

Physiological Changes of Thyroid Hormones in Women with Osteoporosis in Iraq / Basra Province

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Abstract

Osteoporosis is described as sickness due to fading bone mass and microarchitecture spoilage of bone tissue leads to consolidation bone fragility and increase risk of fracture. The relationship between osteoporosis and thyroid is important by of the skeleton bones in turnout of circulating physical thyroid hormone and TSH condensation to reduced bone mineral loss in osteoporosis patients, also researcher derives that hormone thyroid and TSH scale increased bone resorption, by increase bone mineral deposition. (110) patients female transfer from provincial and civilian habitation, their ages between (55-75) years old, they pay a visit to DEXA station to measure the density. The samples of blood after diagnosis of disease were taken, then the thyroid hormones were gauged by the modern VIDAS automated quantitative device according to the methods which assay serum or plasma. The outcome appeared to decrease significantly ($p \leq 0.05$) in TSH, T3, and T4 in osteoporosis women compared with healthy women, also no significant changes occur between housing status. Thyroid hormones have significant changes in osteoporosis women matched with good health women in Iraq / Basra province.

Keywords: Thyroid hormones, Osteoporosis, Low mineral density.

1. Introduction

Osteoporosis is an important disease associated with increased mortality after fractures [1]. Osteoporosis will be defined as a sickness in bone specialized with bone mass deformity and microarchitecture analysis of tissue bone lead to enhance fragility of bone and rise a percent of the risk of fracture [2]. The percent of high fractures risk in people have decreased in bone mineral density, the fractures majority will be found in patients with decrease density of bone rather than osteoporosis because the individuals with bone mass in this range are a high number [3]. Thyroid hormones excess the rate of basal metabolic, affect the synthesis of protein, assist to long bone growth regulation (growth hormone synergy with it), uptight maturation, and increase the sensitivity of the body to catecholamine's, these hormones also arrange fat, protein, and metabolism of carbohydrate [4]. Thyroid problems are significantly more common in women, in the time leading up to menopause, estrogen levels fall significantly, which would undoubtedly affect thyroid levels [5]. The osteoporosis associated with thyroid function for immediate effects of TSH on both components of osteoblastic bone formation, osteoclastic bone resorption, and skeletal remodeling, with move a role for TSH as For more information about the Conference please visit the websites:

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a molecular single switch in the independent control of both bone resorption and formation [6]. The relationship between osteoporosis and thyroid is important by of the skeleton bones in the existence of normal thyroid hormone circulating and concentration of TSH to reduced bone mineral loss in osteoporosis patients, also researcher derives that thyroid hormone standard and TSH increased bone resorption, with rising mineral bone deposition [7].

2. Materials Method

This study was conducted between February 2019 to November 2019 in Basra province / Iraq to include (110) women referring from rural and urban placing, (68) of them considered osteoporosis women while (42) determined as healthy. The age between (55-75) years old and weighing between (50-70 kg) while the length of this patient about (145-165 cm). Those patients visited al Zahraa clinic in Ibnalbetar private hospital to quantum the density of bone mineral by measure the hips and lumbar spine density using Lunar Prodigy (version 16) a dual-energy x-ray absorptiometry (DEXA) from (USA). According to the WHO criteria the patients are divided into normal, osteopenia, and osteoporosis, also the main outcome measure is low bone mineral density (T-score).

2.1. Human Models

The women are divided into two groups according to age and residing of housing status:

- (43) Women age between (55-75) years old residing in urban and this category are subdivided into two categories: (15) Healthy patients, (28) Osteoporosis patients.
- (67) Women age between (55-75) years old residing in rural, also subdivided into two subgroups: (31) Healthy patients, (36) Osteoporosis patients.

2.2. Dual Energy X-ray Absorptiometry

The technique of choice to diagnose osteoporosis and to monitor the response to treatment is called (DXA, DEXA) Dual-energy X-ray absorptiometry **Figure (1)**. It is considered a useful for also body composition measuring. The (WHO) known as World Health Organization has assign criteria for assessing the risk of fracture after diagnosis of osteoporosis by employ DXA screening, bone mineral density value at the hip or spine that is above 2.5 SDs under the optimal average health young people of the same perspiration and genus clarifies individuals have osteoporosis (T- score ≤ -2.5) [8].



Figure 1. Dual-energy X-ray absorptiometry.

2.3. Sample Collection

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After diagnosing the disease by using a DEXA machine, four milliliters of venous blood sample was drawing from each patient. Also, blood samples were collected from healthy persons. Blood transfused into a disposable gelatin tube, left at room temperature for at least 30 minutes for clotting, centrifuged (3500 r/m for 10 minutes) then the produced serum was removal into the special tube and stored at (-20°C) unless used directly.

