ASSESSMENT OF KNOWLEDGE, ATTITUDE AND PRACTICE OF PERSONNEL RADIATION MONITORING AMONG RADIATION HEALTH WORKERS IN KANO METROPOLIS, NIGERIA

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ABSTRACT

Background: Occupational radiation protection measures are essential for all individuals who work in the imaging departments that use ionizing radiation.

Aims: The study aims at assessing the knowledge, attitude and practice of personnel radiation monitoring among radiation workers in Kano metropolis, Nigeria.

Materials and Methods: The study design was cross sectional, and it was prospectively carried out from January 2017 to September 2017. An ethical clearance to conduct the study was sought and obtained from Kano State Hospital Management Board. A total number of 218 semi-structured questionnaires were distributed to consented radiation workers for the purpose of data collection. The validity and reliability of the questionnaire were tested. The collected data were analyzed using SPSS version 21.0.

Results: The results showed that 105(56.8%) respondents were not aware of personnel radiation monitoring. Only 10 (5.4%) respondents were provided with radiation monitoring device (Thermoluminiscent dosimeters) and only 9 (4.9%) of the respondents wear their monitoring devices. They could not remember how often the device was taken for reading. However, only 7 (3.8%) of those that used the monitoring devices were told the radiation doses they received. A great number of the respondents 175 (94.6%) were never monitored.

Conclusion: The findings of this study indicated that, there was poor knowledge of personnel radiation monitoring among Radiation Health workers, and the attitude of radiation workers toward radiation monitoring is not encouraging and there was a practice of personnel monitoring in some of the departments in Kano metropolis.

Keywords: Knowledge; Attitude; Personnel monitoring device; radiation protection.

INTRODUCTION

Radiation protection is concerned with minimizing the occurrence of stochastic and prevention of non-stochastic effects by setting dose equivalent limits well below the threshold values for these effects, such that the limits cannot be reached even for the total period of one working life [1]. This would limit the risks of stochastic disease to a frequency not greater than the risks of non-radiation workers[1].The instrument used for recording the dose equivalents received by individuals working with radiation is referred to as a personal dosimeter. All instruments must be calibrated in terms of appropriate quantities used in radiation protection. Personal Monitoring devices are film Badge, Thermoluminiscence dosimeter (TLD), Optically Stimulated Luminescence (OSL), Radio-photoluminescent (RPL) and Pocket Dosimeter [2]. Monitoring of radiation doses received by staff in radio-diagnostic centers are of great importance to the radiographers in their effort to protect themselves, patients and the general public from the effect of excessive radiation exposure. It is clearly sensible for those involved in the use of ionizing radiation in diagnostic radiology to have an appreciation of the possible risks involved [3].To ensure the safety of patients, their relations, staff and members of the public, it is important that the health personnel become familiar with the terminology, common equipment, and standard practices used in radiation safety and monitoring [4].

The implication of inadequate knowledge, bad attitude and practice can lead to radiation injury. Radiation injury is an injury an individual suffers as

a result of exposure to ionizing radiation. The injury is classified into two groups, namely the stochastic and non-stochastic radiation injuries [5].

Personnel radiation monitoring is essential in ensuring that the dose limits for staff are not exceeded. The dose limits for staff were published by the International Commission on Radiological Protection (ICRP) in 1977 and subsequently in the ionizing radiation regulations. A downward revision was done in 1991 by re-evaluation of data on risks. The effective annual dose limits were formerly 50mSv and the newly adopted effective annual dose limit is 20mSv averaged over five years[6].The downward review of an annual dose limit was to put stricter control over the use of ionizing radiation in Medicine and minimize possible hazard, especially the stochastic effects[7].

