

# Verification of vitamin D levels and the influence of primary hyperthyroidism in a sample of Iraqi patients

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## ABSTRACT

**Background:** Hyperthyroidism can influence the metabolism and regulation of various essential nutrients, including vitamin D. Thyroid dysfunction is often associated with altered serum levels of vitamin D, potentially contributing to further metabolic complications. **Aim:** This study aims to investigate the relationship between thyroid hormone levels and vitamin D status in Iraqi patients diagnosed with hyperthyroidism. **Methodology:** A total of 50 patients with hyperthyroidism (23 males and 27 females), aged 20 to 72 years, attending the endocrinology clinic at Baghdad Medical City were included in this study. A control group consisting of 20 healthy individuals was also enrolled. Demographic data including age, gender, and body mass index (BMI) were recorded. Serum levels of thyroid hormones (T3, T4, and TSH) and vitamin D were measured and statistically analyzed. **Results:** Patients with hyperthyroidism showed significantly elevated levels of T3 and T4 ( $p < 0.05$ ) compared to the control group. In contrast, vitamin D levels were significantly lower in the hyperthyroid group ( $p < 0.001$ ). A significant negative correlation was observed between vitamin D levels and both T3 and T4. Conversely, vitamin D demonstrated a positive correlation with TSH levels. **Conclusion:** Hyperthyroidism is associated with reduced vitamin D levels, which may contribute to or worsen the clinical manifestations of vitamin D deficiency. Additionally, vitamin D deficiency may further aggravate thyroid dysfunction. The findings also highlight a higher prevalence of thyroid disorders among females compared to males.

## KEYWORDS

primary hyperthyroidism, thyroid stimulating hormone, vitamin D3, triiodothyronine, thyroxine

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## 1. INTRODUCTION

Hyperthyroidism is a hormonal disorder in the production of thyroid hormone, which causes an excessive metabolism and thus thyrotoxicosis. Hyperthyroidism is associated with a significant increase in triiodothyronine (T3) levels, and severe hyperthyroidism constitutes about 85-90% of cases, such cases can be treated by relieving symptoms such as radioactive iodine, and thyroidectomy may be required because these cases are related to the production of thyroid hormones, the measurement of the thyroid-stimulating hormone

TSH level is the most reliable test in diagnosing hyperthyroidism [1]. Hypothyroidism denotes a deficiency in thyroid hormone production stemming from an underlying endocrine disorder, primarily characterized by insufficient thyroid hormone synthesis by the thyroid gland, this insufficiency can result from diminished thyroid stimulation due to low levels of TSH secreted by the pituitary gland, Vitamin D, a lipo steroid compound, is soluble in fat and plays a crucial role in facilitating the absorption of essential minerals such as calcium, magnesium, and phosphorus from the intestines, while also exerting various biological effects in humans, Recent evidence suggests an association between vitamin D levels and thyroid function, Studies show significantly lower vitamin D levels in patients with hyperthyroidism compared to healthy individuals [2]. Studies suggest that this relationship may be influenced by multiple factors including age, gender, dietary habits, and body mass index, as well as seasonal effects [3].

The aim of this study is to investigate the association between serum vitamin D levels and thyroid function, particularly in patients with hyperthyroidism. The study seeks to evaluate whether there is a statistically significant difference in vitamin D status between hyperthyroid patients and healthy controls, and to explore the potential factors influencing this relationship.

## 2. METHODOLOGY

### 2.1. Study subjects

Seventy Iraqi participants (33 males and 37 females) participated in this study while attending the Endocrinology and Diabetes Consultation / Medical City in Baghdad. The mean age of the participants ranged from 20-72 years. The participants were divided into two groups, the first group of hyperthyroid patients (23 males and 27 females) and the second group, the control group (10 males and 10 females). The descriptive data of the patients such as age, gender, height, and weight were recorded to calculate the body mass index. Consent was obtained from all participants before conducting the study.

