

**Evaluation of deficiency of Vitamin D and low level of Serum Calcium in Hypothyroid Patients****Deepika Singh<sup>1</sup>, Mohd. Rais Alam<sup>2\*</sup>***Assistant Professor, Department of General Medicine, TSM Medical College Lucknow, Uttar Pradesh, India***Received: 08-10-2020 / Revised: 20-11-2020 / Accepted: 21-12-2020****Abstract**

**Background:** Autoimmune thyroid diseases, including HT and GD, are the most common organ-specific autoimmune disorders. Vitamin D plays a significant role in modulation of the immune system, enhancing the innate immune response while exerting an inhibitory action on the adaptive immune system. **Aim of the study:** To evaluate deficiency of Vitamin D and low level of serum calcium in hypothyroid patients. **Materials and methods:** For the present study, we selected a total of 100 patients for the study enrolled from the inpatient department of General Medicine. A complete medical history was taken from each patient and clinical examination was performed. The subjects were grouped into two groups, Group A with 50 hypothyroid patients and Group B with 50 healthy control subjects. Venous samples were taken from all the patients from the antecubital vein. The quantitative determination of 25-OH vitamin D was carried out by using UV 2005 spectrophotometer method. A serum level of 0-20 ng/ml was considered as deficient, level 21-29 ng/ml was considered insufficient and > 30ng/ml was considered sufficient. **Results:** In the present study, a total of 100 patients were studied. Group A contained 50 healthy patients and Group B contained 50 patients with hypothyroidism. The number of male and female patients in Group B was 26 and 24 respectively. The mean age of Group A patients was 49.69 years and Group B patients was 46.25 years. We observed that Serum 25 (OH) Vitamin D was significantly decreased in patients with hypothyroidism. Similarly, serum calcium was also decreased in hypothyroidism patients. The serum TSH level was significantly higher in hypothyroid patients. **Conclusion:** Within the limitations of the present study, it can be concluded that the level of serum calcium and serum vit D was significantly decreased in hypothyroid patients in comparison to healthy patients. The level of TSH was significantly increased in hypothyroid patients.

**Keywords:** Hypothyroid, calcium, vitamin D.

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**Introduction**

Autoimmune thyroid diseases, including HT and GD, are the most common organ-specific autoimmune disorders[1]. These AITDs are polygenic diseases resulting from a combination of genetic predisposition (thyroid-specific genes and immune-modulating genes) and environmental triggers (iodine, selenium, drugs, irradiation, smoking, infections, stress, etc.), characterized by lymphocytic infiltration into the thyroid gland and production of thyroid-specific auto antibodies[1,2].

Vitamin D plays a significant role in modulation of the immune system, enhancing the innate immune

response while exerting an inhibitory action on the adaptive immune system[3]. Most immune cells, including T cells, B cells, and antigen-presenting cells (APCs), such as dendritic cells (DCs) and macrophages, express VDR and 1 $\alpha$ -hydroxylase[3-5]. Importantly, both vitamin D and thyroid hormone bind to similar receptors called steroid hormone receptors. A different gene in the Vitamin D receptor was shown to predispose people to autoimmune thyroid disease including Graves' disease and Hashimoto's thyroiditis. For these reasons, it is important for patients with thyroid problems to understand how the vitamin D system works[6]. Vitamin D mediates its effect through binding to vitamin D receptor (VDR), and activation of VDR-responsive genes.

While VDR gene polymorphism was found to associate with autoimmune thyroid diseases (AITDs)[6]. Hence, the present study was conducted to evaluate deficiency

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of Vitamin D and low level of serum calcium in hypothyroid patients.

**Materials and methods**

The present study was conducted in the Department of General Medicine of the Medical institution. The ethical clearance for the study was approved from the ethical committee of the hospital. For the present study, we selected a total of 100 patients for the study enrolled from the inpatient department of General Medicine. A complete medical history was taken from each patient and clinical examination was performed. Structured questionnaires was given to the patient them to obtain demographic information including age, gender, BMI. The subjects were grouped into two groups, Group A with 50 hypothyroid patients and Group B with 50 healthy control subjects. An informed written consent was obtained from the patients after explaining them the protocol of the study. Venous samples was taken from all the patients from the antecubital vein. The quantitative determination of 25 – OH vitamin D was carried out by using UV 2005 spectrophotometer method, A serum level of 0-20 ng/ml was considered as deficient, level 21-29 ng/ml was considered insufficient and > 30ng/ml was considered sufficient. Determination of serum Calcium levels using Spectrophotometer method. This method is based on formation of Ca+ ions violet complex with o-

cresol-pthalein complex in alkaline medium. Serum T3 , T4, andTSH levels were assessed using fluorescence array with reference range (1.2-4.4 pg/ml for T3 ) (0.8-2.0 ng/dl for T4 ) and 0.3- 5.0 m u/l for TSH).

