

Assessment of Serum Osteopontin, Osteoprotegerin and Bone-Specific Alp as Markers of Bone Turnover in Patients with Disorders of Thyroid Function in Nigeria, Sub-Saharan Africa

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Abstract : Background: Disorders of thyroid function are the second most common endocrine disorders worldwide, with a direct relationship with metabolic bone diseases. These metabolic bone complications are often subtle but manifest as bone pains and an increased risk of fractures. The gold standard for diagnosis, Dual Energy X-ray Absorptiometry (DEXA), is limited in this environment due to unavailability, cumbersomeness and cost. However, bone biomarkers have shown prospects in assessing alterations in bone remodeling, which has not been studied in this environment. Aim: This study evaluates serum levels of bone-specific alkaline phosphatase (bone-specific ALP), osteopontin and osteoprotegerin biomarkers of bone turnover in patients with disorders of thyroid function. Methods: This is a cross-sectional study carried out over a period of one and a half years. Forty patients with thyroid dysfunctions, aged 20 to 50 years, and thirty-eight age and sex-matched healthy euthyroid controls were included in this study. Patients were further stratified into hyperthyroid and hypothyroid groups. Bone-specific ALP, osteopontin, and osteoprotegerin, alongside serum total calcium, ionized calcium and inorganic phosphate, were assayed for all patients and controls. A self-administered questionnaire was used to obtain data on sociodemographic and medical history. Then, 5 ml of blood was collected in a plain bottle and serum was harvested following clotting and centrifugation. Serum samples were assayed for B-ALP, osteopontin, and osteoprotegerin using the ELISA technique. Total calcium and ionized calcium were assayed using an ion-selective electrode, while the inorganic phosphate was assayed with automated photometry. Results: The hyperthyroid and hypothyroid patient groups had significantly increased median serum B-ALP (30.40 and 26.50) ng/ml and significantly lower median OPG (0.80 and 0.80) ng/ml than the controls (10.81 and 1.30) ng/ml respectively, $p < 0.05$. However, serum osteopontin in the hyperthyroid group was significantly higher and significantly lower in the hypothyroid group when compared with the controls (11.00 and 2.10 vs 3.70) ng/ml, respectively, $p < 0.05$. Both hyperthyroid and hypothyroid groups had significantly higher mean serum total calcium, ionized calcium and inorganic phosphate than the controls (2.49 ± 0.28 , 1.27 ± 0.14 and 1.33 ± 0.33) mmol/l and (2.41 ± 0.04 , 1.20 ± 0.04 and 1.15 ± 0.16) mmol/l vs (2.27 ± 0.11 , 1.17 ± 0.06 and 1.08 ± 0.16) mmol/l respectively, $p < 0.05$. Conclusion: Patients with disorders of thyroid function have metabolic imbalances of all the studied bone markers, suggesting a higher bone turnover. The routine bone markers will be an invaluable tool for monitoring bone health in patients with thyroid dysfunctions, while the less readily available markers can be introduced as supplementary tools. Moreover, bone-specific ALP, osteopontin and osteoprotegerin were found to be the strongest independent predictors of metabolic bone markers' derangements in patients with thyroid dysfunctions.

Keywords : metabolic bone diseases, biomarker, bone turnover, hyperthyroid, hypothyroid, euthyroid

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