2.4. Measurement of Thyroid Hormone

For the determination of thyroid hormone (TSH, T3, T4) the modern VIDAS automated quantitative device, these trials were examined in a specialist laboratory according to the methods which assay by using the Enzyme-Linked Fluorescent Assay (ELFA) technique to plasma or serum [9].

2.5. Statistical Analysis

According to SPSS16 program in the computer, the Analysis of variance table (ANOVA) was used in this study, and then the Least Significant Differences test (L.S.D) was used to determine the significant differences among the categories at a significant level ($p \leq 0.05$).

3. Results

Thyroid hormones in healthy and osteoporosis women aged between (55-75) years old. The results in **Table (1)** clarify a decrease ($p \leq 0.05$) in thyroid hormones TSH, T3, T4 in women who suffers from osteoporosis disease compared with healthy women.

Table 1. Thyroid and growth hormone in healthy and osteoporosis women (mean \pm SD).

Hormones	Healthy women (n=46)	Osteoporosis women (n=64)
TSH (mic. IU/ml)	3.43 \pm 1.33	*2.02 \pm 0.38
T3 (nmol/L)	1.89 \pm 0.64	*0.48 \pm 0.42
T4 (nmol/L)	81 \pm 5.31	*62 \pm 6.08

*Indicates significant changes at the level of probability ($p \leq 0.05$) compared with healthy women

3.1. Thyroid hormones in healthy and osteoporosis women aged between (55-75) years old living in (urban).

The results in **Table (2)** show the changes in thyroid hormones which include a significant decreased ($p \leq 0.05$) in all criteria for women with osteoporosis disease compared to women from the healthy group and residents in the urban.

Table 2. Thyroid hormones in healthy and osteoporosis women living in (urban) (mean \pm SD).

Hormones	Healthy women (n=15)	Osteoporosis women (n=28)
TSH (mic. IU/ml)	3.38 \pm 1.37	*1.95 \pm 0.44
T3 (nmol/L)	1.85 \pm 0.64	*0.43 \pm 0.36
T4 (nmol/L)	80 \pm 5.79	*61 \pm 4.35

* Indicates significant changes at the level of probability ($p \leq 0.05$) compared with healthy women.

3.2. Thyroid hormones in healthy and osteoporosis women aged between (55-75) years old and living in (rural).

The results in **Table (3)** show a decrease ($p \leq 0.05$) in thyroid hormones (TSH, T3, T4) in women with osteoporosis disease who is living in the rural areas compared with healthy women living in the same area.

Table 3. Thyroid hormones in healthy and osteoporosis women living in (rural) (mean \pm SD).

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Hormones	Healthy women (n=31)	Osteoporosis women (n=36)
TSH (mic. IU/ml)	3.48 ± 1.30	*2.10 ± 0.42
T3 (nmol/L)	1.93 ± 0.64	*0.53 ± 0.43
T4 (nmol/L)	81 ± 5.02	*63 ± 4.79

*Indicates significant changes at the level of probability ($p \leq 0.05$) compared with healthy women.

4. Discussion

Data of our study suggested a significant decrease in thyroid hormonal levels in osteoporosis women which include TSH, T3, T4 compared with healthy women in the same age. Also, results showed changes but not significant between housing status of osteoporosis women compared with control women in the same area. The functions of the thyroid have prevalent systemic semblance include effect metabolism of bone mineral contain a clinical disease have received enormous solicitude from scientist through the bygone century with be the paramount cause of secondary osteoporosis [10]. Thyroid hormone is required for regulates bone turnover and mineralization in adults, these results suggested that osteoporosis women have decreased in thyroid hormones may be due to that mechanism of T3-action in bone include receptors of T3 which expressed in growth plate chondrocytes and osteoblasts, that represent T3 primary target cells of the skeleton and increase the resorption of osteoclast-mediated bone leading to loss of bone density [11, 12]. Furthermore, (TSH) act a significant role in the metabolism of bone by rising bone bulk and recover microarchitecture for bone and intensity at least partially by osteoclastogenesis restrain [13]. The hormones of the thyroid include catabolic direct effect on homeostasis mineral bone, the inhibition in these hormones due to excess resorption of mineral bone, and calcium deprivation through kidneys which consider a basic reason for cause major abnormality in mineral bone density of osteoporosis patients [14, 15]. In addition, TSH, T3, T4 restrain bone lack and catalyze the formation of bone by preventing osteoclast activity, also TSH has stimulated the formation of bone osteoblast target receptors by motivating osteoblastogenesis, likewise, animate osteoblasts to make osteoprotegerin (OPG) production that reduces osteoclastic resorption for maintaining the health of bone [16]. The results of our study found that thyroid hormones are associated with abnormalities in the markers of bone turnover and density of mineral bone, osteoporosis women have a decrease in TSH, T3, T4 hormones with effect in bone turnover by a role in the maintenance of osteoblast cell and prevent loss bone density [17]. On the other hand, the role of estrogen levels affects thyroid receptors, these receptors are the molecules that allow thyroid hormones to enter cells when estrogen levels decrease they might affect this receptor and lead to a decrease in thyroid hormones [18].

