Contribution ID: **184** Type: **Poster**

Assessment of workplace radiation exposure levels in diagnostic radiology facilities in Coast, Lindi and Mtwara regions, Tanzania

Background
The aim of this study was to assess radiation exposure levels in diagnostic x-ray units in medical facilities in Coast, Lindi and Mtwra regions in Tanzania, in order to establish whether the exposure levels are within the internationally recommended dose rate limits.
Method
A total of 26 public and private radiological imaging centres were involved in a cross-sectional study carried out from May to July 2021 in Tanzania. These centres had 31 x-ray rooms. A calibrated radiation survey meter was used to measure exposure levels in these x-ray rooms. Scattered x-ray behind the lead glass of the control area, door to control area, wall of the control area and the entry door to x-ray room were measured to assess the levels of exposure of professionals and as well as exposure of the public. Radiation dose rates were compared with the dose limits of 10 and 0.5 μSv per hour (μSv/hr) for workers and the public, respectively. A checklist was also used to obtain information regarding the materials used for radiation shielding, suitability in design and fitting of the materials.
Results
Minimum-maximum doses at the lead glass of control area, entrance to control area, entry to x-ray rooms, and wall of the control area were; 0.098 - 3880, 0.3-263, 0.07-96, 0.05-16 μSv/hr respectively. Average dose rates were 137.59, 25.71, 8.53 and 1.57 μSv/hr at the lead glass, door to control cubicle, door to x-ray room, and wall of control cubicle respectively. Among 31 examination rooms, 32.25% of the dose rates at the lead glass was greater than 10 μSv/hr, 25.8% of the rooms showed the dose behind the door to control cubicle was greater than 10 μSv/hr, 6.45% showed that dose behind the wall of control cubicle was above10 μSv/hr, while 58.06% showed that the dose rates at the entry to x-ray room were above 0.5 μSv/hr. Main factors contributing to the poor radiation shielding were improperly fitted shielding material, poor design of the shields, and use of inappropriate shielding materials such as normal glass instead of lead glass.
Conclusion
These results demonstrated that a significant number of the x-ray rooms have high dose rates above the recommended limits, hence inadequate safety of occupationally exposed workers. A need for the facilities to consult qualified personnel during design and shielding of x-ray rooms, and the need for strengthening of enforcement by regulatory body are apparent, in order to further improve occupational radiation safety.

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Session Classification: Session 8. Occupational radiation protection in medicine

Track Classification: 4. Occupational radiation protection in medicine