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Assessment The Levels Of 25(OH) Vitamin D And Ferritin In Patients With Hypothyroid

Amera Kamal Mohammed[1], Thanaa Abdulmahdi[2], Zainab Nasser Nabat[3]

[1]*Department of Clinical Laboratory Sciences., College of Pharmacy, University of Kirkuk, 52001, Kirkuk, Iraq .ORCID ID: 0000-0002-8984-6824 ,*
[2]*Babylon Technical Institute, Al-Furat Al-Awsat Technical University, 51015, Babylon, Iraq. ORCID ID: 0000-0002-9661-8280,*
[3]*Babylon Technical Institute, Al-Furat Al-Awsat Technical University, 51015, Babylon, Iraq.*

[1]*dr.amera.k@uokirkuk.edu.iq.*
[2]*inb.thn@atu.edu.iq.*

Abstract :Background: Thyroid hormones are essential and have various effects. For instance, they maintain normal growth and regulate metabolism. Hypothyroidism is a condition where the body doesn't make enough thyroid hormones and people with hypothyroidism usually have a slower metabolism. The serum ferritin levels and vitamin D levels have been changed in patients with Hypothyroidism.
Objective: a study has been carried out to investigate the association among thyroid disorder and the levels of both vitamin D and ferritin.
Materials and Method: The BMI was calculated using the formula BMI= weight (kg)/ height2 (m)2. Vitamin D (25-hydroxyvitamin D), ferritin, T3, T4 and TSH levels were measured using the ELFA (Enzyme Linked Fluorescent Assay, Model: bioMérieux). the results were analysed using SPSS package (version 18).
Results: The results indicated that the age of participants played an ignorable role in this investigation, while significant increases (P<0.05) differences were noticed between the patients and controls in terms of BMI, 25(OH) vit D, ferritin, TSH, T3 and T4. There was also a significant difference(P<0.05) between male and female patients in terms of ferritin, TSH, T3 and T4 in comparison with the controls.
Conclusion: The low levels of Vitamin D and Ferritin concentration were associated with the Patients of hypothyroidism .

Keywords: Hypothyroid; 25(OH) vit D; ferritin; TSH,BMI.

I. INTRODUCTION

Thyroid hormones are essential and have various effects. For instance, they maintain normal growth and regulate metabolism. Therefore, hypothyroid patients usually suffer from fatigue and cold, and easily gain weight due to their altered metabolism [1]. There are two thyroid hormones in the human body, Thyroxin (T4) and triiodothyroxine (T3); these hormones are produced in the thyroid gland [2]. The latter converts the iodine in food, in a series of reactions, into thyroid hormones. Although a disorder of the thyroid hormones, which is also known as hypothyroidism, can be easily diagnosed and treated, late diagnosis and consequently late treatment could cause adverse effects, such as slowed metabolism, and changes in the levels of serum ferritin and vitamin D [3]. 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 [4]. 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 [5]. It is estimated that hypothyroidism occurs in from 3.8% to 4.6% of the world's population [6]. 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% [7]. 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 [8]. Thyroperoxidase enzyme, which is a thyroid hormone, plays an important role in the synthetisation of thyroid hormones [9]. 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 [10]. For example, both Takamatsu, Majima [11] and Sachdeva, Singh [10] have demonstrated that the thyroid profile is highly influenced by the ferritin levels. It is noteworthy to mention that ferritin is an iron storage protein, with a diameter ca 10–12 nm; it is essential for physiologic and pathologic activities [12].

Additionally, the literature indicates a relationship between vitamin D and the disorder of thyroid hormones. Vitamin D, which is produced in the skin, plays a major role in the balance of calcium and phosphate, and regulates the activity of many genes [13]. Vitamin D is divided into two types: cholecalciferol (D3) and ergocalciferol (D2). The body synthesises D3 in the skin during exposure to ultraviolet radiation, or it can be obtained from food such as fatty fish. D2 can be obtained from different foods, again such as fatty fish. Both D2 and D3 are hydroxylated to 25-hydroxyvitamin D (25-OH-D3, or calcidiol) by the liver [14]. Several studies have indicated a relationship between the level of vitamin D and thyroid diseases [15].

