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Evaluation of Personnel Radiation Protection and Monitoring In Government Hospitals Western Coast Libyan State

Dr. Nureddin. A. Musa

College of Medical Technology - A Zahra

Al Jafara University

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Abstract: **Aims of this study to find out the state of personnel radiation protection and monitoring practices applied to staff of the government hospitals (Radio-diagnostic and therapeutic departments) in western coast of the Libyan state. A cross survey was conducted targeted radiology staff working in ten selected government owned hospitals on Western coast of the Libya state was conducted.**

Materials and Methods: Survey visits were conducted to all the functional radiology departments facilities in Western coast of the Libya state and the available facilities identified, staff interviewed and the data collection tool was a questionnaire consisting of twenty-nine questions, which was distributed to the targeted sample, data was collected and analyzed using a statistical package Microsoft excel.

Result: Personnel radiation monitoring was available in only 4 out of 10 hospitals (40%) and in two of the hospitals radiation monitoring does not cover all the Staff on employment. Radiation monitors were found to be read fairly regularly at about every quarter of the year but it takes more than 3 years for fresh supplies of radiation monitoring devices to be made in the hospitals where radiation monitoring is carried out. Radiation protection supervisors were available in only 4 hospitals (40%). The majority of radiology staffs employees believe that the hospitals administration doesn't provide allocations for this, its budget and doesn't care about that.

Dosimetric records of staff are not given any consideration during recruitment of new staff.

Conclusion: There are inadequate personnel radiation monitoring practices in most of functional radio-diagnostic and radio-therapeutic in western coast of Libya state, and the level of monitoring is very poor. This is a significant precautionary lapse as radiations risks cannot be assessed and corrective measures taken.

Keywords: **Radiation protection assessment Western coast of Libya state.**

1. INTRODUCTION

Ionizing radiation is being used extensively in medical practices and there are (2.3) million medical radiation workers worldwide [1]. Any kind of radiation exposure incurred due to work is regarded as occupational exposure, and in practice, it is customary for all those who are occupationally exposed to external radiation to be individually monitored with personal dosimeters. The routine monitoring of occupational exposures is performed to verify and demonstrate compliance with the regulatory dose limits, recognize new exposure pathways or risks, and demonstrate a suitable level of radiation protection [2].

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2. MATERIALS AND METHODS

Study design, location, and duration: the study was conducted on government hospitals and health centers affiliated with the Ministry of Health in the western coast of the Libyan state during the period between August and December 2022. The study targeted the diagnostic and radiotherapy departments in hospitals operating in the Western coast- Libya. The data collection instrument was a sixteen-item semi-structured self-completion questionnaire designed in line with the objective of the study. A total of 10 questionnaires were distributed and 10 were duly filed out and returned to the researcher during the period of data collection, giving a response rate of 100%. The data collected were analyzed to describe the personnel radiation monitoring practices in the selected hospitals in western coast. The data was analyzed by statistical package Microsoft excel.

3. RESULTS

There are a total of 10 functional x-ray departments in Western coast. Ten (100%) government hospitals all owned by the government 100% are located in Libya state.

Table 1: Availability and methods of personnel radiation monitoring in the various hospitals

Hospital	1	2	3	4	5	6	7	8	9	10
Number of staff in job.	20	12	35	10	3	21	10	22	20	2
Number of Staff monitored	20	12	Nil	Nil	Nil	Nil	10	Nil	Nil	Nil
Type of radiation monitor	F.B	OSL	Nil	Nil	Nil	Nil	TLD	Nil	Nil	Nil

Table 2: Regularity and consistency of personnel radiation monitoring .

Hospital	1	2	7
Time interval before monitors are read (months)	6 months	3 months	3 months
Last time fresh supply of monitor was made	>5 years	>5 years	>5 years

Table 3: Availability of radiation protection supervisor.

Hospital	1	2	3	4	5	6	7	8	9	10
Availability of radiation protection supervisor or radiation protection officer.	Yes	No	No	No	No	No	Yes	No	No	No

Table 4: Availability of radiation protection training programs for workers before work.

Hospital	1	2	3	4	5	6	7	8	9	10
Availability of radiation protection training programs for workers before work	Yes	No	No	No	No	No	Yes	No	No	No

Table 5: Availability of quality assurance program for radiology equipments.

Hospital	1	2	4	7	9
Availability of quality control and quality assurance programs for devices and equipments	Yes	Yes	Yes	Yes	Yes
Frequency	Daily	Daily	Weekly	Monthly	Weekly

Table 6: Availability of implementing emergency plans .

Hospital	1	2	3	4	5	6	7	8	9	10
Availability of implementing emergency plans	No	No	No	No	No	No	No	No	No	No

4. DISCUSSION

Personnel radiation monitoring is an important safety precaution in the practice of medical applications. It does not in itself provide protection against ionizing radiations. Its main purpose is to measure radiation dose received by radiology personnel, which can be used that radiation doses received are within permissible limits, verify that facilities for radiation protection are adequate and show that radiation protection techniques are acceptable [3]. The result of our survey shows that the number of staff in the radiology departments in the selected Hospitals is 155(100%), Staff monitoring is available only in a few hospitals 42 (27.1%) and in most cases does not cover all the staff, also showed that radiation monitoring was almost non-existent in some centers, and in others, it was partial and incomplete.

