

IMPACT OF HYPO AND HYPERTHYROIDISM ON SERUM LEVEL OF CALCIUM, PHOSPHORUS AND MAGNESIUM IN SUDANESE PATIENTS IN KHARTOUM STATE

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ABSTRACT

Background: Thyroid hormones exert their effect on all tissue and modulate the rate of metabolic activity. The role of thyroid hormones on mineral metabolism is not well understood and the underlying mechanism too. The present study was undertaken to assess and analyze the alterations of the levels of serum calcium, phosphorous and magnesium and their relation with T3, T4 and TSH in hyper and hypothyroid patients. **Materials and methods:** in this case control study, 50 apparently healthy individuals and 100 patients (50 hyper and 50 hypothyroidism) were included. Serum calcium, phosphorous and magnesium levels were estimated by colorimetric method. **Results:** the levels of Calcium was significantly decreased in hypothyroidism Patients compared to control group (Mean±SD:8.08±0.95, p.value:0,00). and was significantly increased in hyperthyroidism patients compared to control group (Mean±SD:11.67±1.4, p.value:0,00). The levels of phosphorous was significantly increased in hypothyroidism Patients compared to control group (Mean±SD:4.61±0.5, p.value:0,00) and was significantly decreased in hyperthyroidism patients compared to control group (Mean±SD:1.94±0.6,p.value:0,00). The levels of Magnesium was significantly decreased in hypothyroidism Patients compared to control group (Mean±SD:1.74±0.5, p.value:0,00). and was significantly increased in hyperthyroidism patients compared to control group (Mean±SD:2.95±0.9,p.value:0,00). **In conclusion:** In hyperthyroidism Calcium and Magnesium are elevated and Phosphorous is decreased, while in hypothyroidism Calcium and Magnesium is decreased and phosphorus is increased.

KEYWORDS: Thyroid disorders, minerals, hypothyroidism, hyperthyroidism, Sudanese.

1. INTRODUCTION

The thyroid gland is a butterfly-shaped organ located in the base of your neck. It releases hormones that control metabolism—the way your body uses energy. Thyroid gland produce T3 and T4 these hormone intervention in number of vital function in the body such as metabolism including regulation of lipid, Carbohydrate, protein and mineral metabolism and also have role in normal growth and maturation of the skeleton^{[1],[2]} Thyroid dysfunction is group of disorders that affect the thyroid some of them have a companion change in structure and function, others have no effect. Thyroid disease, which is observed spread in Sudan include hypothyroidism, thyrotoxicosis (which could be from hypothyroidism or non thyroid causes), thyroid malignancies and iodine deficiency disorder.^[1] Thyroid disease specials hyperthyroidisms have adverse effect on many organs of the body such as bone and mineral metabolism. Mineral metabolism disorder is imbalance of Calcium & Phosphorus.^[3] Excess thyroid hormone in hyperthyroidism effect on

production of coalition and on osteoblast via nuclear receptors to stimulate osteoclasticbone resorption there by increasing the serum Calcium and serum Phosphorus level^[4] and suppressing Para thyroid hormone.^[5] For this hyperthyroidism is considered one of major causes of secondary osteoporosis.^[6] Hyperthyroidism affects the production of the hormone calcitonine and on kidney by increase tubular excretion of phosphate and tubular absorption of calcium, on other hand opposite effect is noted in hypothyroidism deficiency of thyroid hormone dely in the development of bone and stippled appearance of epiphysial centers of ossification, this result possible dwarfism. In hypothyroidism there is a depressed turnover due to impaired mobilization of calcium into the bone than leads to decrease the blood calcium level. In hypothyriodism increased production of thyroid calcitonine. Can promote the tubular reabsorption of phosphate and also favors the tubular excretion of calcium.^[7]

2. MATERIALS AND METHODS

Study design: this was a case control study.

Study area and period study: was conducted in Khartoum state in Suba hospital. Between July 2016 and February 2017.

Study population: 100 patients(50 hyperthyroidism: 25% male and 75% female, 50 hypothyroidism: (13%male and 87% female) and 50 apparently healthy individuals (20%male and 80%female), age was matched (range :20-65years) between study groups.

Inclusion and exclusion criteria: patients with hypo and hyperthyroidism were included. Patients suffering from renal diseases, hepatic diseases, pituitary adenomas, bone diseases, diabetes mellitus, alcoholism, or other serious medical conditions or with mineral supplementation or any drugs that may affect the level of calcium, phosphorous and magnesium were may excluded.

Ethical Considerations: Ethical Clearance was obtained from the Alneelain University committee. After explaining the aim of the study informed consent from volunteers was obtained.

