

# Study of Patients with Vitamin D Deficiency and Hypocalcemia in Hypothyroidism – An Observational Study

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## Abstract

**Introduction:** Vitamin D deficiency is linked with predisposition to various autoimmune diseases, including multiple sclerosis (MS), rheumatoid arthritis (RA), diabetes mellitus (DM), inflammatory bowel disease, and systemic lupus erythematosus (SLE). The primary action of Vitamin D is the regulation of calcium and phosphorus homeostasis. Several studies demonstrated a relationship between Vitamin D deficiency, autoimmune thyroid disorders, and thyroid cancer.

**Aim:** The aim of this study was to study the association of Vitamin D deficiency and hypocalcemia in hypothyroidism.

**Materials and Methods:** This observational study was conducted in the Department of General Medicine, Government Medical College, Pudukkottai, in patients with Hypothyroidism. Venous samples were collected from all patients. The quantitative determination of 25 (OH) Vitamin D and serum  $Ca^{2+}$  was done using spectrophotometer method. Levels of TSH, T3, and T4 were estimated using fluorescence array.

**Results:** Out of 50 patients, 38 were female, and 12 were male. The mean age was  $42.38 \pm 7.12$  years. Mean duration of Hypothyroidism was  $5.12 \pm 2.48$  years. The mean value of TSH was  $8.48 \pm 2.14$  mU/L, T3 value was  $0.88 \pm 0.09$  ng/mL, T4 value was  $6.72 \pm 1.02$  mIU/mL, 25-hydroxy Vitamin D  $14.28 \pm 1.44$  ng/ml, and calcium was  $7.41 \pm 0.38$  mg/dl.

**Conclusion:** Hypothyroidism patients had 25-hydroxy Vitamin-D deficiency and hypocalcemia, hence screening for Vitamin D deficiency and serum calcium levels for all hypothyroid patients warranted.

**Key words:** 25-Hydroxy Vitamin-D, Hypocalcemia, Hypothyroidism, Vitamin D

## INTRODUCTION

Vitamin D is a steroid produced by the skin, and it aids in the regulation of expression of various genes.<sup>[1]</sup> The primary action of Vitamin D is the regulation of calcium and phosphorus homeostasis, deficiency of Vitamin D has become a common health problem in the general population. Vitamin D insufficiency has been linked to various morbidities such as cardiovascular disease, insulin resistance, fatty liver disease, type2 diabetes and its complications, infections, and cancer.<sup>[2]</sup> Apart

from a skeletal metabolism role, Vitamin D has been recognized as both an exogenous and an endogenous player in endocrinopathies such as type 1 and type 2 diabetes mellitus, adrenal diseases, and polycystic ovary syndrome.<sup>[3,4]</sup> It has also been linked to several autoimmune disorders, including autoimmune thyroid disorders (AITD).<sup>[5,6]</sup>

Hypothyroidism, the exchangeable pool of calcium, and its turnover rate are reduced, reflecting decreased bone formation and resorption. Hypothyroidism levels of parathyroid hormone are often slightly increased with some degree of resistance to its action, and 1,25(OH)<sub>2</sub>D (dihydroxyvitamin D) are also increased.<sup>[7]</sup>

### Aim

The aim of this study was to study the association of Vitamin D deficiency and hypocalcemia in hypothyroidism.

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## MATERIALS AND METHODS

This observational study was conducted in the Department of General Medicine, Government Medical College, Pudukkottai in patients with hypothyroidism. Structured questionnaires were administered to them to obtain demographic information including age, gender, and BMI. Venous samples were collected from all patients. The quantitative determination of 25 (OH) Vitamin D and serum  $\text{Ca}^{2+}$  was done using spectrophotometer method. Levels of TSH, T3, and T4 were estimated using fluorescence array. A serum 25-OH vitamin D level of 0–20 ng/ml was considered as deficient, level 21–29 ng/ml was considered insufficient, and > 30 ng/ml was considered sufficient. Serum calcium levels were done using spectrophotometer method.