The finding of our is appalling considering the importance of radiation monitoring to staff practice. Determining radiation dose received by personnel will ensure reduction of untoward biological radiation effects. Radiation exposures in medical applications are usually no accidental and protection is usually geared towards reducing stochastic effects, which likelihood is determined by the magnitude of the absorbed dose [4]. Its therefore important to estimate the risk of low dose radiation to radiography personnel. The most important of the stochastic effects is cancer induction. The risk associated with genetic effects of radiation is smaller than the risk of cancer induction, so it is the latter that is the principal consideration in determining dose limits [5]. To limit the probability of stochastic effects on radiographers, exposure doses have to be constantly monitored using suitable devices.

Our finding is that monitoring devices are available only in 3 (30%) out of 10 hospitals where they used, 7 (70%) of staff are not included in radiation monitoring services. We therefore note that all staffs are exposed to radiation risk and therefore should be monitored and leaving some in the monitoring process may dampen their morale and affect their output negatively.

The radiation monitoring device used in hospitals where radiation monitoring is available are film badge, OSL (Optically Stimulated Luminescence) and TLD (Thermoluminiscent dosimetry. The working principle of all monitoring and measuring devices is based on the effects that occur on the physics and chemical properties of the material used in their manufacture. Devices is a convenient method of personnel radiation monitoring as its portable, lightweight and can always be worn by the staff during work sessions. The most important features of the devices used are that they measure the total radiation dose over a period of time, have high sensitivity, reusable as OSL and TLD. Also the gender factor was found significant only in dosimeter use. Female workers were more likely to be consistent in measuring their radiation exposures, which corresponds with reports that health and protective behavior is gender -sensitive, being more positive in females than males[6,7]. Previous studies also reported better adherence to the use of dosimeters among female radiation workers [8,9] . This finding may also relate to the known risks if a woman is pregnant. The poor level of personnel radiation monitoring is obvious. Majority of the staff believe it is not provided for in the hospitals' recurrent budgets. This lack of will to do something beneficial to radiation staff leads to job dissatisfaction and discourage young leavers who may want to work in the field of using radiation applications in medical. The results of the survey showed that the process of collecting and reading radiation monitoring devices does not take place regularly for 3 to 6 months, and the process of providing new radiation monitoring devices may take more than 5 years in hospitals where radiation monitoring is performed. The dosimetric records which are not considered during recruitment of new staff is another lapse on the part of the centers. In other parts of the world its recommended and practiced that persons who have worked with radiation in the past should make their dosimetric recodes available to their new employers [10,11]. this is important as it helps to assess the radiation morbidity risk associated with the new employee**.**

Radiation protection advisers or supervisors are hardly available in the hospitals surveyed. They were found only in 2 (20%) hospitals when ideally they should be in every radiology department. It means that where they are not available, no oversees radiation monitoring in the department. In an ideal situation a medical physicists or health physicists is employed to the job or a radiologist trained and assigned the duties**.**

The survey result showed that 2 (20%) of the Radio-diagnostic and therapeutic staff had attended some form of training, both on-the-job and off-the-job; however, 8 (80%) indicated that they have not had the opportunity of attending any training program since employed. Majority also agreed that the wrong people are sometimes selected to attend training programs. It was thus recommended that in order to achieve maximum objective of a training program, before embarking on a training the first step in the training process must be carried out, thus conducting need assessment to know if training and what

training would be required to fill a gap. This would go a long way to maximize the benefits of the numerous training program at the Hospital. Its known that appropriate education and training of workers is an important factor in managing and reducing radiation risks. World health organization (WHO) (2008) defines quality assurance as an organized effort by staff operating a facility to ensure that the services produced by the facility are of high quality and at a low radiation dose to the patient [12]. Diagnostic image can consistently be of high quality with minimum radiation dose to the patient, only if there is a planned and systematic action by the staff of the facility to ensure that the diagnostic images produced by the facility are of acceptable standard in terms of diagnostic information and optimization of radiation protection [13]. The idea behind quality assurance is to maintain or improve quality and it includes monitoring, evaluating and maintenance at required levels of performance of the x-ray equipment among others. The results showed that 5 (50%) of the radiology department in the targeted hospitals implement QA and QC programs in a partially or incomplete manner with no trained staff to carry out these duties, no system of records and documentation for the results of pervious work, which makes them worthless and unreliable in making decisions related to evaluating the quality of services. Which means that QC and QA is unlikely to be maintained leading to frequent repeat and time wasting with their associated increased radiation to both staff and patient. It has been increasingly recognized that quality assurance programmes directed at equipment and operator performance a great value in improving the diagnostic information content, reducing radiation exposure, reducing medical costs, extending the life of devices and improving departmental management. Quality assurance programmes thus contribute to the provision of high quality health care This comes with complex challenges of QA, QC, radiation protection and patient dose management. In all this, the ultimate goal should be to achieving a diagnostic image that meets clinical requirements with doses to patients as low as possible. Now is the time for all stakeholders (Regulatory Authority, Heath Authorities, Universities and other Training Institutions, Physicists, Hospital or Biomedical Engineers, Radiologists, General Physicians, etc.) to work together to improve the quality services, Patient protection, Staff and environment at the same time. The increasing use of ionizing radiation in medical diagnostic and therapeutic applications leads to an increased possibility of a radiation emergency occurring in facilities where radioactive materials are produced, handled, used, stored, transported or disposed, and cannot be ruled out. It requires the availability of a radiation emergency plan that workers have been trained to implement to control and reduce radiation risks within hospitals. From the results of this study, it was noted that there are no such plans or programs in all the hospitals included in the study, which increases the degree of risk to workers in the event of a radiation accident occurring within their hospitals.