Sampling: Venous blood was drawn using a plain disposable vacutainer system in aseptic condition.

The Samples were centrifuged for 10 minutes at 3000-4000 rpm and serum was separated in new containers and stored at 20co till the time of analysis.

Data collection: from clinical data of Suba hospital.

Methods: serum calcium, phosphorous and magnesium was estimated by colorimetric method, by using spinreact reagents.

Quality control: normal and pathological control sera were used to insure the accuracy of results.

Statistical Analysis: SPSS Package Version 20 statistical software was used for data analysis, independ sample T test was used for comparision and Person's correlation test was used to test correlation, $p < 0.05$ considered significant with confidence 95%.

3. RESULT: the level of Calcium was significantly increased in hyperthyroidism patient compared to control group.

In contrast level of Calcium significant decreased in hypothyroidism patient.(table 1) the level of phosphorous was significantly decreased in hyperthyroidism patient compared to control group.

In contrast levels of Phosphorous significantly increased in hypothyroidism patient.(table 1) the level of Magnesium was significantly increased in hyperthyroidism patient compared to control group.

In contrast level of Magnesium significantly decreased in hypothyroidism patient. (table1).

There is a positive correlation between calcium level and TSH in hyperthyroidism patient (figure 1), between phosphorous level and TSH in hyperthyroidism patient.(figure 2), between phosphorous level and duration of hypothyroidism patient.(figure 4), negative correlation between calcium level and duration of hypothyroidism patient.(figure 3) and between magnesium level and duration of hypothyroidism patient.(figure 5).

Table 1: Comparison between levels of calcium, Phosphorous and Magnesium among study groups.

Parameters	Control (Mean±SD) N = 50	Hypothyroidism (Mean±SD) N = 50	Hyperthyroidism (Mean±SD) N = 50
Calcium	9.54±0.49	8.08±0.95	11.67±1.42
<i>P-value</i>		0.000	0.000
Phosphorous	3.28±0.52	4.61±0.58	1.94±0.60
<i>P-value</i>		0.000	0.000
Magnesium	1.99±0.25	1.74±0.59	2.95±0.96
<i>P-value</i>		0.062	0.000

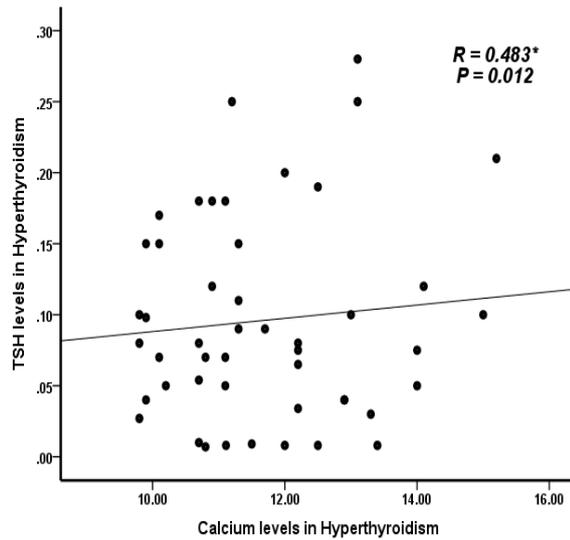


Figure 1: correlation between calcium level and TSH in hyperthyroidism patients.

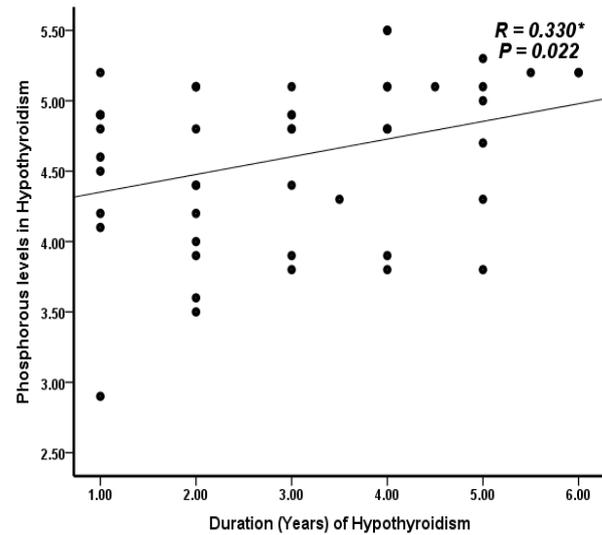


Figure 4: correlation between phosphorous level and duration in hypothyroidis patient.

