ISSN: 0975-3583,0976-2833 VOL 16, ISSUE 7, 2025

Association between Vitamin D, Calcium and T.S.H Levels in Hypothyroid Patients

1) Dr. Sandip Chakraborty, Associate professor, Malda medical college.
2) Dr. Susmita Sarkar, Associate professor, Malda medical college
3) Dr. Indranil Dawn, Associate professor, NRS medical college
Corresponding author: Dr. Indranil Dawn, Associate professor, NRS medical college
Email : dawn.indranil@gmail.com ,NRS Medical College, kol-14

Background and Objective: Vitamin D deficiency is prevalent, as is Hypothyroidism, among the Indian population. There is limited data regarding the influence of Vitamin D deficiency on Thyroid functions and its effects on patients with hypothyroidism. This study aimed to evaluate the serum concentrations of 25-hydroxy-vitamin D and calcium in patients identified with hypothyroidism compared to a group of healthy controls. **Materials and Methodology**: A study conducted in a Tertiary Care Hospital aimed to assess and correlate Serum Vitamin D, Calcium, and Thyroid hormone levels in 20 hypothyroid cases and 28 control subjects. The analysis was conducted using the SPSS statistical software. **Results**: A statistically significant correlation was observed between low Vitamin D levels and elevated TSH. Serum Calcium levels were found to be low in individuals with hypothyroidism. **Conclusion**: Assessing serum Vitamin D and calcium levels in hypothyroid patients could be notably beneficial, as it may indicate the need for preventive Vitamin D supplementation to mitigate cardiovascular risks and other factors contributing to increased morbidity in these individuals.

.

Key Words: Serum Calcium, Vitamin D, Thyroid Hormones, Hypothyroidism

Introduction A significant global public health issue across all age groups is vitamin D deficiency .[1]VitaminD is crucial for managing bone metabolism and maintaining calcium and phosphorus balan ce. VitaminD possesses numerous noncalcaemic effects and has been shown to be more than just a ba sic vitamin; it acts as a prohormone with diverse roles across different tissues.This is partly because V itaminD Receptors are found in various tissues and cells such as the skin, skeletal muscle, fat tissue, e ndocrine pancreas, immune cells, blood vessels, brain, breast, numerous cancer cells, and placenta result in clinical problems such as infectious diseases, weak bones, and abnormal bone mineralization, as indicated by literature reviews, yet its causal role remains unclear.[2]

VitaminDis a steroid compound largely synthesized in the skin, which controls the expression of numerous genes. It has effects that modulate the immune system and provide protection against cardio metabolic conditions. [2]Vitamin D is essential for the proper functioning of several organs, including the thyroid gland.

Thyroid hormone attach to analogous receptors known as steroid hormone receptors. Another gene in the Vitamin D receptor has been demonstrated to make individuals more susceptible to autoim mune thyroid diseases such as Graves's disease and Hashimoto's thyroiditis.

Thyroid hormones (T3, T4, and TSH) are essential for maintaining body homeostasis, which inclu des proper growth and energy metabolism. Typical thyroid disorders encompass hypothyroidism and hyperthyroidism, which generally arise from pathological alterations in the thyroid gland (primary thy roid disease) [3]

ISSN: 0975-3583,0976-2833 VOL 16, ISSUE 7, 2025

A deficiency in vitamin D is connected to several autoimmune disorders, including systemic lupus erythematosus (SLE), inflammatory bowel disease and type-1 diabetes are, which are related to a lack of vitamin D.

Prior research indicated that vitamin D supplementation hinders both initiation and advancement of autoimmune disorders, additionally, individuals with Hashimoto's thyroiditis exhibit reduced levels of vitamin D4 [4]

Based on the above explanation, we aimed to carry out the current study to assess the serum levels of 25-hydroxy-vitamin D and calcium in patients diagnosed with hypothyroidism in comparison to healthy controls group.

Materials and Methodology: The research took place between September and December 2024. All participants were recruited from the outpatient department at Malda Medical College, Malda. This case-control study involved 20 patients diagnosed clinically with hypothyroidism, who were compared to 28 controls matched for age and sex that had regular health check-ups. All patients and controls were older than 15 years. Cases consisted of patients recently diagnosed with hypothyroidism through clinical evaluation and laboratory tests. Controls consisted of health check-up patients lacking any recognized chronic illness or family history of thyroid conditions. Individuals already undergoing treatment for hypothyroidism, diagnosed with diabetes, liver or kidney disorders, metabolic bone disease, cancer, pregnancy, lactation, or those on medications affecting bone metabolism and joint diseases were excluded from the study. Consent was acquired from all participants who were included, and the study received approval from the institutional ethical committee.

