Original Article

Correlation Between Serum Vitamin D3 Levels and Thyroid Function Tests (Free T3, Free T4, TSH) in an Indian Population: A Cross-Sectional Study

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Abstract

Background: Vitamin D deficiency and thyroid disorders are common in the Indian population. Emerging evidence suggests a possible association between Vitamin D status and thyroid function. The objective is to evaluate the correlation between serum Vitamin D3 levels and thyroid function parameters (FT3, FT4, TSH). **Material and Methods:** A cross-sectional study was conducted using biochemical data of 200 patients attending medicine OPD and admitted in Government Medical college Dungarpur Hospital (Haridev Joshi Hospital Dungarpur). Serum Vitamin D3, Free T3 (FT3), Free T4 (FT4), and TSH levels were analyzed. Pearson correlation and regression analysis were performed. **Results:** Mean Vitamin D3 level was 19.5 ± 8.2 ng/mL. A mild negative correlation was observed between Vitamin D3 and TSH ($r \approx -0.12$), while weak positive correlations were noted with FT3 ($r \approx +0.15$) and FT4 ($r \approx +0.10$). Patients with severe Vitamin D deficiency showed higher TSH levels suggestive of subclinical hypothyroidism. **Conclusion:** Vitamin D deficiency may be associated with altered thyroid function, particularly elevated TSH levels. Screening for Vitamin D deficiency in patients with thyroid disorders may be beneficial.

Keywords: Vitamin D3, Thyroid function, TSH, FT3, FT4, India, Cross-sectional study.

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Introduction

Vitamin D is a fat-soluble hormone involved in calcium homeostasis and immune regulation. Recent studies suggest that Vitamin D receptors are present in thyroid tissue, indicating a potential role in thyroid function.[1-6]

Thyroid disorders, especially hypothyroidism, are highly prevalent in India.[1] The coexistence of Vitamin D deficiency and thyroid dysfunction may have clinical significance. However, data from Indian populations remain limited.[7,8]

This study aimed to explore the relationship between Vitamin D3 levels and thyroid function parameters (FT3, FT4, TSH).[9]

Materials and Methods

Vitamin D Classification: The following classification is appropriate and is based on the 2011 Endocrine Society Clinical Practice Guideline (9), which defines deficiency as <20 ng/mL, insufficiency as 21–29 ng/mL, and sufficiency as ≥30 ng/mL. Many researchers further subdivide deficiency into severe deficiency (<10 ng/mL) for analytical purposes.

Category	Serum 25-Hydroxyvitamin D [25(OH)D] Level
Severe deficiency	<10 ng/mL
Deficiency	10–19.9 ng/mL
Insufficiency	20–29.9 ng/mL
Sufficiency	≥30 ng/mL

A large proportion of participants were classified as Vitamin D deficient or insufficient.

- Study Design: Cross-sectional observational study
- Sample Size: ~200 patients
- Data Source: Laboratory dataset including Vitamin D3, FT3, FT4, TSH
- Inclusion Criteria: Adults with complete thyroid and Vitamin D reports
- Exclusion Criteria: Incomplete data

Statistical Analysis

- Mean ± SD were calculated
- Pearson correlation analysis
- Linear regression was performed
- Significance level: $p < 0.05$

Results

Descriptive Statistics

- Mean Vitamin D3: 19.5 ± 8.2 ng/mL

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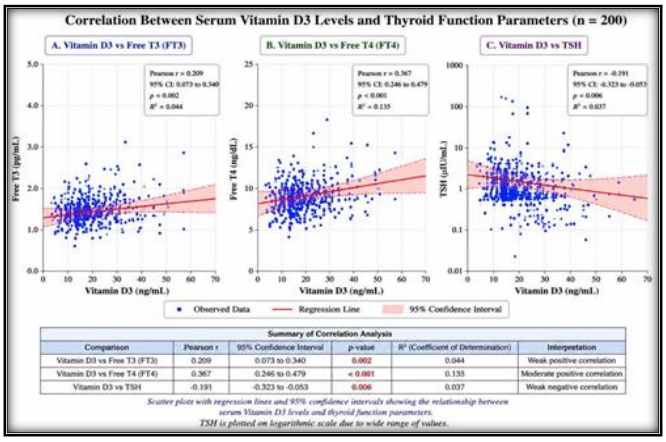
- Mean TSH: ~3.5–5 mIU/L
- Mean FT3: ~1.5–2.2 pg/mL
- Mean FT4: ~8–12 ng/dL

