Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/rajxds57

THYROID DYSFUNCTIONS AND VITAMIN D DEFICIENCY AMONGST FEMALES

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Abstract

Background: The thyroid gland is a vital gland that is essential for promoting normal growth, regulating metabolism, promoting vitamin requirements, phosphorus and calcium metabolism. **Objective:** The aim of this study was to determine the prevalence of thyroid dysfunction and vitamin D deficiency in females.

Materials and method: The current cross- sectional study was carried out at the department of Department of medicine Type C hospital city karak from May 2023 to May 2024. A total of 85 female participants with thyroid gland dysfunction of different age groups were examined for vitamin D deficiency. Venous blood was taken from the individuals. Within 12 hours of collection, specimens were examined using an electrochemiluminescence immunoassay (Roche Diagnostics, Indianapolis, Germany). Data were input into SPSS version 25.0. The Chi Square test was used to analyze categorical data.

Results: In the current study, vitamin D levels and thyroid profiles were assessed in female participants. T3 level was measured and it was found that 5 (5.8%) had excessive levels. T3 decreased level was not seen in any participant. Of the total number of examined females, 8 (9.41%) had TSH levels less than 0.4 µIU/ml, whereas 61 (71.76%) had normal TSH levels. It was found that 70% of the study participants who had their thyroid profiles tested had normal thyroid profiles. However, it was shown that 20% of females had hypothyroidism and 10% had hyperthyroidism. The number of cases of females with vitamin D deficiency was 70.58%. When thyroid dysfunction and vitamin D deficiency were linked, it was shown that vitamin D levels were not significantly ($p = 0.35$) associated with hypothyroidism.

Conclusion: Hypothyroidism was most prevalent (20%) in tested female's population while 10% of them got hyperthyroidism. In addition, the majority of females (70.58%) were vitamin D deficient. There was no significant association between vitamin D deficiency and thyroid dysfunction.

Key words: Thyroid dysfunctions; Vitamin D deficiency; Females

Introduction

The thyroid gland is located in front of the neck, between the C5 and T1 vertebrae. It is present below the sternohyoid, platysma, and sternothyroid muscles and its weight is from 15 to 20 grams. As Compared to males the weight of this gland is less in female while in infants it weight is 1 gram and increase with age. The thyroid gland is a parenchymal structure that is delicate, red-colored, and

