

Original Article

A Comparative Study on Vitamin D levels among Hypothyroid and Euthyroid Patients

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ABSTRACT:

Introduction: The reported prevalence of Vitamin D insufficiency in India is around 50-90 %. Vitamin D affects more than 36 cell types which possess Vitamin D Receptor (VDR) one of which is the thyroid gland. Both Vitamin D and thyroid hormones act through steroid receptors and may affect each other's action as they have similar response elements on genes. Vitamin D deficiency has recently been seen in cardiovascular diseases, cancer and several autoimmune disorders including Diabetes mellitus, Multiple sclerosis, Rheumatoid Arthritis and SLE. Some of the symptoms of vitamin D deficiency overlap with that of hypothyroidism. Very few studies have been undertaken in the Indian population to find the relation between Vitamin D and hypothyroidism. **Objective:** (1) To estimate the serum 25(OH)D levels in patients with newly diagnosed hypothyroidism and to compare the levels with normal healthy controls (2) To find correlation between the levels of 25(OH)D and TSH in the case group (3) To find correlation between 25(OH)D and FT4 in the case group.

Methodology: It was a case control study conducted in central lab Gauhati Medical College & Hospital, Guwahati from August 2014 to July 2015. Study population comprised of 45 cases and 45 controls. Blood serum was used to test the TSH, FT4 and Calcium. Data were analysed using epi-info by proportion, mean, SD and Correlation. T-test was used as test of significance.

Results: There was no statistically significant difference found in mean age of cases and controls. Similarly no statistically significant difference was found in proportion of male and female among cases and controls. These findings make the two groups comparable. Statistically significant difference was found in mean TSH, mean BMI, mean FT4 and mean Calcium levels among cases and controls.

Conclusion: Vitamin D deficiency can be a risk factor for hypothyroidism and further community based trials are required to establish a cause and effect relation of Vit D deficiency and pathogenesis of hypothyroidism.

Key Words: Vit D Receptor, TSH, FT4

INTRODUCTION:

Hypothyroidism is a very common endocrine disorder. Reduced production of thyroid hormone by the thyroid gland is the central feature of hypothyroidism. (1) Hypothyroidism is the most common thyroid disorder affecting approximately one in 10 adults in India. (2,3) The reason behind the higher prevalence of hypothyroidism in India compared with western countries is possibly linked to long-standing iodine deficiency in the country, which has only been partly corrected over the past 20 years. Iodine is regarded as a "double-edged sword". Iodine supplementation

can also induce or aggravate autoimmunity, resulting in goitre and thyroid dysfunction. One of the most recent factor found responsible in etiopathogenesis in autoimmune thyroid disorders is deficiency of 25(OH)D.(4) The sunshine Vitamin or Vitamin D has gained a lot of attention in the recent years. Vitamin D deficiency was considered rare in India because of abundant sunshine However, a systemic study carried out in Delhi showed the presence of low 25(OH)D in a majority of subjects including newborns, their mothers, healthy physicians, nurses, soldiers and those with vitiligo and albinism. (5) Based on these study groups, subnormal serum 25(OH) D levels of Asian Indians could be linked to their skin pigmentation and poor sun exposure. The reported prevalence of Vitamin D insufficiency in India is around 50-90 % .(6) Vitamin D affects more than 36 cell types which possess Vitamin D Receptor(VDR) one of which is the thyroid gland. (7) Both Vitamin D and thyroid hormones act through steroid receptors and may affect each other's action as they have similar response elements on genes. (8) Vitamin D deficiency has recently been seen in cardiovascular diseases, cancer and several autoimmune disorders including Diabetes mellitus, Multiple sclerosis, Rheumatoid Arthritis and SLE.(9,10,11) Some of the symptoms of vitamin D deficiency overlap with that of hypothyroidism. So, a lower level of vitamin D is likely to aggravate the systemic abnormalities such as hypertension associated with hypothyroidism as well (12,13,14) A study done by Bhardwaj SH et al (2014) demonstrated a Vitamin D deficiency in patients of hypothyroidism in the Indian population.(7) Tamer G et al (2011) also demonstrated an increase in Vitamin D deficiency in patients with AITDs along with the deficiency of Vitamin D to be higher in patients with overt hypothyroidism than in euthyroid controls.(15,16) To the best of our knowledge, till date , very few studies have been undertaken in the Indian population to find the relation between Vitamin D and hypothyroidism . Thus, taking into consideration the high prevalence of hypothyroidism and vitamin D deficiency in the Indian population, along with the dearth of research in this particular field, the following study was undertaken to find the levels of 25(OH)D in patients of hypothyroidism.

