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A STUDY OF VITAMIN D LEVELS IN PRIMARY HYPOTHYROID FEMALE PATIENTS OF RIMS, RANCHI, JHARKHAND

Biochemistry

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ABSTRACT

Introduction: Vitamin D deficiency is common now a days due to increased indoor activity. Vitamin D is a steroid molecule that is mainly produced in the skin and regulates the expression of many genes.Vitamin D has also been shown to influence thyrocytes directly by attenuating TSH. Thyroid hormones influences vitamin D levels.

Objectives- To assess serum 25-OH vitamin D levels in female hypothyroid patients and compare it with euthyroid females.

Materials and Methods- 50 patient samples and 50 control samples were taken. Serum was separated and serum25-OH vitamin D levels and thyroid estimation were done on ABOTT ARCHITCT i1000SR IMMUNOASSAY machine . Data was analyzed using SPSS 20 software.

Results- Cases have significantly lower values for serum 25-OH vitamin D than controls and have significantly negative correlation with TSH.

Conclusions- Hypothyroidism is associated with decreased 25-OH vitamin D .

KEYWORDS

Females ,Primary hypothyroidism,TSH, 25-OH vitamin D

INTRODUCTION

Thyroid gland although small in size but impact on metabolic functions of body is enormous through producing two hormones namely thyroxine (T4) and triiodthyronine (T3).[1] Diseases of the thyroid gland are among the most abundant endocrine diseases worldwide,second only to diabetes. A study shows prevalence of over hypothyroidism is 7.4% in Indian population.[2] Impaired production of thyroid hormones is usually due to a primary abnormality of thyroid gland or iodine deficiency.

The onset of primary hypothyroidism is gradual and may be detected when TSH is elevated to compensate for impaired thyroid output and free thyroid hormones are normal.This state is called subclinical hypothyroidism.As the damage to the thyroid continues ,TSH levels rises further but T4 levels fall.The TSH at this stage is usually greater than 10 µIU/ml, symptoms become apparent and the patient is said to have overt or clinical hypothyroidism.[3]

Hypothyroidism is a clinical syndrome caused by deficiency of thyroid hormones (below reference range) that causes a generalized slowing of metabolic process. Primary hypothyroidism is a frequent syndrome, whose prevalence is 0.5–2.0% among women and around 0.2% among men. According to several authors, recently the number of patients with autoimmune diseases with hypothyroidism have increased by 2.1%.[4]

Vitamin D is a steroid molecule that is mainly produced in the skin and regulates the expression of many genes.[5] Two forms of vitamin D are biologically important -vitamin D3(Cholecalciferol) and vitamin D2(Ergocalciferol).Both vitamins D3 and D2 can be absorbed from food,with vitamin D2 being an artificial source ,but only an estimated 10-20% of vitamin D is supplied through nutritional intake.

The major storage form of vitamin D is 25-OH vitamin D and is present in blood at upto 1000 fold higher concentration compared to active 1,25-(OH)2-vitamin D.Half life of 25-OH vitamin D is 2-3 weeks as compared to half life of 1,25-(OH)2-vitamin D which is only 4 hours.Therefore , 25-OH vitamin D is test of choice used for determination of vitamin D status.The vitamin D receptor (VDR) is found in almost all tissues and cells in the body. The major role of vitamin D is regulating bone metabolism and calcium and phosphorus homeostasis. Vitamin D deficiency is a global health problem now a days due to changing lifestlyes . Over a billion people worldwide are vitamin D deficient.[6]Vitamin D deficiency has been drawing much attention in the association of various diseases including cancer, cardiovascular diseases, autoimmune diseases, endocrine and metabolic diseases.[7]Vitamin D has also been shown to influence thyrocytes directly by attenuating TSH stimulated iodide uptake and cell growth.[8]

Oral administration of 25(OH) D3, elevated TSH and slightly decreased T3 suggesting that 25 (OH) cholecalciferol interferes with the process of hormone secretion probably by altering intracellular calcium of secretory cells[9]. Further thyrocalcitonin and vitamin D control calcium metabolism through their coordinated actions. Based on the effects of vitamin D on immune system, endocrine, autocrine, paracrine, regulation of gene expression, cell differentiation and proliferation the relationship between hypothyroidism and vitamin D gained importance. Vitamin D mediates its effect through binding to vitamin D receptor(VDR), and activation of VDR-responsive genes.[10,11] Importantly, both vitamin D and thyroid hormone bind to receptors which are similar in structure.[11]

Hence the present study aims at exploring a relationship between thyroid hormones, TSH and 25-OH vitamin D in primary hypothyroidism.

MATERIALS AND METHODS

This study was performed in the Department of Biochemistry, RIMS RANCHI from period of AUG 16 to JULY 17. 50 patient samples and 50 control samples were taken.

The study subjects was divided into two groups of which include:

Group 1:

Comprising of 50 newly diagnosed and untreated female cases of hypothyroidism. The diagnosis was based on decreased serum T3 and T4 levels associated with increased TSH levels.All female patients suffering from hypothyroidism was diagnosed and confirmed by the physician based on freeT3 (Normal: 2.4-4.2 pg/ml), freeT4 (Normal: 0.7-1.4 ng/dl) and TSH (Normal: 0.34-4.25 µIU/ml) levels of the patients.[12]

Group 2:

Comprising of 50 healthy females in the similar age group having normal thyroid profile and normal vitamin D levels.

