AN ASSOCIATION BETWEEN THYROID FUNCTION STATUS AND BONE MINERAL DENSITY (BMD) AMONG POSTMENOPAUSAL WOMEN WITH OSTEOPOROSIS

K. P. Neethu¹, Santhosh Kumar SS², Mini Joseph³

¹Student, Department of MLT, Government Medical College, Trivandrum.
²Assistant Professor, Department of Orthopaedics, Government Medical College, Trivandrum.
³Assistant Professor, Department of MLT, Government Medical College, Trivandrum.

ABSTRACT

BACKGROUND
Osteoporosis is the most common metabolic bone disorder. It is a disorder characterized by low bone and microarchitectural deterioration of bone tissue, leading to enhanced bone fragility and a consequent increase in fracture risk. Thyroid hormones are necessary to normal development and function of human skeleton. The aim of this study was to investigate the association between thyroid function status and bone mineral density (BMD) among postmenopausal women with osteoporosis.

MATERIALS AND METHODS
The study was completed in central diagnostic biochemistry laboratory, medical college, Thiruvananthapuram. Consecutive blood samples (5 ml) were collected from the postmenopausal women after confirming menopause, attending camp under the guidance of orthopaedic department, MCH hospital, to detect bone mineral density by quantitative ultra sonometry. Thiruvananthapuram and the parameters evaluating are Serum T3, T4, TSH, Serum Calcium, Phosphorous and ALP, in the Central Diagnostic Biochemistry Laboratory, Medical College Hospital, Thiruvananthapuram.

RESULTS
Average TSH of osteoporosis 1.61 ± 1.24, that of control 3.38 ± 1.65, p value is <0.001. There is a positive correlation between BMD and TSH, p value is Significant (<0.001) and r value (0.565). Average T3 of osteoporosis (10.54 ± 1.70), that of control (9.98 ± 1.67). and average T4 of osteoporosis (1.23 ± 0.25), that of control 1.13 ± 0.16. p value is >0.05. T3 and T4 shows No correlation with bone mineral density.

CONCLUSION
In osteoporosis population 83.3% of individuals having TSH value in the lower range of normal value. The study concluded that there is a positive correlation with Bone mineral density and TSH, even at TSH level with in the normal limit. The p value obtained is< 0.001 and the coefficient of correlation r = 0.565 Similarly, the study also concluded that there is no correlation of bone mineral density with T3 and T4. The mean serum levels of T3 and T4 were similar among women with or without osteoporosis. The low-normal TSH levels were associated with lowered BMD value. Average TSH of osteoporosis is 1.61 ± 1.24, that of control 3.38 ± 1.65, p value is <0.001

KEYWORDS
Bone Mineral Density, Osteoporosis, T3, T4, TSH.

HOW TO CITE THIS ARTICLE: Neethu KP, Kumar SSS, Joseph M. An association between thyroid function status and bone mineral density (bmd) among postmenopausal women with osteoporosis. J. Evid. Based Med. Healthc. 2017; 4(95), 5908-5910. DOI: 10.18410/jebmh/2017/1191

BACKGROUND
Osteoporosis is the most common metabolic bone disorder. It is a disorder characterized by low bone and microarchitectural deterioration of bone tissue, leading to enhanced bone fragility and a consequent increase in fracture risk. The greatest bone loss occurs in women during postmenopause.¹ ² Menopause is defined as the time when there have been no menstrual periods for 12 consecutive months and no other biological or physiological cause can be identified a condition of menopause. The most common causes of secondary osteoporosis are, increase endogenic and exogenous glucocorticoids, hyperthyroidism, hyperparathyroidism, and vitamin D deficiency. Several studies have proposed that subclinical hyperthyroidism is associated with lowered bone mass and increased risk of fracture.³ Thyroid-stimulating hormone (TSH; also known as thyrotropin) exerts a modifying effect on osteoblastic and osteoclastic activity through binding to its receptors on bone precursor cells.⁴ ⁵

Financial or Other; Competing Interest: None.
Submission 26-11-2017, Peer Review 04-12-2017,
Acceptance 11-12-2017, Published 19-12-2017.
Corresponding Author:
Dr. Santhosh Kumar S. S,
Assistant Professor,
Department of Orthopaedics,
Government Medical College, Trivandrum.
E-mail: santhoshkumarss@gmail.com
DOI: 10.18410/jebmh/2017/1191
Previous study indicated that the bone mineral density of the lumbar spine, femoral neck and the mid shaft of the radius were not significantly decreased in premenopausal patient with endogenous subclinical hyperthyroidism but that also concluded that long-lasting endogenous subclinical hyperthyroidism may be a contributing factor to the development of osteoporosis in some postmenopausal women.1

MATERIALS AND METHODS

Study Design- Case control comparison study.

Study Population- The study population includes the postmenopausal women attending a CAMP, under the guidance of orthopaedic department to detect osteoporosis (BMD) by Quantitative ultra sonometry (QUS).

Case- The study population includes the postmenopausal women, after confirming menopause and whose BMD (T Score) less than -2.5.

Control- postmenopausal women, after confirming Menopause and whose BMD (T score) greater than -1.

The study was carried out in serum sample collected from osteoporosis patients, attending camp under the guidance of orthopaedic department, MCH, hospital, Thiruvananthapuram.

All the patients were screened for BMD by using quantitative ultra sonometry. From this population select 42 post-menopausal osteoporosis women, whose BMD (T-Score) is less than -2.5 and 42 control population, whose BMD (T-Score) is greater than -1. Parameters such as serum T3, T4, TSH, Calcium, Phosphorus, Alkaline phosphatase (ALP), were determined, along with all patients were screened for any drug history especially calcium, vitamin D, and Thyroid hormones. An informed consent was taken before the screening and collection of the sample from cases and control.

