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Full Length Research Paper

Knowledge of radiation and it effects among Doctors in Makurdi, North Central Nigeria

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ABSTRACT

Ionizing radiation is widely used to diagnose many diseases. The relevant hazards are known to be as an important limitation of its application. It is believed that the awareness of ionizing radiation dose value is one of the main stages in patient radiation protection. This study therefore assessed doctors knowledge on patient radiation doses during radiological investigation using medical imaging equipment namely: convectional X-ray machine, computerized tomography, mammography, MRI and ultrasound in various hospitals in Benue State. A questionnaire was designed and distributed to all cadres of medical doctors apart from Radiologists. Doctors were asked to estimate equivalent doses using the posterior-anterior chest x-ray as a reference with the use of the listed radiological investigations. Questions on knowledge of hazards of radiation, radiation measurement units and use of required guidelines were also included. Scores were aggregated for each question. A total of 100 questionnaires were distributed and 49(49%) were returned. The gender for the study includes 79.6% males and 20.4% females. About 100% of the doctors were aware of radiation hazards, but only 24.5% knew its unit and measurement. A total of 71.4% of the participants are not aware of the required guidelines for imaging and also 63.3% were unable to estimate doses for most of the radiological examinations. Only 16.3% of the doctors knew that MRI and Ultrasound do not use ionizing radiation. The study findings revealed that most doctors were aware of radiation hazards but did not have appropriate awareness about radiation dose delivered by different imaging modalities. Implementation of radiation protection courses and education of practical users including radiation safety during medical education programs could be an effective method to reduce the patient dose in medical exposures.

Keywords: Doctors' knowledge, radiation, dose, Nigeria.

INTRODUCTION

The widespread use of X-rays for medical diagnosis ensures that diagnostic medical radiology represents by far the most significant man-made source of exposure to ionizing radiation for population in the western world and also the developing countries (Ujah et al., 2012; Faulkner et al., 1999).

In view of the significant benefits to patients from medical radiation exposures, the principal concern of radiological protection is the reduction of unnecessary exposures (Faulkner et al., 1999). These unnecessary exposures are examinations that are either unlikely to be helpful to the patient management or involve doses that are not as low as reasonably practicable in order to meet specified clinical objectives. According to Ujah et al. (2012) it has been estimated that over 70% of the world population is exposed to medical X-rays annually, and about 95% of all man-made radiation is from diagnostic X-rays (Agba and Abu, 2005). It is instructive to note that the objective of any diagnostic X-rays procedure or examination is to produce images of patient of sufficient quality in order to provide adequate diagnostic information for clinical use (shrimpton et al., 1999; Faulkner et al., 1999). However, the somatic and genetic health risks associated with exposures to X-rays dictate that these examinations should be achieved with minimum amount of radiation levels (Agba and Abu, 2005).

Various studies from different parts of the world have

Table 1. Number of doctors based on their cadre

Doctors Cadre	Frequency	Percentage (%)
Consultants	5	10.2
Residents	24	49
Medical Officers	18	36.7
House Officers	2	4.1
Total	49	100

Doctors Cadre

Table 2: Percentage of doctors' estimate of radiation dose absorbed by patients during radiological investigation using the dose of CXR as a reference.

Types of Exams	Percentage of radiation dose estimated by doctors			
	Consultants	Residents	Medical officers	House officers
Skull	0	16.3	18.4	65.3
Sinuses	2	18.4	14.2	65.3
Post nasal space	0	18.4	18.4	63.3
Plain abdomen	2	16.3	16.3	65.3
Knee joint	0	16.3	20.4	63.3
Pelvis	2	16.3	16.3	65.3
Lumbosacral spine	2	18.4	16.3	63.3
Thoracic spine	2	14.3	18.4	65.3
Cervical spine	0	16.3	20.4	63.3
IVU	10.2	10.2	14.2	65.3
Barium Enema	18.4	16.3	2	63.3
CT Brain	20.4	4.1	10.2	65.3
CT Chest	24.5	10.2	0	65.3
CT Abdomen	28.6	6.1	0	65.3
Mamography	16.3	12.2	6.1	65.3

Table 3. Median score for weighing the impact factor when requiring for imaging:
1= very important, 2= important, 3=not important