Inclusion criteria:

Newly diagonsed and untreated female cases of hypothyroidism was included in the study.

Exclusion criteria:

a) Pregnancy
b) Paediatric age group (<18 yrs).
c) Elderly age group (> 60 yrs).
d) Renal disorders.
e) Hepatic disorders.
f) Bone disorders.
g) Diabetes, hypertension or any other systemic illness that may affect the vitamin D levels.

h) Patients on drugs for treatment of thyroid disorders .

THYROID ASSAY INCLUDE:

Thyroid assay test was done by chemiluminescent microparticle immunoassay method on ABOTT ARCHITCT i1000SR IMMUNOASSAY machine.

VITAMIN D ASSAY INCLUDE:

Assessment of 25-OH vitamin D was done chemiluminescent microparticle immunoassay method on ABOTT ARCHITCT i1000SR IMMUNOASSAY machine.

STATISTICAL ANALYSIS AND RESULTS

Table 1 :Age distribution of study subjects:

	Control	Cases
No of study subject	50	50
Age(yrs) Mean±SD	36.30±11.94	38.73±12.56

Table 1 suggest that cases were slightly older than controls.

Table 2: Comparison of levels of TSH and vitamin D between cases and controls:

PARAMTERS	Group 1 (N=50) Hypothyroid MEAN±SD	Group 2 (N= 50) Healthy controls MEAN±SD	p value
TSH (µIU/ml)	64.24±33.34	2.08± 1.14	<0.001
25-OH VitaminD(ng/ml)	13.31±2.96	23.36± 3.75	<0.001

Table 2 depicting the comparison of the serum TSH and 25-OH VitaminD levels between the cases and the controls. Mean serum TSH levels in cases were 64.24±33.34µIU/ml and 2.08± 1.14 ng/ml in controls. Mean serum TSH levels were significantly increased in cases as compared to controls. This difference is statistically significant (p<.0001).This table also showing vitamin d levels in cases 13.31±2.96 ng/ml is lower than controls 23.36± 3.75 ng/ml which is statistically highly significant.

Table 3: pearsons correlatios:

Parameters	Cases	
	r value	p value
25-OH VitaminD vs TSH	-0.663	<0.001

Table 3 showing the correlation of TSH with and 25-OH VitaminD it is clear from table data that TSH is negatively correlated with25-OH VitaminD . The associations between two variables is statistically highly significant (p<.001).

Discussion

Changing lifestyles and increased indoor activity leads to decrease in sunlight exposure and it results in decrease in vitamin D level in indian as well as world population.[13]Vitamin D having primary role in bone and mineral homeostasis also has potent immunomodulatory effects and plays important roles in the pathogenesis of autoimmune diseases.[14] 25(OH) vitamin D deficiency is associated with predisposition to autoimmune diseases like type I diabetes and multiple sclerosis.[15]We found in this study that vitamin D may have a role to play in hypothyroidism, hypothyroid patients had significantly lower levels of serum 25(OH) Vitamin D as compared to controls (p <0.001). These findings were supported by Tahir et al.[16] study that illustrated deficiency of serum Vit D levels were significantly associated with degree and severity of hypothyroidism. In another study done by Mackawy, Al-Ayed and Al-Rashidi[17] also depicted Hypothyroidism was associated with hypovitaminosis D. In their study comprising 30 patients and 30 controls, respective serum 25(OH)D levels were 14.8 and 44.5 ng/ml; a negative correlation between TSH and calcidiol was found: r = − 0.59. We also observed a negative correlation of serum 25(OH) Vitamin D levels with TSH in female hypothyroid patients on Pearson's correlation analysis (r= -0.663, P=<0.001), which shows an association exists between vitamin D insufficiency and hypothyroidism. It also indicates a role of vitamin D as a potential modifiable risk factor for hypothyroidism. In order to function, vitamin D must bind to its receptor VDR which is found in several cell types including thyroid gland[18]. Study done by Zaletel and Gaberscek et al[19] have shown that patients of autoimmune thyroid disease have several VDR polymorphisms that affect its expression and activation. Probably vitamin D plays a role in maintaining a euthyroid state by interacting with its receptor in the thyroid gland. One more studies reported low vitamin D level in both hypothyroid and hyper thyroid postmenopausal women[20] Thyroid hormones decreases plasma 1,25vitamin D3 through transcriptional repression of renal 1 alpha hydroxylase gene[21].

CONCLUSION

The study establishes the fact that 25-OH VitaminD may play an important role in altering thyroid hormones and TSH levels in primary hypothyroidism. Study showed that female patients with hypothyroidism having hypovitaminosis D which encourages screening of Vitamin D levels in female hypothyroid patients. Further, large scale studies will be required to establish a cause and effect relation of vitamin D deficiency in pathogenesis of hypothyroidism.

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