shaped like an H.[1] Thyroid gland has two lobes which are connected by isthmus. Thyroid follicle or acinus is the secretory unit of thyroid gland. Each follicle's outer layer is composed of thyroglobulin (Tg) and contains epithelial cells as well as an amorphous substance called colloid. Some significant processes, including the production of thyroid hormone via iodination and hormone secretion, occur in colloid near the surface of epithelial cells. Thyroid gland also has C cells, or parafollicular cells. A polypeptide hormone called calcitonin is produces by these cells. These cells are found only in the basement lamina or in clusters in the interfollicular gaps.[2] The thyroid gland is a vital gland that is essential for promoting normal growth and the central nervous system (CNS), regulating metabolism, promoting vitamin requirements, phosphorus and calcium metabolism, promoting sexual metabolism, increasing mitochondrial metabolism, boosting adrenergic activity with myocardial contractility, and increasing heart rate.[2] One of the major global health concerns of this day is the deficiency of calcium and vitamin D. A significant portion of the global population lacks adequate amounts of calcium or vitamin D.[3] Hypothyroidism and hyperthyroidism are two disorders involving the thyroid gland. The decrease in thyroid hormone secretion and production is known as hypothyroidism. This prevalent condition occurs in both types mild and serious in 2% and 15% populations. Compared to women, males are less affected, and as people age, both genders suffer more frequently. Numerous defects in the anatomy and physiology of the thyroid gland can result in a thyroid hormone deficiency[2]. Especially, vitamin D is essential for the maintenance of strong, healthy bones. It is also necessary for the organs, including the heart, brain, muscles, and lungs, to work properly. In order to fight infectious organisms, it strengthens the immune system. The body obtains its vitamin D from outside sources. It converts from inactive vitamin D into calcitriol, also known as activated vitamin D. additionally, in order to absorb minerals like calcium and phosphorus, vitamin D is necessary.[4] The range of normal vitamin D levels is 30 to 100 ng/ml. If the amount of vitamin D is less than 12 ng/ml, it is considered a critical insufficient level of vitamin D. A level between 20 and 29 ng/mL is considered deficient. Vitamin D and circulating thyroid hormone are attached on identical receptors called steroid hormone receptors.[5] There are two factors that explain why vitamin D levels are lower in hypothyroid patients. Two of these processes are the inadequate activation of vitamin D and the malabsorption of vitamin D in the gastrointestinal tract. Patients with Grave's disease have low amounts of vitamin D in their bodies. The level of vitamin D and vitamin D malabsorption in the intestinal tract can influence the onset or development of certain autoimmune disorders. Additionally, vitamin D supplementation is essential for preventing a number of auto immune diseases in people.[6] The level of vitamin D does not directly influence the quantity of thyroid hormone, which can result in either hyperthyroidism or hypothyroidism. A more realistic explanation for this occurrence seems to be immune-regulation. In the control of cytokines and tumor necrosis factor, vitamin D is essential for the development of autoimmune thyroid disease. A statistical study revealed a correlation between a lower blood vitamin D level and the onset of postpartum thyroiditis (PPT). Though it did not connect with thyroid hormone levels or the thyroid peroxidase antibody (TPOAb) and thyroglobulin antibody (TgAb) titers, vitamin D deficiency may be a contributing factor to the advancement of AITD.[6] The development of AITD is connected to the highest vitamin D level. The thyroid reactive antibodies (TRAb) titer in GD fluctuates with vitamin D level. In individuals with GD, there is no significant correlation seen between vitamin D and thyroid antibody titers.[7] The vitamin D receptor has been shown to have a distinct gene. It suggested that individuals are prone to Grave's disease and Hashimoto thyroiditis. Vitamin D binds to the vitamin D receptor (VDR), activating the genes that are receptive to the receptor and producing its effects. Nonetheless, VDR gene polymorphism may be linked to autoimmune thyroid disorders (AITDs).[8] Vitamin D deficiency has been seen to occur much more frequently in people with AITDs than in healthy individuals. Low levels of vitamin D have been linked to a higher frequency of autoimmune conditions, such as systemic lupus erythematous, rheumatoid arthritis, and type 1 diabetes mellitus (T1DM).[8] Variations in latitude contribute to a number of autoimmune diseases. As vitamin D levels rise, the incidence of multiple sclerosis (MS) decreases; the risk of MS is lower in sunny areas. There is a clear correlation between latitude and the prevalence of type 1 diabetes mellitus (T1DM). It was shown that a lower consumption of vitamin D supplementation and less sun exposure in early life were associated with

an increased incidence of type 1 diabetic mellitus (T1DM).[8] Cyclosporine and vitamin D supplementation can stop the stimulation of experimental autoimmune thyroiditis. There was considerable variation in thyroid function based on demographic factors. Hashimoto's thyroiditis and Graves' disease are characterized by a prominent T-lymphocyte infiltration of the thyroid gland.[9] Another possible cause might be that individuals with hyperthyroidism have a greater loss of calcium from their bones. Elevated calcium levels in the plasma were the result, but the calcium level did not affect parathyroid hormone or activate vitamin D production. There is a larger correlation between vitamin D and hypothyroidism than between hyperthyroidism. On the other hand, thyroid dysfunction is mostly caused by a vitamin D deficient diet.[10] The aim of this study was to determine the prevalence of thyroid dysfunction and vitamin D deficiency in females.

Material and method

The current cross- sectional study was carried out at the department of Department of medicine Type C hospital city karak from May 2023 to May 2024 after taking permission from the ethical committee of the institute. In the present study, female patients with thyroid dysfunction were included while Male patients and children were excluded. A total of 85 female participants with thyroid gland dysfunction of different age groups were examined for vitamin D deficiency. Venous blood was taken in an aseptic approach from the individual and placed in 3.5 ml gel vials. Serums were extracted from each sample after it was centrifuged for five minutes at 4,000 revolutions per minute. Once the serum was separated, the samples were brought into the lab. Within 12 hours of collection, specimens were examined using an electrochemiluminescence immunoassay (Roche Diagnostics, Indianapolis, Germany).

