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Correlation of Vitamin D status with TSH levels in postmenopausal women; A pilot study

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ABSTRACT

Introduction: Vitamin D (VitD) insufficiency is present in over half of population worldwide. Over a billion people worldwide are vitamin D deficient or insufficient. It has been long known that VitD insufficiency contributes to development of osteopenia and osteoporosis.
Materials and Methods: We performed a retrospective review of data of 60 patients in postmenopausal age group (45-75 years) during their routine blood investigation for the first time at Government Medical College and Guru Nanak Dev Hospital Amritsar over a period of 3 months (February 2023 to April 2023).
Results: Vitamin D levels were insufficient (10-30 ng/mL) in 35% of the patients, deficient (10 ng/mL) in 18.5%, and normal in the remaining 35%. TSH levels were low (less than 0.3 mIU/L) in 5%, high (more than 4.5 mIU/L) in 18.3%, and normal (0.3-4.5 mIU/L) in the remaining 76.6%. 54% (n-11) of individuals with elevated TSH had vitamin D deficiency, while 18% had insufficient vitamin D. 100%(n-3) patients with low TSH had normal vitamin D levels. TSH and vitamin D levels were normal in 22 individuals.
Conclusion: High TSH levels was associated with low vitamin D levels, low TSH levels was associated with normal serum vitamin D level. Hence association was linear between TSH and vitamin D in post-menopausal women.

1. Introduction

Vitamin D (VitD) insufficiency is present in over half of population worldwide.[1] It has been long known that VitD insufficiency contributes to development of osteopenia and osteoporosis.[2,3] As the VitD receptors are present in all human cells regardless of their different embryo logic origins, several studies have focused on the extra-skeletal effects of VitD and the way it affects general health of patients.[4] In addition to the limited oral intake and age-related decline in its absorption, decreased exposure to sunlight is among the leading causes of VitD insufficiency in women.[5] Age-related changes that contribute to the reduced serum levels of this vitamin are mediated through the attenuation of hypodermal synthesis of VitD precursor, as well as reductions in alimentary absorption of cholesterol based provitamin molecules in daily nutritional intake.[6]

VitD insufficiency has been implicated in increasing prevalence of autoimmune diseases, including type I diabetes mellitus,[7] rheumatoid arthritis[8] and systemic lupus erythematosus.[9,10] On the other hand, immune-mediated pathophysiology comprises the major etiology of hypothyroidism in iodine-replete areas.[11] Moreover, aging

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is linked to the increased prevalence of subclinical forms of hypothyroidism.[12,13] Interestingly low VitD levels is reported in patients with hyperthyroidism presumably due to the acceleration of its metabolism.[14] Studies have yielded conflicting results on the frequency of VitD insufficiency among patients with an ongoing autoimmune process in humans. VitD levels have been found to be lower in patients with autoimmune thyroid disorders compared to the healthy volunteers in one study.[15] Yet, other studies have not yielded similar results.[16]

VitD insufficiency is very common among women in the geographic region where this study is conducted. In view of these conflicting reports, we aim to examine the association between serum levels of VitD and thyroid stimulating hormone (TSH) among postmenopausal women. We hypothesize that serum levels of VitD would be lower in postmenopausal women with elevated serum concentrations of TSH presumably due to the diminished synthesis.

2. Aims and Objective

To assess the serum vitamin D and TSH status in postmenopausal women who have undergone routine blood investigations.

3. Material and Methods

A retrospective review of data of 60 patients in postmenopausal age group (above 45 to 75yrs) during their routine blood investigation for the first time at Government Medical College and Guru Nanak Dev Hospital Amritsar over a period of 3 months (February 2023 to April 2023). Laboratory investigations, including: Serum 25-OH Vitamin D levels below 10ng/ml were considered 'deficient', where as those with levels between 10-30 ng/ml were considered 'insufficient' and normal if its 30-100 ng/ml. Serum TSH reference range of age below 55yrs is 0.3-4.5mlU/L and above 55yrs is 0.5-8.9mIU/L is considered normal.

3.1. Inclusion criteria

Patients in postmenopausal age group (45-75yrs).

3.2. Exclusion criteria

1. Diagnosed and treated cases of vitamin D deficiency.
2. Diagnosed and treated cases of thyroid disease.
3. Surgical menopause.
4. Women receiving hormonal replacement therapy (HRT).
5. Who is on Vitamin D and calcium supplementation.

4. Results

The analysis of 60 patients included in this study are as follows;

Table 1: Vitamin D status according to age of the patients.

Age	Vitamin D Status		
	Normal	Insufficient	Deficient
45-50	14	9	6
51-55	5	3	1
56-60	6	5	1
61-65	3	3	3
66-70	0	1	0
71-75	0	0	0
Total	28 (47.5%)	21 (35%)	11 (18.0%)

35% of patient had insufficient vit D and 18.0% had deficient vit D.

