



A Cross-Sectional Study Evaluating the Correlation of Vitamin D deficiency in Hypothyroidism patients

Dr Annie T George^{1*}, Dr Balachandra A Shetty²

1: PG Resident, 2: Professor and Head of Department of General Medicine, AJ Institute of Medical Sciences, Mangalore,

Date of Submission: 09-06-2023

Date of Acceptance: 19-06-2023

ABSTRACT

Impairment of thyroid hormone synthesis and changes in enzymatic activity are hypothesized to contribute to the attenuation of Vitamin D activation. Moreover, the presence of chronic inflammation and immune dysregulation commonly observed in individuals with hypothyroidism could potentially interfere with Vitamin D metabolism. Further research in this area is warranted, prompting our study to explore the correlation between Vitamin D levels and thyroid profiles in hypothyroid patients. We studied 55 patients with hypothyroidism for a period of 12 months, whose blood samples were collected to assess thyroid profile and Vitamin D status. The prevalence of Vitamin D deficiency among the hypothyroid patients was found to be 34.5%. Also there exists negative correlation between the levels of TSH and Vitamin D, with statistical significance, thereby implying significant decrease in the Vitamin D levels with increase in the TSH levels. Thus, regular monitoring of vitamin D levels is necessary among hypothyroid patients to ensure optimal management and overall health.

KEYWORDS: Cross-sectional study, Hypothyroidism, Vitamin D, Correlation

I. INTRODUCTION

Vitamin D deficiency remains a significant global health concern, affecting a substantial number of individuals. [1] Research suggests that approximately one billion people worldwide have insufficient levels of Vitamin D. [2] In India, the burden is particularly high, with prevalence rates ranging from 40% to 99% across different population groups. Vitamin D deficiency is often associated with various health complications, including bone disorders, cardiovascular diseases, autoimmune disorders, and increased mortality rates.

Moreover, individuals with hypothyroidism commonly experience Vitamin D deficiency. [3][4] Studies have reported varying

rates of deficiency, with estimates ranging from 60% to 80% in this particular population. Multiple factors contribute to the mechanism of Vitamin D deficiency in hypothyroidism. [3][5] Impaired thyroid hormone synthesis and altered enzymatic activity are believed to play a role in reducing Vitamin D activation. Additionally, chronic inflammation and immune dysregulation associated with hypothyroidism may disrupt Vitamin D metabolism.

Consequently, there is a compelling need to investigate and comprehend the correlation between Vitamin D deficiency and hypothyroidism in different regions all around the globe, particularly among the malnourished Indian population. [6] Addressing Vitamin D deficiency in individuals with hypothyroidism could potentially improve clinical outcomes and enhance the management of both conditions. Further research in this area is warranted, and hence our study was conducted to correlate the levels of Vitamin D with thyroid profiles in hypothyroid patients.

II. METHODS

This hospital based cross-sectional study was conducted for a period of 12 months between January and December 2022, on patients with hypothyroidism visiting as an outpatient or admitted as an inpatient under the Department of General Medicine, in a Tertiary care Hospital. The sample size was calculated based on the findings from the study by [7] Mackawy AMH et al, where the correlation coefficient between the levels of Vitamin D and TSH was observed to be -0.589. Considering 95.0% confidence level and 80.0% power of the test, the minimum sample size was estimated to be 21 subjects, which was rounded to 55 subjects.

Our study included hypothyroid patients of either gender aged above 30 years. Patients with co-morbidities such as diabetes mellitus, chronic kidney disease, chronic liver disease, coronary artery disease, and pregnant women were excluded



from the study. All consecutive cases satisfying inclusion criteria were recruited for the study after taking informed consent. A pre-designed proforma which is internally validated was used to collect the information on all the needed variables.

Basic demographic details and relevant history were collected, physical examination including examination of thyroid were noted. Routine investigations, along with thyroid profile and Vitamin D levels (Serum 25 Hydroxy D) were documented. Subsequently, the levels of Vitamin D were analyzed for any correlation with the thyroid profile of the subjects.

III. STATISTICAL ANALYSIS

The information collected regarding all the selected cases was recorded in MS excel. Continuous data was represented in terms of means

and standard deviations, and the categorical data in frequencies and proportions. Statistical Software SPSS version 26 was used to analyze the data. Pearson correlation was used to evaluate the association between thyroid profile and Vitamin D status. A p-value of <0.05 was considered as statistically significant after assuming all the rules of statistical tests.

IV. RESULTS

In our study, majority of the subjects belonged to the age group of 41 to 50 years (47.3%). The mean age was 41.60 ± 7.40 years, with the minimum and maximum ages of 31 years and 70 years respectively. Majority were females (70.9%), and remaining were males (29.1%). (Table 1)

Table 1: Characteristics of the study subjects

		Frequency (N)	Percentage (%)
Age group	31 to 40 years	24	43.6%
	41 to 50 years	26	47.3%
	51 to 60 years	3	5.5%
	>60 years	2	3.6%
Gender	Male	16	29.1%
	Female	39	70.9%

The thyroid profile of all the subjects was assessed, and the mean levels of TSH, free T3 and T4 were estimated to be 40.49 ± 27.69 mIU/L, 1.43 ± 0.28 pg/mL and 0.52 ± 0.12 ng/dL respectively. (Table 2)

Table 2: Thyroid profile of the study subjects

	Mean	SD	Median	Minimum	Maximum
TSH (in mIU/L)	40.49	27.69	32.16	8.20	128.61
FT3 (in pg/mL)	1.43	0.28	1.57	0.81	1.72
FT4 (in ng/dL)	0.52	0.12	0.55	0.25	0.68

