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# How Knowledgeable are Non-Radiology Doctors on Ionizing Radiation?

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## ABSTRACT

**Background:** Due to the risk of hazard from ionizing radiation, non-radiology doctors who refer patients to the radiology departments ought to be knowledgeable enough about what their patients are subjected to. The high throughput of radiology requests in our centre in Nigeria justifies this study.

**Aim:** To evaluate the level of knowledge of non-radiology doctors on ionizing radiation with a view to reviewing local protocols on justification of investigations involving ionizing radiation.

**Material and method:** Eighty (80) structured questionnaires were administered to non-radiology doctors practising in different hospitals in Kano city, Nigeria. Answers were elicited on radiation protection principles, concept of ionizing radiation, radiation effects, imaging modalities that emit ionizing radiation, radiation measurements and attitude towards ionizing radiation.

**Results:** Seventy questionnaires were returned out of the eighty sent out with sixty-four (80 %) being properly filled. Knowledge of non-radiology doctors was variable on different indices; 15.6 %, n = 10 (fundamental principles of radiation protection); 45.3 %, n = 29 (effects of ionizing radiation); 34.4 %, n = 22 (knowledge on ionizing property of radiation); 73 %, n = 47 (emission of ionizing radiation by computed tomography); and 85.9 %, n = 55 (interest in specific modality).

**Conclusion:** Non-radiology doctors in Kano metropolis have fairly good knowledge of potential hazards of radiation.

**Keywords:** Knowledge, ionizing radiation, radiation protection, radiology,

## Introduction

Ionizing radiation interacts with matter to cause ionizations with potential for intracellular damage and biological effects [1, 2]. In spite of this potential for hazard, the largest man-made source of radiation exposure results from medical use [3]. In radiation medicine practice, ionizing radiation are emitted during radiography, fluoroscopy, mammography, computed tomography as well as in nuclear medicine and radiotherapy.

Rather than the modalities quaranteeing radiation safety, it is the expertize of radiographers that does. To achieve a compromise between image quality and dose, patients' anthropometric and machine technical parameters must be balanced. Each patient sent for exposure is at a risk of mismatch of anthropo-technical parameters, a risk extenuated by justification of investigation by referring physicians [4, 5].

Many radiological investigations expose patients to significant amounts of ionizing radiation thereby raising concerns about possible side effects in patients, particularly those related to cancer risk [6]. The largest contributor to this dramatic increase in radiation exposure is computed tomography (CT) scan [7]. A dose of radiation given should be as low as reasonably achievable in order to minimize risk to patients [8, 9]. Exposure to ionizing radiation without appropriate justification is discouraged because of deterministic and stochastic effect [10]. It was reported that knowledge of clinicians on ionizing radiation is inadequate [11]. The present study aims at evaluating the knowledge of non-radiology physicians in our own locality, in order to review local protocols on justification of investigations involving ionizing radiation.

**Material and methods**

Ethical approval was obtained from Ministry of Health, Kano State, Nigeria. The study was questionnaire-based and done in a prospective and cross-sectional manner. Volunteering respondents were selected from three public and two private hospitals between March to September, 2018. Public hospitals were Aminu Kano Teaching Hospital (AKTH), Murtala Mohammed Specialist Hospital (MMSH), and Sheik Muhammad Jidda Hospital (SMJH), while Premier Clinics (PC) and UMC Zhahir Hospital were private ones.

Eighty structured questionnaires, validated through an earlier pilot survey, and with reliability coefficient of 0.85, were distributed. The questionnaire had two sections; ‘A’ representing demographic information of respondents, and ‘B’ which assessed knowledge.

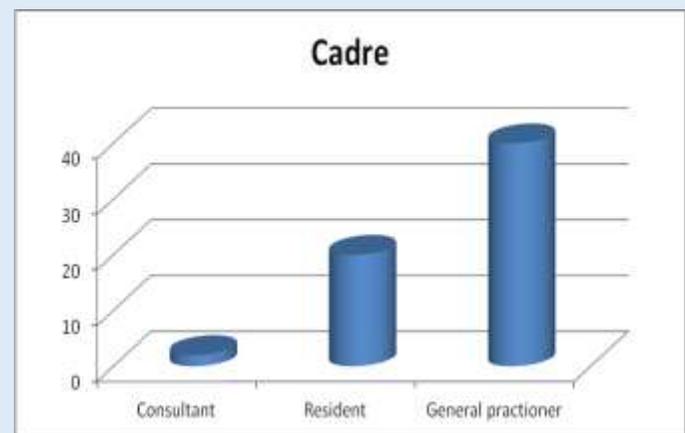
Questions included knowledge of fundamental principles of radiation protection, major effect of ionizing radiation, basic concept of ionizing radiation, when foetal tissues are more susceptible to ionizing radiation, imaging modality that uses ionizing radiation, sources of ionizing radiation, consideration of ionizing radiation equipment when requesting radiological investigation and protection when entering radiology department and during exposures. Data was analyzed using SPSS version 20.