### 2.2. Statistical analysis

The collected data were analyzed utilizing the statistical software packages SPSS (Ver.28) by IBM and GraphPad Prism (Ver.8). The statistical analyses involved employing an independent t-test and One-way Anavo to determine p-values. Furthermore, the Pearson correlation coefficient was utilized to assess the relationship between Vitamin D

and the parameters under investigation. The results were expressed as Mean and SE [4].

### 2.3. Ethical consent

The College Science Research Ethics Committee has approved the research proposal to be conducted in its presented form. None of the investigators or co-investigators participating in this study took part in the decision-making or voting procedures related to this approval.

The College Science Research Ethics Committee expects to be informed about the progress of the study, any serious adverse events occurring during the course of the study, any revisions to the protocol, and any updates to patient information or informed consent, in accordance with reference number Ref: CSEC/0921/0053, dated September 20, 2023.

## 3. RESULTS

The levels of vitamin D3 in the studied groups, Statistically, there was a significant ( $p < 0.001$ ) decrease in vitamin D3 levels ( $14.01 \pm 1.0448$  1.9 ng/dL) in patients with hyperthyroidism when compared with the control group ( $39.2 \pm 2.54$  ng/dL), are shown in Figure 1.

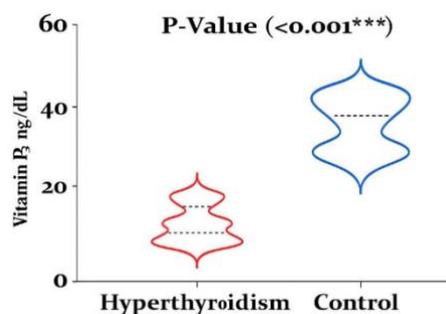


Figure 1. Levels of vitamin D3 in the studied subjects.

## 4. DISCUSSION

The current study findings elevated levels of T3 and T4 cause a decrease in TSH levels by affecting the anterior pituitary gland through inhibiting the secretion of thyrotropin-releasing hormone (TRH) via negative feedback inhibition, Consequently, this reduces the secretion of TSH from the pituitary gland due to excessive thyroid gland activity, A decrease in TSH level is considered a key indicator in diagnosing hyperthyroidism and Graves' disease, especially when accompanied by symptoms suggestive of such conditions, as indi-

cated by a study conducted by Altahir, W.H., *et al* [5]. A previous study done by Fadel, B.M., *et al*. [6]. on the initiation of hyperthyroidism is normally accompanied by a substantial decrease in TSH and a further increase in T3, T4 levels. These findings align with current research, which has shown a marked elevation in thyroid hormone levels among individuals with hyperthyroidism compared to control groups. This increase may be attributed to excessive iodine intake, thyroiditis, or elevated production of synthetic thyroid hormones by the thyroid gland. [7]. The current study results revealed a significant decrease in vitamin D levels among patients compared to the control group. It is believed that this may be due to the influence of vitamin D receptors on the thyroid gland disorder, consistent with the findings of Wang, J., *et al*. [8]. The effect of thyroid antibodies was evident on the level of vitamin D that appeared in this study in the case of Graves' disease, which contribute to vitamin D deficiency and may lead to a cardiovascular disease with similar results were reported by other authors Vieira, I.H., *et al*. [9]. Additionally, hyperthyroidism can also affect vitamin D levels by influencing the parathyroid hormone (PTH) as it is parathyroid glands are attached anatomically to the opposite surface of thyroid gland. Since PTH is crucial in maintaining vitamin D levels, it can be affected by this thyroid disorder [10].

## 5. CONCLUSION

In conclusion, the risk of hyperthyroidism lies in its impact on vitamin D levels, which can exacerbate complications associated with vitamin D deficiency. Furthermore, vitamin D deficiency can exacerbate thyroid disorders, and the prevalence of thyroid disorders is more common in women compared to men.

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## CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

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