

CORRELATION OF SERUM FT₃ WITH SERUM CALCIUM IN THYROTOXIC INDIVIDUALS

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ABSTRACT

Objectives: To see the correlation of free tri-iodothyronine (FT₃) with serum calcium level in thyrotoxicosis.

Methods: This comparative cross sectional study had 50 thyrotoxic individuals and 50 controls. Demographic and clinical data of the study individuals was recorded by interviewing and examining them. Blood samples were analyzed for serum FT₃ concentration and serum calcium at RIA laboratory, Institute of Radiotherapy and Nuclear Medicine (IRNUM) and Hitech laboratory, Aman Hospital Peshawar respectively. The data was analyzed on SPSS version 13.0 using Pearson's correlation test.

RESULTS: A statistically non significant positive correlation of FT₃ was noted with serum calcium in thyrotoxic patients.

Conclusion: Hypercalcemia is absent in thyrotoxic patients of Khyber Pakhtunkhwa.

Key Words: Free T₃, serum calcium, thyrotoxic, hypercalcemia

INTRODUCTION

A decrease in the blood levels of bone minerals results in the mobilization of calcium and phosphate from the bones by parathyroid hormone (PTH) and vitamin D. Vitamin D increases the intestinal absorption of these minerals. Majority of the thyrotoxic patients in the west have normal or increased serum total calcium concentrations whereas the mean plasma calcium concentration is more than controls. Only thirty one cases of hypercalcemia due to thyrotoxicosis were reported in literature up to 1963. Baxter and Bondy described hypercalcemia in 19 of the 77 patients (23%) in 1966. In another study of thyrotoxic patients percentage of hypercalcemia varies from 5 to 27 [1]. Manicourt *et al* noted increase in serum free calcium in half of thyrotoxic patients and the hypercalcemia correlated with serum T₃ levels. [2, 3]. Severe symptomatic hypercalcemia is however rare in thyrotoxic patients. Renal excretion of calcium is usually enhanced in thyrotoxicosis and correlates positively with thyroid hormone levels.

MATERIALS AND METHODS

Clinically thyrotoxic individuals of age range 14 – 65 years and of either sex belonging to different part of Khyber Pakhtunkhwa (n = 100), referred to Radio-immunoassay (RIA) laboratory for thyroid function tests (TFTs) were enrolled for this cross sectional study and divided on the basis of results of Thyroid Function Tests

(TFTs) into thyrotoxic (group I) and euthyroid (group II).

Clinically hyperthyroid patients of age range 14 – 65 years and of either sex visiting/referred to RIA Lab IRNUM hospital for thyroid functions tests were included in this study. Patients with concomitant primary hyper-parathyroidism, malignancy, and hyper-vitaminosis D were excluded. Data was collected on a Proforma composed of questions (history), physical examination and laboratory tests. A blood sample of approximately 5 ml was drawn from antecubital vein of every subject with disposable syringe using all the aseptic techniques, immediately centrifuged (IEC Model DPR – 6000 centrifuge) at the rate of 1500 – 2000 rpm for 10 minutes and then stored in freezer at – 20 °C till analysis. The samples were analyzed for serum FT₃ concentration by RIA method in RIA laboratory at the Institute of Radiotherapy and Nuclear Medicine (IR- NUM), Peshawar. Serum concentration of calcium was determined by colorimetry in Hitech laboratory, Aman Hospital Peshawar.

RESULTS

We found a moderately positive correlation between FT₃ and serum calcium with r- values of 0.064 and 0.060 and p-values of 0.659 and 0.677 for total and ionized calcium respectively showing no statistical significance (table 3.1).

Table 3.1: Correlation of FT₃ with serum calcium in thyrotoxic and euthyroid individuals

Parameter	Thyrotoxic individuals			
	Total calcium		Ionized calcium	
	r-value	p-value	r-value	p-value
FT ₃	.064	.659	.060	.677

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DISCUSSIONS

This work was basically designed to study and explore any relationship between hyperthyroidism and hypercalcemia, based upon the hypothesis/assumption that there will be no hypercalcemia in thyrotoxic patients; although the western researchers have reported hypercalcemia in about 20% of the thyrotoxic patients [3-8].

There is a moderately positive correlation between FT_3 and serum calcium which is not significant statistically. Baxter *et al.* and Moskilde *et al.* reported that the changes in serum calcium correlate positively with concentration of serum T_3 . [1, 9]. However, Morris *et al.* have reported no correlation between concentration of T_4 and status of bone. As most of T_3 is formed from T_4 at the cellular level no correlation can be expected on the basis of this study. [10]. Kumeda *et al.* have also reported in subclinical hyperthyroid patients that there is no significant positive correlation between serum FT_3 or FT_4 and parameters of bone metabolism. [11]. Majima *et al.* have also reported relative positive correlation between markers of bone metabolism and thyroid function. [12]. Recently Dhanwal *et al.* have found that unlike Western data, a high serum concentration of calcium is not a feature in Indian thyrotoxic patients. This also negates significant positive correlation between FT_3 and calcium concentration in thyrotoxic patients [13]. Thyroid hormones cause hypercalcemia in vitamin D sufficient population by increasing osteoclastic resorption of bone and thereby causes decreased PTH concentration through negative feedback by increasing ionized serum calcium. Due to vitamin D deficiency thyroid hormones cannot mobilize calcium effectively from bone. Vitamin D deficiency also leads to increased PTH in thyrotoxic patients. The bone is already poorly mineralized so thyroid hormones cannot liberate calcium from bone to cause hypercalcemia.

CONCLUSIONS

Absence of hypercalcemia or even presence of hypocalcaemia cannot exclude thyrotoxicosis especially in population belonging to lower socioeconomic groups because they usually consume a diet deficient in vitamin D and / or calcium. As the thyrotoxic patients are much prone to osteoporosis, osteoporosis should be searched for in thyrotoxic patients and if found, treated properly at right time. This should be especially taken care of in those thyrotoxic patients having increased concentrations of serum ALP or complaining of bone pains.

Importance of vitamin D, exposure to early morning sunlight for at least half an hour daily and fortification of selected foods with vitamin D and calcium should be explained to the general public through print and electronic media as well as through health education sessions in educational institutes and places of public gathering.

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