Biomedical Research 2018; 29 (18): 3456-3458 *ISSN 0970-938X*
www.biomedres.info

Estimation of serum calcium in sub clinical hypothyroid females of different age groups in Kanchipuram population.

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Abstract

Background: Thyroid hormones play an important role in the homeostasis of calcium and phosphorous levels. A person with thyroid dysfunction may exhibit symptoms that are owing to the alteration in calcium levels.
Aim: To find out the calcium alteration in hypothyroidism with different age groups in Kanchipuram district.
Methodology: In this study 40 patients with the age group of 20-60 y were taken. The parameters like TSH and Ca^{2+} were estimated with commercially available kits.
Results: In our study out of 40 patients 18 patients with hypothyroidism had hypocalcemia, which constitute 45% (n=18) of the study had less serum calcium. Remaining 55% patients having normal calcium levels, In future it may develop hypocalcaemia.
Discussion and conclusion: Total calcium levels in serum were found to be significantly lower in hypothyroid patients in all age groups. This study concluded that, in Kanchipuram district patients have low levels of serum calcium in hypothyroidism. $S.Ca^{++}$ in hypothyroid people demonstrates a constructive connection between the $S.Ca^{++}$ and serum TSH. These fluctuations of serum calcium ought to be considered in treating the patients with hypothyroidism by therapeutic experts.

Keywords: Thyroid stimulating hormone, Calcium, Subclinical hypothyroidism.

Accepted on August 27, 2018

Introduction

Thyroid gland is involved in a wide array of metabolic functions like regulation of lipid, carbohydrate, protein and mineral metabolism [1]. For physiological growth and maturation of skeletal system thyroid hormones are vital. Thyroid diseases are common and their incidence and prevalence were considered to increase with age. Among the 42 million people suffering from thyroid diseases in India, hypothyroidism is the commonest [2]. Disturbance of calcium homeostasis were frequently observed with thyroid dysfunction [3]. Literature has revealed serum levels of hypocalcaemia in the commonly occurring thyroid dysfunction, hypothyroidism [4,5]. Hypocalcaemia has been a significant finding in hypothyroid patients as per the literature [6].

Increased production of calcitonin in hypothyroidism can promote tubular clearance of calcium and tubular absorption of phosphate [7]. The changes in the calcium account to slight levels in thyroid disorders, these disturbances were vital for the patients in long run [8]. Studies revealed that metabolic syndrome and cardio vascular diseases were related to disturbances in metabolism of calcium in hypothyroidism [9,10]. As the effect of hypothyroidism in these minerals like calcium is quite complex, this study was undertaken to find their alteration in hypothyroidism with different age groups in the Kanchipuram population.

Methods and Materials

This study was approved by the Institutional Ethical Committee. This is descriptive cross sectional study. This study was conducted in department of physiology, Karpaga Vinayaga Institute of Medical Sciences and Research centre, Tamilnadu from July 2016 to June 2017. Patients attending to the outpatient department of general medicine in Karpaga Vinayaga Institute of Medical Sciences and Research Centre for evaluation of their thyroid status were enrolled in the study. Forty female patients with Hypothyroidism (with TSH levels

more than 5.0 mIU/L, free T4 with in normal limits) between the age of 20-60 y were taken for this study. Based on the age the patients are divided in to group I (20-40 y) and group II (40-60 y).

Inclusion criteria

Newly diagnosed hypothyroid patients

Exclusion criteria

Patients with history of hepatic disease, renal disease, alcoholism, or other major medical conditions or those who were on mineral supplementation and thyroid drugs or any medications that might affect calcium concentrations were excluded from the study.

Biochemical analysis

After taking informed consent, about 2 ml of venous blood was drawn in a plain bulb. Serum was separated by centrifugation and stored at 4°C-8°C until the estimation of biochemical parameters. Serum TSH (Reference values for laboratory are TSH-0.25-5 μIU/ml were estimated by Enzyme Linked Fluorescent Assay (ELFA by Minividas) and Free Calcium (reference value 9.0-11 mg/dl), were estimated by using commercially available kits. At last, a comparison was made between the age of patients with the TSH and serum free calcium.

Statistical analysis

The mean values of all parameters in hypothyroidism were statistically analysed by applying paired 'T' test and calculated 'p' values by using SPSS 19 version.

