

Vitamin D Deficiency and its Association with Thyroid Diseases

Swati Sonawane¹, Sahil Bansal¹

ABSTRACT

Introduction: The primary action of Vitamin D is regulation of calcium and phosphorus homeostasis. Recent studies have shown that Vitamin D deficiency is associated with increased risk of diabetes Mellitus, infectious diseases, atherosclerosis and autoimmune condition like autoimmune thyroiditis. There has not been any clear research to show the association between hypothyroidism and Vitamin deficiency. The present study was conducted with the prime aim to establish association between thyroid disorder and Vitamin D deficiency.

Material and methods: The present study was conducted in the Department, institute, State. The study was conducted for a duration of two year (June, 2016- June, 2017). This cross sectional study enrolled 90 subjects. Under complete aseptic conditions venous blood was withdrawn from antecubital vein. Levels of T3, T4 and TSH were estimated using fluorescence array. To determine the levels of Vitamin D, 25(OH)D was calculated. All the data was arranged in a tabulated form and analyzed using SPSS software. Independent T Test was used for comparison.

Results: It was observed that out of 90 subjects, there were 58.8% patients (n=53) who had Vitamin D deficiency i.e. the Vitamin levels were less than 20 ng/ml. There were 73 cases of euthyroid in which the TSH levels were between 0.25-5 U/U/ml. There were 10 cases of subclinical hypothyroid and 7 cases of overt hypothyroidism. The mean levels of Vitamin D in subclinical and overt hypothyroidism were 16.23+/-10.47 and 13.11+/-10.48 ng/ml respectively. There was a significant difference in the level of Vitamin D in all the cases.

Conclusion: In present study deficiency of Vitamin D correlates with increase in levels of TSH. There is progressive decrease in level of Vitamin D from subclinical to overt hypothyroidism.

Keywords: Hypothyroid, Subclinical, Vitamin

INTRODUCTION

Vitamin D is a steroid that is produced by skin and it aids in the regulation of expression of various genes.¹ The primary action of Vitamin D is regulation of calcium and phosphorus homeostasis. Recent studies have shown that Vitamin D deficiency is associated with increased risk of diabetes Mellitus^{2,3}, infectious diseases⁴, atherosclerosis⁵ and autoimmune condition like autoimmune thyroiditis.^{6,7} Decrease in the levels of Vitamin D are majorly due to decreased exposure to sun, obesity and decrease in physical activity. There are increasing reports in literature regarding association between deficiency of Vitamin D and diseases outside the skeletal system. Activity of Vitamin D is mediated through vitamin D receptors which further leads to activation of various genes.⁸ Vitamin D receptors are present in different body tissues like myocardium, pancreas, and thyroid gland etc.⁹

Studies conducted in animals have shown that supplementation with Vitamin D reduces the severity of symptoms and leads to decrease in the TH1 action in autoimmune arthritis and it also prevented

diabetes and pancreatic lesions in mice models.¹⁰ Since both Vitamin D and thyroid hormones act via steroid receptors; so any alteration in the level of Vitamin D is likely to increase problems associated with hypothyroidism.^{11,12} There are approximately 42 million people in India who suffer from thyroid disorders. There has not been any clear research to show the association between hypothyroidism and Vitamin deficiency. The present study was conducted with the prime aim to establish association between thyroid disorder and Vitamin D deficiency.

MATERIAL AND METHODS

The present study was conducted in the Department of Pediatrics, RMC, Loni. The study was conducted for a duration of two year (June, 2016 - June 2017). This cross sectional study enrolled 90 subjects. Ethical committee clearance was obtained from the Institute's ethical board and all the subjects were informed about the study and a written consent was obtained from all. All the clinically detected cases of hypothyroidism between the age group of 5-12 years were included in the study. Any case of hyperthyroidism patients receiving Calcium or Vitamin D supplements were excluded from the study.

Under complete aseptic conditions venous blood was withdrawn from antecubital vein. Levels of T3, T4 and TSH were estimated using fluorescence array. To determine the levels of Vitamin D, 25(OH)D was calculated. Patients with TSH levels between 0.25-5 uIU/ml were categorized as euthyroid and with levels greater than 7uIU/ml were taken as overt hypothyroids. Vitamin D deficiency was considered if Vitamin D levels were less than 30 ng/ml and if the levels were between 20-30 ng/ml, it was regarded as insufficient.

STATISTICAL ANALYSIS

All the data was arranged in a tabulated form and analyzed using SPSS software. Independent t test was used for comparison.

RESULTS

It was observed that out of 90 subjects, there were 58.8% patients (n=53) who had Vitamin D deficiency i.e. the Vitamin levels were less than 20 ng/ml. There were 21.1% patients (n=19) who had insufficiency of Vitamin D i.e. levels were between 20-30 ng/ml. Only 20% subjects have sufficient levels of Vitamin D (Table 1).

