ORIGINAL RESEARCH ARTICLE

Vitamin D3 Deficiency in Hypothyroidism Patients: A Hospital Based Prospective Study.

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Abstract:

Objectives: This present study was to find the various parameters like age, TSH levels, FT4, FT3, anti TPO levels and vitamin D3 levels in hypothyroidism patients. Methods: Detail history clinical examinations and relevant investigations were performed to all subjects. Sample was collected for the estimation of serum TSH, FT3, FT4, Anti-TPO and Vitamin D3 levels. Under complete aseptic conditions venous blood was withdrawn from antecubital vein. Levels of FT3, FT4, TSH, Anti-TPOAb and Vitamin D3 were estimated using fluorescence array. Results: Data was analyzed by using SPSS version 26 software. One sample statistical methods analysis was used. Mean ± standard deviation were calculated. P value was taken less than or equal to 0.05 for significant differences (p ≤ 0.05). Conclusions: Hypothyroidism patients had significantly decreased vitamin D3 levels and increased TSH levels. Therefore, regular screening of vitamin D3 levels should be performed in all hypothyroid patients. And vitamin D3 supplementation should be recommend for early prevention and management of vitamin D3 deficiency in hypothyroidism patients.

Key words: Vitamin D3, Hypothyroidism, TSH, FT4, FT3, anti TPO.

Introduction:

Vitamin D deficiency is a global health problem [1]. Over a billion people worldwide are vitamin D deficient or insufficient [1].

Vitamin D deficiency has been shown to be associated with autoimmune diseases, including rheumatoid arthritis (RA), systemic lupus erythematosus (SLE), inflammatory bowel disease (IBD), multiple sclerosis (MS) and type 1 diabetes (T1DM), and that vitamin D supplementation prevents the onset and/or development of these autoimmune diseases [2]. Furthermore, it was reported that patients with Hashimoto's thyroiditis, an autoimmune thyroid disease had lower vitamin D levels [3].

The molecular mechanism by which vitamin D exerts its action seems to be mediated by its binding to VDR, an intracellular receptor belonging to the steroid/thyroid nuclear receptor family, expressed by human immune cells, such as macrophages, dendritic cells and T and B lymphocytes. Vitamin D central target are dendritic cells (DCs) [4]. In particular, it has been shown that 1, 25(OH)2D3 and calcifediol impair T-cell-stimulatory capacities of murine DC [5]. DCs isolated from VDR knockout mice were not impaired in their T-cell-activating potential, demonstrating that the inhibitory effect of these vitamin D metabolites was dependent on the presence of VDR [5].In particular, 1,25(OH)2D3 inhibited DC maturation as well as production of DC-derived cytokines, such as interleukin (IL)-12 and IL-23.

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Moreover, 1,25(OH)2D3 decreased the production of inflammatory Th1 cytokines such as IL-2 and interferon-γ, which promote cell-mediated cytotoxicity leading to thyroid destruction in HT [7]. In this regard, it is worth mentioning that the suppression of Th1 response by Vitamin D may counteract the onset of GD, as Th1 dominance seems to be involved in the induction of the disease [8]. Finally, 1,25(OH)2D3 inhibits Th17-derived cytokines IL-17 and IL-21 production, promoting the induction of regulatory rather than effect or T cells [7].

Vitamin D plays an essential role in calcium homeostasis and the development and maintenance of the skeleton [9]. It is recognized as the sunshine fat soluble vitamin. Exposure to ultraviolet B light (290–320 nm) are the main source of vitamin D [10]. Objectives of this present study was to found the levels of TSH, FT4, FT3, TPO ab and its correlation with vitamin D3 levels in hypothyroidisms patients.

Materials & Methods:

This present study was conducted in Department of Medicine, Katihar Medical College and Hospital, Katihar, Bihar during a period from March 2019 to November 2019. Attendant of entire subjects /subjects signed an informed consent approved by institutional ethical committee of KMCH, Katihar, Bihar, India was sought.

In this present study, we were enrolled a total of 60 patients of hypothyroidism with age group 20 to 70 years. Data was collected with irrespective of sex by random sampling methods.

