

DEVELOPMENT OF LOCAL RADIOLOGICAL REFERENCE LEVELS FOR MEDICAL RADIODIAGNOSTIC PRACTICES IN SOUTHWEST NIGERIA

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Abstract— Background: Radiation protection of patient undergoing diagnostic x-ray imaging has become an indispensable subject today due to significant increase in patient absorbed dose. The goal of diagnostic x-ray imaging is to use only the required radiation dose that will produce optimal image quality with minimal patient dose. However, this feat has been found difficult to achieve in practice due to diversities in x-ray equipment and examination protocols. Patient's dose from x-rays diagnosis varies significantly between countries, diagnostic centres, x-ray equipment, procedures and from one operator to the other. Dose reference levels (DRL) serve as the guidance level to curtail the superfluous dose and enhance patient safety. There are international, national and, local dose reference levels (DRL) worldwide. Nigeria has no indigenous DRL yet but adopts the International Atomic Energy Agency (IAEA) standards; hence, the need for national and local DRL development. Purpose: To develop local dose reference levels (DRL) for diagnostic x-ray examinations in Southwest Nigeria.

Methods: Thermoluminescence dosimeters (TLD) and computational methods were used to determine the patient skin equivalent dose. Consented adult human subjects of about 2500 from nine tertiary and secondary healthcare institutions with certified institutional consent were selected for the study. The quality control of the x-ray facilities was conducted using MagicMax universal quality control kits. Radiation risks assessment was determined using Personal Computer X-ray Monte Carlo (PCXMC) software and statistical analysis were conducted using Statistical Package for Social Science

(SPSS) (version 23.0).

Results: The estimated DRL for radiography were 1.32 mGy, 1.94 mGy, 2.16 mGy, 4.94 mGy, 7.96 mGy, 1.27 mGy, and 1.38 mGy for chest PA, cervical spine (CS) AP, CS LAT, lumbar spine (LS) AP, LS LAT, upper extremity, and lower extremity, respectively. The computed tomography (CT) DRL for CTDIvol were 54.00 mGy, 47.50 mGy, 20.15 mGy, 20.45 mGy, and 13.45 mGy, respectively for head CT without contrast, head CT with contrast, abdomen CT without contrast, abdomen CT with contrast, and chest CT, respectively. The computed tomography DRL for DLP were 1504.38 mGy.cm, 2030.80 mGy.cm, 1214.52 mGy.cm, 1188.43 mGy.cm, and 723.43 mGy.cm for head CT without contrast, head CT with contrast, abdomen CT without contrast, abdomen CT with contrast, and chest CT, respectively. The DRL for fluoroscopy were 24.17 mGy for conventional x-ray machine for hysterosalpingography (HSG) examinations. The DRL for mean glandular dose for mammography was 1.97 mGy.

Conclusion: The DRL obtained in this study are comparable with those from other countries and showed the possibility of dose harmonization in southwest Nigeria. Adoption and implementation of DRL is therefore recommended in order to enhance patient safety.

Keywords — X-ray imaging, Dose reference levels, Radiography, Computed tomography, Fluoroscopy, Southwest Nigeria.