Original Article

# Bone Mineral Density Status in 48 Iraqi Hyperthyroid Patients

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**Summary:**

**Background:** Bone disease of hyperthyroidism is a type of high-turnover osteoporosis. In many patients with hyperthyroidism, there is excessive bone resorption, occasionally marked in degree and far exceeding that in the usual patient with osteoporosis. The purpose of this study was to evaluate the bone mineral density (BMD) in hyperthyroid patients in a controlled study.

**Patients and Methods.** The study group consists of 48 patients with hyperthyroidism who were seen at Specialized Centre for Endocrinology and Diabetes, and at Rheumatology Clinic and Osteoporosis Clinic in Baghdad Teaching Hospital. In all patients, measurement of BMD at the lumbar spine (L1-L4) using dual-energy x-ray absorptiometry (DXA) machine was done.

**Results:** The BMD was reduced in 40 patients (83.33%). Seventeen postmenopausal women, 2 premenopausal, and 2 men have osteopenia. Fourteen postmenopausal women and 2 premenopausal women have osteoporosis. Osteoporosis was not reported in men.

**Conclusion:** When compared with control group, the prevalence of osteopenia in hyperthyroid patients was statistically significant in postmenopausal women only ($p = 0.013$).

**Key words:** Bone Mineral Density, Iraqi, Hyperthyroid

## Introduction:

Hyperthyroidism is an important, reversible, and easily detected cause of osteoporosis. (1) Bone disease of hyperthyroidism is a type of high-turnover osteoporosis. Serum triodothyronine level inversely correlates with bone mass. (2)

In many patients with hyperthyroidism, there is excessive bone resorption, occasionally marked in degree and far exceeding that in the usual patient with osteoporosis, associated with increased excretion of calcium and phosphorus in urine and feces. (3, 4) Urinary excretion of collagen breakdown fragments is often increased. (2) The excessive bone resorption is usually accompanied by a compensatory increase in bone formation. Parathyroid hormone secretion is decreased, and levels of 1, 25(OH)2D are normal or low.(3) Patients may have bone pain and fracture, in addition to other features of hyperthyroidism.(2) Patients with past history of hyperthyroidism, when compared with those who have not had hyperthyroidism have an increased relative risk of hip fractures of 2.4 times.(5) Radiographs may show diffuse osteopenia; abnormal striations of cortical bone are observed occasionally.(2) Administration of levothyroxin as replacement therapy for suppression of thyroid nodules may lead to osteoporosis.(6, 7) The purpose of this study was to evaluate the bone mineral density (BMD) in hyperthyroid patients in a controlled study.

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## Patients and Methods:

**Patients**: The study group consists of 48 patients with hyperthyroidism who were seen at Specialized Center for Endocrinology and Diabetes, and at Rheumatology Clinic and Osteoporosis Clinic in Baghdad Teaching Hospital from January through August 2006.

The diagnosis of hyperthyroidism had been documented by a raised total serum thyroxin (T4) and suppressed serum thyroid-stimulating hormone (TSH). Normal T4 5-12 microg/dl, and normal TSH < 5 microU/ml. (8) for comparative purposes, 29 healthy subjects with normal thyroid function test were studied. A signed consensual was taken from every person before admission to the study.

**Methods:** We measured BMD at the lumbar spine (L1-L4), using dual-energy x-ray absorptiometry (DXA) machine (Lunar DPX). BMD was expressed as T-score considering the diagnostic criteria for osteoporosis established by World Health Organization (WHO). (9)

**Statistical analysis:** Statistical analysis was done, using Chi-square or Fisher exact test when needed. A "p value" of < 0.05 was considered to indicate significance. (10)

## Results:

Some demographic and clinical characteristics of patients and controls were reported in Table 1.

