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Optimizing The Individual Monitoring Service In Sri Lanka By Minimizing The Background Radiation Dose Effect

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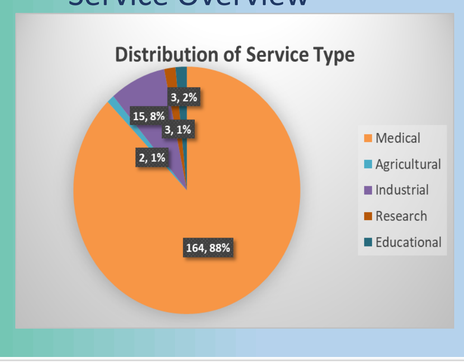
PERSONAL MONITORING SERVICE

Personal Monitoring Service Laboratory (PMSL) of Sri Lanka Atomic Energy Board (SLAEB) is the sole service provider for the external individual radiation monitoring 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. 182 institutes are monitored bimonthly and 5 are monitored monthly. Thermo Luminescence Dosimeters with two elements (TLD-100) composed of LiF: Mg, Ti are used for monitoring the personal dose equivalent, whole body dose (H_p (10)) and skin dose (H_p (0.07)). The effective whole body radiation doses are reported with 22% uncertainty for single dosimetry and 12% for double dosimetry. Personal Monitoring has been prepared on the basis of IAEA Safety Standards GSR part 03 and GSG 07.

Service Overview



BACKGROUND

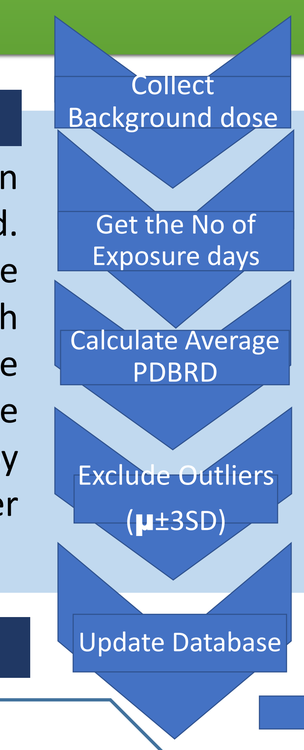
Background radiation dose rate varies significantly due to geographical anomalies in Sri Lanka (Minimum and maximum dose rate discovered by the baseline data collection done for the 350 different locations reported are 27 nSv/hr,1125nSv/hr).Therefore, each monitoring period a control TLD (Background TLD) is issued to each facility to measure the background radiation dose. Background subtraction is applied to assess the occupational radiation dose. Even though PMSL frequently instructs the importance of the background dose to its customers, sometimes it is observed control TLD is lost, damaged, not returned to the laboratory and low doses observed due to keeping inside lockers or abnormal background doses reported due to placing mistakenly in the controlled area.

STUDY AREA & AIMS

Study investigated the effect of using an average **Per Day, Background Radiation Dose (PDBRD)** (Hp(10) to estimate the periodic background radiation dose when background dose cannot be obtained from Control TLD and to avoid incorrect background radiation dose causes to estimate a false occupational radiation doses of workers.

METHODOLOGY

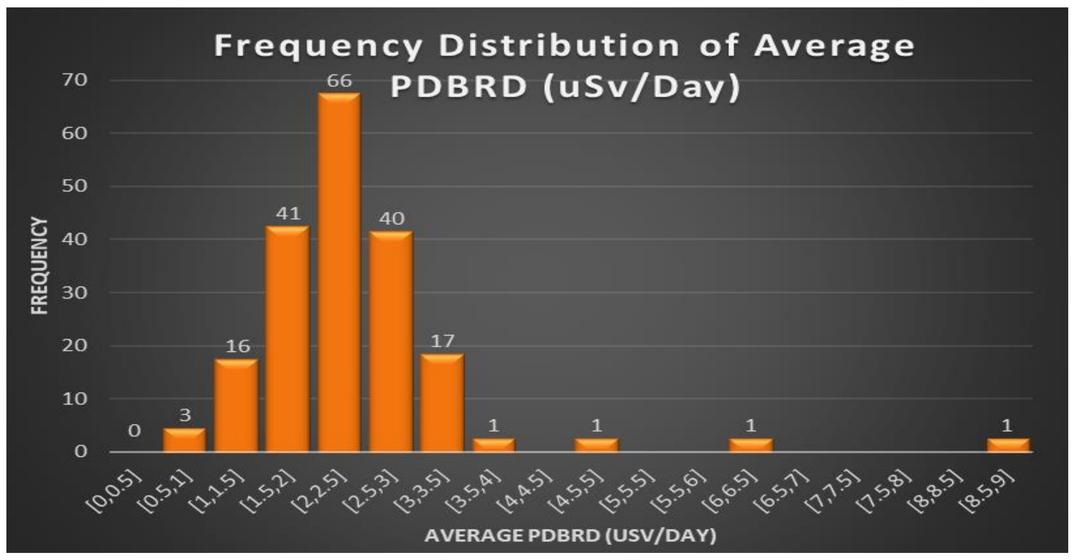
PDBRD is calculated by dividing the background radiation dose by the number of days for the monitoring period. PDBRDs with three sigma deviation (μ±3SD) from the average are excluded. Average PDBRD database for each institute is regularly updated with acceptable values at the end of each monitoring period. When needed, the periodic background radiation dose is estimated by multiplying the institute's average PDBRD by the number of days for the monitoring period.

