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Study of Vitamin D levels in Hypothyroidism in Tertiary Care Hospital: A case control Study

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Abstract

Introduction: Vitamin D not only regulates calcium homeosatsis, but also related with various other systemic diseases and hypothyroidism is one of them. This study was conducted to find out association between Vitamin D deficiency and hypothyroidism.

Material & method: The study was conducted at tertiary care hospital at Lucknow. Total 240 subjects were selected out of them 120 were diagnosed cased of hypothyroidism and 120 were healthy controls. Fasting blood samples were taken for estimation of Vitamin D and T3, T4 and TSH. Estimation of these parameters were done by ELISA. Data analysis was done by SPSS software.

Results: We found that Vitamin D deficiency is related with raised TSH. In hypothyroidism patients (N=120) 60.83% patients show Vitamin D levels of <20 ng/ml, with raised TSH levels, 21.6% patients had Vitamin D levels between 20-30 ng/ml with normal TSH levels and 17.5% patients had normal Vitamin D and TSH levels.

Conclusion: This study found association between Vitamin D deficiency and Hypothyroidism, so we think that vitamin D testing should be done in patients of hypothyroidism and if deficiency is present than treatment should be given

Key words: Hypothyroidism, Vitamin D, Deficiency

INTRODUCTION

Vitamin D deficiency is one of the global health problem.[(1)] . Vitamin D is synthesized in skin in sun light exposure but in recent years various researches

showed that serum Vitamin D levels are deficient in peoples living in tropical countries where exposure to sunlight is adequate. [2,3] The prevalence of Vitamin D insufficiency in India is around 50-90 %.[4]

The primary action of Vitamin D is regulation of calcium and phosphorus homeostasis but various studies showed that vitamin D deficiency is associated with increased risk of diabetes Mellitus [5,6] infectious diseases [7], atherosclerosis [8] autoimmune thyroiditis [9,10] etc. Activity of Vitamin D is mediated through vitamin D receptors, which are present in different body tissues like myocardium, pancreas, and thyroid gland etc.[11] Both Vitamin D and thyroid hormones act via steroid receptors; so any alteration in the level of Vitamin D is likely to increase problems associated with hypothyroidism.[12,13]

It was noticed that about 42 million people in India suffered from thyroid diseases.[14] Unnikrishnan and Usha,2011[15] reported that prevalence of hypothyroidism has increased rapidly and it affects even younger age groups.

Both Vitamin D and thyroid hormone act through steroid receptors and may affect each other's action as they have similar response elements on genes, that's why we hypothesize that in patients with decreased thyroid hormone levels Vitamin D deficiency may be present. Vitamin D deficiency is considered to be present when serum 25(OH) Vitamin D levels are < 20ng/ml, insufficiency between 20-30ng/ml and sufficient when levels are above 30ng/ml. [16]

Study type: Case Control study.

MATERIAL AND METHOD:

This study was conducted in a tertiary care hospital at Lucknow, in Department of Biochemistry. Total 240 subjects were taken, out of them 120 patients were newly diagnosed case of hypothyroidism and another 120 were healthy controls with normal thyroid levels. Written consent were taken from all subjects.

Subjects were categorized in two groups:

Group 1: Newly diagnosed case of hypothyroidism with TSH level of >7.0 IU/ml and lower T3 and T4 levels than normal..

Group 2: Healthy individuals with no history of any chronic medical diseases which affects vitamin D levels, no history of thyroid diseases and they were not on vitamin D supplements.

5ml of fasting sample was collected from each patient as well as control for testing of Serum T3, T4, TSH and Vitamin D levels Blood samples were centrifuged to separate serum and stored at -20°C for testing of all above mentioned parameters. Testing was done by ELISA using standard protocols. The reference range for T3, T4 and TSH were 0.6-2.02 pg/ml, 4.4-11.6 ng/dl and 0.39-6.16 IU/ ml respectively.