In this context, a study has been carried out to investigate the association among thyroid disorder and the levels of both vitamin D and ferritin.

II. MATERIALS AND METHOD

Information taken from all patients and control groups sheets included: age, sex, and excluded patients with family background of thyroid disorder .The article involved 90 participants; were divided into two groups: healthy (controls) and hypothyroid patient groups, were living in Babylon Governorate, Iraq. They were examined at the laboratories of Marajan hospital and at Ibn al-Nafis specialist laboratory during the period of study (September 2017 to January 2018). 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, Model: bioMérieux). 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 18).

III. RESULTS

The obtained results showed that there was no relationship between the age of participants and the thyroid disorder, while significant increases (P<0.05)were observed at the levels of BMI and TSH in the hyperthyroid patients (BMI ± standard error) 31.48±0.56 kg/m2 ,(TSH± standard error) 0.56±11.82(µu/ml)compared with healthy groups the rest of the studied parameters showed Significant decrease (P<0.05, it has been found that the values of 25(OH) vit D, ferritin, T3 and T4 in the patients were(25(OH) vit D± standard error) 18.29±1.54, (ng/ml),(ferritin± standard error) 24.46±1.90 ng/ml,(T3± standard error) 1.18 ± 0.07nmol/L , (T4± standard error) 9.20 ± 0.18nmol/L. In contrast, the values of these parameters in the healthy people (controls) were 32.01 ±2.76, 33.16± 3.02, 3.60±0.12, 19.04± 0.66, respectively, as shown in Table 1.

Table 2 shows that the sex of the participants did not cause any a significant differences in the Age (years), BMI (kg/M2) and in the levels 25(OH) vit D (ng/ml) . However, a significant variation was observed in the levels of ferritin(ng/ml),Male (35.12±3.26), Female (18.14±1.25),TSH(µu/ml) Male (10.16±0.540, Female (12.80±0.79) , T3 (nmol/L) Male (1.11±0.11), Female (1.09±0.10)and T4(nmol/L) Male (9.57±0.20),Female (9.64±0.26) in patients comparison with the controls ferritin(ng/ml) male (51.44±4.85), Female (21.82±1.87), TSH(µu/ml) Male (2.02±0.23), Female(2.41±0.26) ,T3 (nmol/L) Male (3.72±0.19), Female (3.52±0.16), and T4(nmol/L) Male (20.32±1.53), Female (18.25±0.49).

Table 1: Comparison between Hypothyroid Patients and control subjects

Parameters	Controls (n=47) Mean±S.E	Patients (n=43) Mean±S.E	p- value
Age (years)	31.8±1.50	37.13±1.79	0.12
BMI (Kg/M^2)	23.94±0.39	31.48±0.56	**0.01**
25(OH) vit D (ng/ml)	32.01±2.76	18.29±1.54	**0.001**
Ferritin (ng/ml)	33.16±3.02	24.46±1.90	**0.003**
TSH (µu/ml)	2.26±0.18	11.82±0.56	**0.001**
T3 (nmol/L)	3.60±0.12	1.18±0.07	**0.005**
T4 (nmol/L)	19.04±0.66	9.20±0.18	**0.004**

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

Table 2: Comparison between hypothyroid patients and control subjects for both sex.

Parameters	Controls (Mean ±S.E)		Patients (Mean ±S.E)		p-value
	Male (n=18)	Female (n=29)	Male (n= 16)	Female (n=27)	
Age (years)	32.16±2.88	31.58±1.69	32.93±2.93	39.62±2.17	0.93
BMI (Kg/M2)	24.21±0.79	23.77±0.41	29.18±1.03	32.85±0.49	0.30
25(OH) vit D (ng/ml)	53.96±1.81	18.38±1.32	28.05±2.52	12.50±0.71	0.31
Ferritin (ng/ml)	51.44±4.85	21.82±1.87	35.12±3.26	18.14±1.25	0.03

TSH (µu/ml)	2.02±0.23	2.41±0.26	10.16±0.54	12.80±0.79	0.001
T3 (nmol/L)	3.72±0.190	3.52±0.16	1.11±0.11	1.09±0.10	0.05
T4 (nmol/L)	20.32±1.53	18.25±0.49	9.57±0.20	9.64±0.26	0.04

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

IV. DISCUSSION

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 [16].