Table 2: Thyroid status according to age of the patients.

Age	Thyroid status		
	Normal TSH	Hyperthyroid	Hypothyroid
45-50	27	0	5
51-55	5	1	2
56-60	10	1	1
61-65	4	1	3
66-70	1	0	0
Total	46	3	11

*18.3% of patients were hypothyroid and 5% were hyperthyroid

Table 3: Correlation of Vitamin D and thyroid status.

Age	Thyroid status		
	Normal TSH	Hyperthyroid	Hypothyroid
Normal	22	3	3
Insufficient	19	0	2
Deficient	5	0	6

*9.5% of patients with insufficient vitamin D had hypothyroidism and 54.5% of patients with deficient vitamin D had hypothyroidism.

5. Discussion

In the classical endocrine pathway, vitamin D enters the circulation attached to a D-binding protein, is first hydroxylated in the liver to 25-hydroxy vitamin D (25(OH) D) and then in the kidney to form the active metabolite, 1, 25 dihydroxy vitamin D (1, 25-(OH)2 D) or calcitriol.[17] Serum 25(OH)D has a half-life of approximately two to three weeks, in contrast, 1,25-(OH)2D has a short circulating half-life and is tightly regulated over a narrow range by parathyroid hormone, calcium and phosphate.[18] Serum 1,25-(OH)2D is not a good measure of vitamin D status since a decrease may not occur until vitamin D deficiency is severe.[19] Vitamin D mediates its effect through binding to vitamin D receptor (VDR), which is present on many cells of immune system and thereby regulating the activity of the immune cells.[20] Individuals with genetic polymorphisms of these receptors are particularly prone to autoimmune thyroid disorders.[21] Metabolism of VitD is also reciprocally regulated by thyroid hormones. Provitamin D3 is synthesized from 7-dehydrocholesterol and the

enzymatic reaction takes place principally in keratinocytes located in the basal and spinous strata of the epidermis layer.[22] In hypothyroid patients skin changes occur in the form of epidermal thinning and hyperkeratosis.[23] This suggests that epidermal barrier function is probably impaired in hypothyroidism with a hypothesizing that synthesis of VitD is decreased in patients with overt hypothyroidism and high TSH.[24] Thyroid disorders are more common in women by 5–10 times,[25] while their frequency increases with age.[26] Thyroid function is diagnosed by measuring serum TSH (Thyrotropin) and it is the best and most reliable test to diagnose thyroid disease.[27,28] Prevalence of both vitamin D and TSH levels are more among postmenopausal women. Menopause is a natural aging process causing oestrogen deficiency. It is known that oestrogen influence on serum thyroid hormone by increasing the level of thyroxin binding globulin, with the decrease of its clearance.[29] Therefore, routine screening of thyroid function in menopausal period to determine thyroid disease is required. Present study showed that most of the patients with insufficient and deficient Vitamin D also have hypothyroidism.

Similarly Amal Mohammed et al., stated that patients with hypothyroism suffered from hypovitaminosis D with hypocalcaemia. A study done by Mitra Niafar et al., included 229 postmenopausal women in that 12% had insufficient VitD, deficient in 60.9% of the participants. And in 11.3% TSH was low and in 7.6% of women, TSH was high, while the remaining 80.1% had normal TSH levels. Subjects with low TSH had significantly higher VitD concentration compared to the other 2 groups.[30] Byron Richards[31] studied the effect of vitamin D deficiency on thyroid gland in experimental study; he reported that a lack of vitamin D contributed to the possibility of low thyroid hormone. K. Vondra et al., concluded that significant vitamin D deficiency would occur in the most of the subjects suffering from various forms of thyroid autoimmunity.[32]

Swati Sonawane et al., observed that out of 90 subjects, there were 58.8% patients who had Vitamin D deficiency. There were 21.1% patients who had insufficiency of Vitamin D. Only 20% subjects have sufficient levels of Vitamin D. There were 73 cases of euthyroid in which the TSH levels were between 0.25-5 U/U/ml. There were 10 cases of subclinical hypothyroid and 7 cases of overt hypothyroidism. The mean levels of Vitamin D in subclinical and overt hypothyroidism were 16.23± 10.47 and 13.11±10.48 ng/ml respectively.[33]

6. Conclusion

Prevalence of Vitamin D deficiency and hypothyroidism are common in postmenopausal women and our study will also confirm this. There is no linear correlation between TSH (increased) and Vitamin D (decreased) levels. So all postmenopausal women should be submitted for estimation of thyroid function test and serum vitamin D levels. Since both are treatable diseases and proper treatment of these diseases will prevent the complication related to cardio-metabolic disease and mortality in postmenopausal women.

7. Source of Funding

None.

8. Conflict of Interest

None.

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