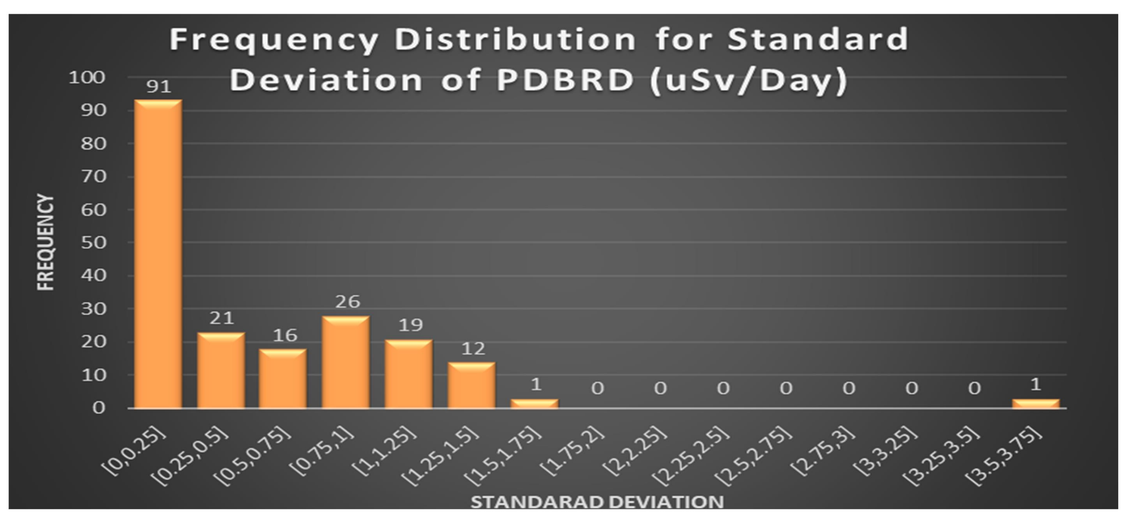


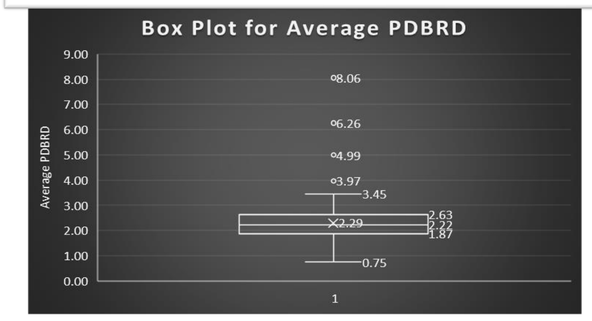
ANALYSIS & RESULTS

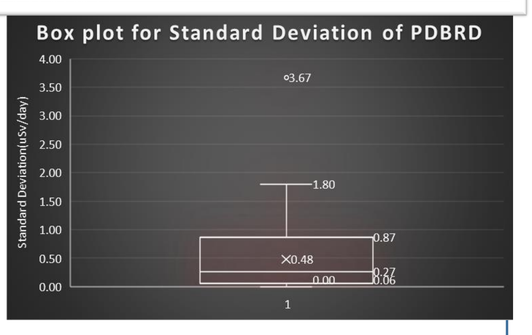
ASSUMSIONS:

To calculate the No of days for the survey period, annealed date is subtracted from read date. However TLDs receive a transit dose as it takes some duration for dispatching and collection of TL dosimeters. It is assumed, this transit dose is negligible compared to the exposure inside the institute. And also, it is assumed that TLDs are read as soon as received to the Laboratory. Two control TLDs are allocated to each institute. Data were collected from both control TLDs. Their performance is assumed to be same.









Data were collected from 14 monitoring periods. An electronic database system is maintained to automatically update the data.

DISCUSSION

Only Personal dose equivalent Hp(10) is considered in this study as it is crucial for decision making. Average PDBRD has ranged between 0.7±0.04 μSv/day to 8.6±0.05 μSv/day and 97% of the observations are fallen between 0.75 μSv/day to 3.45 μSv/day. Average PDBRD of the most institutes is 2.29 μSv/day. SDs for most institutes remain very low (80% of SDs are less than 1) but other institutes are shown significantly higher SDs compared to the values of the PDBRDs. Single dosimetry incorporated with 22% uncertainty for the results given by PMSL. Uncertainty has a considerable impact on the higher SDs. Data are used from 14 monitoring periods only. When the number of monitoring periods increase the accuracy of the results expected to be enhanced. Number of days for the monitoring period depend on the anneal date and the read date. Practically this does not match 100% to the exposure period of the institute. PDBRD is most effective for the institutes with small SDs.

CONCLUSIONS & RECOMMENDATIONS

Using an average PDBRD when background radiation dose unacceptable is a better alternative to minimize the error. For the success of this method, transit dose shall be minimized. Also the dosimeters shall be read earliest of the receipt to the laboratory for dose estimation.

PMSL frequently instructs its customers to keep Background TLD at a radiation free area, to use a badge board, to store worker TLDs with control TLD when not in use and to return it with shipment of others itself for dose estimations to receive accurate individualized occupational radiation doses.

ACKNOWLEDGEMENTS

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