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Optimizing the Individual Monitoring Service in Sri Lanka by Minimizing the Background Radiation Dose Effect.

Personal Monitoring Service Laboratory (PMSL) of Sri Lanka Atomic Energy Board (SLAEB) solely provides the external individual radiation monitoring service for the radiation workers in Sri Lanka. More than 2300 radiation workers from 187 radiation facilities are monitored. Out of 187 institutes, 164 are medical, 02 are agricultural, 15 are industrial, 03 are research and 03 are educational. Thermo Luminescence Dosimeters with two elements (TLD-100) composed of LiF: Mg, Ti are used for monitoring the personal dose equivalent, whole body dose (Hp (10)) and skin dose (Hp (0.07)). The effective whole body radiation doses are reported with 22% uncertainty for use of single TLD and 12% when using two TLDs. TLDs are read by using Harshaw TLD reader Model 6600+. Background radiation dose is subtracted to obtain the occupational radiation exposure. A separate TLD card is used to measure the background radiation dose which varies significantly due to geographical anomalies. Baseline environmental radiation monitoring program provides average radiation dose rates obtained from 355 different locations of Sri Lanka, which ranges from 27 nSv/hr to 1125 nSv/hr.

This study investigated the effect of using an average Per Day, Background Radiation Dose (PDBRD) to estimate the periodic background radiation dose in situations of background TLD card is lost, damaged, not returned to the laboratory or an abnormal background radiation dose is read out. This methodology was adopted hence incorrect background radiation doses would result a false loss or an enhancement to the occupational radiation doses. PDBRD was calculated by dividing the background radiation dose by the number of days for the entire monitoring period. The periodic background radiation dose was estimated by multiplying the institute's average PDBRD by number of days. Average per day dose database for each institute was updated with reading from background TLD card at the end of each monitoring period. PDBRDs with three sigma deviation (μ±3SD) from the average were excluded from the database.

It was observed that average PDBRD has ranged between 0.07±0.04 μSv/day to 8.6±0.05 μSv/day and 90% of the observations were fallen between 1.2 μSv/day to 2.8 μSv/day. Average PDBRD of the most institutes were approximately 2.3 μSv/day. SDs for most institutes remain very low but a few institutes were shown significantly higher SDs.

Using an average PDBRD when background TLD card is not available, was found to be a better alternative to minimize the effect. However, it could still result incorrect dose estimations. To improve the accuracy of the occupational radiation doses, it is highly recommended to place the background TLD card at a radiation free area and return it back to PMSL together with other TLDs. Radiation protection officers are instructed by PMSL to store all the TLD cards with the background TLD card when they are not in use to effectively avoid the background radiation dose effect.

Key words: Thermo Luminescence Dosimeter, Occupational radiation exposure, Background Radiation dose, Estimated per day background radiation exposure, Radiation workers.

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