ABSTRACT

Bone scan examinations using Technetium-99m Methylene Diphosphonate (Tc-99m MDP) are crucial in determining whether cancer has spread to the bones. However, variations in the injected activity can lead to patients receiving more radiation than necessary, contradicting the As Low As Reasonably Achievable (ALARA) principle. This study aimed to determine the local Diagnostic Reference Level (DRL), calculate the effective dose received by patients, and analyze factors influencing injection activity variations at Dr. Sardjito General Hospital. A retrospective observational study of 50 adult patients with normal body mass index undergoing examinations from January to February 2025 was conducted. Data on injection activity, body parameters, and effective dose were analyzed statistically, including descriptive analysis, linear regression, and 75th percentile calculation. Results showed a local DRL of 751.1 MBq, slightly lower (approximately 2.45%) than the national BAPETEN standard (770 MBq), with a 94% compliance rate. The median effective dose per procedure was 3.64 mSv (IQR: 3.64-3.68 mSv), with the highest accumulation reaching 15.24 mSv per year in patients with four examinations annually. Regression analysis revealed a unique relationship between body weight and injection activity: higher weight correlated with lower activity ($r = -0.2889$; $R^2 = 0.0835$). Furthermore, the diagnosis of cancer significantly influenced the activity administered. Prostate cancer patients received similar activity (approximately 743.7 MBq) regardless of weight, while breast cancer patients, especially those weighing under 50 kg, experienced overdoses up to 21.58 MBq per kg. In conclusion, injection activity administration at Dr. Sardjito General Hospital met national DRL standards, but activity was adjusted based on diagnostic needs and the varying biological characteristics of each patient's disease.

Keywords: *Diagnostic Reference Level (DRL), Tc-99m MDP, Effective Dose, Bone Scintigraphy, ALARA.*