There were 73 cases of euthyroid in which the TSH levels were between 0.25-5 U/U/ml. There were 10 cases of subclinical hypothyroid and 7 cases of overt hypothyroidism. The mean levels of Vitamin D in subclinical and overt hypothyroidism were 16.23+/-10.47 and 13.11+/-10.48 ng/ml respectively. There was a significant difference in the level of Vitamin D in all the cases. The mean TSH level in euthyroid cases was 2.46+/-1.10 uIU/ml. The mean TSH

¹Resident, Department of Pediatrics, RMC, Loni, Maharashtra, India

Corresponding author: Bhagyashri Bora, Associate Professor, Department of Pediatrics, RMC, Loni, Maharashtra, India

How to cite this article: Swati Sonawane, Sahil Bansal. Vitamin D deficiency and its association with thyroid diseases. International Journal of Contemporary Medical Research 2017;4(8):1765-1767.

Vitamin D	Frequency	Percentage
Deficiency (<20ng/ml)	53	58.8
Insufficiency(20- 30ng/ml)	19	21.1
Sufficiency(>30ng/ml)	18	20

Table-1: Vitamin D levels amongst patients

Parameters	Euthyroid (TSH=.25-5) (n=73)	Subclinical hypothyroid (TSH >5-7) (n=10)	Overt hypothyroid (TSH >7) (7)
Vitamin D (ng/mL)	29.12±17.04	16.23±10.47	13.11±10.48
TSH (uIU/mL)	2.46±1.10	6.45±0.67	17.24±15.32
T3 (nmol/L)	2.84±3.18	1.21±0.65	0.76±0.49
T4 (nmol/L)	99.19±26.01	63.48±23.91	50.12±24.68

Table-2: Comparison between vit D levels and Thyroid Disorders

levels in subclinical and over hypothyroidism were 6.45±/-0.67 and 17.24±-15.32 uIU/ml respectively. There was significant difference in TSH levels amongst the three graphs (P<0.05) (Table 2).

DISCUSSION

Thyroid diseases are the most prevalent in endocrine disorders.^{13,14} Iodine deficiency and fluorosis are two most common endemics in India.¹⁵ Fluoride being more electronegative than iodine, replaces iodine from its binding sites on thyroid leading to thyroid derangements. There are 7-95% females and 1-2% males across the world that has variable thyroid conditions.¹⁶ In previous decades, Vitamin D deficiency was considered virtually nonexistent In the Indian population as India lies in the tropical area.¹⁷ But now a days various studies have revealed that 50-90% of the Indian population is deficient in Vitamin D due to inadequate dietary intake of Calcium.¹⁸ In our present study Vitamin D deficiency was seen in 59% of the subjects irrespective of the thyroid status. These findings were in accordance with the study conducted by Giovannucci et al¹⁹ to determine the Vitamin D status amongst men and Gross MD et al²⁰ to find the role of Vitamin D in prevention of prostate and colon cancer. In a study conducted by Nirensiongh et al²¹ in North Indian population of Meerut, there were 53.94% subjects who were Vitamin D deficient.

In our study there were 73 cases of Euthyroid. Subclinical hypothyroidism was seen in 10 cases and overt hypothyroidism was seen in 7 subjects. There was a significant decrease in the levels of Vitamin D amongst hypothyroid patients. In a study conducted by Shilpa et al²² there were 56% of the hypothyroid subjects in whom Vitamin D levels were below 20 ng/ml. there were only 10% subjects who had sufficient levels of Vitamin D. Deficiency of Vitamin D can lead to Grave's disease and various other autoimmune thyroid disorders.^{23,24} Variation in the VDR gene are thought due to mediate susceptibility to various endocrinal autoimmune diseases.^{25,26} Another reason for decrease in level of vitamin D is increased in bone turnover in hyperthyroid patients leads to increase in level of calcium and hence negative feedback on the secretion of parathyroid hormone and Vitamin D synthesis.²⁷

CONCLUSION

In present study deficiency of Vitamin D correlates with increase in levels of TSH. There is progressive decrease in level of Vitamin D from subclinical to overt hypothyroidism. Therefore there should be regular screening of hypothyroid patients for deficiency of Vitamin D.

