Austin Journal of Radiology

Open Access

Austin Publishing Group

Editorial

Knowledge of Radiation Protection for Workers Exposed to ionizing Radiation in a Medical Environment in Conakry

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Received: March 28, 2024

Accepted: April 23, 2024

Published: April 30, 2024

Summary

Objective: To assess the current state of radiation protection in hospitals in Conakry.

Material and Methods: We carried out a descriptive cross-sectional study in the form of a survey during the period from May to August 2022 among the staff of the radiology departments in Conakry: CNSS, UGANC odontology centre, CIMED and Ignace Deen. The target population was workers directly assigned to radiation work (DATR). Staff knowledge of radiation protection principles and standards was assessed according to the normative approach suggested by the International Atomic Energy Agency and after an analysis of literature data.

Results: A total of 50 staff took part in the survey, with an average age of 34.1 ± 11 years, 66% of whom were men and 34% women. Of those surveyed, 72% had less than five years' professional experience working with ionising radiation (IR), 12% and 8% had worked for 5 to 10 and 10 to 15 years respectively, and 6% had more than 20 years' experience. More than three quarters of respondents (88%) said they had received specific training in radiation protection. The level of knowledge of the principles of radiation protection was classified as good for 5 respondents (10%), insufficient for 48% and poor for 42% of respondents.

Conclusion : The level of knowledge of workers exposed to ionising radiation in the medical environment in Conakry is inadequate. This calls on the health authorities to organise regular in-service training for these groups.

Keywords: Ionizing radiation; Knowledge; Conakry

Introduction

The Radiation protection refers to the protection of people against the effects of exposure to Ionizing Radiation (IR) and the means of ensuring this protection [1]. The use of IR for medical purposes, the main artificial source of exposure [2], presents a real dilemma. Exposure to sources of ionizing radiation (IR) results in the absorption by the subject in contact with the radiation of a dose likely to induce beneficial and harmful biological effects, making it essential for personnel directly assigned to work with radiation (DATR) to comply strictly with protection rules [3]. The latter are required to have perfect knowledge and mastery of the principles and standards of radiation protection, in particular justification of the procedure, optimization and dose limitation. The latter two are governed by the ALARA (As Low As Reasonably Achievable) concept [3]. The latter is required to have perfect knowledge and mastery of the principles and standards of radiation protection, in particular justification of the procedure, optimization and dose limitation. The latter two are governed by the ALARA (As Low As Reasonably Achievable) concept [3]. For several decades now, the International Atomic Energy Agency (IAEA) and the International Commission on Radiological Protection (ICRP) have regularly published recommendations calling on member states to ensure controlled and safe use of IR for medical purposes, based on two main principles : justification and optimization [4]. The IAEA recommends that ESRT workers' knowledge of the fundamentals of radiation protection be assessed and confirmed as adequate, prior to any unsupervised assignment to a workstation [5]. In Europe, IAEA member states ensure that measures are taken to organize education, training and retraining [6]. In Africa, a low level of overall knowledge of radiation protection for exposed workers had been observed in isolated cases in different countries, notably Cameroon [7], Burkina Faso [8], Benin [9] and the Central African Republic [10]. In Togo, a 2013 study showed a low level of knowledge among Togolese radiology

Citation: Doumbouya IS, Baldeth, Sackoa, Kourouma M. Knowledge of Radiation Protection for Workers Exposed to ionizing Radiation in a Medical Environment in Conakry. Austin J Radiol. 2024; 11(2): 1230.

manipulators about medical irradiation of pregnancies [12]. Despite the growing number of radiological facilities, and in particular cross-sectional imaging (CT) facilities, in sub-Saharan Africa, dosimetry centers are often lacking [14]. The absence of dosimetry means that there are no diagnostic reference levels for the most commonly performed radiological examinations. In Guinea, there has been no study of radiation protection to initiate positive change in this area. In this study, we set out to assess the current state of radiation protection in hospitals in Conakry.

