

Establishment of Local Diagnostic Reference Levels for Adult and Pediatric Patients in Intraoral Radiography at South African Oral Health Care Center

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Background and Objectives: Dental radiography utilizes X-rays to obtain images of teeth, jaws, and surrounding tissues for diagnosis, treatment planning and monitoring of oral conditions. While radiographs provide significant clinical benefits, there is concern that exposure to X-rays, a form of ionizing radiation increases the stochastic risks such as cancer. To mitigate risks, the International Commission on Radiological Protection advocates implementation of diagnostic reference levels (DRLs). DRLs are an optimization tool that identifies doses that are either too high or too low that are not commensurate with the clinical objective. This study aimed to establish local DRLs for adult and pediatric patients undergoing intraoral radiography at a South African Oral Health Care Centre, addressing the current lack of national benchmarks.

Materials and Methods: Six intraoral x-ray units were selected for dose measurements. Patient Entrance Dose (PED) measurements were obtained using a RaySafe X2 Survey Meter with an X-ray sensor calibrated for intraoral energies. Three measurements per X-ray unit were taken for both adult and pediatric mandibular and maxillary molars with each X-ray unit set at 70 kV, 7 mA. For each unit, the dose area product (DAP) was calculated as the product of exposed area and PED. The 75th percentile of the median DAP values across units was used to Propose DRLs.

Results: The proposed intraoral DRLs were 1.16 mGy (adult mandibular), 1.35 mGy (adult maxillary), 0.70 mGy (pediatric mandibular) and 0.85 mGy (pediatric maxillary). These values are lower than reported DRLs from Cyprus and India, indicating relatively optimized dose practices at the study site.

Conclusion: This study establishes preliminary local DRLs for intraoral radiography in South Africa, contributing to dose optimization and patient safety. The findings provide a baseline for national DRL development and highlight the importance of pediatric dose management in dental radiology.

Keywords: Diagnostic Reference Levels, Radiography, Dose Area Product, Patient Entrance Dose