ASSESSMENT OF PERSONNEL DOSE EXPOSURE MONITORING BY TLD AT NMC, RANGPUR

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ABSTRACT

We investigated the whole body dose exposure monitoring on scientific personnel of Rangpur Nuclear Medicine Centre for the period of 01-12-2000 to 30-06-2002 due to gamma and beta rediation.

Methods : Distributed the Thermoluminescent Dosimeter badge among the 17 scientific personnel at Nuclear Medicine Centre, Rangpur and every after three months supplied by the health physics division of Bangladesh Atomic Energy Commission, Dhaka. The TLD badges are sent to the health physics division of BAEC, Dhaka for examinations. In this way six time TLD badges are worn and examined.

Results : The whole body dose equivalents of the same individuals for 19 months in this centre ranged from 0.107 to 4.56 mSv. The highest dose was found to be received by the individual who was involved in dispensing, radioiodine uptake and scanning section. On the other hand, lowest doses were received by individuals working registration and reception section.

Conclusion : It is evident that, the doses received by the individual depend on the nature of their duties and the exposure level is higher in the dispensing, thyroid uptake lab., gamma lab., and isotope store room. Moreover, it was found that, direct radionuclide handlers received more dose than the other working personnel.

Key word : Radioactive dose exposure, Themoluminescent dosimeter (TLD).

INTRODUCTION

Radiation survey monitoring is used to define radiation levels at various points in a laboratory or around a reactor. It is not an accurate method of assessing the accountable dose received by workers in these areas because, (i) The dose rate will vary considerably with time, depending on the operations being carried out, (ii) The working personnel will usually move around from one radiation level to another during the course of their work. To overcome these difficulties, it is normal practice for radiation working personnel in radiation areas to wear a personnel dosimeter. This is a device which measures the dose accumulated by the radiation workers. The majority of establishments are now using TLD system as the primary method of personnel monitoring. The TLD offers an accurate and stable means of measuring dose over the short and long term and find that the applications both as whole body and extremity monitors

Nuclear Medicine Centre, Rangpur, Bangladesh

particularly suitable for automatic linking to computerized dose recording system in diagnostic and therapeutic nuclear medicine, radioisotopes like Technetium-99m, Iodine-131, Iodine-125 and Strontium-90 etc. are administrated for the patients orally or intravenously, and blood drawn from the patients in Iodine-131 therapy for thyroid cancer and thyrotoxicosis and beta radiation for eye (post-operative pterygium patients). The application of radioisotopes to the patients are done by scientific personnel of nuclear medicine centres and consequently, they receive more or less radiation during these applications. The patients themselves act as another source of exposure that is why scientific personnel of nuclear medicine departments are continuously being exposed to ionizing radiation at the time of their duty.

AIMS & OBJECTIVES

In the present study, the radiation dose received by the scientific personnel of Rangpur Nuclear Medicine Centre was investigated to evaluate their whole body radiation exposure due to the handling of different types of radioisotopes / radiopharmaceuticals.

MATERIALS & METHODS

We distributed the fresh TLD badges among the 17 scientific personnels at nuclear medicine centre, Rangpur. It was supplied by the Health Physics Division of Bangladesh Atomic Energy Commission every after three months. The TLD technology was started at Nuclear Medicine Centre, Rangpur on 1st December, 2000 for personnel radiation monitoring service. Each TLD badge was labeled with an identification number to distinguish one person from another. We also recorded the issuing date of TLD badges which were distributed among the scientific personnel into the register. The personnel wore the TLD badges within the region of their gonad or chest so that the response of TLD badges may be considered as the response of the whole body during the period of their duty of every day. After their duty the badges were kept into the radiation-free rooms. In this way every after three months, badges are sent to the Health Physics Division of BAEC for measuring activity. Besides, workplace radiation monitoring was done from time to time to see the radiation level of laboratory as well as comparison with results of Thermoluminescent Dosimeters technology.

RESULTS

The results of radiation dose equivalent obtained from the exposure of doses of the scientific personnel of the Nuclear Medicine Centre, Rangpur for 19 months (01/12/2000 to 30/06/2002) are shown in the table.

Subject No.	Personnel Dose Equivalent Hp (10) in mSv.	Effective dose in mSv.
01	4.568	4.568
02	1.594	1.594
03	1.440	1.440
04	1.138	1.138
05	1.095	1.095
06	0.999	0.999
07	0.988	0.988
08	0.901	0.901
09	0.895	0.895
10	0.795	0.795
11	0.638	0.638
12	0.616	0.616
13	0.126	0.126
14	0.107	0.107
15	0.000	0.000
16	0.000	0.000
17	0.000	0.000

DISCUSSION

The radiation dose received by the working personnel of Nuclear Medicine Centre, Rangpur during their routine works were investigated by Thermoluminescent Dosimeter Technology. The monitoring periods of dosimeters were 19 months. The whole body dose equivalents observed for 15 working months (450 days) ranged from 0.107 mSv to 4.568 mSv. For 15 working months of total 19 months, it was found that the highest doses were received by the individuals who work in radioisotope dispensing section, gamma camera and uptake laboratory. On the other hand, low doses were found in those who were working in the registration and reception section. It was also found that, registration, reception and RIA lab. scientific personnel received highest doses when they worked in dispensing, scanning and uptake section in addition to their normal duties (e. g. colleague on leave). The investigation shows that the dose received by the individuals depend by the nature of their duties and the exposure level is higher in the dispensing, scanning and uptake section than in the registration, reception and RIA laboratory. Moreover, direct radionuclide handlers received more radiation than other working personnel. It is inferred that, most of the scientific personnel of Rangpur Nuclear Medicine Centre received dose from 1 mSv to 4 mSv per year for their routine works with some exception. It may be mentioned that Maximum Permissible Dose is 20 mSv/year.

CONCLUSION

The radiation exposure to every individual should be kept as low as reasonably achievable. This can be achieved by keeping a maximum distance possible from the source, working with a source for the minimum time required and employing adequate shielding as well as shifting of duties. Patients should be restricted in one place during their waiting period after administration of radioisotopes, away from the working personnel. To prevent contaminations, hand gloves should be won during dispensing and administration of radioisotope as well as radioimmunoassay works. Using syringe shields during dispensing and administration of radioactive injection as well as therapeutic dose administration can minimize exposures very efficiently. It was observed that, probably some of the scientific personnel do not always follow all of the safety rules strictly and TLD badges are worn irregularly thus the results of these TLD badges are almost always found to be below the detectable range or unexpected results. The scientific personnels of Rangpur Nuclear Medicine Centre are not getting their exact individual dose equivalents due to only one set of TLD badges were supplied by the Health Physics Division of BAEC. Supplying of double set of TLD one after another may improve the situation.

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