IJFANS INTERNATIONAL JOURNAL OF FOOD AND NUTRITIONAL SCIENCES
ISSN PRINT 2319 1775 Online 2320 7876
 Journal UGC CARE Listed (Group-I) Volume 11, Iss 05 2022

INVESTIGATION OF SERUM CALCIUM, VITAMIN D WITH THYROID HORMONES AND BMD IN HYPOTHYROID AND EUTHYROID PATIENTS

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Abstract

The emergence of bones-related pathologies and anomalies due to nutritional, bone, and metabolic mineral inadequacies is a major concern for the nation's health. The objective of this research is to compare the bone mineral density (BMD), blood the mineral calcium, and blood vitamin D levels in underweight and a healthy thyroid individual in relation to their thyroid hormones. The concentration of calcium in the blood was measured using the Arsenazo III Procedure. We looked at how the thyroid hormones affected a number of different factors. Statistical significance was defined as a p-value less than 0.05. The entire calculation was executed through the software for statistical calculations SPSS 21, a product of IBM USA. In individuals with normal thyroid function, there had been a beneficial relationship between vitamin D consumption and both "T3 ($r2= 0.04$, $p<0.01$)" as well as "FT4 ($r2= 0.1$, $p<0.01$)." Vitamin D and bone mineral density (BMD) at the collarbone region were shown to be significantly correlated "($r2= 0.008$, $p<0.05$)" in the present study. Vitamin D level and urinary calcium levels were found to be positively correlated, according to the data. "($r2= 0.56$, $p<0.01$)".

Keywords: Thyroid, Serum calcium, Vitamin D, Hypothyroid, Euthyroid

1. Introduction

Thyroid issues are perhaps among the most common medical conditions globally (Choi et al., 2018), and India is no exception (Hou et al., 2020). Multipleresearch on the topic have reached the same conclusion: over 42 million people in India suffer from thyroid disorders (Joshi et al., 2019). Hypothyroidism and hyperthyroidism are the main thyroid diseases that affect basal rates of metabolism (Mense and Boorman et al., 2018). The effects of this disruption, however, show themselves in many different organs as different symptoms (Suljic et al., 2018). Such abnormalities in the thyroid gland's functioning may have an effect on the dental health of those who suffer from thyroid problems. (Liu et al., 2020).

Radiogrammetry, biochemical procedures, radiographic absorptiometry, etc x-rays are among the many ways that bone health may be assessed (Nguyen et al., 2018). However, most of these procedures and approaches may only give you a rough idea of how healthy your bones are (Hu et al., 2018). On the other hand, determining the quantity of bone and its exact condition is best accomplished by measuring the quantity of bone (Kimura, 2018). One of the most recognized and trustworthy indicators of bone health status is "bone mineral density (BMD) (Czigléczki et al., 2018). Predicting bone health issues like osteopenia and fractures is possible with high accuracy using bone mineral density (BMD) (Formenti et al., 2019)." According to Chong et al. (2020), the best way to determine the likelihood of fractures is to assess the bone mass. This

study aims to assess bone mineral density (BMD), blood calcium, and vitamin D levels in both underweight and a healthy thyroid individual by means of the hormones produced by.

2. Material and method

"The study group was composed of both male and female subjects, with ages ranging from 18 to 60 years. The sample population was partitioned into three categories. Group I consisted of 151 hypothyroid patients, including 57 males and 94 females. Group II contained 100 euthyroid subjects (25 males and 75 females), and Group III contained 210 hyperthyroid patients, including 77 males and 133 females."

"The research work was started after approval of the ethical committee in July 2019 to December 2020."

DXA bone Scan - This is to measure the hip and lumbar spine bone mineral content (BMD). This study made use of a DEXA device using the Hologic Insight QDR series. When it came to diagnosing and tracking variations in the density of your bones, the T-score and BMD were the gold standards.

The Arsenazo III methodology was employed to determine the serum sodium level. When a pH of neutral, sodium forms a blue mixture with arsenazo lll. A sample's color percentage is directly linked to its calcium content.

ELISA chemical method - The microtiter plate was pre-coated with an antibody specific to Vitamin D and was made available in kit 44.

Individuals included in the research had initial characteristics such as indicated as "Mean+/- SEM (Standard Error of Mean)". When comparing the three teams' baseline features, a one-way ANOVA was used. A student t-test without paired data was used to examine the thyroid's impact on different categories. "The hormones found in the thyroid were examined in relation to BMI, the levels of calcium in the and the thickness of bones (3D) using the test for Pearson correlation on every data point and within the various groups."