The study carried out by Mojiri and Moghimbeigi [8] titled Awareness and attitude of radiographers towards radiation protection, Hamadan city, Iran. Reported that, Majority of respondents knew that using film-badge as a personnel dosimeter in radiation field is necessary. However, in a study conducted by Botwe *et al.* [9] titled Personal radiation monitoring of occupationally exposed radiographers in the biggest tertiary referral hospital in Ghana. Eithysix of the respondents admitted that they do not wear their TLD Badges at all times during work. While, in a related study conducted by Okaro *et al.* [3] titled Evaluation of Personnel Radiation Monitoring in Radio-diagnostic Centres in South Eastern Nigeria, they reported that, Personnel radiation monitoring was available in only 4 out of 10 hospitals (40%) and in two of the hospital radiation monitoring does not cover all the radiographers on employment.

Occupational radiation protection measures are essential for all individuals who work in the imaging departments. This includes not only radiographers, radiologists and nurses, but also individuals who occasionally may be in the radiation environment. This category of people may be considered radiation workers, depending on their level of exposure and on national regulations [8]. Therefore, empirical study shows that, in some of the hospitals in the selected study area, these protective measures are not well practiced among the radiation workers. The consequences of not monitoring the personnel radiation dose can lead to the radiation injury such as stochastic and non-stochastic radiation injuries.

The result and recommendations of the study will help the radiation workers to be much aware of the importance of personnel monitoring. Thus, they will focus more in protecting themselves, patients and members of the public, and the finding of the study would provide a baseline data that can be used by the radiation regulators such as Nigeria Nuclear Regulatory Authority (NNRA) and the management of various hospitals to ensure radiation protection measures are adhered to and modify the rules where necessary. The study aims at assessing the knowledge, attitude and practice of personnel radiation monitoring among radiation workers in Kano metropolis, Nigeria.

MATERIALS AND METHODS

The study design was cross sectional, and prospectively carried out from January 2017 to September 2017.An ethical clearance to conduct the study was sought and obtained from Kano State Hospital Management Board. A total number of 218 Semi-structured questionnaires were distributed to consented radiation workers in eight hospitals located within metropolis, for the purpose of data collection. Because of the limited sample size, the researcher decided to study the entire population of radiation workers in the study locality. The questionnaire was designed to evaluate the knowledge, attitude and practices of personnel radiation monitoring among radiation workers in Kano metropolis. The questionnaire consists of four sections (A, B, C and D). Section A of the questionnaire contains the demographic data of the respondent, Section B fielded questions to evaluate the knowledge, Section C fielded questions to evaluate the attitude and Section D fielded questions to evaluate the practices of personnel radiation monitoring among radiation workers in Kano metropolis. The questionnaire was validated by a senior and experience colleague, a pilot study was conducted and the Cronbach alpha reliability coefficient was found to be 0.856. A consent form was attached to every questionnaire in order to obtain the consent of the respondents. The collected data were analyzed, using SPSS version 21.0 to perform descriptive analysis of the respondents' demographic information as well as calculate percentages of some of the responses obtained from the questionnaires. Pie and Bar charts were equally plotted.

RESULT

A total number of 218 questionnaires were distributed and 193 (88.5%) were returned. About 8 (4.2%) questionnaires were not properly filed. The returned questionnaires consist of 97 (52.4%) and 88 (47.6%) of male and female respondents respectively.

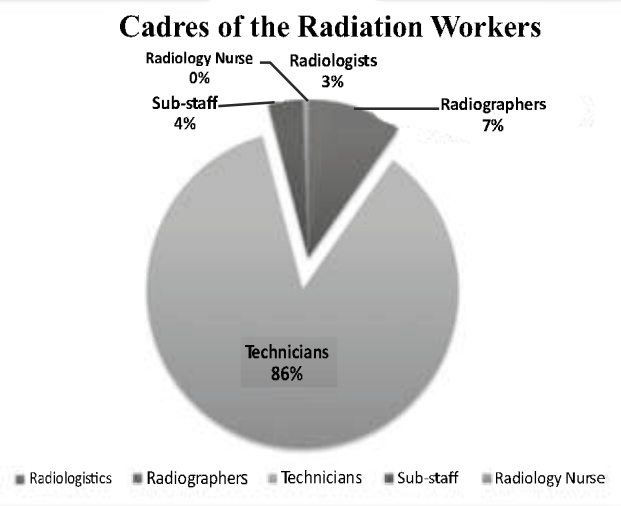

Figure1: Radiation workers based on cadre.