Materials and Methods

We carried out a descriptive cross-sectional study in the form of a survey during the period from May to August 2022 among staff in the radiology departments of the following health facilities: caisse nationale de sécurité sociale, center d'odontologie de l'UGANC, CIMED and Ignace Deen. The target population was workers directly assigned to radiation work (DATR) in the departments concerned at the time of the survey. Only those who freely agreed to answer the questionnaire after a personal interview were selected. The questionnaire used was based on various research and previous studies. The semi-structured questionnaire contained 37 items divided into three groups relating to:

- Socio-professional profiles of staff assigned to the selected radiology departments;
- Staff knowledge of radiation protection principles and standards;
- Radiation protection equipment available in the departments, and any waiting lists.
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The assessment of staff knowledge of radiation protection principles and standards was based on the normative approach suggested by the International Atomic Energy Agency and an analysis of literature data. The principles and standards of radiation protection were covered by a series of twenty (20) multiple-choice questions. Each correct answer was scored out of 1 and each incorrect answer out of 0. The Overall Knowledge Score (OKS) was calculated from the number of correct answers to the questions (n = 20). For statistical purposes, we grouped the scores: [1-5] Poor, [6-10] Insufficient and [11-15] Good. This work was authorized by the Dean of the Faculty of Health Sciences and Techniques of the Gamal Abdel Nasser University of Conakry and the hospital authorities.

The feasibility and applicability of the questionnaire were first tested in a pilot study involving ten people.

For statistical analysis, we used SPSS software (SPSS version 19.0 (IBM)). In a first step, we calculated absolute and relative (percentage) frequencies for the categorical variables. Using Excel (Microsoft Office), we calculated means, medians and standard deviations, and determined extreme values for quantitative variables. In a second step, we carried out a comparative study between socio-occupational factors and knowledge of radiation protection. We carried out a mono-variate analytical study, testing the variables one by one, in order to identify factors that could have an impact on workers' knowledge. Percentage comparisons on independent series were performed using Pearson's Chi-square test. A difference between two groups was considered statically significant if p was less than 0.05.

Results

A total of 50 staff took part in the survey. The average age of those surveyed was 34.1 ± 11 years (20 to 65 years), with 66% men and 34% women. Of these, 72% had less than five years' professional experience under ionizing radiation (IR), 12% and 8% had worked for 5 to 10 and 10 to 15 years respectively under IR, and 6% had more than 20 years' experience. Respondents included: dentists (30%), trainee doctors (24%), radiology and medical imaging technicians (TRIM) (22%), radiologists (12%), TRIM students (8%), secretaries (4%). Over three quarters of respondents (88%) said they had received specific training in radiation protection, compared with 12% who said they had never received any training in radiation protection. Of those who said they had received training in radiation protection, 97.7% said it had been during their initial training, compared with 2.2% for training via the Internet. The average score for knowledge of radiation protection principles was 6.4 ± 2.9, with a range of 1 to 15. The level of knowledge of radiation protection principles was classified as good for 5 respondents (10%), insufficient for 48% and poor for 42%. The professional qualification of DATR staff was statistically associated with the level of their knowledge of radiation protection p=0.007. Of the total number of DATR personnel, only (20%) stated that there were illuminated signs at room entrances, followed by (80%) who answered this question in the negative. With regard to the availability of leaded aprons, 100% of respondents answered in the affirmative, 74% for thyroid covers, then 62% for leaded glass. DATRs also reported the availability of leaded gloves at 40%, leaded glasses at 32%, gonad protection at 24%, and leaded caps and skirts at 18% each. Less than half (34%) were aware of the availability of a radiation protection medical referent in their work unit. There was no occupational physician in any of the diagnostic X-ray centers in our study. All DATRs stated that they had never received any occupational medical follow-up. DATR staff at all the centers in our study expressed a desire for further and continuing training in radiation protection.