3. Result and Discussion

Table 1: "Correlation of serum calcium, vitamin D with thyroid hormones and BMD in hypothyroid patients"

	Serum Calcium		Vitamin D	
	r	**p**	**r**	**p**
TSH	-0.55	<0.01	-0.48	<0.01
T3	0.18	<0.01 0.2 <0.01		
FT4	0.32	<0.01	0.33	<0.01
Serum Calcium	--	--	0.75	<0.01
Vitamin D	0.75	<0.01	--	--
BMD femoral	0.11	>0.05	0.09	<0.05
BMD lumbar vertebra	0.21	<0.05	0.11	<0.05

"Values are denoted as TSH (thyroid stimulating hormone).

Triidothyronine is represented by T3, while free throxine is represented by FT4. BMD is the bone mineral density ($p < 0.01$). The Pearson correlation coefficient for serum calcium and vitamin D with thyroid hormones and BMD is illustrated in Table 1. The table clearly demonstrates a negative correlation between serum calcium and TSH ($r2= 0.27$, $p<0.01$). There was a positive correlation between serum calcium and T3 ($r2= 0.03$, $p<0.01$) and FT4 ($r2= 0.1$, $p<0.01$).

Additionally, there was an insignificant correlation ($r2= 0.01$, $p>0.05$) between serum calcium and BMD at the femoral neck. Nevertheless, a substantial positive correlation was observed between calcium and BMD at the lumbar vertebra ($r2= 0.23$, $p<0.01$). In addition, the results indicated that vitamin D was negatively correlated with TSH ($r2= 0.27$, $p<0.01$) in euthyroid subjects. Additionally, there was a substantial positive correlation between vitamin D and BMD at the lumbar vertebra ($r2= 0.01$, $p<0.05$) in euthyroid subjects. (Table 2) Subjects who are euthyroid. There was a positive correlation between vitamin D and T3 ($r2= 0.04$, $p<0.01$) and FT4 ($r2= 0.1$, $p<0.01$) in euthyroid subjects. The results of the current study indicated a substantial correlation ($r2= 0.008$, $p<0.05$) between BMD at the femoral neck and vitamin D. Additionally, there was a substantial positive correlation between vitamin D and BMD at the lumbar vertebra ($r2= 0.01$, $p<0.05$) in euthyroid subjects (Table 2)."

Table 2- "Correlation of serum calcium, vitamin D with thyroid hormones and BMD in euthyroid subjects."

	Serum Calcium		Vitamin D	
	r	P	r	P
TSH	0.05	<0.05		<0.01
T3	0.005	<0.05		<0.01
FT4	-.20	<0.05		<0.01
Serum Calcium	--	--		<0.01
Vitamin D	0.32	<0.01		--
BMD femoral	0.46	<0.01		<0.05
BMD lumbar vertebra	0.26	<0.01		<0.05

"Values are expressed as, TSH = thyroid stimulating hormoneT3 = triidothyronine, FT4 = free throxine. BMD = Bone mineral density ($p <0.01$)".

Table 3: "Comparison of difference between intragroup I& II female hypothyroid and difference between intragroup I & II male hypothyroid"

Parameters	Female	Male	t value	p value
BMD (FN)	0.033±0.02	0.05±0.004	6.33	<0.0001***
BMD (LV)	0.028±0.027	0.029±0.01	0.26	<0.788NS
Serum Calcium	1.29±0.48	0.81±0.28	6.86	<0.0001***
Vitamin D	18.48±3.74	27.96±6.88	10.96	<0.0001***

"The values are denoted as BMD (FN) for bone mineral density in the femoral neck and BMD (LV) for bone mineral density in the lumbar vertebrae. NS denotes non-significant, and *** indicates very highly significant ($p <0.0001$)."

Once the variation between the group of I female thyroid dysfunction clients and group II female thyroid-free people was evaluated, Table 3 shows that there was actually a significantly different trend in BMD at the ankle joint comparing male and female recipients of hypothyroid medication.

4. Conclusion

In addition, there was no meaningful difference between male and female hypothyroid individuals with regard to BMD at the thoracic vertebra. When comparing male and female low thyroid levels patients, the difference in blood levels of calcium was more noticeable in the former. As well, male underweight individuals had a more noticeable differential in thyroid hormone levels compared to female people with the disorder.

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