The outcomes of the current study agree with those of [17], which indicated that deficiency of vitamin D is responsible for low thyroid hormones. Mackawy, Al-Ayed [18] found two facts, firstly the level of serum 25(OH) vit D in hypothyroid patients is less than its level in healthy people. Secondly, the authors noticed a clear correlation between serum 25(OH) vit D and TSH., which agrees with the results of Shilpa, Mishra [19] that showed a clear reduction in the level of vitamin D in hypothyroid patients (≤ 20 ng\ml). Additionally, the literature showed that treatment of the vitamin D deficiency in thyroid patients has enhanced thyroid functions [20]. The literature also indicated an inverse relationship between the levels of vitamin D and TSH [21].

In terms of patient gender, the obtained results indicated an ignorable correlation between the sex of the patient and the level of vitamin D. These results agree with those of Hashemipour, Larijani [22] that confirmed the absence of any relationship between the level of vit D and the sex of the patient. In contrast, both Fida [23] and Naeem, AlMohaimeed [24] stated that the decrease in the level of vit D serum in females was more than in males.

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 [25]. In addition, other factors such as age, obesity, and smoking could cause skin pigmentation, which in turn could decreases the synthetisation of vitamin D [26]. 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 [27] 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 [27],[28]. Additionally, hypothyroidism is related to the lack of serum ferritin, which means that the thyroid functions are influenced by the level of serum ferritin[10]. However, other studies have demonstrated that the thyroid performance is independent of the iron deficiency[29]. Akhter, Nahar [30] demonstrated that the changes in the status of thyroid hormones in iron-deficient patients could be attributed to the destruction in the activities of iron-dependent enzymes such as thyroid peroxidase that impairs thyroid hormone metabolism [30]. Additionally, Hess, Zimmermann [9] indicated that iron is an important part of the thyroid hormone function in the body cells and its lack causes poor of thyroid hormone, which in turn results in deficient metabolic activity of hypothyroid even in presence of normal FT3 levels.