5. CONCLUSION

Radio-diagnostic and radio-therapeutic departments in Libyan hospitals on the western coast suffer from a lack of radiation protection and monitoring of workers during the practice of their daily work, which is an important precautionary measure as it is not possible to assess radiation risks and take corrective actions to reduce the degree of risk.

6. RECOMMENDATIONS

1. Health provider should support and encourage staff in radiology department to consider the importance of an effective radiation protection program which should be designed for each department.

2. The radiation staff and other staff members should undergo regular training courses to be updated to the radiation protection developments.

3. Quality assurance is an essential element to ensure a high degree of accuracy in diagnosis and treatment. It’s necessary to train a team of workers to implement quality assurance and quality control programs within the radiology departments that provide service to the patient.

4. All radiation buildings should be designed in such a way as to meet the requirements of the international radiation protection rules.

5. Taking care of the safety and health of workers by conducting periodic medical examinations for them.

6. Establishing a national registry documenting radiation doses for workers in all different applications.

7. The future studies should include large number of x-ray departments in Libya in order to obtain more reliable results in radiation monitoring and radiation protection field.

REFERENCES

[1] UNITED NATIONS SCIENTIFIC COMMITTEE ON THE EFFECTS OF ATOMIC RADIATION. UNSCEAR 2000 Report to the General Assembly. Vol. 1: Sources and effects of ionizing radiation. New York, (2000). www.unscear. org (19.06.2008).

[2] COVENS C, BERUS D, BULS N, CLERINX P, VANHAVERE F. Personal dose monitoring in hospitals: Global assessment, critical applications and future needs. Radiation Protection Dosimetry. Vol. 124, No. 3, pp. 250–259 (2007).

[3] The University of Western Australia. Personnel radiation monitoring (updated 23 May, 2003) Location: http:www. safety.uwa.ed.au/page/8744(Acesesd 13/01/2010).

[4] Rosenbloom, M., 2007. Theoretical background to radiation protection. In: P. Mayles, A. Nahum and J.C. Rosenwald, (Eds). Handbook of radiotherapy physics: theory and practice. Florida, USA: Taylor and francis Group

[5] United Nation Scientific Committee on the Effects of Atomic Radiation (UNSCEAR). 2001. Hereditary effects of radiation. Report to the General Assembly, United Nations, New York, http://www.unscear.org/unsear/en/publication/ 2001.html.

[6] Rehman R, Zafar A, Mohib A, Baig M (2018) A gender -based comparison in health behaviors and state of happiness among university students. Cureus, 10(3): e2342.

[7] Guzek D, Skolmowska D, Głąbska D (2020) Analysis of gender - dependent personal protective behaviors in a national sample: Polish adolescents' COVID -19 experience (PLACE -19) study. Int J Environ Res Public Health, 17(16): 5770.

[8] Alavi SS, Dabbagh ST, Abbasi M, Mehrdad R (2017) Medical radiation workers' knowledge, attitude, and practice to protect themselves against ionizing radiation in Tehran Province, Iran. J. Educ. Health Promot, 6(2017):58.

[9] Nomura S, Tsubokura M, Hayano R, et al. (2015) Compliance with the proper use of an individual radiation dosimeter among children and the effects of improper use on the measured dose: a retrospective study 18 –20 months following Japan's 2011 Fukushima nuclear incident. BMJ Open, 5(12): e00955.

[10] Jean, M.C., 1998. Community legistion on medical radiation protection in the context of internal market. Radiation Protection Division, DG XI, Commission of the European Communities, Luxembourg.

[11] World Health Organization. 1984. Radiation protection. International Digest of Healt Legislation, 35:688.

[12] World Health Organization (WHO) (2008). Global initiative on radiation safety in healthcare settings technical meeting-report, 55-58.

[13] Australian Radiation Protection and Nuclear Safety Agency (ARPNSA) (2008). Radiation Protection Series Publication No. 14.1.