OBJECTIVE: (1) To estimate the serum 25(OH)D levels in patients with newly diagnosed hypothyroidism and to compare the levels with normal healthy controls (2) To find correlation between the levels of 25(OH)D and TSH in the case group (3)To find correlation between 25(OH)D and FT4 in the case group.

MATERIAL AND METHOD:

This was a case control study conducted in central lab Gauhati Medical College & Hospital, Guwahati from august 2014 to july 2015. Study population comprised of 90 subjects with age from 20-80 years divided in case group comprising 45 subjects of newly diagnosed hypothyroidism and control group comprising 45 apparently healthy subjects. Patients with normal TSH and FT4 were considered euthyroid and taken as control. Normal range for TSH was (0.465-4.68) μ IU/ml and for FT4 was (10-28) pmol/L Patients with high TSH and low or normal FT4 levels were taken as cases. (17,18) Estimations of 25(OH)D was done by ELISA. Serum TSH, Serum FT4 and Serum calcium were done using Autoanalyzer Vitros 5600, Ortho Diagnostics. Patients with following conditions were excluded from the study:

- H/o chronic kidney, liver, thyroid disease, on Vitamin D and calcium supplementation.
- H/o diabetes mellitus, dermatological disease, rheumatological disease, alcoholics
- History of Thyroidectomy and Radio-Iodine ablation
- History of malabsorption disorder

- Pregnancy
- Statins and other medications that alter thyroid function and lipid levels.

After getting informed written consent and with aseptic and antiseptic precautions, 5ml of blood was drawn from the median cubital vein. A random, pre-dialysis sample was used for all the investigations. The needle was removed from the syringe and the blood was immediately transferred carefully into clean, dry properly labeled vials. The samples were mixed thoroughly. The vials were stoppered and the blood was left to clot for 30 - 45 minutes. The clot which was formed was rimmed and the separated serum poured into the centrifuge tube and then centrifuged at 3000 r.p.m. for 5 minutes in a centrifuge machine. Precautionary measures were taken to prevent hemolysis of the sample. The supernatant serum was used for the investigations or transferred to clean dry vials for storage if the estimations were not done at the same sitting. Data were analysed using epi-info by proportion, mean, SD and Correlation. T-test was used as test of significance.

RESULTS:

Table 1: Distribution of study subjects according to age

Age in years	20-29	30-39	40-49	50-59	60-69	70-79
Case	13	20	3	5	2	2
Control	12	14	8	8	3	0

Table 1 show that maximum patients were in 30 to 39 years age group in both cases and controls.

Table 2: The Frequency distribution of sex in Case and Control group

SEX	Case group	Control group	Total
Male	18(40%)	18(40%)	36
Female	27(60%)	27(60%)	54
Total	45	45	90

Table 2 shows that females were 60% and males were 40% in the study

Table 3 shows the comparison between cases and controls. There was no statistically significant difference was found in mean age of cases and controls. Similarly no statistically significant difference was found in proportion of male and female among cases and controls. These finding make the two groups comparable. Statistically significant difference was found in mean TSH, mean BMI, mean FT4 and mean Calcium levels among cases and controls.