The primary aim of the research was to evaluate the serum levels of Vitamin D and calcium in both cases and controls, as well as to examine the relationship between TSH levels and Vitamin D and calcium levels. Serum samples were collected to measure TSH, 25 Hydroxy vitamin D, and calcium levels while following aseptic precautions. TSH and 25 OH Vitamin D were analyzed using the CLIA Method on the CENTURE-XP Immunoassay analyzer, while Serum Calcium was measured by Arsenazo III on the INTEGRA-400 Chemistry analyzer. The collected socio-demographic data were organized into tables. The data was analyzed statistically utilizing SPSS Software. The correlation between various parameters in the groups was analysed using student's T test & pearson correlation study and p value was considered statistically significant if <0.05.

Result - The Mean values of TSH among controls was 2.48±0.9 **mIU/m** and in hypothyroid cases it was 11.2±8.8 **mIU/mL** respectively. The serum 25 OH Vitamin D levels and serum calcium levels among controls was observed to be 22±4.6 **ng/ml** and 8.2±1**mg/dl** respectively and among cases it was 14.8±3.6 **ng/ml** and 6.9±0.6 **mg/dl** respectively (Table 1, figure 1 & figure 2)

Table 1: Showing Comparison between cases and controls biochemical parameters

parameter	Case	Control	T value,p value
T.S.H (mIU/mL)	11.2±8.8	2.48±0.9	t = 5.22 ,p= <0.001
Calcium (mg/dl)	6.9±0.6	8.2±1	t = -5.2,p= <0.001
25 OH Vit D (ng/ml)	14.8±3.6	22±4.6	t =- 6.06,p= <0.001

This showed that mean calcium and vitamin D levels were significantly low in cases of hypothyroid as compared to controls. (p value <0.001)

Figure-1: Graphical presentation of serum vitamin D levels

ISSN: 0975-3583,0976-2833 VOL 16, ISSUE 7, 2025

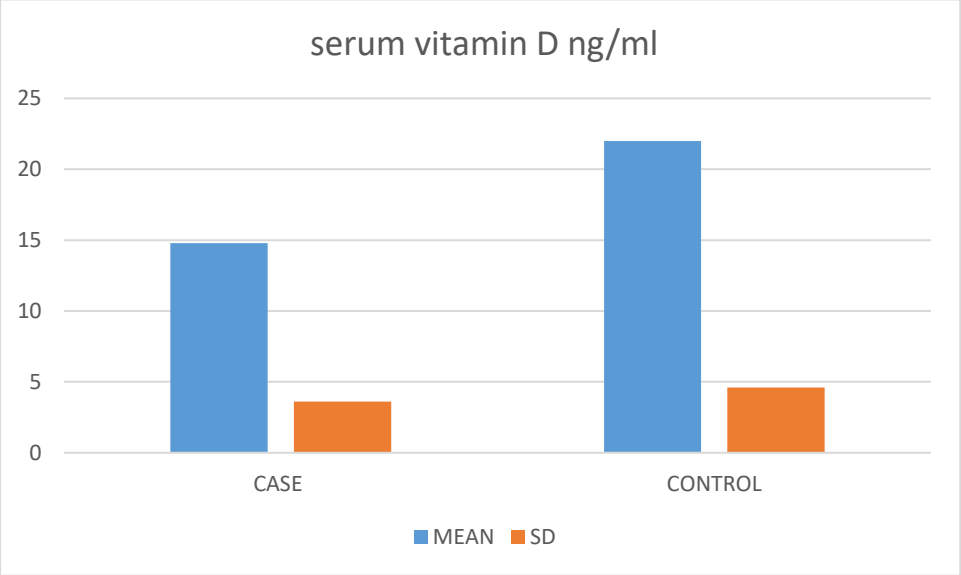
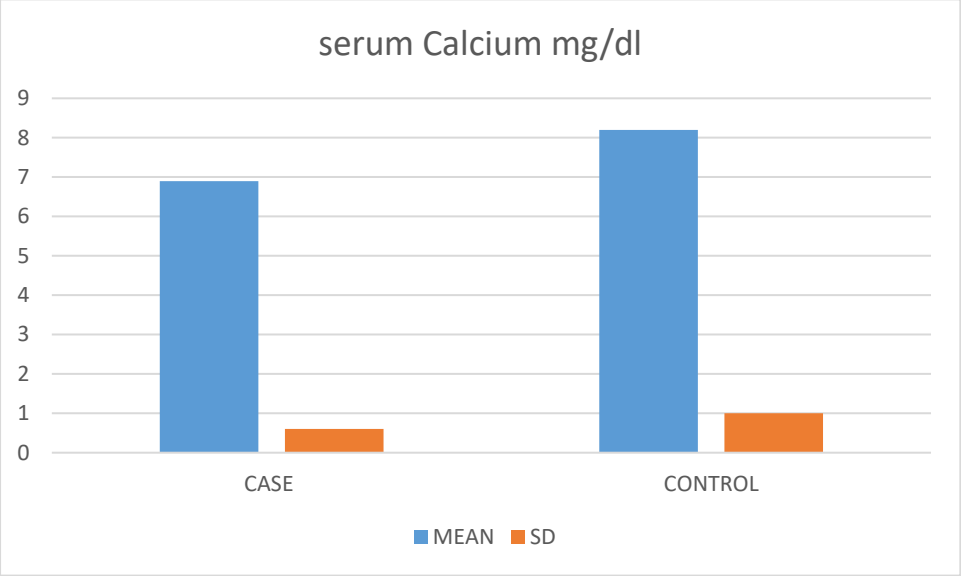