Data analysis

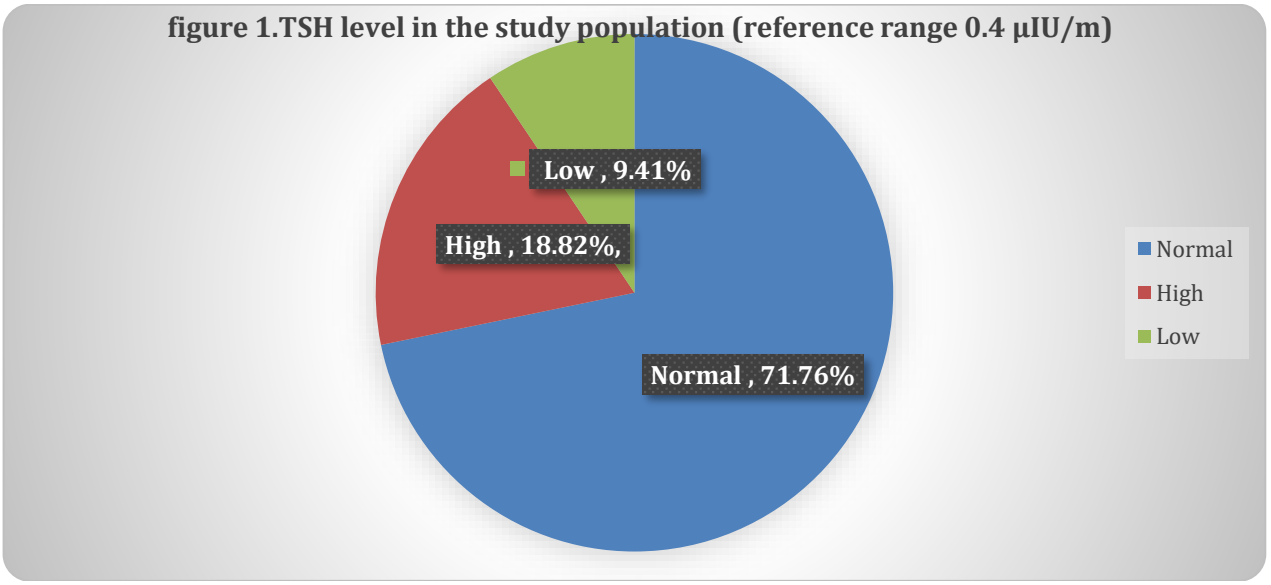
Data were input into SPSS version 25.0. The Chi Square test was used to analyze categorical data (degree of freedom = 0.5).

Results

In the current study, vitamin D levels and thyroid profiles were assessed in female participants. Blood samples were collected from a total of 85 females for the evaluation of thyroid profile and vitamin D level. These participants were classified in to 7 different aged groups **(table 1).** Of the total number of examined females, 8 (9.41%) had TSH levels less than 0.4 µIU/ml, whereas 61 (71.76%) had normal TSH levels. On the other side, 16 (18.82%) had unusually high TSH levels **Fig (1).** After the T3 level was measured, it was found that, 80 (94.1%) had normal levels, while 5 (5.8%) had excessive levels. T3 decreased level was not seen in any participant. Upon testing the T4 levels of the chosen female population, it was found that 8 (9.41%) of the females had low levels, 59 (69.41%) had normal levels, and 18 (21.17%) had high levels. Participants with serum TSH levels greater than 5.5 mIU, T3 levels less than 2.4 pg/ml, and T4 levels less than 0.61 ng/dl were classified as hypothyroid, whereas those with serum TSH levels less than 0.4 mIU, T3 levels greater than 3.8 pg/ml, and T4 levels greater than 1.1 ng/dl were classified as hyperthyroid. After evaluating the data, it was found that 70% of the study participants who had their thyroid profiles tested had normal thyroid profiles. Nonetheless, it was shown that 20% of females had hypothyroidism and 10% had hyperthyroidism.(**figure 2)** Of the 17 (20%) cases of hypothyroidism that were documented, 7 had moderate (subclinical) hypothyroidism, 2 had non-thyroidal disease, and 8 had unusual pituitary hypothyroidism. In the age group of 71–80 years and the age group of 11–20 years, not a single case was found when the findings were analyzed based on the number of thyroid abnormalities and age groups. However, the group (41–50 years) had the highest number of cases, followed by the groups (31–40 years) and (61–70 years) as represented in **table2.** The vitamin D levels were also evaluated. If the vitamin D level was less than 12 ng/ml, it was considered to be a sign of severe vitamin D deficiency. A level of vitamin D between 20 and 29 ng/mL was regarded to be deficient. Only 25 (29.41%) of the 85 female participants had normal blood levels of vitamin D. The number of cases of females with vitamin D deficiency was 60 (70.58%). When thyroid dysfunction and vitamin D