The statistical analysis of the data was done using SPSS version 11.0 for windows. Chi-square and Student’s t-test were used for checking the significance of the data. A p-value of 0.05 and lesser was defined to be statistically significant.

**Results**

In the present study, a total of 100 patietns were studied. Group A contained 50 healthy patients and Group B contained 50 patients with hypothyroidism. The number of male and female patients in Group A was 27 and 23 respectively. The number of male and female patients in Group B was 26 and 24 respectively. The mean age of Group A patients was 49.69 years and Group B patients was 46.25 years.

Table 2 shows blood parameters in Group A and Group B patients. We observed that Serum 25 (OH) Vitamin D was significantly decreased in patients with hypothyroidism.

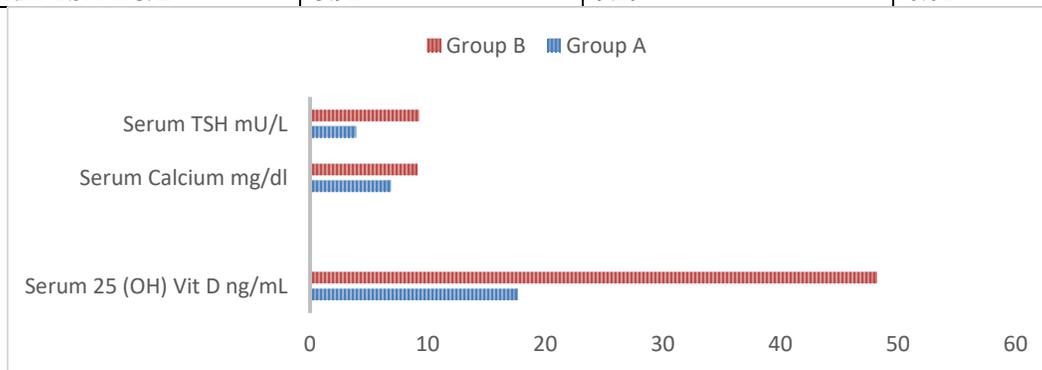
Similarly, serum calcium was also decreased in hypothyroidism patients. The serum TSH level was significantly higher in hypothyroid patients. [Fig 1] The results on comparison were found to be statistically significant for blood parameters (p<0.05).

**Table 1: Demographic details of the participants**

Parameters	Group A	Group B	p-value
Total no. of participants	50	50	0.226
No. of male participants	27	26	0.87
No. of female participants	23	24	0.85
Mean age (years)	49.69	46.25	0.62

**Table 2: Blood parameters in Group A and Group B**

Blood parameters	Group A	Group B	p-value
Serum 25 (OH) Vit D ng/mL	48.21	17.68	0.006
Serum Calcium mg/dl	9.16	6.92	0.001
Serum TSH mU/L	3.92	9.29	0.02



**Fig 1: Blood parameters comparison**

## Discussion

In the present study, we studied the blood parameters of 50 hypothyroid patients and 50 normal healthy patients. We observed that that Serum 25 (OH) Vitamin D and serum calcium were significantly decreased in hypothyroid patients in comparison to control subjects. Serum TSH levels was significantly increased in patients with hypothyroidism. The results on comparison were found to be statistically significant. The results on comparison were found to be consistent with the results from previous studies in the literature. Mackawy AM et al[7] examined the relationship between hypothyroidism and vitamin D deficiency and clarified the relation between serum calcium levels with hypothyroid disease. Serum vitamin D (25-OH) levels were measured in 30 patients with hypothyroidism and 30 healthy subjects, utilizing the spectrophotometric method. Serum 25(OH) vit D was significantly lower in hypothyroid patients than in controls. Its level was insignificantly decreased in females than male patients. Moreover, serum calcium levels recorded a significant decrease in hypothyroid patients when compared to controls. Their results indicated that patients with hypothyroidism suffered from hypovitaminosis D with hypocalcaemia that is significantly associated with the degree and severity of the hypothyroidism. That encourages the advisability of vit D supplementation and recommends the screening for Vitamin D deficiency and serum calcium levels for all hypothyroid patients. Talaei A et al[8] evaluated the effects of vitamin D supplementation on thyroid function in hypothyroid patients. The study was conducted on 201 hypothyroid patients aged 20–60 years old. Subjects were randomly assigned into two groups to intake either 50,000 IU vitamin D supplements (n = 102) or placebo (n = 99) weekly for 12 weeks. Markers of related with thyroid function were assessed at first and 12 weeks after the intervention. After 12 weeks of intervention, compared to the placebo, vitamin D supplementation resulted in significant increases in serum 25-hydroxyvitamin D and calcium, and a significant decrease in serum thyroid-stimulating hormone (TSH) levels. A trend towards a greater decrease in serum parathyroid hormone (PTH) levels was observed in vitamin D group compared to placebo group. They did not observe any significant changes in serum T3, T4, alkaline phosphatase (ALP) and albumin levels following supplementation of vitamin D compared with the placebo. They concluded that vitamin D supplementation among hypothyroid patients for 12 weeks improved serum TSH and calcium