Table 3: Comparison of various parameters in the case and control group

PARAMETERS	CASES n=45	CONTROL n=45	P VALUE
AGE(in years)	37.37±13.63	39.80±12.79	>0.05
SEX	Male 18(40%), Females 27(60%)	Male 19(40%), Females 27 (60%)	>0.05
BMI(kg/m ²)	24.053±1.954	21.547±1.720	<0.0001
TSH(μ I u/ml)	28.064±25.363	2.431±1.528	<0.0001
FT4(pmol/l)	11.834±8.4447	20.471±8.279	<0.0001
CALCIUM(mg/dl)	8.100±1.104	9.900±1.497	<0.0001

Table 4 shows statistically significant but negative correlation between 25(OH) D and TSH among cases. Statistically significant and positive correlation was found between 25(OH) D and FT4 among cases and no statistically significant correlation was found between 25(OH) D and BMI among cases.

Table 4: Correlation of 25(OH)D with various parameters in hypothyroid patients:

	25(OH) D	
	r (correlation coefficient)	p value
BMI	0.1207	0.4297
TSH	- 0.5633	<0.0001*
FT4	0.3812	=0.0185*

*Statistically significant

DISCUSSION:

In the present study, majority of the subjects i.e. 60% in the case group were females. This finding suggests that hypothyroidism is much more prevalent in the female population. Vanderpump et al also found that hypothyroidism is 10 times more common in women than men. (19) In the present study, we found statistically significant difference in mean BMI among the case and control group and Mean BMI was more among cases. This could be due to peripheral effects of thyroid hormones and their local regulation of central nervous system in the physiological regulation of appetite . Aljohani et al also found BMI to be higher in patients with thyroid dysfunction than in controls (p<0.001). (20) However, when we tried to find a correlation between 25(OH)D and BMI , no correlation was established.

In our study we found that the mean 25(OH) Vitamin D levels was lower in females than in males in the case group (18.711±11.942 vs. 21.422 ±14.572, p=0.4984) and control group though the decrease was not significant. The decrease levels of 25(OH)Vitamin D in females may be attributed to clothing habits like the use of Burkha

by females in the Mohammeden population also leads to an inadequate exposure of the skin to the ultraviolet B portion of sunlight. The use of sunscreen has also increased nowadays for both cosmetic reasons and also for protection against skin cancer. These products with high sun protection factors (SPF) may lead to a significant decrease in solar –induced previtamin D (3) production, leading to insufficient levels of vitamin D which are not enough to protect against chronic diseases. (21) However, the insignificant decrease may be attributed to the small sample size of our study. Goswami et al in their study also found lower levels of 25(OH) Vitamin D in females, but the value in their study was also not significant ($p=0.31$). (5)

Vitamin D deficiency may also occur in patients with malabsorption from their intestine, Thus decreased levels of 25(OH) Vitamin D leads to decreased absorption of Calcium from the intestine. Calcium absorption from the gut is maximum at 25(OH) Vitamin D levels of $>30\text{ng/ml}$. When there is deficiency of 25(OH) Vitamin D as in hypothyroidism, the effective calcium absorption from the gut is reduced. (6) In our study, we found decreased levels of mean Vitamin D in the hypothyroid group as compared to the control group thus indicating that deficiency of Vitamin D may lead to increased destruction of thyroid follicular cells and can lead to decreased thyroid hormone production ultimately leading to increased TSH levels. A negative correlation between 25(OH) and TSH in the case group was also seen with $r= - 0.5633$; $p<0.0001$. The similar finding was observed by Mackawy et al and Fawzy et al (22,23). Vitamin D is involved in binding of thyroid hormone to the nuclear receptor thus emphasizing that lack of Vitamin D may contribute to decreased levels of thyroid hormones and increased levels of TSH.(24) In our study, we thus found a positive correlation between serum Vitamin D and FT4 levels in the hypothyroid group and similar result was obtained by Fawzy et al (23).

CONCLUSION:

Vitamin D deficiency can be a risk factor for hypothyroidism and further community based trials are required to establish a cause and effect relation of Vit D deficiency and pathogenesis of hypothyroidism.

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