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**Estimation and comparison of patient doses in lumbar spine X-ray examination: A case study at a government hospital in Sri Lanka**

W. D. S. D. Welarathna<sup>1,2\*</sup>, V. Sivakumar<sup>3</sup>, W. M. N. M. B. Wanninayake<sup>4</sup> and S. Sarasanandarajah<sup>5</sup>

<sup>1</sup>Postgraduate Institute of Science, University of Peradeniya, Sri Lanka

<sup>2</sup>Horizon Campus, Malabe, Sri Lanka

<sup>3</sup>Department of Physics, Faculty of Science, University of Peradeniya, Sri Lanka

<sup>4</sup>British College of Applied Studies, Colombo, Sri Lanka

<sup>5</sup>Peter MacCallum Cancer Research Institute and RMIT University, Melbourne, Australia  
sachith.dhak@email.com\*

The number of projection X-ray examinations is rising rapidly worldwide due to its extensive usage in accurately diagnosing diseases and injuries in patients. Apart from the enormous benefits of X-ray examinations, the patients are exposed to substantial radiation doses, which may cause stochastic and deterministic effects that could be harmful to the patients. The lumbar spine X-ray test is considered the most routinely performed projection X-ray examination for the proper diagnosis of various clinical indications, including low back pain, fractures, arthritis, spondylolisthesis, tumours, and degenerative pathologies. Diagnostic Reference Levels (DRLs), the concept introduced by the International Commission on Radiological Protection (ICRP), can be used to assist in optimising radiation doses during radiographic procedures. Accordingly, radiation doses associated with lumbar spine X-ray examinations need to be assessed, justified, and optimised in terms of benefits and risks to improve patient protection. The objective of this study was two-fold: first, assess the kerma-area product (KAP) of adult patients undergoing lumbar spine X-ray examinations (anteroposterior (AP) and lateral (LAT)), and then compare the obtained patient doses with the DRLs reported in some other countries: United Kingdom (UK), Ireland, Austria, Germany, France, Greece, India, Iran, and Australia. This study was conducted in a government hospital in Sri Lanka with 80 adult patients. The ages of the patients involved were from 18 years to 84 years, while their weights ranged from 38 kg to 78 kg. The AP and LAT projections of the lumbar spine examination were acquired on a digital radiography system with flat-panel detectors in the supine position. Patient characteristics (age, sex, weight, height, and body mass index) and corresponding exposure parameters (tube voltage [kV] and the product of tube current and exposure time [mAs]) were obtained. The KAP values were measured by a direct method, and descriptive statistics were utilised for the data analysis. The results showed wide variations in the KAP values for both AP and LAT of the lumbar spine examination. The mean value (1.91 Gy.cm<sup>2</sup>) of the KAP of LAT projection of the lumbar spine X-ray examination was higher than 200% of the value of AP projection (0.86 Gy.cm<sup>2</sup>). The KAP ranges for lumbar spine AP and LAT projections were 0.29-1.55 and 0.73-3.55 Gy.cm<sup>2</sup>, respectively. The mean KAP values for the AP and LAT projections of the lumbar spine examination were lower than the reported values (AP%, LAT%), respectively in the following countries: UK (43%, 24%), Ireland (46%, 15%), Austria (57%, 40%), Germany (57%, 45%), France (68%, 51%), Greece (43%, 15%), India (8%, 39%), Iran (16%, 3%), Australia (46%, 11%). The overall findings of this preliminary study ensure the commitment of the radiographers in following the ALARA (as low as reasonably achievable) principle in this hospital and make further optimisation unessential.

**Keywords:** Diagnostic reference levels, Kerma-area product, Lumbar spine, Patient dosimetry, X-ray examination

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