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

K. P. Neethu[1], Santhosh Kumar SS[2], Mini Joseph[3]

[1]Student, Department of MLT, Government Medical College, Trivandrum.
[2]Assistant Professor, Department of Orthopaedics, Government Medical College, Trivandrum.
[3]Assistant 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 micro architectural 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 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 T_3, T_4, 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 T_4 of osteoporosis (10.54 ± 1.70), that of control (9.98 ± 1.67). and average T_3 of osteoporosis (1.23 ± 0.25), that of control 1.13 ± 0.16. p value is >0.05. T_3 and T_4 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 T_3 and T_4. The mean serum levels of T_3 and T_4 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, T_3, T_4, 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

CC BY NC ND

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 T_3, T_4, 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 have 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 3.38 ± 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 3.38 ± 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.[1,6]

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 T_3 & T_4 with bone mineral density. 97.7% of osteoporosis individuals have T_3 values with in the normal range. Average T_3 of osteoporosis 1.23 ± 0.25, that of control 1.13 ± 0.16, p value is 0.03. In case of T_4, 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 T_3 or T_4 leading to loss of bone mass.

97.7% of osteoporosis individuals have T_3 values with in the normal range. Average T_3 of osteoporosis 1.23 ± 0.25, that of control 1.13 ± 0.16, p value is 0.03. In case of T_4, 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 T_3 or T_4 leading to loss of bone mass.

Grimnes 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.[9]

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 osteoporosis 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 T_3 and T_4. The mean serum levels of T_3 and T_4 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

[1] Acar B, Ozay AC, Ozay OE, et al. Evaluation of thyroid function status among postmenopausal women with and without osteoporosis. Int J Gynaecol Obstet 2016;134(1):53-57.

[2] Aggarwal N, Raveendran A, Khandelwal N, et al. Prevalence and related risk factors of osteoporosis in peri- and postmenopausal Indian women. J Midlife Health 2011;2(2):81-85.

[3] Bauer DC, Ettinger B, Nevitt MC, et al. Risk for fracture in women with low serum levels of thyroid-stimulating hormone. Ann Intern Med 2001;134(7):561-568.

[4] Abe E, Marians RC, Yu W, et al. TSH is a negative regulator of skeletal remodeling. Cell 2003;115(2):151-162.

[5] Morris MS. The association between serum thyroid-stimulating hormone in its reference range and bone status in postmenopausal American women. Bone 2007;40(4):1128-1134.

[6] Tuchendler D, Bolanowski M. The influence of thyroid dysfunction on bone metabolism. Thyroid Res 2014;7:12.

[7] Neema A, Shweta V, Inamdar SA. Prevalence of osteoporosis using quantitative ultrasound for menopausal women in rural and urban area. The international Journal of Gynecology and Obstetrics 2009;13(1):1-7.

[8] Grimnes G, Emaus N, Joakimsen RM, et al. The relationship between serum TSH and bone mineral density in men and postmenopausal women: the Tromsø study. Thyroid 2008;18(11):1147-1155.

[9] Ongphiphadhanakul B, Puavilai G, Rajatanavin R. Effect of TSH-suppressive doses of levothyroxine on bone mineral density in Thai women. J Med Assoc Thai 1996;79(9):563-567.

[10] Ercolano M, Drnovsek M, Croome MCS, et al. Negative correlation between bone mineral density and TSH receptor antibodies in long-term euthyroid postmenopausal women with treated Graves' disease. Thyroid Res 2013;6(1):11.

[11] Qorbani M, Bazrafshan HR, Aghaei M, et al. Diabetes mellitus, tyroid dysfunction and osteoporosis: is there an association. J Diabetes Metab Disord 2013;12:38.