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Elevated TSH – A Risk of Fracture in Post Menopausal Women

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Abstract:
Background: *Thyroid diseases are common worldwide. Hypothyroidism is very commonly seen in females and the incidence increases with age. Due to this endocrine dysfunction ,there are various of signs and symptoms. Most common cause of hypothyroidism is autoimmune thyroiditis. In postmenopausal females, the incidence of hypothyroidism is high, leading to increase in the risk of fractures. The study was conducted in Department of Biochemistry and Orthopaedics, Govt. Medical College, Kota and attached group of hospitals. A total of 112 postmenopausal fractured females of age group 51 – 80 years are included. Duration of study is from September 2014 to May 2015. Level of Thyroid Stimulating Hormone(TSH) was measured.*
Method*: The estimation of TSH was done by chemiluminescence in Hormonal Assay Lab, Department of Biochemistry, Govt. Medical College, Kota. The study was conducted on 112 postmenopausal females having fracture, out of which 28 were hypothyroid, 72 were euthyroid and 12 were hyperthyroid. The hyperthyroid cases were excluded from the study.*
Result*: Analysis was done by Microsoft Excel. Mean ± SD of TSH was calculated. TSH level was increased in postmenopausal hypothyroid females. Unpaired t-test was done. P value was found to be < 0.05, which is highly significant.*
Conclusion *: Our study shows that increased level of TSH is associated with increased risk of fracture.*
Keywords*: Fracture, Hypothyroidism, Menopause, Thyroid Stimulating Hormone(TSH).*

I. Introduction

Hypothyroidism is decreased activity of thyroid gland which may be primary(disease of thyroid gland) or less commonly secondary to hypothalamic/ pituitary disease, seen more common in females with its incidence increasing as the age advances. It is prevalent in 0.1-2% of population worldwide(1).

Menopause is the time of life when menstrual cycles ceases and is caused by reduced secretions of ovarian hormones, oestrogen and progesterone(2). It naturally occurs at the age of 45 – 55 years. Symptoms of menopause are hot flushes, vaginal dryness, depression, weight gain and loss of bone density(osteoporosis)(3).

Hypothyroidism is associated with broad range of metabolic disturbances and conditions such as osteoporosis, obesity, cold intolerance, arthralgia, myalgia and cardiovascular disease (4-9). Rate of bone turnover is reduced in hypothyroidism leading to reduction in the pool of exchangeable calcium (10) which impairs bone formation and mineralization(11). Hypothyroidism has been associated with an increased risk of fractures (12-13). Neuromuscular symptoms and impaired muscle energy metabolism could be responsible for bone changes in hypothyroid patients. Even after the restoration of euthyroid status there is impaired neuromuscular response to exercise(14). Hypothyroidism is a risk factor for falls(15).

Fracture of bone is a medical condition in which there is a break in continuity of the bone, which may occur as a result of high force impact or stress or trauma(16). Commonly observed fractures in elderly females are Colles' fracture (the fracture of distal end of radius, at its cortico – cancellous junction) – most commonly seen in osteoporosis(17) and Femoral neck fractures & intertrochanteric fracture of femur(18). It is estimated that about 40% of women after the age of 50 experience at least one fracture connected with osteoporosis (19).

Measurement of plasma TSH concentration provides the cornerstone of biochemical evaluation of hypothyroidism(20).Normal level of TSH is 0.3 – 3.5 mU/l and > 10 mU/l is observed in hypothyroidism(21).

II. Aim And Objectives

To find out the levels of TSH in postmenopausal females having fracture and comparing the hypothyroid and euthyroid postmenopausal fractured females, so as to establish a relation between increased level of TSH and risk of fracture. This study may be helpful for public health and clinical practice.

III. Materials And Methods

A total of 112 postmenopausal females(cessation of menstruation since 1 year) having fractures of age group between 51 – 80 years were included in the study. The patients with chronic renal failure, parathyroid or calcium related diseases, history of therapy with glucocorticoids, calcium & vitamin D, postmenopausal females of age < 50 years , > 80 years and patients on treatment for hypothyroidism were excluded from the study.

Sample : The sample of postmenopausal fractured females were collected after confirmation of fracture radio logically. After the consent of the patient, 2ml of blood was withdrawn. After centrifugation, serum sample was analysed on Roche cobas e 411 by chemiluminescence in Hormonal Assay Lab in Department of Biochemistry, Govt. Medical College, Kota.

IV. Statistical Analysis

The statistical analysis was performed by using Microsoft Excel Program. The results were expressed as mean ± standard deviation. A $P < 0.05$ was considered statistically significant. The results were compared between Hypothyroid and Euthyroid females by Student's unpaired ' t ' test.

V. Results

Among the total of 112 postmenopausal fractured females, 26 females were found to be hypothyroid(TSH > 10mU/l), 12 females were found to be hyperthyroid(TSH< 0.3 mU/l) and 74 euthyroid(TSH level between 0.3 – 3.5 mU/l).

HYPOTHYROID FEMALES (TSH > 10mU/l)	26
EUTHYROID FEMALES (TSH level between 0.3 – 3.5 mU/l)	74
HYPERTHYROID FEMALES (TSH level< 0.3mU/l)	12
TOTAL POSTMENOPAUSAL FEMALES with FRACTURE	112

Table 1: Number of Hypothyroid, Euthyroid & Hyperthyroid Postmenopausal females having Fracture. Hyperthyroid females with fracture were excluded from the study.