deficiency were linked, it was shown that vitamin D levels were not significantly (p = 0.35) associated with hypothyroidism.

Table 1. Age distribution of females examined for vitamin D and thyroid profile n= 85		
Serial number	Age in years	Number of individuals
1	11-20	6
2	21-30	20
3	31-40	22
4	41-50	14
5	51-60	10
6	61-70	12
7	71-80	1



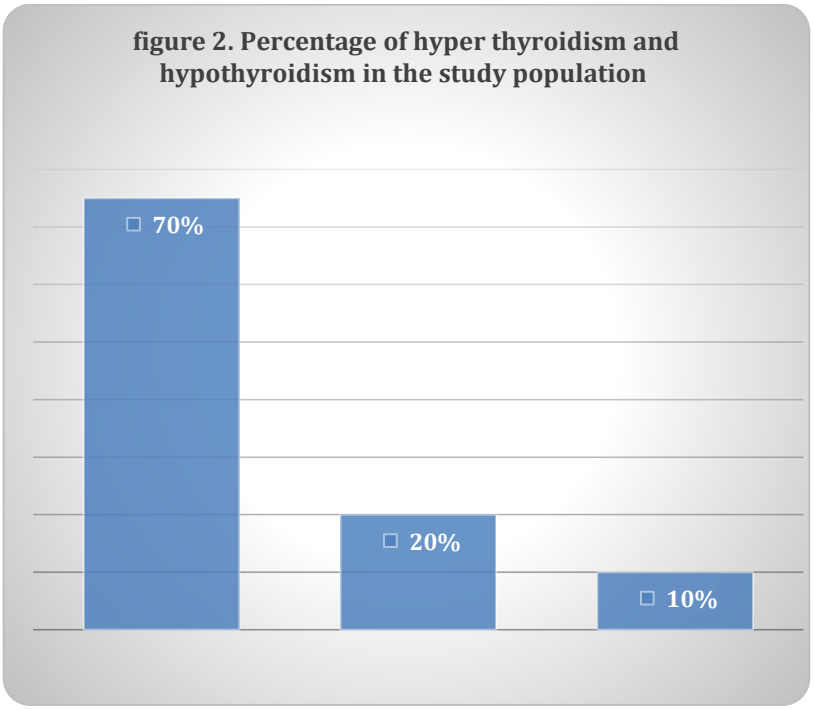
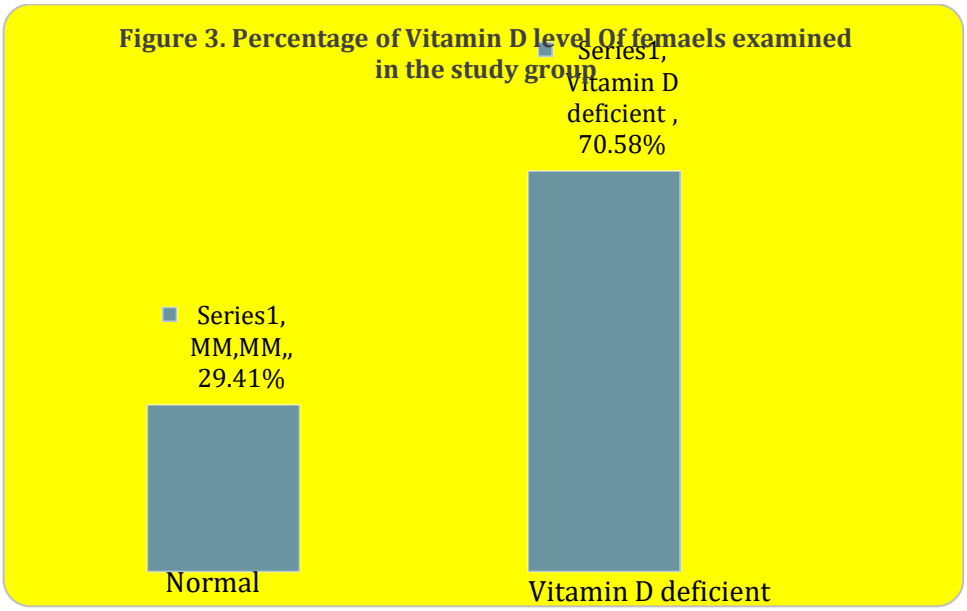


