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Original Research Article

Evaluate the Levels of 25(OH) Vitamin D and Ferritin in Hypothyroid Patients

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Abstract

Background: The effects of thyroid hormones are varied and they are necessary. They sustain appropriate growth, for instance, and control metabolism. People who have hypothyroidism, a disorder in which the body doesn't produce enough thyroid hormones, typically have a slower metabolism. In hypothyroid patients, the serum ferritin and vitamin D levels have changed. The purpose of this study is to assess the relationship between ferritin and 25(OH) vitamin D in hypothyroid individuals.

Methods: After receiving approval from the institutional ethics committee, this prospective observational study was conducted. The study included 40 volunteers who were split into two groups: healthy (controls) and hypothyroid patient groups. Using the formula BMI=weight (kg)/height(m)^2, the BMI was determined. Using the CLIA (Chemiluminescent immunoassay), the levels of ferritin, T3, T4, and TSH, as well as vitamin D (25-hydroxyvitamin D), were determined.

Results: While the rest of the analysed characteristics revealed a significant link ($P<0.05$), the data obtained demonstrated that there was no relationship between the age of participants and the thyroid condition. For instance, it was discovered that the patients' values for BMI, 25(OH) vitamin D, ferritin, TSH, T3 and T4 were 23.99±0.27, 32.98±2.59, 33.97±2.99, 33.97±2.99, 2.44±0.26, 3.59±0.19, and 19.97±0.49, respectively. These parameters' respective values in the healthy individuals (controls) were 32.65±0.64, 19.25±1.66, 24.98±1.88, 11.96±0.53, 1.30±0.08, and 9.33±0.29.

Conclusion: The findings demonstrated that high BMI and low levels of 25(OH) vitamin D, ferritin, TSH, T3, and T4 were related with hypothyroidism, represented by a high level of TSH, whereas age was not found to be a significant factor.

Keywords: Vitamin D, Ferritin, Hypothyroid.

Introduction

The effects of thyroid hormones are varied and they are necessary. They sustain appropriate growth, for instance, and control metabolism. Due to their changed metabolism, hypothyroid individuals frequently experience fatigue, cold, and weight gain[1]. Thyroxin (T4) and triiodothyroxine (T3) are the two thyroid hormones that are present in the human body and are produced by the thyroid

gland [2]. Through a sequence of chemical events, the latter produces thyroid hormones from the iodine in diet. Although hypothyroidism, a disease of the thyroid hormones, is easily diagnosable and treatable, a delayed diagnosis and subsequent delayed treatment may have negative consequences, including decreased metabolism and alterations in the levels of serum ferritin and vitamin D[3].

The ability of the thyroid gland to produce the necessary amount of T3 and T4 is constrained by the concentration of iodine in the body, where excess or deficiency could lead to a disorder of thyroid hormones [4]. Previous studies have confirmed that hypothyroidism is directly related to iodine concentration. Most commonly, hypothyroidism is diagnosed by examining the inverse relationship between TSH, T4, and T3, where it is anticipated that a healthy individual will have a high level of TSH and a low level of T4 or T3[5].

According to estimates, between 3.8% and 4.6% of people worldwide have hypothyroidism[6]. However, some studies have shown that the prevalence of hypothyroidism varies depending on the study location and the ages of the participants, and it may even reach 8.4% [7]. The duration and degree of the thyroid hormone shortage are two additional parameters that have a significant impact on the clinical signs of hypothyroidism. The general symptoms of hypothyroidism include fatigue, a cold, weight gain, and dry skin, which can be used to identify the condition[8].

The thyroid hormone-producing enzyme thyroperoxidase is crucial for the production of thyroid hormones[9]. Recent research has shown that a particular amount of iron is necessary for the thyroperoxidase enzyme to be synthesised, explaining the correlation between the ferritin level and thyroid hormone abnormalities [10]. For instance, Takamatsu, Majima[11] and Sachdeva, Singh[10] have both shown that the ferritin levels have a significant impact on the thyroid profile. Ferritin is an iron-storing protein with a diameter of around 10–12 nm, and it is crucial for both physiologic and pathologic functions [12].

The literature also suggests a link between vitamin D deficiency and thyroid hormone imbalance. The production of vitamin D in the skin contributes significantly to the equilibrium between calcium and phosphate and controls the expression of numerous genes [13]. Cholecalciferol (vitamin D3) and ergocalciferol (vitamin D2) are the two subtypes of vitamin D. When exposed to UV rays, the body produces D3 in the skin, or it can be consumed, such as in fatty fish. D2 can be found in a variety of foods, including fatty fish. The liver converts D2 and D3 into 25-hydroxyvitamin D3 (25-OH-D3, also known as calcidiol)[14]. The amount of vitamin D and thyroid disorders may be related, according to several research [15].In this regard, a study has been conducted to look into the relationship between vitamin D and ferritin levels and thyroid disorders.