**Table 1. Demographic and clinical characteristics of hyperthyroid patients and controls included in study.**

| | Hyperthyroid patients | Controls |
|---|---|---|
| Gender women<br>men | 36<br>12 | 24<br>5 |
| Average age, years (range) | 38 (22-60) | 41 (20-66) |
| Average duration of thyroid disease, years (range) | 3.5 (0.5-10) | _ |
| Number of patients receiving carbimazole during data collection (%) | 41 (85.42%) | _ |

In 48 patients with hyperthyroidism included in the study, the BMD measured by DXA was reduced in 40 patients (83.33%); 21 patients (43.75%) had osteopenia, 16 patients (33.33%) had osteoporosis, and 3 patients (6.25%) had severe osteoporosis according to WHO criteria for the diagnosis of osteopenia.

Seventeen postmenopausal women, 2 premenopausal women, and 2 men had osteopenia. When compared with control group, osteopenia was statistically significant in postmenopausal women only (p = 0.013) as shown in Table 2. Fourteen postmenopausal women and 2 premenopausal women had osteoporosis. Osteoporosis was not reported in men. When compared with control group, osteoporosis was more common in postmenopausal women but the difference was statistically not significant (p = 0.101) as shown in Table 2.

**Table 2. Dual-energy x-ray absorptiometry (DXA) study results in 48 hyperthyroid patients compared with control group.**

| | Hyperthyroid patients (No. = 48) | Controls (No. = 29) | p value |
|---|---|---|---|
| Normal<br>Postmenopausal women<br>Premenopausal women<br>Men | <br>4<br>3<br>1 | <br>8<br>8<br>5 | <br>0.028*<br>0.013*<br>0.026* |
| Osteopenia<br>Postmenopausal women<br>Premenopausal women<br>Men | <br>17<br>2<br>2 | <br>0<br>0<br>0 | <br>0.013*<br>0.386<br>0.386 |
| Osteoporosis<br>Postmenopausal women<br>Premenopausal women<br>Men | <br>14<br>2<br>0 | <br>4<br>0<br>0 | <br>0.101<br>0.386<br>- |
| Severe osteoporosis<br>Postmenopausal women<br>Premenopausal women<br>Men | <br>3<br>0<br>0 | <br>1<br>0<br>0 | <br>0.541<br>-<br>- |

* P value < 0.05 indicates significance.

**Discussion:**

Several writers have commented on the co-existence of thyroid dysfunction and musculoskeletal manifestations. (4, 11-13) this study adds further results to this subject.

Hyperthyroidism and thyroxin replacement therapy are risk factors for osteopenia. (14) Thyroxin induces an increased bone-turnover. An undetected endogenous overproduction or long-term use of high doses of this hormone may lead to secondary osteoporosis. Secondary osteoporosis due only to this mechanism is, however, observed very rarely today. (15) Although, the bone status was compromised in a good percentage of hyperthyroid patients included in this study, the increased bone loss is statistically significant in postmenopausal women only. These results were similar to what was previously reported by other authors. (16-17)

An endogenous overproduction of thyroid hormone may be a contributory factor in patients with poly-etiological secondary osteoporosis. The impact of the thyroxin on the development of osteopenia remains unclear in most cases. Since postmenopausal women very often have osteopenia (preclinical osteoporosis), hyperthyroidism may in some cases be the trigger for established disease. (15)

If the hyperthyroidism is of short duration, skeletal loses are inconsequential. However, in patients with chronic hyperthyroidism, especially in women after the menopause, this accelerated bone loss becomes clinically significant, and it is important to eliminate hyperthyroidism as a contributory cause of osteoporosis. (3) Most of hyperthyroid patients included in this study had long disease duration (average 3.5 years).

Negative effects on the skeleton can be avoided by early diagnosis and treatment of hyperthyroidism. In such patients, BMD should be measured, endogenous thyroxin should be reduced. (15) Correction of hyperthyroid state often restores bone mass. Estrogen for women or bisphosphonates may be considered if accelerated rate of bone loss or decreased bone mass is present. (18)

**Conclusion:**

The presence of osteopenia in hyperthyroid patients was statistically significant in postmenopausal women only when compared with healthy controls. When compared with control group, osteoporosis was more common in postmenopausal women but the difference was statistically not significant.

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