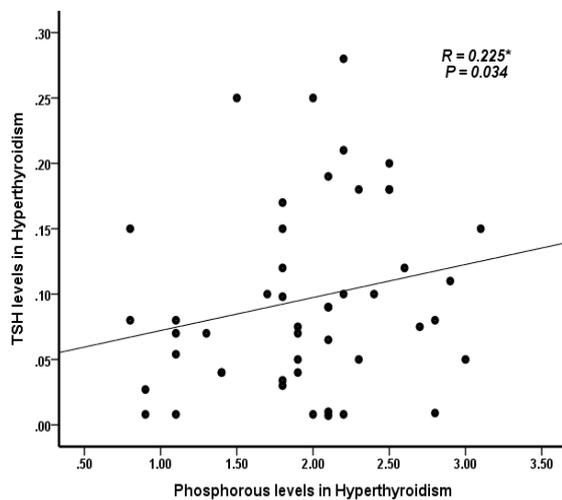


Figure 2: correlation between phosphorous level and TSH in hyperthyroidism patients.

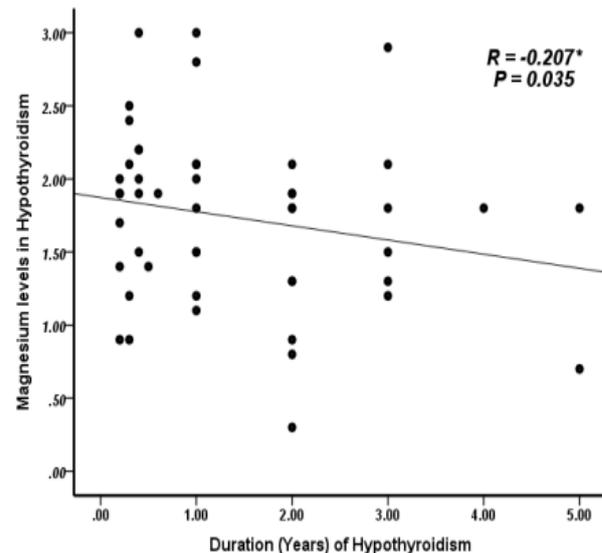


Figure 5: correlation between magnesium level and duration in hypothyroidism patients.

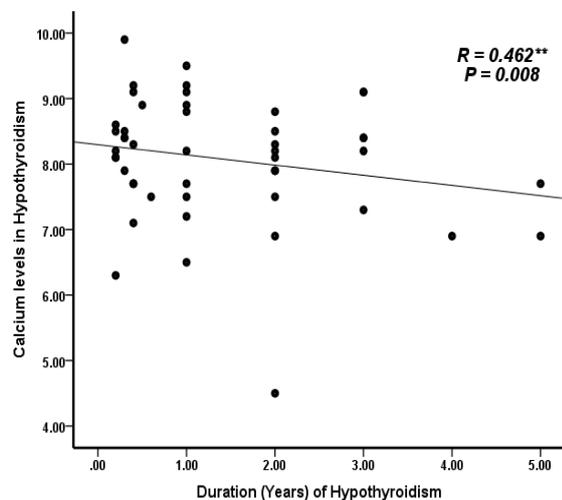


Figure 3: correlation between calcium Correlation between calcium level and duration in hypothyroidis patient.

4. DISCUSSION

Thyroid dysfunction is one of more providence disease and has severe complications. In this study the level of Calcium, phosphorus and Magnesium were determined to be correlated with hyper and hypothyroidism. Hyperthyroidism is an important cause of secondary osteoporosis. Early studies have used conventional radiography to assess bone mineral content (15). Hypothyroidism being the most prevalent endocrine disease, can lead to a variety of clinical situations including, electrolyte and mineral disturbances, congestive heart failure and coma (16). The current study results revealed that level of serum calcium was significantly decreased in hypothyroidism patient compared to control, while concentration was increased in hyperthyroidism patient compared to control. These results agreed with study done by Shivaleela et al (17). A statistically significant increase in serum phosphorous

was observed in hypothyroidism patient compared to controls while concentration was decrease in hyperthyroidism patient compared to control. Our study results were in accordance with study conducted by Abbas et al (18), while our findings were in contrast to study by Gammage (19). A statistically significant increase in serum Magnesium was observed in hyperthyroidism patients compared to controls in our study, while there was no significant difference in hypothyroidism patients compared by controls. Our study results are in accordance with study conducted by Frizel et al (20). A significant positive correlation between TSH and calcium level among hyperthyroidism was observed, and also a significant positive correlation between TSH and phosphorous level among hyperthyroidism was observed, but insignificant correlation between TSH and serum Magnesium level among cases was observed.

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