Journal of Medical and Scientific Research

JMSR
www.jmsronline.com

Kotwal V et al. J Med Sci Res. 2026; 14(2):53-57
DOI: http://dx.doi.org/10.17727/JMSR.2026/14-10

ORIGINAL RESEARCH OPEN ACCESS

Effect of vitamin D supplementation on thyroid function in TPO-positive patients with subclinical hypothyroidism and vitamin D deficiency

Vishali Kotwal[1,*], Suman Kotwal[2] and Atul Sharma[3]

[1]Department of Medicine, Government Medical College, Jammu, Jammu and Kashmir 180016, India
[2]Department of Endocrinology, Government Medical College, Jammu, Jammu and Kashmir 180016, India

Abstract

Background: Vitamin D deficiency has been implicated in the pathogenesis of autoimmune thyroid disorders. This study evaluated the effect of vitamin D supplementation on thyroid function in patients with mild, thyroid peroxidase (TPO)-positive subclinical hypothyroidism and vitamin D deficiency.

Methods: A total of 100 patients aged 20–60 years with mild subclinical hypothyroidism, vitamin D deficiency, and positive TPO antibodies were enrolled. Fifty patients received oral cholecalciferol 60,000 IU once weekly for 12 weeks, while 50 served as controls. Participants were followed monthly, and serum free triiodothyronine (fT3), free thyroxine (fT4), TSH, and vitamin D levels were assessed at baseline and at 12 weeks.

Results: At 12 weeks, the mean TSH level was lower in the vitamin D supplementation group than in the control group (5.62 vs. 7.06 mIU/L; $p < 0.001$). The mean vitamin D level was higher in the supplementation group than in the control group (30.18 vs. 20.38 nmol/L; $p < 0.001$). No significant between-group differences were observed in fT3 or fT4 levels.

Conclusion: Vitamin D supplementation was associated with a reduction in TSH levels in patients with mild, TPO-positive subclinical hypothyroidism and vitamin D deficiency. These findings suggest that correction of vitamin D deficiency may have a beneficial effect on thyroid function in this patient population.

Keywords: subclinical hypothyroidism; vitamin D deficiency; thyroid peroxidase; autoimmune thyroid disease; thyroid-stimulating hormone

Introduction

Subclinical hypothyroidism (SCH) is characterized by an elevated serum thyroid-stimulating hormone (TSH) concentration with serum free thyroxine (fT4) levels within the reference range [1]. SCH is common in the Indian population, with autoimmune thyroiditis being an important underlying cause [2].

Although many patients with SCH are asymptomatic, the condition has important clinical implications. SCH has been associated with dyslipidemia and cardiovascular risk and may progress to overt hypothyroidism. The risk of progression is higher in patients who are positive for anti-thyroid peroxidase (anti-TPO) antibodies [3].

Vitamin D is recognized for its role in immune regulation in addition to its established functions in calcium homeostasis and bone metabolism. Evidence suggests an association between low vitamin D levels and autoimmune thyroid diseases, including Hashimoto's thyroiditis, which commonly presents with SCH [4–6].

***Corresponding author:** Dr. Vishali Kotwal, Professor, Department of Medicine, Government Medical College, Jammu and Kashmir 180016, India. Email: vishalikotwal@gmail.com

Received 23 December 2025; *Revised* 12 February 2026; *Accepted* 25 February 2026; *Published* 5 March 2026

Citation: Kotwal V, Kotwal S, Sharma A. Effect of vitamin D supplementation on thyroid function in TPO-positive patients with subclinical hypothyroidism and vitamin D deficiency. J Med Sci Res. 2026; 14(2):53-57. DOI: http://dx.doi.org/10.17727/JMSR.2026/14-10

Vitamin D deficiency has therefore been proposed as a potential contributor to immune dysregulation and thyroid autoimmunity.

Polymorphisms in the vitamin D receptor gene have also been associated with susceptibility to autoimmune thyroid diseases [7]. Several studies have evaluated the effect of vitamin D supplementation on thyroid autoimmunity and thyroid function, with generally inconsistent effects on thyroid function parameters. Many previous studies included heterogeneous populations, including patients with overt as well as subclinical hypothyroidism, and some participants were receiving levothyroxine therapy.

Therefore, the present study evaluated the effect of vitamin D supplementation alone on thyroid function in patients with mild, TPO-positive subclinical hypothyroidism and vitamin D deficiency who were not receiving levothyroxine therapy.

