

Full Length Research Paper

Referring doctors knowledge about radiation doses in patients undergoing common radiological examinations

*A. Ahidjo¹, I. Garba¹, Z. Mustapha¹, A.M. Abubakar¹, U.A. Usman²

¹Department of Radiology University of Maiduguri Teaching Hospital, Borno State, Nigeria ²Federal Neuropsychiatric Hospital Maiduguri, Borno State, Nigeria

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In the present day scenario, radiation dose from medical imaging has come under scrutiny both in the medical and public press. This is as a result of the increased cancer risks associated with radiation as well as cases of excess radiation exposure from advance radiological equipment like CT scans.

Therefore, this study assessed doctors' knowledge on patients' radiation doses during radiological investigations on medical imaging equipment namely: conventional x-ray machine, CT, mammography, MRI and ultrasound in two tertiary institutions. This was a prospective study conducted at Maiduguri North Eastern Nigeria. A questionnaire was designed and distributed to all cadres of medical doctors apart from Radiologists. Radiological investigations were listed, and participants were asked to estimate equivalent doses using the dose of postero-anterio chest x-ray as a reference. Questions on knowledge of hazard of radiation, radiation measurement units, and use of referral guidelines were also included. A total score was aggregated for each question. A total of 81 questionnaires were distributed, and 65(80.2%) were returned. The participants that indicated their gender consist of 33.2% females and 64.6% males. Most of the doctors 96.9% are aware of radiation hazard, but only 38.5% knew its units of measurement. However, 58.5% are not aware of referral guidelines for imaging, and also 80% are unable to estimate doses for most of the radiological examinations. Only 14% of the doctors knew that MRI does not use ionizing radiation. The findings of the study revealed that most of the doctors are aware of radiation hazard, but did not know the amount of radiation dose received by their patients during radiological investigations. There is need to train doctors on radiation protection and its inclusion in the curriculum of medical schools especially in the developing countries where regulation may be poor. The introduction of referral guidelines is pertinent to success of radiation protection.

Keywords: Doctors, Radiation, Knowledge, Radiological Examinations, Nigeria.

INTRODUCTION

Radiation has been proven to have adverse biological effects on living organisms. These adverse effects vary according to dose and duration of exposure (Arslanoğlu et al., 2007). Also the increasing volume of medical imaging procedures particularly multi-slice Computed Tomography (CT) during the last few decades has turned radiation protection into one of the main concerns of the radiological community (Borgen et al 2010). Although, radiation is used widely in the diagnosis and treatment of

many diseases, but its limited usage for medical purposes is important (Arslanoğlu et al., 2007).

In the present day scenario, radiation dose from medical imaging has come under scrutiny both in the medical and lay press. This is as a result of the increased cancer risks associated with radiation as well as recent cases of excess radiation exposure from advance radiological equipment like CT scans (Eugene, 2010).

Radiological examinations play an indispensable role in Medicine (Guleria, 2009). Patients coming for radiological investigations are being referred by the referring doctors from various clinics, and study did however, show that there is lack of adequate knowledge of radiation among

*Corresponding Author E-mail. ahmedahidjo@hotmail.com

Table 1: Number of doctors based on their cadres

Doctors cadre	Frequency	Percentage (%)
Consultants	11	17.5
Residents	30	47.6
Medical officers	15	23.8
House officers	7	11.1
Total	63	100

doctors concerning radiation doses received by patients when they undergo such radiological investigations. More so, it has been noted that most of the doctors are submitting their patients to a radiation dose that is 16 times larger than they thought it was and it has been shown that the average mean dose of irradiation is six times the quantity estimated by the doctors (Shiralkar et al., 2003).

Former studies also, have revealed that referring doctors possess limited knowledge about ionizing radiation and its carcinogenic potential, and referral guidelines are not widely used (Borgen et al., 2010; Shiralkar et al., 2003). Therefore, based on the researcher's knowledge the situation in these centers might not be different from what is happening in the study locality, and it was the trigger of this study. There is dearth of literature regarding the level of doctor's knowledge on radiation received by patients during radiological examinations in developing countries.

METHODOLOGY

This was a prospective cross-sectional study conducted in two tertiary institutions University of Maiduguri Teaching Hospital and Federal Neuro-Psychiatric Hospital) located in Maiduguri North Eastern Nigeria from April 2011 to July 2011. Consent was sorted from all the participants. A questionnaire was designed based on literature reviewed (Arslanoğlu et al., 2007; Borgen et al., 2010; Eugene 2010; Guleria, 2009) and distributed to all cadres of medical doctors apart from Radiologists. This is because Radiologists gain extensive grounding in radiation protection and the relative radiation dose of different examinations during their formal training (Quinn et al., 1996).

Radiological investigations were listed, and participants were asked to estimate equivalent doses using the dose of postero-anterior chest x-ray as a reference. The correct values of radiation dose received by patients in different investigations were obtained from average values reported in literature (Eugene, 2010; Shiralkar et al., 2003; Quinn et al., 1997; Edwards, 2008). Questions on knowledge of hazard of radiation, radiation measurement units, and use of referral guidelines were included. Also the participants were asked to classify radiation injuries into deterministic and non-deterministic effects. Decision making as regard to the use of ionizing radiation was also assessed using a Likert scale of 1-3, score of 1 as very important, and score of 3 as not important. A total score was aggregated for each question, and data were analyzed using SPSS version (16) statistical software.

