result to fetal abnormalities[5], therefore the future doctors ought to know when the fetal tissues are more susceptible to ionizing radiation. As indicated by findings of this study only forty eight (42.9%) respondents know when fetal tissues are more susceptible to ionizing radiation as shown on table 1 above.

The findings of the current study revealed forty one (36.6%) and thirty six (32.1%) of the respondents respectively have the knowledge of imaging modalities that are associated with high and low doses of ionizing radiation as shown on table 2 above. Radiation dose optimization which is an essential component of radiation protection can only be achieved with good knowledge of radiation doses associated with different imaging modalities. Breast cancer screening is a vital procedure for the detection of breast cancer which is an international practice. The entire medical students are supposed to know the best imaging modality for breast cancer. But the findings of the study show that seventy two (64.3%) of the medical students are aware of the best imaging modality for breast cancer screening as shown on table 2 above. With the high rate of accidents in Nigeria and mostly associated with head injury the future doctors should know the best modality of choice for head injury. As shown on table 2 above only fifty six (50%) of the respondents know the best imaging modality for head injury cases. With the increasing number of patients with cardio-vascular diseases, it becomes necessary for all the medical students to know the best imaging modality for such cases. The current study shows that only forty six (41.1%) of the respondents are aware of the modality of choice for cadio-vascular diseases as indicated on table 2 above. It is crucial for future doctors to be aware of the best imaging modality of choice for spinal cord injury because it is one of the critical conditions in clinical practices however, as shown on table 2 above only 41(36.6%) of the respondents has knowledge on the best imaging modality for spinal cord injury. The findings of the study shows that forty eight (42.9%) of the respondents scored 50% and above for questions on knowledge of the effect on ionizing radiation on human body as shown on table 3 above. Therefore only 42.9% of the respondents have good knowledge of the effect of ionizing radiation on living tissues. Furthermore the results of the study shows that only forty nine (43.6%) of the medical students scored 50% and above for questions on knowledge of the choice of imaging modality for particular radiological procedure. As such only 43.6% of the medical students have good knowledge of choice of imaging modality for particular procedure. Less than 50% of the medical students proved to have good knowledge of ionizing radiation, therefore medi-

cal students in Bayero University Kano have poor knowledge of ionizing radiation. The current study is in accordance with the study conducted by[6,7,8,9] on the knowledge of ionizing radiation among medical students which revealed poor knowledge among medical students. But the study disagrees with the study conducted by[10] which revealed good knowledge of ionizing radiation among medical students.

## Conclusion

Medical students in Bayero University Kano have poor knowledge of ionizing radiation.

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