On evaluating the Vitamin D status of the subjects in our study, the minimum and maximum levels were observed to be 10.50 ng/mL and 36.00 ng/mL respectively, with the mean value of 23.38 ± 7.08 ng/mL. The prevalence of Vitamin D

deficiency among the hypothyroid patients in our study was found to be 34.5%. About 45.5% cases showed insufficient levels of Vitamin D, while remaining 20.0% were having optimal levels. (Table 3)

Table 3: Distribution of the study subjects based on Vitamin D levels

		Frequency (N)	Percentage (%)
Vitamin D	Optimal	11	20.0%
	Insufficient	25	45.5%
	Deficient	19	34.5%

Further, on analysing the relation of Vitamin D levels with respect to thyroid profile of the subjects, our study found significant decrease in

the Vitamin D levels with increase in the TSH levels, and decrease in free T3 and T4 levels. (Table 4 & Figure 1)



Table 4: Correlation between Thyroid profile and Vitamin D

		Vitamin D (in ng/mL)
TSH (in mIU/L)	Pearson Correlation	-0.944
	p-value	<0.001*
FT3 (in pg/mL)	Pearson Correlation	0.783
	p-value	<0.001*
FT4 (in ng/dL)	Pearson Correlation	0.854
	p-value	<0.001*

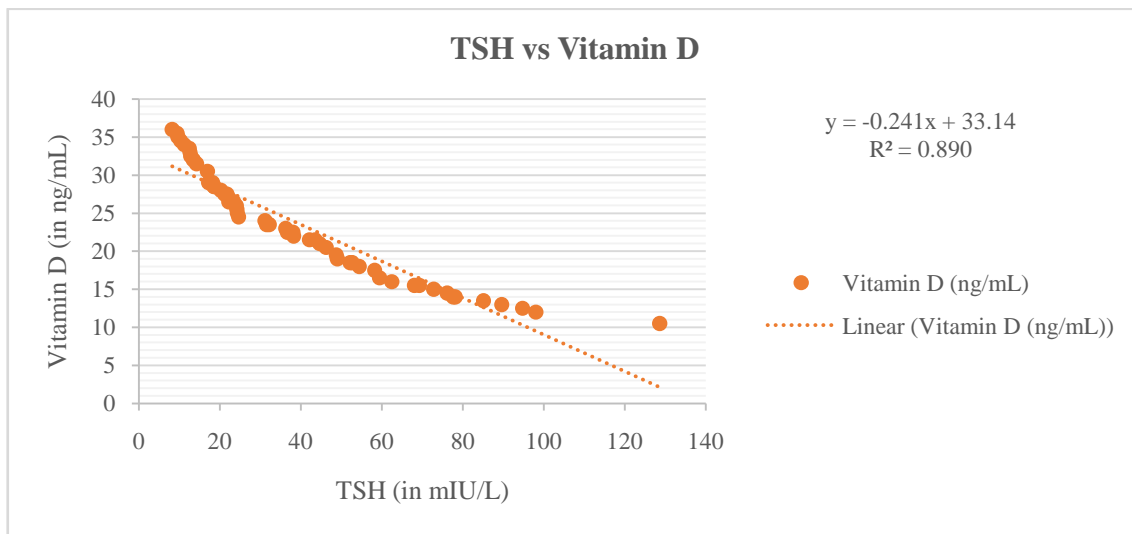


Figure 1: Scatter plot showing correlation between TSH and Vitamin D

V. DISCUSSION

Our study with cross-sectional design was conducted for a period of 12 months on 55 patients with hypothyroidism who attended general medicine outpatient department (OPD) or admitted in the wards. Blood samples were collected to assess thyroid profile and Vitamin D status.

In our study, majority of the subjects belonged to the age group of 41 to 50 years (47.3%), with the mean age of 41.60 ± 7.40 years. This resembles the findings of the previous studies such as [8] Palanisamy S et al and [7] Mackawy AMH et al, where the mean ages were estimated to be 42.38 ± 7.12 years and 46.66 ± 5.22 years respectively.

Majority of the subjects were females (70.9%), and this sort of female predominance was observed in most of the previous studies such as [9] Sari IK et al, [10] Appunni S et al, and [11] Nar R et al, where the proportion of females was 71.5%, 76.0% and 76.9% respectively.

On assessing the Vitamin D status of all the subjects, the mean levels were observed to be 23.38 ± 7.08 ng/mL. This can be compared with the previous studies such as [12] Garg A et al and [11]

Nar R et al, where the mean Vitamin D levels were estimated to be 22.01 ± 10.83 ng/mL and 18.30 ± 14.50 ng/mL respectively.

On further analysis, the prevalence of Vitamin D deficiency among the hypothyroid patients in our study was found to be 34.5%. This is quite more compared to the study by [10] Appunni S et al, where the prevalence was 25.60%, whereas less compared to the study by [13] Kalavathi C et al, where about 55.0% of hypothyroid patients showed Vitamin D deficiency.

Our study also found negative correlation between the levels of TSH and Vitamin D, with statistical significance, thereby implying significant decrease in the Vitamin D levels with increase in the TSH levels. This can be supported by the findings in many previous studies such as [7] Mackawy AMH et al, [11] Nar R et al and [12] Garg A et al. This confirms that regular monitoring of vitamin D levels is necessary among hypothyroid patients to ensure optimal management and overall health.



VI. CONCLUSION

Vitamin D deficiency is prevalent among hypothyroid patients and is negatively correlated with thyroid function. The interplay between these conditions underscores the importance of routine monitoring, adequate supplementation, and comprehensive management to optimize patient outcomes and improve overall health. Further research is warranted to deepen our understanding of this complex relationship.

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