**Results**

As shown in Figures i, ii and iii, there were 37 male and 27 female respondents (n = 64) distributed as follows: AKTH (n = 28), MMSH (n = 20), SMJH (n=8),PC( n = 6), UMC (n = 2). There were also 2 consultants, 20 residents and 40 general practitioners. Their ages ranged between 20 and 49 years with lower rung (20 – 29 years) constituting the bulk of respondents. The longest years of experience was 0 – 4 years(n = 34). Table 1 shows the response to questions on knowledge of ionizing radiation.

**Table 1. Responses to questions on knowledge of ionizing radiation.**

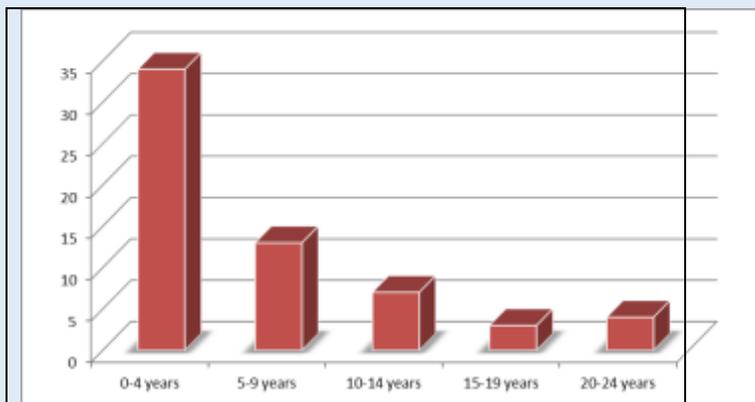
Questions	Positive (%)	Negative (%)	Neutral (%)
Know 3 fundamental principles of radiation protection	10 (15.6)	51 (80.0)	3 (4.4)
Know 2 major effects of ionizing radiation	29 (45.3)	31 (48.4)	4 (6.3)
Know if embryo is radiosensitive	49 (76.6)	13 (20.3)	2 (3.1)
Examples of ionizing radiation	53 (82.8)	10 (15.6)	1 (1.6)
Modalities that emit ionizing radiation	47 (73.4)	14 (22.0)	3 (4.4)
Sources of ionizing radiation	26 (40.6)	34 (53.1)	4 (6.3)
Consideration of ionizing radiation equipment	55 (86.0)	8 (12.5)	1 (1.6)
Protection when entering radiology department	53 (82.8)	10 (15.6)	1 (1.6)
stepping out when x-ray equipment is on	40 (62.5)	22 (34.4)	2 (3.1)



**Figure 1: Distribution of respondents by cadre**



**Figure 2: Distribution of respondents by work place.**



**Figure 3: Distribution of respondents by working experience**

### Discussion

Knowledge of radiation protection among non-radiology doctors will help them to justify procedures requiring exposure to ionizing radiation to minimize unnecessary exposure of patients. Good knowledge of ionizing radiation equipment will enable them to consider the specific risks from equipment when making a request. Since diagnostic radiology is indispensable in the evaluation of patients, it will be difficult to stop patient exposure entirely. A combination of factors which involves knowledge of referring clinicians, is a guarantee against unnecessary exposures [5].

The findings of the current study show that only 15.6 % (n = 10) of respondents knew that justification, optimization and limitation are fundamental principles of radiation protection. This response is in consonance with findings from

a similar study conducted in Saudi Arabia [12], which showed that only 13.7 % of respondents achieved high score on principles of radiation protection. The implication of inadequate knowledge of principles of radiation protection is the risk of unjustified investigations leading to unnecessary irradiation. Furthermore, the current study showed that 45.3% (n = 29) of respondents knew about stochastic and deterministic effects of ionizing radiation on human body, contrary to findings from a work in our neighbourhood [13] which showed that 96.9 % were aware of radiation hazard. The contradiction from both studies is explained by the fact that we assessed knowledge of specifics while the other study was about general awareness.

On theory of radiation protection that involved specifics, responses were poor, hovering between 15.6 – 45.3 %. However, knowledge on general awareness of radiation hazard was good (62.5 – 86 %). Our findings are similar to other works [1, 14, 15]. If the physicians read up on radiation and hazards, their knowledge gap will disappear.

### Conclusion

Non-radiology doctors in Kano metropolis have fairly good knowledge of potential hazards of radiation.

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