Discussion

This study, the first of its kind in the Guinean context to our knowledge, assessed the state of radiation protection by providing a snapshot of the staff profile as well as the level of knowledge of radiation protection standards and principles among DATRs, while identifying the radiation protection equipment available in the various centers. We noted a male predominance of 66%, as did Ongolo et al (2013) [3] from Cameroon, who had a male predominance of 64%. Other studies such as Ndong et al from Senegal [11] and Akanni et al [9] from Benin had a female predominance with respective percentages of 54.1% and 66.5%. This predominance of men may be due to easier access for men in the workplace, and to preconceived ideas about the effects of ionizing radiation on female fertility. The average age in our study was 34.1 ± 11 years, with extremes ranging from 20 to 65 years. DATR personnel in Guinea are relatively young, as shown by Ongolo et al [3] and Ndong et al [11], with respective mean ages of 38.8 ±7.7 (22 to 61) and 38.5 (23 to 65). The Global Knowledge Score (GKS) was below 10 for 90% of respondents. This is in line with the results of Ongolo et al [3], who obtained 83.1% of TRMDs with an overall score below 10. Akanni et al [9], despite having subjected the DATRs to prior training, had 93.4% of DATRs with a score below 10. The low level of overall knowledge of radiation protection among exposed workers had already been observed in isolation in the various member countries of SRANF (Société de radiolo-

gie d'Afrique noire froncophone), notably in Cameroon (Moifo et al., 2017) [7], Burkina Faso (Nikiema et al., 2017) [8], and the Central African Republic (Kouandongui Bangué Songrou et al., 2019) [10]. Cette mauvaise connaissance globale de la radioprotection par les travailleurs exposés n'était pas spécifique aux pays francophones sub- sahariens. Une étude quasi similaire réalisée en 2015 en Tunisie a montré que 59 % des travailleurs exposés avaient un SGC classé « Mauvais » (Marzouk Moussa et Kamoun, 2016) [19].

La moyenne du SCG des travailleurs exposés dans cette étude était de 11,8 avec des valeurs limites de 1 et 18 (Marzouk Moussa et Kamoun, 2016) [19]. This average, although slightly higher than ours, remains low. Another study in Saudi Arabia also showed a lack of knowledge of radiation protection among RPATs (Aldhafeeri, 2020) [20]. The level of knowledge of radiation protection standards and principles among physicians (radiologists and trainees) was better compared to other survey groups. This difference had also been observed in Cameroon (Ongolo et al., 2013) [3]. Professional qualification was the only factor associated with knowledge level that was found. This demonstrates the importance and relevance of developing teaching on radiation protection during initial training, while offering ongoing training to DATR personnel.

This reform would then require the introduction of legislation and a supervisory body for radiation protection. In contrast to Ongolo et al [3], who noted the presence of the occupational physician in hospitals, we note the absence of the occupational physician for the follow-up of WMSD personnel. However, 33.8% were unaware of their existence, and only 42% had received a follow-up in the last 12 months. With regard to the radiation protection equipment available in the centers concerned by our survey, only 20% of staff reported the presence of luminous signs at the entrance to the rooms, which is far from the results obtained by (Ongolo et al.) [3], which were 73.1%. This difference is due to the absence of laws and organizations governing the installation and control of radiation protection in Conakry. On the other hand, we found that 100% of DATR staff wore lead aprons, and that no dosimeters were worn at all. These results are identical to those found by Ndong et al [11], where the use of lead aprons was well established (57.6 or 93.4%). Hospitals should support staff retraining and ensure not only the availability of an occupational physician, but also finance the acquisition of radiation protection equipment, while ensuring quality control of equipment in collaboration with the competent bodies that would have been set up beforehand.

Conclusion

The level of knowledge among workers exposed to ionizing radiation in medical environments in Conakry is inadequate. This calls on the health authorities to organize a continuous and regular training program for these populations.

Author Statements

Conflict of Interest

The authors declare that they have no conflicts of interest in relation to this article.

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