RESULTS

Out of 42 cases, 3 (7.1%) were at the age group of 45-49 followed by 21 (50.0%) at the age group of 50-54 and 18 (42.9%) at the age group of 55-59. In the control group 10 (23.8 %) were at the age group of 45-49 followed by 24 (57.1%) at the age group of 50-55 and 8 (19%) at the age group of 55-59. There is a positive correlation of BMD with Calcium, and age, both have significant p value <0.001 and BMI has a weak positive correlation with BMD.

A positive correlation with Bone mineral density and TSH that was maintained even when TSH levels were within the normal range. The p value obtained is < 0.001 and the coefficient of correlation r = 0.565. Average TSH of osteoporosis 1.61 ± 1.24, that of control 3.88 ± 1.65, p value is <0.001.

83.3% osteoporosis population have TSH value < 2.77 (“low normal”) were as in control 66.7% of TSH values > 2.77 ("high normal").

DISCUSSION

In total study population 83.3% of osteoporosis have TSH value lying lower range of normal value (<2.77) than higher range of normal value. The remaining 16% have TSH value in the higher range of normal value (>2.77). In control population only 33.3% have TSH value < 2.77 and 66.7% values are in higher range of normal value. Average TSH of osteoporosis 1.61 ± 1.24, that of control 3.88 ± 1.65, p value is <0.001.

In this study, statistically significant positive correlation was found between TSH and Bone mineral density, even at TSH level with in the normal limit. The hypothesis of the present study was that postmenopausal women with low serum TSH level (Subclinical hyperthyroidism or clinical hyperthyroidism) would exhibit decreased measures of BMD suggesting that treatment of subclinical hyperthyroidism might help to maintain bone health in this population.1

In addition, Berrin Acar et al concluded that a statistically significant, positive correlation between TSH level and measure of BMD was observed p value is 0.01. The spearman correlation coefficient was 0.16 for the L1-L2 Lumbar vertebra (p=0.01), 0.08 for the trochanter of the femur (p=0.01), and 0.17 for the femoral neck (p=0.01).1

In this study, there is a positive correlation of BMD with Calcium, have significant p value <0.001. Phosphorus and ALP shows a weak negative correlation with BMD.

In current study shows no significant association between T3 & T4 with bone mineral density. 97.7% of osteoporosis individuals have T3 values with in the normal range. Average T3 of osteoporosis 1.23 ± 0.25, that of control 1.13 ± 0.16, p value is 0.03. In case of T4, average value of osteoporosis population 10.54 ± 1.70, that of control 9.98 ± 1.6, p value is not significant (0.135). This finding suggested that osteoporosis was independently associated with the physiological role of TSH rather than increasing level of T3 or T4 leading to loss of bone mass.

97.7% of osteoporosis individuals have T3 values with in the normal range. Average T3 of osteoporosis 1.23 ± 0.25, that of control 1.13 ± 0.16, p value is 0.03. In case of T4, average value of osteoporosis population 10.54 ± 1.70, that of control 9.98 ± 1.6, p value is not significant (0.135). This finding suggested that osteoporosis was independently associated with the physiological role of TSH rather than increasing level of T3 or T4 leading to loss of bone mass.

Grimes et al. noted that the highest BMD values were obtained among women with a TSH level over its normal range. Likewise, the present study showed that mean serum TSH level was associated with a protective effect for development of osteoporosis among postmenopausal women, after adjustment for age, duration of menopause, and BMI.7,8

Ongphiphadhanakul B et al concluded that postmenopausal women on long-term TSH-suppressive doses of L-T4 have reduced BMD at various skeletal sites which may increase fracture risks. TSH-suppressive doses of thyroid hormone should only be prescribed when appropriate and no longer than necessary to minimize this adverse effect of excessive doses of thyroid hormone on bone.8

Ercolano et al. examined 57 women with diagnosed Graves’ disease, who were in state of euthyroidism during

study, they want to determine the correlation with BMD and TSH receptor antibodies (TRAb). They concluded that BMD was decreased only in postmenopausal women and they found a negative correlation between Z-score of lumbar spine and TRAb.10

Mostafa Qorbani et al noted that the mean BMI in the osteoporotic subject is lower than normal subject, and also underweight subjects are more prone to osteoporosis.11 In this study the Average BMI of osteoporotic subject is 23.07 ±2.79, that of control 24.98 ± 4.78, p value is 0.05. Amiri et al study which showed that BMI is associated with osteoporosis and osteopenia.

CONCLUSION
In osteoporosis population 83.3% of individuals having TSH value in the lower range of normal value. The study concluded that there is a positive correlation with Bone mineral density and TSH, even at TSH level with in the normal limit. The p value obtained is< 0.001 and the coefficient of correlation r = 0.565. Similarly, the study also concluded that there is no correlation of bone mineral density with T3 and T4. The mean serum levels of T3 and T4 were similar among women with or without osteoporosis. The low-normal TSH levels were associated with lowered BMD value. Average TSH of osteoporosis is 1.61 ± 1.24, that of control 3.38 ± 1.65, p value is <0.001. Present study showed that, subclinical hyperthyroidism was independently associated with an increase rate of osteoporosis. Therefore, clinicians should aim to maintain TSH level within the upper limit of the reference range during the treatment of hypothyroidism.

REFERENCES