Materials and Methods

This 12-week prospective study, conducted from July 2023 to June 2024, was carried out in the Departments of Medicine and Endocrinology following approval from the Institutional Ethics Committee. Patients attending the outpatient departments of Medicine and Endocrinology were screened for thyroid dysfunction. A total of 100 consecutive patients aged 20–60 years with mild subclinical hypothyroidism, defined as a serum TSH level of 5–10 mIU/L, TPO antibody levels >35 IU/mL, and serum vitamin D levels <30 nmol/L were enrolled. Written informed consent was obtained from all participants before enrollment, and the study was conducted in accordance with the principles of the Declaration of Helsinki.

Patients receiving levothyroxine therapy, those with TSH levels >10 mIU/L, pregnant women, and those taking vitamin D or other nutritional supplements were excluded. Additional exclusion criteria were obesity (body mass index >30 kg/m^2), low-density lipoprotein cholesterol >150 mg/dL, and significant comorbid conditions such as coronary artery disease, chronic kidney disease, liver disease, malignancy, or other autoimmune disorders.

Of the 100 enrolled participants, 50 were randomly assigned to receive oral cholecalciferol 60,000 IU once weekly for 12 weeks, while the remaining 50 served as controls. All participants were followed monthly in the outpatient department, and serum TSH levels were measured at each follow-up visit. At the end of 12 weeks, serum fT3, fT4, TSH, and vitamin D levels were reassessed and compared between the two groups.

Biochemical assessment: Serum fT3, fT4, TSH, and TPO antibody levels were measured using chemiluminescent immunoassays. Serum 25-hydroxyvitamin D [25(OH) D] levels were measured by radioimmunoassay. Lipid profile parameters were analyzed using standard enzymatic colorimetric methods.

Statistical analysis

Continuous variables were expressed as mean ± standard deviation (SD). Pearson's correlation coefficient was used to assess correlations between serum vitamin D and TPO antibody levels and between serum vitamin D and TSH levels. Student's t-test was used to compare continuous variables between the two groups. A p-value <0.05 was considered statistically significant. Statistical analyses were performed using SPSS version 27.0 (IBM Corp., Armonk, NY, USA).

Results

A total of 100 patients with mild subclinical hypothyroidism, positive TPO antibodies, and vitamin D deficiency were included; 50 received vitamin D supplementation and 50 served as controls. Baseline demographic and biochemical characteristics were comparable between the two groups. There were no statistically significant between-group differences in baseline fT3, fT4, TSH, TPO antibody, or vitamin D levels. The mean baseline TSH level was 7.19 mIU/L in the control group and 7.03 mIU/L in the supplementation group, while the mean baseline vitamin D level was 20.5 and 21.4 nmol/L, respectively. The mean TPO antibody levels were 201 IU/L in the control group and 191 IU/L in the supplementation group (Table 1).

Correlation analysis was performed to evaluate relationships between vitamin D status and thyroid function parameters. Serum vitamin D levels showed a negative correlation with TPO antibody levels and with TSH levels in both groups. TPO antibody levels were positively correlated with TSH levels in both groups. These findings indicate an association between lower vitamin D concentrations, greater thyroid autoimmunity, and higher TSH levels in this study population (Tables 2 and 3).

At 12 weeks, the vitamin D supplementation group showed a significant increase in serum vitamin D levels and a reduction in serum TSH levels compared with the control group. The mean TSH level was 5.62 mIU/L in the supplementation group and 7.06 mIU/L in the control group ($p < 0.001$). The mean vitamin D level was 30.18 nmol/L in the supplementation group and 20.38 nmol/L in the control group ($p < 0.001$). No significant between-group differences were observed in fT3 or fT4 levels (Table 4).

Table 1: Comparison of baseline parameters between the vitamin D supplementation and control groups.

Parameters	*Group*	*N*	*Mean*	*Std. Deviation*	*Statistical significance*	
					t value	*p value*
Age (years)	1.00	50	42.2800	9.31323	0.357	0.722
	2.00	50	41.6400	8.62545		
fT3 (pg/mL)	1.00	50	2.7400	0.46555	0.000	1.000
	2.00	50	2.7400	0.41699		
fT4 (ng/dL)	1.00	50	1.7280	0.57607	-0.881	0.381
	2.00	50	1.8180	0.43645		
TSH (mIU/L)	1.00	50	7.1940	1.34535	0.651	0.517
	2.00	50	7.0360	1.06690		
Vitamin D (nmol/L)	1.00	50	20.5320	4.21583	-1.074	0.285
	2.00	50	21.3900	3.75724		
TPO (IU/mL)	1.00	44	201.20	167.299	0.316	0.753
	2.00	45	190.91	139.167		

Abbreviations: fT3, free triiodothyronine; fT4, free thyroxine; TSH, thyroid-stimulating hormone; TPO, thyroid peroxidase; pg/mL, picograms per milliliter; ng/dL, nanograms per deciliter; nmol/L, nanomoles per liter; IU/mL, international units per milliliter.