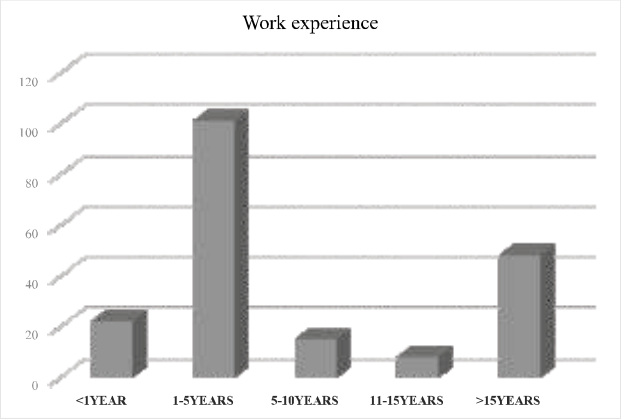

Figure2: Work experience of the respondents

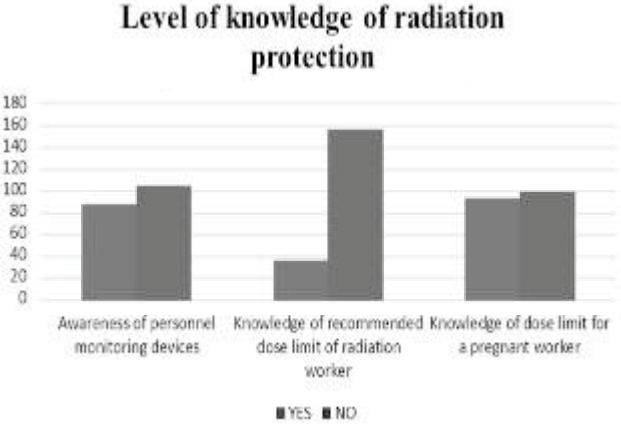

Figure 3: Level of knowledge of radiation protection.

Table 4:1 Attitude of radiation workers towards monitoring device

QUESTIONS	ANSWERS	
	Yes (Freq%)	No (Freq%)
Are you provided with any personnel radiation monitoring device?	10 (5.4%)	175 (94.6%)
Do you wear a radiation monitoring device daily?	9 (4.9%)	176 (95.1%)
Were you ever told of your radiation dose record?	7 (3.8%)	178(96.2%)
What is the type of monitoring device do you use?	Thermoluminescent dosimeter (TLD)	
How often is the monitoring device taken for reading?	They could not remember how often the device was taken for reading.	

It has been mentioned that the monitoring exercise has long been stopped. A great number of the respondents 178 (96.2%) were never monitored. Most of the respondents,175 (94.6%) were never provided with any monitoring devices. However, 116 (62.7%) of them attributed lack of provision of the personnel monitoring device due to lack of concern from the management. Meanwhile, others 69 (37.3%) due to lack of radiation safety officers. The majority of the respondents 117 (63.2%) confirmed that there was complained to the management for not providing the monitoring devices. More so none of the facility has Radiation Protection Advisory (RPA) or Radiation Safety Officer (RSO).

Table 2: Suggestions by the respondents

Suggestions made by the respondents in the study area on the personnel monitoring
1. Management should provide the personnel radiation monitoring devices.
2. Radiology Departments should have Radiation Safety Officers (RSO).
3. To have a regular monitoring from the radiation protection team.
4. To enlighten the workers on the risk of radiation and importance of personnel monitoring.
5. To reduce the number of working hours for radiation workers (from8hours in a day to 5 or 6hours in a day).