Figure-2: Graphical presentation of serum calcium levels



Significant negative correlation were found between serum TSH level and serum vitamin D level (correlation coefficient -.805, p value-< 0.001) but no significant correlation were found serum TSH and serum calcium level (table 2, figure 3 and figure 4)

Table2-Correlations between serum TSH levels with vitamin D and serum calcium in hypothyroid patients

	Correlation coefficient	P value
Serum Vitamin D(ng/ml)	-0.805	< 0.001

ISSN: 0975-3583,0976-2833 VOL 16, ISSUE 7, 2025

Serum Calcium (mg/dl)	0.395	0.069

Figure 3-Correlations between serum TSH levels with serum calcium in hypothyroid patients

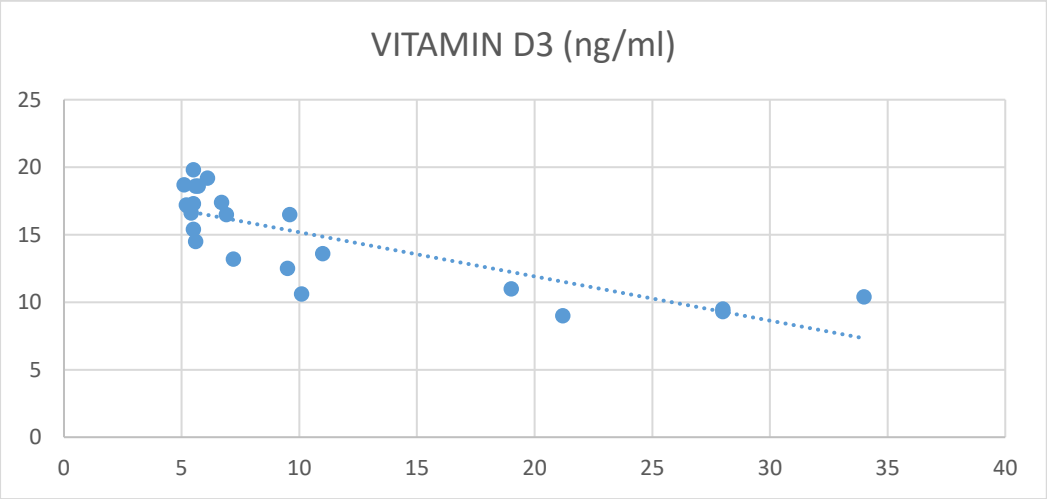
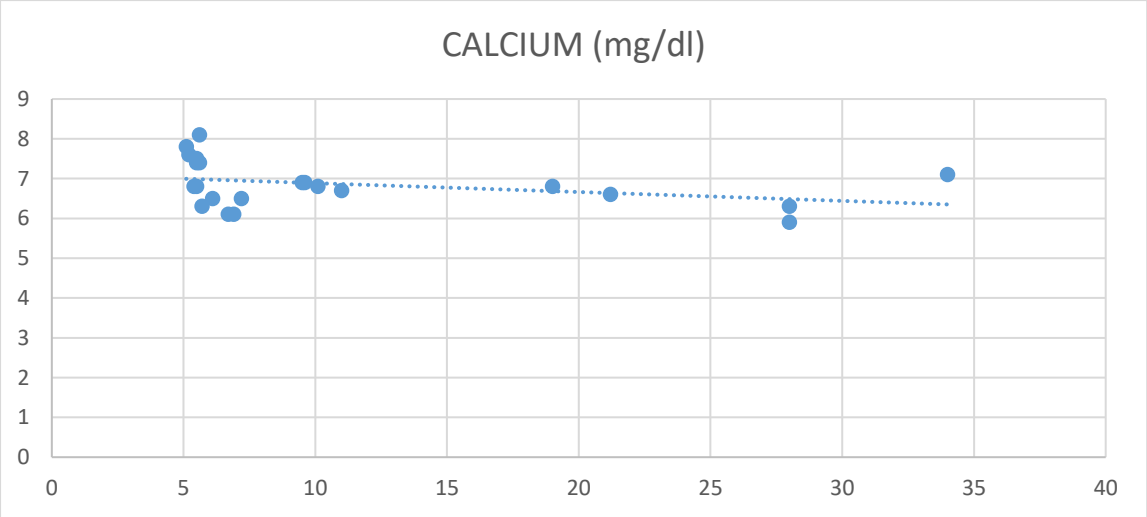