REFERENCES

- Makariou S, Liberopoulos EN, Elisaf M, Challa A, 2011
- Novel roles of vitamin D in disease: What is new in 2011? *Eur J Intern Med* 22:355-362.
- Marwaha RK, Sripathy G. Vitamin D and bone mineral density of healthy school children in northern India. *Indian J Med Res* 2008;127:239-44.
- Khadilkar AV. Vitamin D deficiency in Indian adolescents. *Indian Paediatr* 2010;47:756-7.
- Scragg R, Sowers M, Bell C. Serum 25 hydroxyvitamin D, diabetes and ethnicity in the Third National Health and Nutrition Examination Survey. *Diabetes Care* 2004;27:2813-8.
- Pittas AG, Lau J, Hu FB et al. The role of vitamin D and calcium in type 2 diabetes: a systematic review and meta analysis. *J Clin Endocrinol Metab* 2007;92:2017-29.
- Forman JP, Giovannucci E, Holmes MD et al. Plasma 25 hydroxyvitamin D levels and risk of incident hypertension. *Hypertension* 2007;49:1063-9.
- Carbone LD, Rosenberg EW, Tolley EA et al. 25 hydroxyvitamin D, cholesterol and ultraviolet irradiation. *Metabolism* 2008;57:741-8
- Friedman TC. Vitamin D deficiency and thyroid disease. [www.goodhormonehealth.com/vitamin D](http://www.goodhormonehealth.com/vitamin-D)
- Norman AW. Vitamin D receptor: new assignment for an already busy receptor. *Endocrinology* 2006;147:5542-8.
- Mathieu C, Laureys J, Sobis H, Vandeputte M, Waer M, Bouillon R. 1,25- Dihydroxyvitamin D3 prevents insulinitis in NOD mice. *Diabetes* 1992;41:1491-1495.
- Wang TJ, Pencina MJ, Booth SL et al. Vitamin D deficiency and risk of cardiovascular disease. *Circulation* 2008;117:503-11.
- Chopra S, Cherian D, Jacob JJ. The thyroid hormone, parathyroid hormone and vitamin D associated hypertension. *Indian J Endocrinol Metab* 2011;15:S354-60.
- Shoenfeld Y, Selmi C, Zimlichman E, Gershwin ME. The autoimmunologist: geoepidemiology, a new center of gravity, and prime time for autoimmunity. *J Autoimmun* 2008;31:325-330.
- Shapira Y, Agmon-Levin N, Shoenfeld Y. Geoepidemiology of autoimmune diseases. *Autoimmunity* 2010;8:468-476.
- Hetzel BS, Porter BJ, Dulberg EM. The iodine deficiency disorders: nature, pathogenesis and epidemiology. *World Rev Nutr Diet* 1990;62:59-119.

16. Canaris GJ, Manowitz NR, Mayor G, Ridgway EC. The Colorado thyroid disease prevalence study. *Arch Intern Med* 2000;160:526–534.
17. Hodgkin P, Kay GH, Hine PM. Vitamin D deficiency in Asians at home and in Britain. *Lancet* 1973;2:167-71.
18. Harynarayan CV, Joshi SR. Vitamin D status in India- Its implications and remedial measures. *J Assoc Physicians India* 2009;57:40-8.
19. Giovannucci E, Liu Y, Rimm EB. Prospective study of predictors of vitamin D status and cancer incidence and mortality in men. *J Natl Cancer Inst* 2006;98:451-9.
20. Gross MD. Vitamin D and calcium in the prevention of prostate and colon cancer: new approaches for the identification of needs. *J Nutr* 2005;135:326-31.
21. Koch N, Kaur J, Mittal A, Gupta A, Kaur IP, Agarwal S. Status of vitamin D levels in hypothyroid patients and its associations with TSH, T3 and T4 in north Indian population of Meerut, a cross sectional study. *International Journal of Clinical Biochemistry and Research*. 2016;3:295-8.
22. Shilpa HB, Mishra B, Yadav S et al. Vitamin D levels correlated with hypothyroidism in Indian population: a pilot study. *Int J Rec Sci Res*. 2014;5:984-7.
23. Rotondi M, Chiovato L. Vitamin D deficiency in patients with Graves' disease: probably something more than a casual association. *Endocrine* 2013;43:3-5.
24. Goswami R, Marwaha RK, Gupta N et al. Prevalence of vitamin D deficiency and its relationship with thyroid autoimmunity in Asian Indians: a community-based survey. *Br J Nutr* 2009;102:382-6.
25. Pani MA, Knapp M, Donner H, Braun J, Baur MP, Usadel KH et al. Vitamin D receptor allele combinations influence genetic susceptibility to type 1 diabetes in Germans. *Diabetes* 2000;49:504–507.
26. Pani MA, Seissler J, Usadel KH, Badenhoop K. Vitamin D receptor genotype is associated with Addison's disease. *Eur J Endocrinol* 2002;147:635–640.
27. Iqbal AA, Burgess EH, Gallina DL, Nanes MS, Cook CB. Hypercalcemia in hyperthyroidism: patterns of serum calcium, parathyroid hormone, and 1,25-dihydroxyvitamin D3 levels during management of thyrotoxicosis. *Endocr Pract* 2003;9:517–521.

Source of Support: Nil; **Conflict of Interest:** None

Submitted: 28-07-2017; **Accepted:** 30-08-2017; **Published:** 10-09-2017