Radiation dose	Impact on diagnosis	Impact on treatment	Impact on the future health	Patient wish
Consultants (5)	1	1	1	1
Residents (24)	1	1	1	2
Medical officers (18)	1	1	1	2
House officers (2)	1	1	2	2

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 ultrasound	Correct estimation of patient received dose
				Abdominal CT
Present study		16.3%	14.3%	6%
Shiralkar et al., 2003 in UK(6)		92%	95%	6%
Arslanoglu et al., 2006 in turkey (8)		72.6%	96%	8.2%
Current study	General physician	88.1%	89.3%	20.2%
	Specialist physician	100%	100%	33.3%

demonstrated a general lack of knowledge of radiation doses among doctors requesting for radiological investigations (Ghazikhanlou et al., 2009; Borgen et al., 2010; Ahidjo et al., 2012). Indeed, it has been observed that majority of referring physicians are submitting their patients to a radiation dose that is 16 times larger than

they thought it was and it has also been shown that the average mean dose of irradiation is 6 times the quantity estimated by the doctors (Shiralkar et al., 2003). However, no such work has been done in our community.

The objective of this work therefore, was to determine the doctors knowledge of radiation doses to patients during radiological investigations in Benue State, North-central Nigeria using a data collection instrument of semi-structured completion questionnaire.

METHODOLOGY

The study was a cross sectional prospective survey that targeted doctors working in various hospitals in Benue state, North-Central Nigeria. The survey was done on doctors of various cadres (apart from Radiologists) and these doctors are working in different hospitals in the State.

The data collection instrument was a semi-structured self-completion questionnaire designed in line with the objectives of the study.

A total of 100 questionnaires were distributed and 49 were duly filled and returned to the researchers during the period of data collection, giving a response of 49%.

Radiological investigations were listed and the participants were asked to estimate equivalent dose 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). Questions on knowledge of hazards 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

Table (1) shows the number and percentages of doctors based on their cadres with Consultants 10.2%, Residents 49%, medical officers 36.7%, and house officers 4.1%. Most of the doctors are aware of radiation hazard 100% but only 24.5% knew its units and measurement. The doctors that could correctly identify radiation side effects into deterministic and non-deterministic effects were 8.9%.

Percentage of radiation dose examination by doctors (i.e. under estimate, correct estimate, over estimate, don't know) are shown in Table 2 with references to dose of chest x-rays.

Weighing the impact factor for imaging, participants weighed radiation on diagnosis as more important than the impact on treatment and on future health and less important on patient wish table 3.

DISCUSSION

The application of radiation can aid the patient by providing doctors with medical diagnosis but the exposure must be reasonably low enough to keep the statistical probability of cancers or sarcomas (stochastic effects) below an acceptable level and to eliminate deterministic effect (i.e. skin cataracts) (UNSNRC, 2010)

Studies have shown that physicians have poor knowledge of radiation doses of radiological examinations that are requested and performed in clinical practice (Ghazikhanlou et al., 2009; Borgen et al., 2010; Ahidjo et al., 2012). Our study supports this assertion. The correct estimations of patients dose by doctors was not also appropriate in the field of plain radiography, CT Scan, contrast media radiography and mammography (Tavakoli et al., 2003; Shiralkar et al., 2003).

Most doctors underestimate the dose delivered in above mentioned radiological examinations (Table 2). However, their knowledge about sensitive organs response to radiation as well as low radiation rise examination was found to be ideal. The findings have also been reported by other researchers (Tavakoli et al., 2003; Shiralkar et al., 2003).

Although, similar studies were carried out in other countries and also in Maiduguri, North Eastern Nigeria, to the best of our knowledge there is no evidence of the same study in North Central Nigeria. Comparison of the results of Shiralkar et al. (2003) and Arslanoglu et al. (2006) with our study show that they had better awareness of lack of ionizing in MRI and USS (table 4). This may likely be due to the fact that there were more senior doctors in the sample population of these studies than ours.

CONCLUSION AND RECOMMENDATION

There was appreciable level of awareness of radiation hazard among doctors, but there is limited radiation knowledge and lack of use of referral guidelines. Weighting of radiation dose had a better analysis than the detailed radiation knowledge. We therefore, advocate that radiation protection courses and education of practical issues including radiation safety should be made mandatory both at undergraduate levels and also post qualification.

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