

Bone Mineral Density Values in Sri Lankan Adults: Establishing Reference Standards for the Hip and Lumbar Spine

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Normative bone mineral density (BMD) data are lacking for Sri Lankan population. Current clinical assessments often rely on Caucasian reference standards, which may not reflect ethnic and anthropometric differences. This study aimed to establish age- and sex-specific BMD reference values for lumbar spine and hip in Sri Lankan adults. We retrospectively analyzed BMD data from 11,925 adults (4,549 men; 7,376 women), aged 20–80 years. Data were collected during preventive health screenings between January 2015 and December 2024 at five private hospitals in Western Province. Subjects with medications and conditions affecting bone metabolism were excluded. BMD was measured using Hologic dual-energy X-ray absorptiometry (DXA) systems with phantom-based calibrations and regular quality controls to ensure accuracy. These criteria were applied to ensure the reliability of normative BMD data. Demographic and clinical information gathered via standardized questionnaires. Statistical analysis performed using Python. Participants were stratified by the decade to examine age-related trends. BMD values were consistently higher in men than in women across all age groups. Peak lumbar spine BMD occurred at 31–40 years in both sexes. In women, lumbar BMD declined significantly after age 40, reaching the lowest levels at 71–80 years. In men, lumbar BMD declined after 40 but showed a secondary increase after age 60. Hip BMD declined progressively in both sexes after age 50. Spinal BMD showed moderate positive correlation with weight ($r = 0.47$) and height ($r = 0.39$) ($p < 0.001$). Among postmenopausal women, years since menopause correlated negatively with BMD at spine ($r = -0.46$), left hip ($r = -0.39$), and right hip ($r = -0.44$) ($p < 0.001$). Among women, strongest correlation between weight and hip BMD occurred in 41–50 age group. Cubic polynomial regression models captured the nonlinear trends of BMD variation in all three scanned regions across age groups. These findings demonstrate significant deviations from Caucasian BMD references. Establishing population-specific BMD norms will enhance diagnostic accuracy and guide clinical management of osteoporosis and osteopenia by accounting for ethnic and environmental differences that are not reflected in manufacturer-provided reference data, which is particularly important for postmenopausal women and elderly individuals.

Keywords: Bone mineral density, DXA, normative data, Sri Lanka, population reference standards