Figure 4-Correlations between serum TSH levels with serum calcium in hypothyroid patients



DISCUSSION- Vitamin D is a fat-soluble vitamin primarily produced in the body when exposed to UV light as vitamin D3. Vitamin D is a fat-soluble nutrient that is typically transformed in vivo into the active hormone (calcitriol or 1,25-dihydroxycholecalciferol) through two hydroxylation processes, initially in the liver (calcitriol or 25-hydroxy vitamin D), and subsequently in the kidneys. Numerous studies have indicated a link between vitamin D deficiency and autoimmune thyroiditis. In one study, 72% of participants with autoimmune thyroid disease showed a deficiency in vitamin D, while nearly 31% of healthy individuals exhibited low vitamin D levels. Another study in Greece [5] found that over

ISSN: 0975-3583,0976-2833 VOL 16, ISSUE 7, 2025

85% of people with Hashimoto's thyroiditis had insufficient vitamin D and elevated anti-thyroid antibodies. In another study, [6, 14, 15] individuals with hypothyroidism who received additional vitamin D supplements for 12 weeks showed enhancements in blood levels of thyroid stimulating hormone (though the extra vitamin D did not influence levels of the thyroid hormones triiodothyronine, T3, and thyroxine, T4) Analogous to many other studies we observed in our patients with hypothyroidism, Low vitamin D levels were observed and its association with High TSH was statistically significant.

There are two main reasons for decreased vitamin D levels in hypothyroidism. Firstly, poor absorption of vitamin D from the intestine may be the cause. Second, the body may not activate vitamin D properly.[7]Vitamin D deficiency has also been associated with clinical atherosclerosis in coronary calcification as well as with cardiovascular events such as myocardial infarction, stroke, and congestive heart failure.[8]Thyroid hormones have a variety of effects on the cardiovascular system that can greatly impact cardiac function We also observed a significant difference in serum calcium levels between the studied groups with lower level seen in hypothyroid patients in comparison to others. Low calcium may be due to altered calcium homeostasis due low vitamin deficiency. However, it is still not sure if Vitamin D deficiency is due to hypothyroidism or low vitamin D affects thyroid function. This requires larger population studies to understand the molecular basis of its association. A study [9] showed significant changes in ionized Ca, but not total Ca means that the physiologically active form of Ca is affected, while the overall concentration of Ca is still significantly unchanged.