## RESULTS

In this study, 50 patients with hypothyroidism were included, 38 were female, and 12 were male. The mean value of age among 50 patients were  $42.38 \pm 7.12$  years. Duration of hypothyroidism in this patients was  $5.12 \pm 2.48$  years. Mean value of thyroid parameters in this patients was, T3  $0.88 \pm 0.09$  ng/mL, T4  $6.72 \pm 1.02$  mIU/mL, and TSH  $8.48 \pm 2.14$  mU/L. In this patients, 25-hydroxy Vitamin D level was  $14.28 \pm 1.44$  ng/ml and calcium level was  $7.41 \pm 0.38$  mg/dl [Tables 1-3].

## DISCUSSION

Thyroid diseases are the most prevalent in endocrine disorders.<sup>[8,9]</sup> There are 7–95% females and 1–2% males across the world with variable thyroid conditions.<sup>[10]</sup> In previous decades, Vitamin D deficiency was considered virtually non-existent in the Indian population as India lies in the tropical area.<sup>[11]</sup> However, nowadays, various studies have revealed that 50–90% of the Indian population is deficient in Vitamin D due to inadequate dietary intake of Calcium.<sup>[12]</sup>

Vitamin D deficiency has been recognized as a global health problem. Due to its role in the homeostasis of blood calcium level and decreasing the risk of rickets fractures in children, osteoporosis, and osteomalacia in old age, Vitamin D is of immense importance in our body. Besides its classical role in skeletomuscular functions, Vitamin D has been recently identified as a deeply involved factor in both innate and adaptive immunity.<sup>[13]</sup> “Secosteroid Hormone,” the biologically active form of vitamin D, essential for bone and mineral homeostasis, has also been shown to have immunoregulatory and anti-inflammatory effects. A low level of Vitamin D in blood either due to less absorption or deficient intake was associated with several autoimmune conditions, such as type 1 diabetes mellitus, Crohn’s disease, rheumatoid arthritis, systemic

**Table 1: Gender distribution**

Gender	Number of patients
Male	12
Female	38

**Table 2: Age distribution**

	Mean value
Age	$42.38 \pm 7.12$ years

**Table 3: Diseases parameters**

Diseases parameters	Mean value
Duration of hypothyroidism	$5.12 \pm 2.48$ years
TSH	$8.48 \pm 2.14$ mU/L
T3	$0.88 \pm 0.09$ ng/mL
T4	$6.72 \pm 1.02$ mIU/mL
25-hydroxy Vitamin D	$14.28 \pm 1.44$ ng/ml
Calcium	$7.41 \pm 0.38$ mg/dl

lupus erythematosus, and multiple sclerosis. It has recently been shown that the population in tropical areas is even at high risk of Vitamin D deficiency. This may be attributed to lifestyle-changing behaviour. The best Vitamin D status indicator is the serum concentration of 25(OH)D, which reflects Vitamin D produced cutaneously and obtained from food and other supplements.<sup>[13]</sup> This 25(OH)D has a half-life of about 15 days in the circulation.

Majority of the patients in our study were female. This finding was similar to that of Mackawy *et al.*<sup>[14]</sup> Fida,<sup>[15]</sup> and Naeem *et al.*<sup>[16]</sup> They stated that serum Vitamin D levels were significantly more decreased in females than males. This was in accordance with our finding. Although several authors have reported that Vitamin D levels did not differ significantly between males and females.<sup>[14,17,18]</sup> Furthermore, the present study showed that Vitamin D and calcium serum levels were significantly lower in hypothyroid patients than the controls. A significant positive association was recorded between Vitamin D and calcium levels in both groups. Husein *et al.*<sup>[14]</sup> found a similar finding in their study.

In a study conducted by Koch *et al.*<sup>[19]</sup> in North Indian population of Meerut, 53.94% of subjects were Vitamin D deficient. A study conducted by Bhardwaj *et al.*<sup>[20]</sup> 56% of the hypothyroid subjects, in whom Vitamin D levels were below 20 ng/ml. There were only 10% of subjects who had sufficient levels of Vitamin D.

## CONCLUSION

Hypothyroidism patients had 25-hydroxy Vitamin D deficiency and hypocalcemia, hence screening for Vitamin

D deficiency and serum calcium levels for all hypothyroid patients warranted.

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