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Original Research

Evaluate the correlation between vitamin D and ferritin in hypothyroid patients

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ABSTRACT:
Aim: To evaluate the correlation between vitamin D and ferritin in hypothyroid patients. **Methods:** This prospective observational study was carried out after taking the approval of the protocol review committee and institutional ethics committee. 80 participants; were divided into two groups: healthy (controls) and hypothyroid patient groups, were included in the study. The BMI was calculated using the formula BMI= weight (kg)/ height^2 (m)^2. Vitamin D (25-hydroxyvitamin D), ferritin, T3, T4 and TSH levels were measured using the ELFA (Enzyme Linked Fluorescent Assay**. Results:** The obtained results showed that there was no relationship between the age of participants and the thyroid disorder, while the rest of the studied parameters showed a significant relationships (P<0.05). For example, it has been found that the values of BMI, 25(OH) vit D, ferritin, TSH, T3 and T4 in the patients were 24.83± 0.29, 33.01±2.66, 34.06 ±3.02, 2.36 ± 0.28, 3.670 ± 0.22, 20.04 ± 0.56 respectively. In contrast, the values of these parameters in the healthy people (controls) were 32.38 ± 0.46, 19.19 ± 1.44, 25.36±1.90, 12.72 ± 0.46, 1.28 ± 0.06 and 9.50 ± 0.21, respectively. **Conclusion** : The results showed that hypothyroidism, represented by the high level of TSH, was associated with high BMI and low level of 25(OH) vit D, ferritin, TSH, T3 and T4, and age does not play a significant role.
Keywords: vitamin D, ferritin, hypothyroid

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INTRODUCTION

Vitamin D is ‘‘a fat-soluble steroid hormone” ingested in the diet but the major produced occurthrough the skin after exposure to the solar ultraviolet rays in sunlight.[1]Vitamin D is converted by the liver to inactive form ‘‘25(OH) Vitamin D, it has a half- life of 15 days” and is metabolized in kidneys to the active form “1,25-dihydroxyvitamin D” by the enzyme “25- hydroxyvitamin D-1□-hydroxylase (CYP27B1)”.[2] Only serum “25(OH) Vitamin D3 also called (calcidiol)” considered as the real indicator of the total Vitamin D stores and is used for clinical evaluation of the Vitamin D3 status in body, while circulating 1,25(OH)D is not a good indicator of Vitamin D status because ofithashalf-life of 15 hours shorter than “25(OH) Vitamin D’’. The normal range of Vitamin D assay has approximately 20-60ng/dL, this range may be too low for many serum patients, so when the concentration is less than 30ng/mmol leading to the case called ‘‘Vitamin D deficiency VDD” and if it is less than 10ng/ml (12.5nmol/L) signifies severe deficiency.[3,4] Hypothyroidism is defined as “a deficiency of thyroid activity through reducing the secretion of both T4 and T3 thyroid hormone concentrations leading to hyper secretion of pituitary TSH by negative feedback mechanism casing increase in serum TSH levels. Previous studies have confirmed that hypothyroidism is directly related to the concentration of iodine, as the ability of the thyroid gland to produce the required amount of T3 and T4 is limited by the concentration of iodine in the body, where excess or lack of this element could result in disorder of thyroid hormones.[5] Hypothyroidism is mainly diagnosed by investigating the inverse relationship between TSH and T4 and T3, where it is expected that a normal person will have a low level of T4 or T3 and a high level of TSH.[6] It is estimated that hypothyroidism occurs in from 3.8% to 4.6% of the world’s population.[7] However, some studies have indicated that the occurrence of

hypothyroidism varies according to the area of the study and ages of the studied people, where it could reach 8.4%.[8] Moreover, the clinical indicators of hypothyroidism are highly influenced by different factors, such as the duration and the deficiency level of the thyroid hormones. Generally, hypothyroidism gives a set of associated symptoms such as tiredness, cold, weight increase and dryness of skin, which could be used to diagnose this disease.[9] Thyroperoxidase enzyme, which is a thyroid hormone, plays an important role in the synthetisation of thyroid hormones.[10] Recent studies have demonstrated that the synthetisation process of the thyroperoxidase enzyme requires a certain amount of iron, which explains the association between the disorder of thyroid hormones and the ferritin level.[11]

MATERIAL AND METHODS

This prospective observational study was carried out after taking the approval of the protocol review committee and institutional ethics committee. 80 participants; were divided into two groups: healthy (controls) and hypothyroid patient groups, were included in the study. The BMI was calculated using the formula BMI= weight (kg)/ height^2 (m)^2. Vitamin D (25-hydroxyvitamin D), ferritin, T3, T4 and TSH levels were measured using the ELFA (Enzyme Linked Fluorescent Assay). It is noteworthy to highlight that the normal limit for vitamin D is ranging between 30 and 100 ng/ml. while the limits of ferritin are: male: 20-434 ng/ml, cyclic women: 20-159 ng/ml, menopausal women: 20-278 ng/ml. Finally, limits for serum T3, T4 and TSH thyroid dysfunction patients (hypothyroid) are: T3 between 0.9 to 2.33nmol/l, hyperthyroid <0.15, hypothyroid T4 between 60-and120 nmol/l, TSH thyroid 0.25->7.0. It is notable to highlight that the results were analysed using SPSS package (version 25.0).