5. Conclusion

The osteoporosis women have significant changes in thyroid hormones compared with healthy women in Iraq / Basra province.

References

1. Nguyen, J.R.; Schneider, D.; Sambrook, P.N., Eisman, J.A. Mortality after all major types of osteoporotic fractures in men and women: an observational study. *Lancet* **2009**, 353, 878.

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2. Kanis, J.A. Assessment of fracture risk and its application to screening for postmenopausal osteoporosis: synopsis of a WHO report. *Osteoporosis Int.* **2013**, *4*, 368.
3. Johnell, O.; Kanis, J.A. An estimate of the worldwide prevalence and disability associated with osteoporotic fractures. *Osteoporosis Int.* **2016**, *17*, 1726.
4. Grozinsky, S.; Fraser, A.; Nahshoni, E.; Weizman, A.; Leibovici, L. Thyroxine-triiodothyronine combination therapy versus thyroxine monotherapy for clinical hypothyroidism: meta-analysis of randomized controlled trials. *J. Clin. Endocrinol. Metab.* **2016**, *91*, 2592.
5. Jacobson, M.H.; Howards, P.P.; Darrow, L.A. Thyroid hormones and menstrual cycle function in a longitudinal cohort of premenopausal women. *Paediatr. Perinat. Epidemiol.* **2018**, *32*, 225.
6. Marians, R.C.; Yu, W.; Wu, X.B.; Ando, T.; Li, Y.; Zaidi, M. TSH is a negative regulator of skeletal remodeling. *Cell* **2013**, *115*, 151.
7. Bassett, J.H.; O Shea, P.J.; Rabier, B.; Boyde, A.; Howell, P.G.; Weiss, E. Thyroid hormone excess rather than thyrotropin deficiency induces osteoporosis in hyperthyroidism. *Mol. Endocrinol.* **2015**, *21*, 1095.
8. Vondracek, S.F.; Linnebur, S.A. Diagnosis and management of osteoporosis in the older senior. *Clin. Interv. Aging.* **2009**, *4*, 121.
9. Freidberg, A.; Baldach, C.; Mestre, B.; Smadja, V.; Morel, F. Vidas TSH3 (bioMerieux): Approche analytic performance diagnostic thyroid panel Immuno-anal. *Biol. Specialisee* **2001**, *14*, 339.
10. Dinesh, K. Thyroid disorders and bone mineral metabolism. *Indian J. Endocrinol. Metab.* **2011**, *15*, 107.
11. Williams, G.R. Thyroid hormone actions on bone and growth. *Endocr. J.* **2002**, *4*, 51.
12. Tsai, K.S.; Lai, S.M.; Huang, K.M.; Chieng, P.U.; Su, C.T.; Chen, F.W. Decreased bone mineral density in patients with prolonged thyrotoxicosis before and after treatment. *J. Formos Med. Assoc.* **2015**, *90*, 250.
13. Zhang, W.; Zhang, Y.; Liu, Y.; Wang, J. Thyroid-stimulating hormone maintains bone mass and strength by suppressing osteoclast differentiation. *J. Biomech.* **2014**, *47*, 1307.
14. Dhanwal, D.K.; Kochupillai, N.; Gupta, N.; Cooper, C. Dennison, E.M. Bone mineral metabolism and bone density in hypothyroidism. *J. Clin. Densitom.* **2010**, *13*, 462.
15. Mosekilde, L.; Christensen, M.S. Relationship between serum parathyroid hormone, calcium phosphorus metabolism and thyroid function. *Acta Endocrinol. (Copenh)* **2016**, *84*, 566.
16. Baliram, R.; Latif, R.; Berkowitz, J.; Frid, S.; Colaianni, G.; Sun, L. TSH acts directly on osteoblasts to increase bone production. *J. Bone Key Rep.* **2012**, *1*, 16.
17. Fairfield, W.P.; Sessimo, G.; Katznelson, L.; Pulaski, K.; Freda, P.U. Effects of a thyroid hormones and growth hormone receptor antagonist on bone markers. *Clin. Endocrinol. (Oxf)*. **2012**, *57*, 385.
18. Mochizuki, Y.; Shacha, N.; Aborey, Y.; Mollen, T. Correlation between thyroid hormone and biomarkers of bone metabolism in postmenopausal women. *Hormone Res.* **2016**, *66*, 236.