V. REFERENCES

[1] Stenzel D, Huttner WB. Role of maternal thyroid hormones in the developing neocortex and during human evolution. Frontiers in neuroanatomy2013;7:19.
[2] Moreno M, de Lange P, Lombardi A, Silvestri E, Lanni A, Goglia F. Metabolic effects of thyroid hormone derivatives. Thyroid2008;18(2):239-53.
[3] Chaker L, Bianco A, Jonklaas J, Peeters R. Hypothyroidism. Lancet 2017;390(23).
[4] Zimmermann MB. Iodine deficiency. Endocrine reviews2009;30(4):376-408.
[5] Hadlow NC, Rothacker KM, Wardrop R, Brown SJ, Lim EM, Walsh JP. The relationship between TSH and free T4 in a large population is complex and nonlinear and differs by age and sex. The Journal of Clinical Endocrinology & Metabolism2013;98(7):2936-43.
[6] Leese G, Flynn R, Jung R, Macdonald T, Murphy M, Morris A. Increasing prevalence and incidence of thyroid disease in Tayside, Scotland: the Thyroid Epidemiology Audit and Research Study (TEARS). Clinical endocrinology2008;68(2):311-16.
[7] Caty SA, Marta OB, Jordi R, Leonardo G, Inaki G, Elisabeth M. Factors Associated with the Stability of Thyroid-stimulating Hormone Values in Hypothyroidism. Archives of Medicine2017;9(2:13).
[8] Melmed S. Williams textbook of endocrinology: Elsevier Health Sciences; 2016.
[9] Hess SY, Zimmermann MB, Arnold M, Langhans W, Hurrell RF. Iron deficiency anemia reduces thyroid peroxidase activity in rats. The Journal of nutrition2002;132(7):1951-55.
[10] Sachdeva A, Singh V, Malik I, Roy PS, Madaan H, Nair R. Association between serum ferritin and thyroid hormone profile in hypothyroidism. International Journal of Medical Science and Public Health2015;4(6):863-65.
[11] Takamatsu J, Majima M, Miki K, Kuma K, Mozai T. Serum ferritin as a marker of thyroid hormone action on peripheral tissues. The Journal of Clinical Endocrinology & Metabolism1985;61(4):672-76.
[12] Sarin M, Arora P, Mohapatra S. Association between Serum Ferritin and Thyroid profile in Radiologically proven patients with Goitre with Thyroiditis. The Journal of Community Health Management2017;4(2):50-52.
[13] Theil EC. Ferritin protein nanocages—The story. Nanotechnology perceptions2012;8(1):7.
[14] Knovich MA, Storey JA, Coffman LG, Torti SV, Torti FM. Ferritin for the clinician. Blood reviews2009;23(3):95-104.
[15] Yilmaz R, Ozkayit S. VITAMIN D DEFICIENCY AND CHRONIC WIDESPREAD PAIN. RHEUMATOLOGY2017.
[16] Makariou S, Liberopoulos EN, Elisaf M, Challa A. Novel roles of vitamin D in disease: what is new in 2011? European journal of internal medicine2011;22(4):355-62.
[17] Kmiec P, Sworczak K. Experimental and clinical endocrinology & diabetes : official journal, German Society of Endocrinology [and] German Diabetes Association. Official journal of German Society of Endocrinology [and] German Diabetes Association2015;7(123).
[18] Mackawy AMH, Al-Ayed BM, Al-Rashidi BM. Vitamin D deficiency and its association with thyroid disease. International journal of health sciences2013;7(3):267..
[19] Shilpa H, Mishra B, Yadav S. Vitamin D levels correlated with hypothyroidism in Indian population: a pilot study. Int J Rec Sci Res2014;5(5):984-7.
[20] Richards B. Low Vitamin D Contributes to Thyroid Problems. Health news2008.

[21] Muscogiuri G, Tirabassi G, Bizzaro G, Orio F, Paschou S, Vryonidou A et al. Vitamin D and thyroid disease: to D or not to D? European journal of clinical nutrition2015;69(3):291
[22] Hashemipour S, Larijani B, Adibi H, Javadi E, Sedaghat M, Pajouhi M et al. Vitamin D deficiency and causative factors in the population of Tehran. BMC Public health2004;4(1):38.
[23] Fida NM. Assessment of nutritional rickets in Western Saudi Arabia. Saudi medical journal2003;24(4):337-40.
[24] Naeem Z, AlMohaimeed A, Sharaf FK, Ismail H, Shaukat F, Inam SB. Vitamin D status among population of Qassim region, Saudi Arabia. International journal of health sciences2011;5(2):116.
[25] Kim D. Low vitamin D status is associated with hypothyroid Hashimoto's thyroiditis. Hormones (Athens, Greece)2016;15(3):385-93.
[26] 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. Endocrine practice2003;9(6):517-21.
[27] Talaei A, Ghorbani F, Naseri P, Chehrea A. The Study the Effect of Vitamin D on Hypothyroidism. ISMJ2017;20(3):301-07.
[28] Sonawane S, Bora B, Shrikhande D, Bansal S, Kumar P. Vitamin D deficiency and its association with thyroid diseases. International Journal of Contemporary Medical Research2017;4(8):1765-67.
[29] Mohammed A, Kamal; Mokif Th, Abdulmahdi; Hadwan M, Hussein. The effect of Morbid Obesity on the Liver Function Enzymes. Journal of Research J. Pharm. and Tech2019; 12, (5), : 2241-2244.
[30] Yavuz Ö, Yavuz T, Kahraman C, Yeşildal N, Bundak R. The relationship between iron status and thyroid hormones in adolescents living in an iodine deficient area. Journal of Pediatric Endocrinology and Metabolism2004;17(10):144343-50.
[31] Akhter S, Nahar Z, Parvin S, Alam A, Sharmin S, Arslan M. Thyroid status in patients with low serum ferritin level. Bangladesh Journal of Medical Biochemistry2012;5(1):5-11.