Material And Methods

After receiving approval from the institutional ethics committee, this prospective observational study was conducted. The study included 40 volunteers who were split into two groups: healthy (controls) and hypothyroid patient groups. Using the formula BMI=weight (kg)/height(m)^2, the BMI was determined. Using theCMIA (Chemiluminescent Micro ParticleImmunoassay), the levels of vitamin D (25-hydroxyvitamin D), ferritin, T3, T4, and TSH were determined. The usual range for vitamin D is between 30 and 60 pg/ml, which is worth mentioning. While the upper limits for ferritin are 20-275 ng/ml for men, 4-204 ng/ml for cyclic women, and 20-278 ng/ml for menopausal

women.Finally, the limits for patients with hypothyroidism who have low levels of blood T3, T4, and TSH are: T3 between 0.9 and 2.33 nmol/l, hyperthyroid 0.15, hypothyroid T4 between 60-and-120 nmol/l, and TSH thyroid 0.25->7.0. It is important to note that the SPSS package (version 25.0) was used to examine the results.

Results

Table 1: Age and gender of the patients

Parameters Age(years)	Study group n=20	Percentage	Control group n=20	Percentage
<10	2	10.00%	2	10.00%
10-20	8	40.00%	7	35.00%
20-30	9	45.00%	10	50.00%
>30	1	5.00%	1	5.00%
Gender				
Male	13	65.00%	12	60.00%
Female	7	35.00%	8	40.00%

While the rest of the analysed characteristics revealed a significant link (P<0.05), the data obtained demonstrated that there was no relationship between the age of participants and the thyroid condition. For instance, it was discovered that the patients' BMI, 25(OH) vitamin D, ferritin, TSH, T3 and T4 readings were 23.99±0.27, 32.98±2.59, 33.97±2.99, 2.44±0.26, 3.59±0.19 and 19.97±0.49 respectively. As indicated in Table 2, the healthy individuals (controls) had values for these parameters of 32.65±0.64, 19.25±1.66, 24.98±1.88, 11.96±0.53, 1.30±0.08, and 9.33±0.29, respectively.

Table 2: Comparison between Hypothyroid Patients and control subjects

Parameters	Study group	Control group	p-value
BMI(Kg/M^2)	23.99±0.27	32.65±0.64	0.01
25(OH)vitD(ng/ml)	32.98±2.59	19.25±1.66	0.001
Ferritin(ng/ml)	33.97±2.99	24.98±1.88	0.003
TSH(µu/ml)	2.44±0.26	11.96±0.53	0.001
T3(nmol/L)	3.59±0.19	1.30±0.08	0.005
T4(nmol/L)	19.97±0.49	9.33±0.29	0.004

BMI: Body mass index, TSH: thyroid stimulated hormones, T3: triiodothyroxine, T4: Thyroxin, S.E: Standard error. *P≤0.05

Discussion

It is now widely acknowledged that vitamin D insufficiency, or "VDD," has been linked to a number of clinical and endocrine diseases. Low levels of serum 25(OH) were found in the current investigation as a result of the significant degree of correlation between Vitamin D deficiency (VDD) and anaemia risk in people with hypothyroidism shown by the previous study. When compared to normal serum 25(OH) vitamin D levels, there is frequently a significant link (p<0.05) between low serum ferritin levels and elevated serum TSH levels.This is in line with recent research that found a link between vitamin D3 levels and people without chronic renal disease who have iron deficient anaemia.[17,18] However, Sonawane et al. (2017) hypothesised a causal link between a vitamin D deficit

and rising serum TSH levels.[19] The results showed a substantial relationship between the thyroid disease and vitamin D level. As the average TSH increased, it was observed that the average level of vitamin D decreased. This connection may be due to the increased bone turnover seen in hyperthyroid patients, which raises calcium levels and affects the synthesis of vitamin D and parathyroid hormone.[20]The results of the present study concur with those of, which showed that low thyroid hormones are caused by vitamin D insufficiency.[21] First, Mackawy, Al-Ayed[22] discovered that serum 25(OH)vitamin D levels in hypothyroid patients are lower than those in healthy individuals. Low levels of vitamin D are present in thyroid patients for a variety of reasons, including malabsorption, a lack of sun exposure, and a lack of outside activity.[23] Additionally, additional elements including age, obesity, and smoking may contribute to skin pigmentation, which may reduce the production of vitamin D.[24]The results of the current investigation also showed that there is a connection between ferritin levels and TSH as well as a significant variation in ferritin levels between patients and healthy subjects. A study done at the same time by Singla and Singla[25] revealed that hypothyroidism cases had considerably lower serum ferritin and lower serum iron levels. Additionally, there was a discernible inverse relationship between ferritin and TSH. Additionally, hypothyroidism is associated with a low level of serum ferritin, indicating that the thyroid's ability to operate depends on ferritin levels.[16]

Conclusion

The findings demonstrated that high BMI and low levels of 25(OH) vitamin D, ferritin, TSH, T3, and T4 were related with hypothyroidism, represented by a high level of TSH, whereas age was not found to be a significant factor.

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