In observational studies, significant inverse associations of blood pressure with dietary intake of magnesium (Mg), potassium, Calcium (Ca), fibre and protein have also been reported. Several experimental and clinical studies suggest that Ca depletion elevates blood pressure. Although the changes in these analytes may not be severe in acute stages but it is possible that these disturbances will affect patient in the long term.[9, 13] Serum Calcium in hypothyroidism is believed to connect with hypertension and heart muscle. In our study we observed high TSH were associated with low serum calcium levels. Segal study has provided conclusive evidence for two central issues: That Calcium is the first messenger for the plasma membrane mediated action of thyroid hormone to increase cellular sugar uptake, and that thyroid hormone produces an acute increase in Calcium uptake by the heart, an effect that is demonstrable at physiological concentrations and, therefore, points to a physiological relevance for this action. Calcium influences hypertension through the fact that, Calcium load leads to the increment in Na excretion and a reduced sodium intake reduces Ca excretion and vice versa and hence decrease in hypertension. [9-12]

Limitations: A larger sample size would yield better information as to whether vitamin D deficiency is a casual factor in the pathogenesis of hypothyroidism or rather a consequence of the disease.. Analysis of other parameters like Parathyroid hormone and magnesium and Free thyroid hormones would be helpful in concluding.

CONCLUSION-The results of our study on hypothyroid patients suggested association with Vitamin D deficiency and hypocalcaemia. This association warrants the prophylactic treatment in the form of vitamin D supplementation for all hypothyroid patients as it carrier's cardiovascular and other risk, thereby increasing the morbidity. Screening for Vitamin D deficiency and serum calcium levels recommended for all hypothyroid patients.

REFERENCES-

1. Hollick MF, Chen TC. Vitamin D deficiency a worldwide problem with health consequences. Am J Clin Nutr 2008; 87:10805 68.
2. Amal Mohammed Husein Mackawy, Bushra Mohammed Al ayed, Bashayer Mater Al rashidi .International Journal of Health Sciences, Qassim University, Vol. 7, No. 3 (Nov 2013/ Muharram 1435H)

ISSN: 0975-3583,0976-2833 VOL 16, ISSUE 7, 2025

3. Charoenngam N, Shirvani A, Holick MF. Vitamin D for skeletal and non-skeletal health: What we should know. J Clin Orthop Trauma. 2019 Nov Dec; 10(6):1082 1093.
4. Vitamin D and the Thyroid: A Critica l Review of the Current Evidence Evidence, Department of Medical Biology, University of Split School of Medicine, 21 000 Split, Croatia.
5. AACE Thyroid Task Force. American Association of Clinical Endocrinologists medical guidelines for clinical practice for the evaluation and treatment of hyperthyroidism and hypothyroidism . Endocr Pract 2002;8:458 69.
6. Talaei A, Ghorbani F, Asemi Z The effects of Vitamin D supplementation on thyroid function in hypothyroid patients: A randomized, double blind, placebo controlled trial Indian J Endocr Metab 2018;22(5):584.
7. Friedman Theodore C. Vitamin D Deficiency and Thyroid Disease. www.goodhormonehealth.com/VitaminD
8. Yasuda T, Okamoto Y, Hamada N, Miyashita K, Takahara M, Sakamoto F, Miyatsuka T, et al. Serum vitamin D levels are decreased and associated with thyroid volume in female patients with newly onset Graves' disease. Endocrine. 2012 May 1;
9. Manouchehr Saljoughi an Role of Vitamin D Deficiency in Heart Disease. US Pharm. 2016;41(2):43 45
10. Al Hakeim HK. Serum Levels of Lipids, Calcium and Magnesium in Women with Hypothyroidism and Cardiovascular Diseases. J Lab Physicians 2009; 1 (2):49 52.
11. Chen MD, Sheu WH. Plasma status of selected minerals in hypertensive men with and without insulin resistance. J Trace Elem Med Biol 2000;14:228 31. 7.
12. McCarron DA. Calcium metabolism and hypertension. Kidney Int 1989;35:717 36.
13. Ford HC, Crooke MJ, Murphy CE. Disturbances of calciu m and magnesium metabolism occur in most hyperthyroid patients. Clin Biochem 1989;22:373 6
14. Tamer G, Arik S, Tamer I, Coksert D. Relative vitamin D insufficiency in Hashimoto's thyroiditis. Thyroid. 2011; 21 (8):891 96.
15. Kivity S, Agmon Levin N, Zisappl M, et al. Vitamin D and autoimmune thyroid diseases. Cellular and Molecular Immunology. 2011; 3 (8):43 47.