concentrations compared with the placebo, but it did not alter serum T3, T4, ALP, PTH, and albumin levels. Bener A et al[9] investigated the relationship between vitamin D deficiency and thyroid diseases among type 2 diabetes mellitus (T2DM) patients. 546 T2DM patients and 546 control study participants were enrolled, aged between 25 and 65 years. The subjects were also investigated for fasting blood glucose levels (FBG), post prandial glucose (PPG,) glycosylated hemoglobin (HbA1c), thyroid stimulating hormone (TSH), T3, T4, and presence of other comorbid conditions. The clinical biochemistry values among T2DM for vitamin D, calcium, magnesium, potassium, phosphorous, fasting blood glucose, cholesterol, HbA1c, HDL, LDL, triglyceride, systolic blood pressure (SBP) and diastolic blood pressure (DBP) were lower than control subjects, but higher in creatinine, albumin, TSH, T3, and T4 which appeared statistically significant differences. Also, the study revealed statistically significant differences between subjects vitamin D deficiency and with thyroid nodules for calcium, magnesium, phosphorous, HbA1c, high density lipoprotein (HDL), SBP and DBP, TSH, T3, and T4 among T2DM patients and control subjects. VahabiAnaraki P et al[10] investigated the effect of Vitamin D deficiency treatment on thyroid function and autoimmunity marker (thyroid peroxidase antibody [TPO-Ab]) in patients with Hashimoto's thyroiditis. Fifty-six patients with Hashimoto's thyroiditis and Vitamin D deficiency (25-hydroxyvitamin D level  $\leq 20$  ng/mL) were randomly allocated into two groups to receive Vitamin D (50000 IU/week, orally) or placebo for 12 weeks, as Vitamin D-treated (n = 30) and control (n = 26) groups, respectively. TPO-Ab, thyroid-stimulating hormone (TSH), parathormone, calcium, albumin, and creatinine concentrations were compared before and after trial between and within groups. Mean (SE) of Vitamin D was increased in Vitamin D-treated group. Mean (SE) of TPO-Ab did not significantly change in both groups. Mean (SE) of TSH was not changed in both groups after trial, P = 0.4 and P = 0.15 for Vitamin D-treated and control groups, respectively. No significant difference was observed between two study groups in none studied variables. They concluded that Vitamin D treatment in Vitamin D deficient patients with Hashimoto's thyroiditis could not have significant effect on thyroid function and autoimmunity. NiafarM et al[11] examined VitD and TSH levels among postmenopausal women, as both conditions are more prevalent in elderly women. The clinic records of postmenopausal women during their routine maintenance visits were reviewed. All patients were examined for the symptoms related to thyroid

function and osteoporosis. Participants were divided into three subgroups according to their TSH levels. Patient characteristics and VitD levels were compared between these subgroups. Two-hundred and ninety nine postmenopausal women were included. Average age was  $62.2 \pm 7.5$  years old. VitD was insufficient (10-30 ng/mL) in 12.0% and deficient (<10 ng/mL) in 60.9% of the participants. 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 concentrations compared to the other two groups. In multivariate regression analysis, TSH was not a contributing factor, as age was the only significant predictor of VitD levels. Meanwhile, no predictor (including age and VitD) was identified for TSH levels in linear regression analysis. They concluded that age was the only independent predictor of serum VitD in this study population. Though suppressed TSH was associated with higher VitD levels, the association was not linear between TSH and VitD in postmenopausal women.

### Conclusion

Within the limitations of the present study, it can be concluded that the level of serum calcium and serum vit D was significantly decreased in hypothyroid patients in comparison to healthy patients. The level of TSH was significantly increased in hypothyroid patients.

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**Conflict of Interest: Nil**

**Source of support:Nil**