Table 2.Number of cases of hypothyroidism and hyperthyroidism according to age groups		
Age in years	Hypothyroidism	Hyperthyroidism
11-20	0%	0%
21-30	5%	4%
31-40	25%	26
41-50	50%	52
51-60	5%	3%
61-70	15%	15
71-80	0%	



Discussion

The majority of cases in the current study were found to have hypothyroidism, and the age group most affected was females between the ages of 41 and 50(50%). In the same way, Mammen et al. also suggested that higher levels of TSH were seen in elderly individuals. It have been suggested that changes in thyroid and pituitary events, as well as ageing, might be the cause of variations in thyroid examination.[11] In contrast, a research carried out in China found that, regardless of thyroid diseases blood thyrotropin levels, or TSH levels, increased as individuals older. In correlation with elevated TSH levels, females and older individuals have low T3 and T3/T4 ratios, whereas FT4 readings stay normal. With ageing, the TSH levels of both males and females changed gradually.[12]

There are two factors that explain why vitamin D levels are lower in hypothyroid patients. Two processes contributing to this issue are the inadequate activation of vitamin D and the malabsorption of vitamin D in the intestinal tract. Individuals with Grave's disease have inadequate levels of vitamin D in their bodies. Numerous autoimmune disorders can develop or rise up at different times depending on one's vitamin D level and intestinal malabsorption of vitamin D. Additionally, vitamin D supplementation is essential for preventing a number of autoimmune illnesses in people.[6] According to recent studies, vitamin D has an impact on Grave's disease (GD) as well as the vitamin D binding protein gene plays a part in GD. Vitamin D decreased the inflammatory reactions produced by human thyroid cells & T cells.[13] It has been suggested that there is a positive correlation between the degree and severity of hypothyroidism and blood calcium levels and vitamin D deficiencies.[14] AITD and HT, particularly overt hypothyroidism, have been linked to vitamin D deficiency. High blood TSH levels were shown to be independently correlated with low serum vitamin D levels.[15] Patients with Hashimoto's thyroiditis (HT) have lower activated vitamin D levels, and their TSH levels can fluctuate on their own. The concentration of vitamin D was negatively correlated with TSH levels. The level

of vitamin D was positively correlated with both FT4 and FT3 levels.[16] A study by Mackawy et al. found that patients with hypothyroidism had low vitamin D levels. The results of the study revealed a negative relationship with TSH level and a positive correlation with vitamin D. Low levels of vitamin D was shown to be correlated with the degree of hypothyroidism.[17]

Conclusion

Hypothyroidism was most prevalent (20%) in tested female's population while 10% of them got hyperthyroidism. In addition, the majority of females (70.58%) were vitamin D deficient. There was no significant association between vitamin D deficiency and thyroid dysfunction.

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