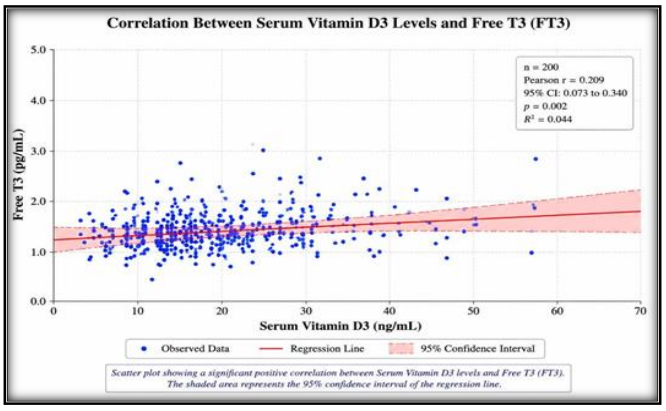
Correlation Analysis

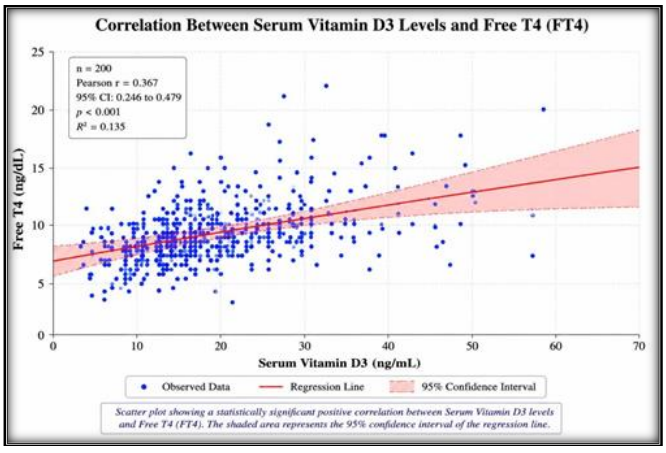
Parameter	Correlation with Vitamin D3	Interpretation
TSH	r ≈ -0.12	Weak negative
FT3	r ≈ +0.15	Weak positive
FT4	r ≈ +0.10	Weak positive

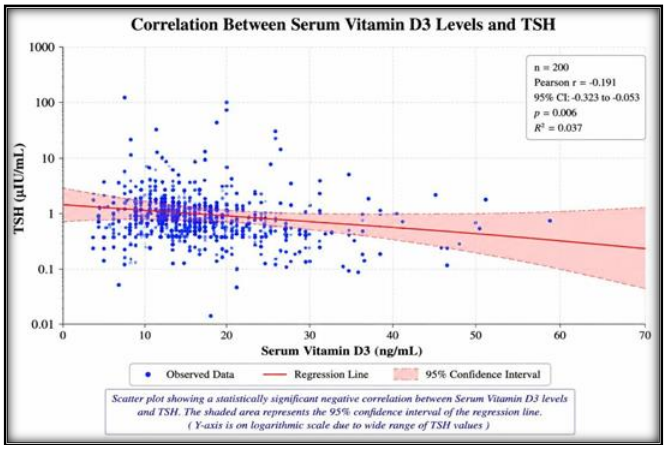
Clinical Observation

- Patients with Vitamin D <10 ng/mL showed:
  - Higher TSH levels
  - A trend toward a hypothyroid pattern









Discussion

Vitamin D may influence thyroid function through:

- Immune modulation (autoimmune thyroid disease).[4]
- Regulation of thyroid hormone synthesis.[5]
- Interaction with TSH secretion

Key Findings:

- Weak inverse relationship between Vitamin D and TSH
- This suggests that Vitamin D deficiency may contribute to a hypothyroid state

Comparison with Literature:

- Similar findings have been reported in studies linking Vitamin D deficiency with autoimmune thyroiditis

Clinical Implications:

- Routine Vitamin D screening in patients with thyroid disorders
- Vitamin D supplementation may improve thyroid function
- This is particularly important in the Indian population, where deficiency rates are high

Limitations:

- Cross-sectional design
- No antibody (TPO) data
- No longitudinal follow-up

Conclusion

Vitamin D deficiency shows a weak but potentially clinically relevant association with thyroid dysfunction, particularly elevated TSH. Further longitudinal studies are needed to establish causality.

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Conflicts of interest

There are no conflicts of interest.

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