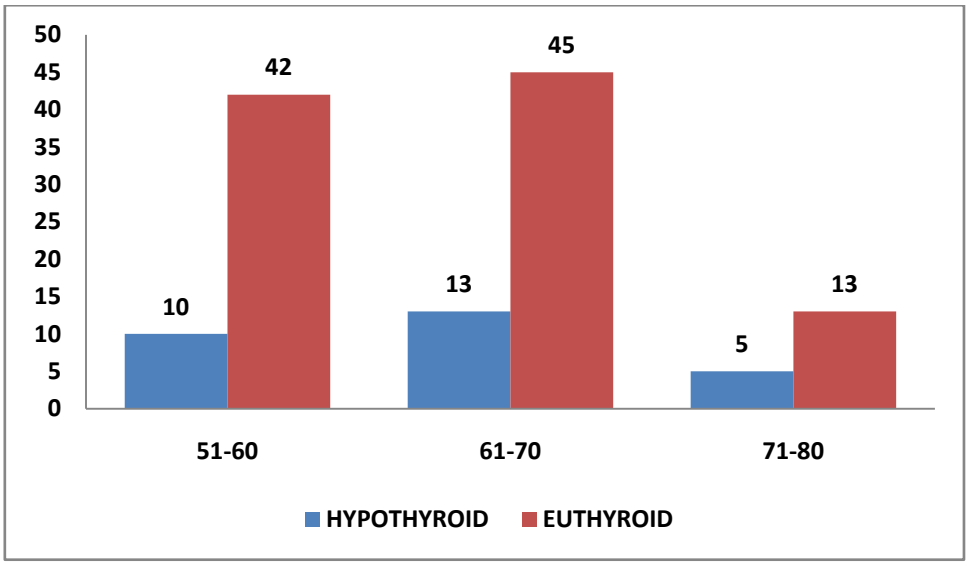
Further, we divided hypothyroid and euthyroid 100 postmenopausal females having fracture, according to age into 3 groups. The first group included females of age between 51-60 years, a total of 42 females were found in this group. Among these, 24% (10/42) postmenopausal females having fracture were found to be hypothyroid.

In the second group, of age 61 -70 years were included. Out of the total 45 postmenopausal females having fracture, 28% (13/45) were found to be hypothyroid.

In the third group,of age between 71 – 80 years were included. In this group a total of 13 postmenopausal females having fracture, 38% (5/13) were found to be hypothyroid.

AGE GROUP	NUMBER OF POSTMENOPAUSAL FRACTURED FEMALES	NUMBER OF HYPOTHYROID POSTMENOPAUSAL FRACTURED FEMALES
51 – 60 YEARS	42	10 (24%)
61 – 70 YEARS	45	13 (28%)
71 – 80 YEARS	13	5 (38%)

TABLE 2 : Percentage Of Hypothyroid Fractured Postmenopausal Females In Different Age Groups.



Graph Showing number of hypothyroid cases in comparison to euthyroid postmenopausal fractured females.

The mean ± SD in case of hypothyroid postmenopausal fractured females is 27.29 ± 4.25 and the mean ± SD in case of euthyroid postmenopausal fractured females is 2.33 ± 0.93. P value < 0.05 is found to be stastically significant.

PARAMETER	HYPOTHYROID POSTMENOPAUSAL FRACTURED FEMALES (n = 28) MEAN ± SD	EUTHYROID POSTMENOPAUSAL FRACTURED FEMALES (n = 72) MEAN ± SD	P value
TSH LEVEL (mU/ l)	27.29 ± 4.25	2.33 ± 0.93	< 0.05

Standard error of mean in hypothyroid cases is 0.8036 and in euthyroid cases is 0.1095.

VI. Discussion And Conclusion

Thyroid dysfunction is one of the commonest disease encountered in today's scenerio. India also has a significant burden of thyroid disease. In India, the prevalence of hypothyroidism was estimated to be 3.9%, in the population based study done in Cochin(20). Its prevalence is more common in females. In postmenopausal females, it accentuates the menopausal problems like decreased bone density, cardiovascular complications, loss of physical activity, etc.. Hypothyroidism has been reported to affect cognitive function and depressed mood(23,24), which may also leads to decreased physical activity. Older people are prone to fall because of general deterioration in bodily functions associated with ageing. Study by Abe et al suggests that TSH is a negative regulator of skeletal remodelling by reducing both differentiation of osteoblasts and formation of osteoclasts(25).

Menopause is itself a condition which leads to osteoporosis due to deficiency of oestrogen. Oestrogen stimulates bone growth by preventing osteoclastic activity, therefore it prevents osteoporosis(26). Hypothyroidism further reduces osteoblastic bone differentiation, resulting in decrease bone formation and resorption(27). Myalgia and arthralgia leads to increase risk of fall thus leading to increased incidence of fracture. In our study we found 'P' value < 0.05, which is found to be significant. A study by Vestergaard et al also suggested that hypothyroidism is a risk factor for the occurrence of fracture(28).

By this study we conclude that the incidence of fracture in case of postmenopausal females is more significantly associated with increased levels of TSH than the euthyroid postmenopausal females. And we also found that the incidence of fracture was slightly higher in the older age group.

Limitations Of The Study

1) There is a need to explore this study further.
2) AntiTPO antibodies could not be measured due to certain limitations.

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