RESULTS

In cases (Group 1) 60.83% (N=73) patients had Vitamin D levels of <20 ng/ml with mean TSH of 11.44±2.5 ng/ml, 21.6% (N=26) patients showing Vitamin D levels in between 20-30 ng/ml with mean TSH value of 4.69 ±2.58 ng/ml, 17.5% (N= 21) patients had Vitamin D levels of >30 ng/ml with mean TSH value of 2.98±2.04 ng/ml. **(Table-1)**

Table 1: Vitamin D and thyroid hormone levels in Cases (GROUP 1)

Vit D level	T3 (pg/ml)	T4 (ng/dl)	TSH (IU/ml)
< 20 ng/ml (N=73) 60.83%	0.42 ± 0.27	3.14±1.7	11.44±2.5
20-30ng/ml (N=26) 21.6%	0.80±0.27	6.56±1.25	4.69±2.58
>30ng/ml (N=21) 17.5%	1.12±0.304	7.85±1.25	3.9±2.04

In control group out of 120 subjects, 76.66% (N=92) subjects had Vitamin D levels of >30 ng/ml and 23.33% (N=28) subjects had Vitamin D levels in between 20-30 ng/ml with normal thyroid hormone levels. **(Table-2).**

Table-2: Vitamin D and thyroid hormone levels in Controls (GROUP 2)

Vit D level	T3	T4	TSH
20-30ng/ml (N=28) 23.33%	0.98±0.38	6.14±1.49	4.45±3.24
>30ng/ml (N=92)76.66%	2.01±0.42	6.11±1.69	3.08±1.79

Comparison of Vitamin D levels with TSH showed that in Group 1 patients had Vitamin D levels of < 20ng/ml with raised TSH levels. In Group 2 no subject had deficient Vitamin D levels. In Group 1&2 subjects had normal TSH levels with vitamin D levels in between 20-30ng/ml. **(Table-3)**

Table-3: Comparison of vitamin D levels with TSH in Group 1 & Group 2

	Group 1 (TSH)	Group 2 (TSH)
Vitamin D (<20 ng/dl)	11.44±2.5	No Subjects
Vitamin D (20-30 ng/dl)	4.69±2.58	4.45±3.24
Vitamin D (>30 ng/dl)	3.90±2.04	3.08±1.79

DISCUSSION

The primary function of Vitamin D is to maintain bone and mineral homeostasis, but it is noticed that Vitamin D deficiency is also associated with various diseases such as Diabetes Mellitus, cardiovascular disease, cancer, infection, hypothyroidism etc. [17] [18] but now a days it is common and it is thought that Vitamin D deficiency in patients of hypothyroidism may be due to poor absorption of Vitamin D from the intestine or may be because of defect in conversion of Vitamin D in its active form. [18] We found in our study that Vitamin D deficiency is related with hypothyroidism. Out of total 240 subject participated in this study including both cases and controls 30.41% had vitamin levels of <20 ng/ml with raised TSH levels, 22.5% had Vitamin D levels in between 20-30 ng/ml with normal TSH levels and 47.08% had normal Vitamin D levels with normal TSH levels.

In this study in cases (Group1) 60.83% patients show Vitamin D levels of <20 ng/ml, with raised TSH levels which is matched with the study by Shilpa et al[19] in which 56% of the hypothyroid cases had Vitamin D levels of less than 20 ng\ml.

In our study 21.6% patients had Vitamin D levels between 20-30 ng/ml with normal TSH levels and 17.5% patients had normal Vitamin D levels (>30ng/ml) and TSH levels. Study by Swati Sonawane and Sahil Bansal[20] found Vitamin D deficiency in 59% of the subjects irrespective of the thyroid status. Jaideep Khare et al[21] found that patients who were TPOAb positive and raised TSH levels have more significant Vitamin D deficiency. These findings suggests that vitamin D and thyroid hormones levels are interrelated and might be due to action through same receptors, so deficiency of Vitamin D affects the production of thyroid hormones.

CONCLUSION

Our study concludes that in hypothyroidism Vitamin D deficiency is present, so Vitamin D testing in hypothyroidism cases should be done and if found Vitamin D supplementation should be given to prevent further consequences.

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