Result and Discussion

In our study out of 40 patients 18 patients with hypothyroidism had hypocalcaemia, which constitute 45% (n=18) of the study had less serum calcium. Remaining 55% (n=22) patients having normal calcium levels there may be chance to develop hypocalcaemia in future is high. The patients under the age of 40 y have low TSH values than the older age group. Among both groups the 20-40 y group is more prone to hypocalcaemia with a mean of 7.08 ± 0.86 when compared to the mean of older age group 9.08 ± 1.25.

Table 1 demonstrates that in the present study mean age for hypothyroid patients was 39.54 ± 13.58 y and mean serum calcium levels are 8.01 ± 1.46 which is lower than the normal (9-10.5 mg/dl).While the mean of thyroid stimulating hormone is 7.80 ± 2.64 which is much higher than the normal range 0.3-5.0 U/ml.

Table 1. *Mean for overall patients.*

Category	Overall patients
	Mean ± standard deviation
Age (Y)	39.54 ± 13.58
Serum calcium (mg/dl)	8.01 ± 1.46
TSH (U/Ml)	7.80 ± 2.64

Table 2. *Mean TSH and calcium values with different age groups.*

Category	Group 1 (20-40 y) mean ± standard deviation	Group 2 (41-60 y) mean ± standard deviation	P value
Age (y)	28.58 ± 7.33	51.53 ± 8.24	0.000*
Calcium (mg/dl)	7.08 ± 0.86	9.08 ± 1.25	-5.741
TSH (U/Ml)	9.57 ± 1.79	10.66 ± 2.47	0.025
*Significant			

The mean age of the patients between 20-40 y is 28.58 ± 7.33 while for patients 41-60 y is 51.53 ± 8.24. Among this age group, the hypocalcaemia levels are more in young patients i.e. 7.08 ± 0.86, while in the older age group, it is 9.08 ± 1.25 which was higher than the young age patients. The TSH in the age group of 20-40 y were 9.57 ± 1.79 while in the age group of 41-60 y it was 10.66 ± 2.47 as shown in Table 2.

Low calcium level is a progressive finding in hypothyroidism. Present study patients with hypothyroidism have an incredible risk of serum calcium insufficiency. This study done in female patients from various localities of Kanchipuram district. In which subclinical hypothyroidism shows large amount of TSH in older age group patients. A study done by Kaleemullah et al. [11] showed a mean age of 39.9 ± 13.82, while the current study revealed the mean age of the patients with hypothyroidism along with low serum calcium levels as 39.54 ± 13.52. It is almost similar to the above study. While the serum calcium level in present study is 8.01 ± 1.46, but in Kaleemullah et al.'s study it was found to be 9.04 ± 1.47 which was higher than our study. The thyroid stimulating hormone in our study were found to be 7.80 ± 2.64, while Kaleemullah et al.'s study revealed the range of 10.47 ± 3.46 which was much higher than our study. A study done by Shivaleela et al. [12] shows TSH levels of 7.73 ± 0.09 which was almost equal to our study and serum calcium levels of Shivaleela et al. was found to be 9.14 ± 0.5 and in our study 8.01 ± 1.46 which was almost lower than that study.

Thyroid hormones are most essential for normal growth and maturation of the skeletal system. Depressed turnover due to impaired mobilization of calcium into the bone was observed in hypothyroidism leading to reduced blood calcium. Increased production of calcitonin which promotes the tubular reabsorption of phosphate and favour the tubular excretion of calcium, leading to hypocalcemia [13].

Total calcium levels in serum were found to be significantly lower in hypothyroid patients in all age groups. Thyroxin normally regulates blood calcium levels by releasing calcium extra cellular [14]. In hypothyroidism, less thyroxin in the bloodstream and thus less thyroxin entry into the cells leading to decreased extra cellular calcium release [6].

Limitations of our study are very small sample size, and the study can be extended to a larger population in future.

Conclusion

This study concluded that patients have low levels of serum calcium in hypothyroidism in Kanchipuram district. These fluctuations of serum calcium ought to be considered in treating the patients with hypothyroidism by therapeutic experts. Also to overcome this hypocalcaemia proper calcium rich diet and proper training should be very important for rural population and also regular evaluation of serum calcium in hypothyroidism is needed. Early detection and correction can prevent further complications from mineral metabolism dysfunction.

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