Procedures:

Detail history clinical examinations and relevant investigations were performed to all subjects. The patients who were known case of hypothyroidism were included in this study. And the patients were receiving any one Vitamin D3 supplement were excluded from this study.

Laboratory findings: Sample was collected for serum TSH, FT3, FT4, ANTI-TPO and Vitamin D3 level estimation. Under complete aseptic conditions venous blood was withdrawn from antecubital vein. Levels of FT3, FT4, TSH, Anti-TPOAb and Vitamin D3 were estimated using fluorescence array. Patients with TSH levels greater than 10 U/mL were taken as overt hypothyroids. Subclinical hypothyroid: >5-7 U/mL and Euthyroid: 0.25-5 U/mL.

Serum 25(OH)D3, the most abundant circulating precursor of active Vitamin D, is the most reliable and widely accepted indicator of Vitamin D status. Vitamin D deficiency is defined as a 25(OH)D3 below20 ng/ml and Vitamin Dinsufficiency as 25(OH)D3of 21–29 ng/ml. Levels of 25(OH)D3 >30 ng/ml are considered to be optimal [11].

Statistical Analysis:

Data was analysed by using SPSS version 26 software. One sample statistical methods was used. Mean ± standard deviation (S.D) and t- value were calculated. P-value was taken equal to or less than 0.05 for significant differences ($p \leq 0.05$).

Observations and Results:

In this present study, we were enrolled a total 60 patients of hypothyroidism. There were 20(33.33%) males and 40(66.66%) females. Male and female ratio was 1:2.

Table 1: various parameters of patients with hypothyroidism.

Parameters	Mean±S.D.	t-value	P-value
Age	53.266± 10.381	39.74	P<0.0001
TSH (uIU/ml)	20.266±5.329	29.45	P<0.0001
FT4(ng/dL)	3.892±1.560	19.32	P<0.0001
FT3(ng/dL)	2.583±1.093	18.30	P<0.0001
Anti TPO(IU/mL)	5.333±1.838	22.47	P<0.0001
Vit D3(ng/mL)	22.900±7.646	23.19	P<0.0001

In this present study, mean ± standard deviations of age of hypothyroid patients were 53.266± 10.381 years. And it was significantly differenced (p=0.000). Mean±S.D of TSH was 20.266±5.329 uIU/ml and it was significant differenced (P<0.0001). Mean±S.D of FT4, FT3 and anti TPO were 3.892±1.560 ng/mL, 2.583±1.093ng/Ml and 5.333±1.838 IU/mL respectively. All these parameters were also significantly differenced (p<0.0001). Similarly, Mean±S.D of vitamin D3 was 22.900±7.646 ng/mL, it was also significant differenced (p<0.0001).

Table.2. Status of vitamin D3 level in cases

Vitamin D3	No. of cases	Percentage
Sufficient	16	26.7%
Insufficient	24	40.0%
Deficiency	20	33.3%

In this present study, 16(26.67%) cases of hypothyroidism had sufficient vitamin D3 levels. And 44(73.33%) patients had decreased vitamin D3 levels. Among them 24(40%) had insufficient and 20(33.33%) patients had significant deficiency of vitamin D3 levels.

Discussions:

Vitamin D plays an important role in preventing the occurrence of many inflammatory diseases, infections, and autoimmune diseases [12]. In numerous studies, the relationship between vitamin D deficiency and a variety of diseases, including musculoskeletal [13], cardiovascular [14], kidney disease [15], diabetes [16] and infections [17] had been shown. The thyroid gland is also one of the organs that have a receptor for vitamin D. The vitamin D receptor in the thyroid is a member of a large group of receptors called nuclear receptors, which also belong to the thyroid hormones receptor [18]. Some studies indicated that vitamin D deficiency is associated with various autoimmune diseases [19].Today, Hashimoto is one of the mostcommon acquired hypothyroidism and autoimmune disease in children and adults [20]. The onset of autoimmune-thyroid disease with vitamin D deficiency is very common [21].