DISCUSSION

The findings of the current study shows that X-ray technicians were representing 162(87.6%) this might be attributed to the fact that, there were very few qualified radiographers in the study area, therefore, more x-ray technicians had to be employed to render radiography services. The findings of the current study is contrary to the findings of the study reported by Rostamzadeh *et al.* [7] Where Radiographers were the majority, most likely due to the level of development of their country. The result of this study shows that most of the respondents 98 (53.0%) were within 1-5years of working experience. However, only few of the respondents 8 (4.3%) were within 11-15years working experience. This is similar to what was reported by Ahmed *et al.* [5] which showed that 56% of the respondents were within 1-5years of working experience, and 4% of the respondents were within 11-16years of working experience.

A good number of radiation workers 105(56.8%) were not aware of the personnel radiation monitoring devices in the study area, perhaps this is attributed to the level of knowledge these categories of staff (X-ray technicians) acquired during their training. This is contrary to the finding of the study conducted by Sharma *et al.* [4] Which revealed that all the study subjects were aware of use of radiation protection materials used in the doors and walls such as lead, periodical radiation dose check from TLD and usage of personal protective devices like lead apron, this might be attributed to the fact that most of the respondents were Radiographers. The results of this study also revealed that most of the respondents 152 (82.2%) were not aware of the recommended dose limit for the radiation workers. This is contrary to the findings of the study reported by Mojiri and Moghimbeigi [8] that showed 81.7% (58 out of 71) had a better knowledge of recommended dose limit for the radiation workers. This is also attributed to the level of knowledge of the respondents. However, with regard to the knowledge of recommended dose limit for a pregnant worker,90(48.7%) of the respondents of this study, had a good knowledge. This was also contrary to what was reported by Sidi *et al.* [10] which showed that 51.4% had knowledge of radiation dose limits for radiation workers, other members of the public and pregnant women. This was attributed to the level of awareness of the respondents.

The attitude of the radiation workers toward using monitoring devices was assessed, and the result obtained, was very poor. This is similar to what was reported Botwe *et al.* [9] which showed that 86% of the respondents admitted that they do not wear their TLD Badges at all times during work.

The result of the current study also revealed that most of the respondents 175(94.6%) were never provided with any monitoring devices. This is almost similar to the findings of the study reported by Okoro *et al.* [3] which showed that personnel monitoring did not cover all employed personnel in Southeastern Nigeria. This is contrary, to the IAEA safety guidelines which require that every occupationally exposed worker must have a personal radiation monitoring device [11]. However, the few respondents that were given the personnel monitoring device (TLD), could not remember how often the device was taken for reading, and they have mentioned that the monitoring exercise has long been stopped, and onlyfew7 (3.8%) of those given the TLD were told of their radiation doses. This is contrary to what was reported by Ahmed *et al.* [5] which showed that 98.7% of the staff had periodical radiation dose

check from their TLDs, probably due to the level of knowledge and seriousness of their respondents.

The findings in this study indicated that no Radiation Safety Officer (RSO) or Radiation Safety Advisor (RSA) available in all the study centers, this means that there is no Radiation protection unit (which comprises the Radiation Safety Officer, Radiation Safety Advisor, Medical Physicist, Radiologist and Radiographer) in all the department in the study area. Designation of an officer as Radiation Safety officer (RSO) who shall develop skills in basic radiation safety and understand the regulatory requirements for practices involving radioactive materials and ionizing radiation is one of the Nigerian Nuclear Regulatory Authority (NNRA) minimum requirements for authorization of diagnostic and interventional radiology facility in Nigeria [12].This is contrary to the findings of the study carried out by Okaro *et al.* [3] where they reported that 40% of the study centers had Radiation safety advisory. The reason is attributed to the fact that there is no qualified medical physicist and no enough radiographers to saddle with such responsibility in the study locality.

CONCLUSION

The findings of this study indicated that, there was poor knowledge of personnel radiation monitoring, and annual dose limit among radiation workers in the study area, the attitude of radiation workers toward radiation monitoring is not encouraging and there was a practice of personnel monitoring in some of the departments but it has long been stopped. It has also discovered that none of the department has radiation monitoring unit, which comprises the Radiation Safety Officer, Radiation Safety Adviser, Medical Physicist, Radiologist and Radiographer.

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