Table 2: Correlations between baseline biochemical parameters in the control group.

Parameters		*Baseline fT3 (pg/mL)*	*Baseline fT4 (ng/dL)*	*Baseline TSH (mIU/L)*	*Baseline vitamin D (nmol/L)*
Baseline vitamin D (nmol/L)	Pearson correlation	-.064	-.237	-.758**	--
	Sig. (2-tailed)	0.659	0.098	0.000	
	N	50	50	50	50
TPO (IU/mL)	Pearson correlation	-0.071	0.340*	0.862**	-0.788**
	Sig. (2-tailed)	0.647	0.024	0.000	0.000
	N	44	44	44	44

Table 3: Correlations between baseline biochemical parameters in the vitamin D supplementation group.

Parameters		*Baseline fT3 (pg/ml)*	*Baseline fT4 (ng/dL)*	*Baseline TSH (mIU/L)*	*Baseline vitamin D (nmol/l)*
Baseline vitamin D (nmol/L)	Pearson correlation	0.054	0.047	-0.702**	--
	Sig. (2-tailed)	0.707	0.745	0.000	
	N	50	50	50	50
TPO (IU/mL)	Pearson correlation	-0.045	-0.075	0.732**	-0.777**
	Sig. (2-tailed)	0.767	0.626	0.000	0.000
	N	45	45	45	45

Abbreviation: TPO, thyroid peroxidase.

Discussion

The present study evaluated the effect of vitamin D supplementation on thyroid function in patients with mild subclinical hypothyroidism, positive TPO antibodies, and vitamin D deficiency. Vitamin D supplementation was associated with a significant increase in serum vitamin D levels and a reduction in TSH levels after 12 weeks, whereas fT3 and fT4 did not differ significantly between groups.

Table 4: Comparison of biochemical parameters between the vitamin D supplementation and control groups at 12 weeks.

Parameters	*Group*	*N*	*Mean*	*Std. Deviation*	*Statistical significance*	
					t-value	*p-value*
fT3 at 12 weeks (pg/mL)	1.00	50	2.67	0.45	-0.95	0.346
	2.00	50	2.75	0.42		
fT4 at 12 weeks (ng/dL)	1.00	50	1.77	0.43	-1.07	0.287
	2.00	50	1.86	0.42		
TSH at 12 weeks (mIU/L)	1.00	50	7.06	1.16	7.10	<0.001
	2.00	50	5.62	0.85		
Vitamin D at 12 weeks (nmol/l)	1.00	50	20.38	3.69	-12.48	<0.001
	2.00	50	30.18	4.15		

Abbreviations: fT3, free triiodothyronine; fT4, free thyroxine; TSH, thyroid-stimulating hormone.

Serum vitamin D levels were negatively correlated with TPO antibody levels, indicating that lower vitamin D concentrations were associated with greater thyroid autoimmunity. Fang et al. similarly reported an association between vitamin D deficiency and thyroid autoimmunity in an epidemiological study [8]. Vitamin D has immunomodulatory effects on both innate and adaptive immune responses, including effects on T-cell differentiation, inflammatory cytokines, and immune tolerance. These mechanisms may contribute to the observed association between vitamin D status and autoimmune thyroid disease [4–6].

A negative correlation was also observed between serum vitamin D and TSH levels. Similar inverse associations between vitamin D status and circulating TSH have been reported by Chailurkit et al. and Barchetta et al. [9,10]. TPO antibody levels were positively correlated with TSH levels in both groups, consistent with studies reporting an association between thyroid autoimmunity and thyroid function [11,12].

The reduction in TSH after vitamin D supplementation was an important finding of the present study. Previous interventional studies have reported variable effects of vitamin D supplementation on thyroid autoimmunity and thyroid function [13–15]. Talaei et al. reported an improvement in thyroid function following vitamin D supplementation in hypothyroid patients [16]. The difference between the present findings and studies reporting no significant change in thyroid function may partly reflect differences in study populations, treatment duration, baseline vitamin D status, and concomitant levothyroxine therapy.