RESULTS

A total of 81 questionnaires were distributed, and 65(80.2%) were returned. The participants that indicated their gender consist of 33.2% females and 64.6% males.

Table 1 classified the doctors based on their cadre, and majority were resident doctors 46.2%. Most of the participants 96.9% are aware of radiation hazard, but only 38.5% knew its units of measurement. The doctors that could correctly classified radiation injuries into non-deterministic and deterministic effects were only 23.1%.

Results of estimation of the received dose by patients in requested radiological examinations proportional to the dose delivered in a routine radiography of PA Chest X-Ray are shown in (Table 2). The percentages of correct, under-estimate, over-estimate and those that did not know are also shown in the table.

Weighting of radiation dose when referring, participants in the total sample, weighted radiation dose as more important than the patients wish and impact on the future health, but less important than the impact on diagnosis and impact on treatment (Table 3).

On the use of referral guidelines for imaging, the results revealed that 36.9% of the doctors are aware of referral guidelines and only 16.9% had made use of it.

Only 14% of the doctors knew that MRI does not use ionizing radiation. Similarly on ultrasound, only 20% had understanding that no ionizing radiation is used.

Table 4 compares the results of the present study with other similar investigations.

DISCUSSION

Radiological examinations have an indispensable role in the diagnosis and treatment of disease, but radiation has been proven to have adverse biological effects on living organisms¹. Therefore, knowledge and legislation about radiation protection need to be given more emphasis in the fundamental radiology teaching curriculum (Singh et al., 2008).

Studies and surveys have shown that doctors have poor knowledge of radiation doses of radiological examinations that are ordered and performed in clinical

Table 2: Percentage of doctors estimations of radiation dose absorbed by patients during radiological investigations using the dose of CXR as a reference

Type of exams	Percentage of radiation estimation of dose by doctors			
	Under estimate	Correct estimate	Over estimate	Don't Know
Skull	7.7	10.8	1.5	80
Sinuses	15.4	3.1	0	81.5
Post nasal space	0	6.2	10.7	83.1
Plain abdomen	18.5	1.5	0	80
Knee joint	17	1.5	0	81.5
Pelvis	15.5	1.5	1.5	81.5
Lumbosacral spine	15.4	1.5	0	83.1
Thoracic spine	13.8	3.1	0	83.1
Cervical spine	13.9	4.6	0	81.5
IVU	10.8	7.7	0	81.5
Barium Enema	12.3	6.2	0	81.5
CT Brain	12.3	4.6	0	83.1
CT Chest	15.4	4.6	0	80
CT Abdomen	13.8	6.2	0	80
mammography	13.9	4.6	0	81.5

Table 3: Median score for weighting the important factors when referring for imaging: 1=Very important, 2= Important and 3= Not important

	Radiation dose	Impact on diagnoses	Impact on treatment	Impact on the future health	Patient wish
Consultant (11)	2	1	1	2	2
Residents (30)	1	1	1	1	2
Medical officers (15)	1	1	1	2	3
House officers (7)	1	1	1	1	2

practice (Kong, 2005). The current study revealed that doctors could not appropriately estimate radiation doses in the field of plain radiography, contrast studies, CT examinations, and mammography. Most of the doctors either under estimate the dose or could not attempt the question. The estimated doses of some of the radiological examinations are much lower than the correct ones. This is in keeping with findings of the previous studies (Shiralkar et al., 2003; Sani et al., 2009).

Although several similar studies were carried out in other countries, there was no evidence for the same study in Nigeria. The comparison showed that the participants in the other studies (Arslanoğlu et al 2007; Shiralkar et al., 2003; Sani et al., 2009) had better awareness of lack of ionizing radiation in MRI and USS (Table 4). This is perhaps due to lack of knowledge of radiation hazard among doctors in the study locality.

As regard to the use of referral guidelines for imaging,

the results of the present study is similar to that of Borgen et al. which reported radiation dose been considered as more important factor when referring for imaging than patient wish and impact on the future health, but less important than impact on treatment and diagnoses.

There are more resident doctors than any cadre of doctors in the study (Table 1), this is because resident doctors represent large number of doctors, and also are found at all time in the clinics or in the wards.

CONCLUSION AND RECOMMENDATION

The study indicates that there is awareness of radiation hazard among doctors but limited radiation knowledge and lack of use of referral guidelines. Surprisingly, weighting of radiation dose was found to play a vital role

Table 4: Comparing the result of this study with other similar investigations

	Awareness about lack of radiation dose in MRI	Awareness about lack of radiation dose in USS	Correct estimation of patients received dose	
			Plain abdomen	Abdominal CT
Present study	14%	20%	1.5%	6.2%
Shiralkar et al 2003 UK (5)	92%	95%	1.5%	6%
Arslanoglu et al 2006 Turkey (1)	72.6%	96%	0	8.2%
Sani et al 2009 Iran (10)	General physician	88.1%	89.1%	23.8%
	Specialist physician	100%	100%	16.7%

than detailed radiation knowledge. Therefore, we strongly recommend introduction of radiation protection courses and education on practical issues, including radiation dose received by patients, radiation safety and justification of referral for imaging to doctors and medical education programs especially in developing countries. The introduction of radiology referral guidelines is pertinent to success of radiation protection.

This could serve as an effective method to reduce the patient's dose in medical exposures.

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