Few studies were conducted to find any significant association between the levels of Vitamin D and hypothyroidism and it's pathogenesis but yieldedconflicting results. Kivity et al. in 2011 documented significantly low levels of 25(OH)D3 with autoimmune thyroid disease, whereas a study by Goswami et al showed a weak association between 25(OH)D3 levels and thyroid peroxidase antibody (TPOAb) titers [22, 23].

In our present study, 60 hypothyroidism patients were enrolled. Male and female ratio was 1:2. Average age of patients was 53.266± 10.381 years. And it was significantly differenced (p=0.000).

Canaris GJ, et al (2000) conducted a study and found that 7-95% females and 1-2% males across the world that has variable thyroid conditions [24]. In our present study 66.67% females and 33.33% males hypothyroid patients were suffered with vitamin D3 deficiency.

Swati Sonawane et al. [25] observed that out of 90 subjects, there were 58.8% patients (n=53) who had Vitamin D deficiency i.e. the Vitamin levels were less than 20 ng/ml. 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. There was a significant difference in the level of Vitamin D in all the cases.

In our present study, we were found that in out of 60 cases of hypothyroidism, mean level of TSH, FT4, FT3 and anti TPO were 20.266±5.329uIU/ml, 3.892±1.560 ng/mL, 2.583±1.093ng/Ml and 5.333±1.838 IU/mL respectively. All these parameters were also significantly differenced (p=0.000).

Vitamin D deficiency was considered virtually nonexistent In the Indian population as India lies in the tropical area [26].But now a days various studies have revealed that 50-90% of the Indian population is deficient in Vitamin D due to inadequate dietary intake of Calcium [27].

Several studies have reported low serum levels of vitamin D in hypothyroid patients which in turn may lead to some musculoskeletal complaints in these patients [28]. Other studies have demonstrated that the patients with Graves' disease also have low serum levels of vitamin D [29]. There are two mechanisms that may explain why serum levels of vitamin D is low in hypothyroid patients; one is that the low levels of vitamin D may be due to poor absorption of vitamin D from the intestine and the other is the body of these patients may not activate vitamin D properly [30].

In our present study, we were observed in atotal 50patients of hypothyroidism, 16 (26.67%) cases had sufficient vitamin D3 levels (>30 ng/mL). 24(40%) had insufficient vitamin D3 levels (20-30 ng/mL). And 20(33.3%) hypothyroidism patients had deficiency of vitamin D3 levels (<20g/mL). And among all 60 hypothyroid patients, average mean of vitamin D3 was 22.900±7.646 g/mL. And it shows significant deficiency of vitamin D3 (P=0.000).

In a study by Chaudhary et al [31] was seen that administration of 60,000 IU vitamin D weekly in autoimmune thyroid disorders (AITD) had a favourable effect on autoimmunity as evidenced by significant reductions in TPO Ab titers. In addition, vitamin D3 intake after 10 weeks in diabetic rats greatly corrected the alterations in thyroid profile and D2 (deiodinase 2) expression [32].

A study from Japan including 200 patients with Graves' disease demonstrated that 40% of women and 20% of men had vitamin D deficiency [33]. Some other studies have indicated that patients with Graves' disease also have low levels of vitamin D [34] According to these findings, Afsaneh Talaei, et al. [35] showed that the prevalence of vitamin D deficiency was high in hypothyroid patients. Vitamin Dsupplementation significantly decreased TSH levels but had no significant effect on T4 or T3 concentrations. They found significant relationship between vitamin D deficiency and hypothyroidism.

Mackawy et al. [36] concluded that the patients with hypothyroidism suffered from hypovitaminosis D and there was a positive significant correlation between serum level of vitamin D with thyroid hormones and a negative significant correlation with TSH levels and suggested that the deficiency of serum levels of vitamin D was significantly associated with the degree and severity of hypothyroidism.

Conclusions:

This present study concluded that the patients with hypothyroidism had significantly decreased vitamin D3 levels and increased TSH levels. Therefore, regular screening of vitamin D3 levels should be performed in all hypothyroid patients.

And vitamin-D3 supplementation should be recommended for early prevention and management of vitamin D3 deficiency in hypothyroidism patients.

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