RESULTS

The obtained results showed that there was no relationship between the age of participants and the thyroid disorder, while the rest of the studied parameters showed a significant relationships ($P<0.05$). For example, it has been found that the values of BMI, 25(OH) vit D, ferritin, TSH, T3 and T4 in the patients were 24.83± 0.29, 33.01±2.66, 34.06 ±3.02, 2.36 ± 0.28, 3.670 ± 0.22, 20.04 ± 0.56 respectively. In contrast, the values of these parameters in the healthy people (controls) were 32.38 ± 0.46, 19.19 ± 1.44, 25.36±1.90, 12.72 ± 0.46, 1.28 ± 0.06 and 9.50 ± 0.21, respectively, as shown in Table 2.

Table 1: Age and gender of the patients

Parameters	Study group=40	Control group=40
Age (years)		
Below10	5	4
10-20	15	15
20-30	16	18
Above 30	4	3
Gender		
Male	25	23
Female	15	17

Table 2: Comparison between Hypothyroid Patients and control subjects

Parameters	Study group	Control group	p- value
BMI (Kg/M2)	24.83± 0.29	32.38 ± 0.46	**0.01**
25(OH) vit D (ng/ml)	33.01±2.66	19.19 ± 1.44	**0.001**
Ferritin (ng/ml)	34.06 ±3.02	25.36±1.90	**0.003**
TSH (µu/ml)	2.36 ± 0.28	12.72 ± 0.46	**0.001**
T3 (nmol/L)	3.670 ± 0.22	1.28 ± 0.06	**0.005**
T4 (nmol/L)	20.04 ± 0.56	9.50 ± 0.21	**0.004**

BMI :Body mass index, TSH: thyroid stimulated hormones ,T3: triiodothyroxine ,T4: Thyroxin, S.E: Standard error. *P ≤ 0 .05

DISCUSSION

Vitamin D deficiency ‘‘VDD” is now commonly accepted has been associated with a number of clinical and endocrine disorders. This study suggested a high degree association between Vitamin D deficiency ‘‘VDD” and risk of anemia in individuals with hypothyroidism so that is observed in the current study low levels of serum 25(OH). Vitamin D has often been a significant correlation ($p < 0.05$) with deficiency of serum ferritin levels and increased serum TSH levels compared with those normal serum 25(OH) vitamin D levels. This is agreed with other studies that were showed an association between Vitamin D3 level and iron deficiency anemia patients ‘‘without and chronic kidney disease” [12,13] while Sonawane *et al* (2017) suggested that a significant relationship between deficiency of vitamin D and increasing serum TSH levels.[14] The outcomes

indicated a significant correlation between the level of vitamin D and the thyroid disorder. A decrease in the average of vitamin D was noticed as the average of TSH increased. This relationship could be related to the increase in bone turnover in hyperthyroid patients that increases the calcium level, which in turn alters the synthetisation of both parathyroid hormone and vitamin D.[15] The outcomes of the current study agree with those of[16] , which indicated that deficiency of vitamin D is responsible for low thyroid hormones. Mackawy, Al-Ayed[17] found two facts, firstly the level of serum 25(OH) vit D in hypothyroid patients is less than its level in healthy people. There are many reasons for the low levels of vitamin D in the thyroid patients, such as the malabsorption, lack of both sun exposure and outdoor activities.[18] In addition, other factors such as age, obesity, and smoking could cause skin pigmentation, which in turn could decreases the synthetisation of vitamin D.[19] The outcomes of the current study also revealed that there is a significant difference between the levels of the ferritin in patients and healthy participants, and there is a relationship between TSH and ferritin levels. At same time, a study was carried out by Singla and Singla[20] showed that the cases of hypothyroidism had much lower serum ferritin and lower serum iron. In addition to that, a significant negative correlation was observed between TSH and ferritin. Additionally, hypothyroidism is related to the lack of serum ferritin, which means that the thyroid functions are influenced by the level of serum ferritin.[11]

CONCLUSION

The results showed that hypothyroidism, represented by the high level of TSH, was associated with high BMI and low level of 25(OH) vit D, ferritin, TSH, T3 and T4, and age does not play a significant role.

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