In the present study, participants were not receiving levothyroxine therapy, which allowed assessment of the association between vitamin D supplementation and thyroid function without the direct TSH-lowering effect of thyroid hormone replacement. Nevertheless, the study was limited by its relatively small sample size and short follow-up period. The findings should therefore be interpreted cautiously and confirmed in larger, adequately randomized and longer-term studies before vitamin D supplementation can be considered an intervention specifically for improving thyroid function in patients with subclinical hypothyroidism.

Conclusion

Vitamin D supplementation is associated with a significant reduction in TSH levels in patients of mild autoimmune subclinical hypothyroidism with vitamin D deficiency, This suggests a potential benefit of correction of vitamin D deficiency in aitoimmune hypothyroidism. However, larger and longer-term studies are required to confirm this effect.

Conflicts of interest

The authors declare that they have no conflicts of interest.

References

[1] Rajput R, Bajaj S, Kalra P, Menon AS, Pillai MG, et al. Subclinical hypothyroidism in adults: Consensus statement of Indian Thyroid Society. Thyroid Res Pract. 2022; 19:8–23.

[2] Deshmukh V, Behl A, Iyer V, Joshi H, Dholye JP, et al. Prevalence, clinical and biochemical profile of subclinical hypothyroidism in normal population in Mumbai. Indian J Endocrinol Metab. 2013; 17:454–459.

[3] Singh SK, Singh R, Singh SK, Iquebal MA, Jaiswal S, et al. Risk of progression to overt hypothyroidism in Indian patients with subclinical hypothyroidism: A prospective observational study. Int J Adv Med. 2022; 9:1183–1187.

[4] Wang J, Lv S, Chen G, Gao C, He J, et al. Meta-analysis of the association between vitamin D and autoimmune thyroid disease. Nutrients. 2015; 7:2485–2498.

[5] Tamer G, Arik S, Tamer I, Coksert D. Relative vitamin D insufficiency in Hashimoto's thyroiditis. Thyroid. 2011; 21:891–896.

[6] Kivity S, Agmon-Levin N, Zisappl M, Shapira Y, Nagy EV, et al. Vitamin D and autoimmune thyroid diseases. Cell Mol Immunol. 2011; 8:243–247.

[7] Feng M, Li H, Chen SF, Li WF, Zhang FB. Polymorphisms in the vitamin D receptor gene and risk of autoimmune thyroid diseases: A meta-analysis. Endocrine. 2013; 43:318–326.

[8] Fang F, Chai Y, Wei H, Wang K, Tan L, et al. Vitamin D deficiency is associated with thyroid autoimmunity: Results from an epidemiological survey in Tianjin, China. Endocrine. 2021; 73:447–454.

[9] Chailurkit LO, Aekplakorn W, Ongphiphadhanakul B. High vitamin D status in younger individuals is associated with low circulating thyrotropin. Thyroid. 2013; 23:25–30.

[10] Barchetta I, Baroni MG, Leonetti F, De Bernardinis M, Bertoccini L, et al. TSH levels are associated with vitamin D status and seasonality in an adult population of euthyroid adults. Clin Exp Med. 2015; 15:389–396.

[11] Shahrukh M, Masood M, Saxena T. Association of anti-thyroid peroxidase antibody with thyroid profile in the patients of subclinical hypothyroidism. Int J Health Sci. 2022; 6: 12203–12210

[12] Shimizu Y, Matsuyama M, Noguchi Y, Noda K, Koyamatsu J, et al. Association between anti-thyroid peroxidase antibody and thyroid stimulating hormone: A cross-sectional study. Sci Rep. 2023; 13:14358.

[13] Simsek Y, Cakir I, Yetmis M, Dizdar OS, Baspinar O, et al. Effects of vitamin D treatment on thyroid autoimmunity. J Res Med Sci. 2016; 21:85.

[14] Krysiak R, Szkrobka W, Okopien B. The effect of vitamin D on thyroid autoimmunity in levothyroxine-treated women with Hashimoto's thyroiditis and normal vitamin D status. Exp Clin Endocrinol Diabetes. 2017; 125:229–233.

[15] Chaudhary S, Dutta D, Kumar M, Saha S, Mondal SA, et al. Vitamin D supplementation reduces thyroid peroxidase antibody levels in patients with autoimmune thyroid disease: An open-labeled randomized controlled trial. Indian J Endocrinol Metab. 2016; 20:391–398.

[16] 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 Endocrinol Metab. 2018; 22:584–588.