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## RESEARCH ARTICLE

# SALIVARY CALCIUM LEVELS IN HYPOTHYROID PATIENTS-A CASE CONTROL STUDY

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### ABSTRACT

**Background:** Calcium plays an important role in bone turn over. Deficiency of calcium in hypothyroid patients often results in osteoporosis. It is a disease which is characterized by severe destruction of organic and mineral parts of the bone resulting in fractures of bone. Estimation of serum calcium levels in hypothyroid patients is an instilled method but as it is invasive and time taking, in this study we tried to estimate the salivary calcium levels which is noninvasive, patient friendly and easy to monitor.

**Aims:** To estimate the serum calcium and salivary calcium levels in known hypothyroid patients. To implicate salivary calcium estimation as a flipside to serum calcium estimation as it is noninvasive and patient friendly

**Materials and methods:** Study group consisted of 30 hypothyroid patients and Control group consisted of 30 healthy volunteers. Blood sample of 2ml was collected in micropipettes from both groups. From the same patient salivary sample was collected with spitting method. Serum calcium levels and salivary calcium levels were estimated with the help of calcium reagent and semi auto analyser.

**Results:** Results showed a significant decrease in the serum and salivary levels of Calcium in the study group when compared to the control group ( $p < 0.0001$ ). The difference between serum and salivary calcium level in both the groups was statistically insignificant.

**Conclusion:** Salivary diagnostics is noninvasive and can be used as a diagnostic & screening tool alternative to invasive blood investigation even in estimating calcium levels in hypothyroid patients.

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## INTRODUCTION

Thyroid hormones play an important role in homeostasis of calcium and phosphorous levels by their action on bone turn over. Thyroid dysfunction amends calcium metabolism there by necessitating regular monitoring of calcium levels. Normal serum calcium level is 9-11mg/dl.<sup>1,2</sup> Decreased serum calcium level is observed in hypothyroidism and also in many other pathological conditions. Comparitive estimation of serum calcium levels and salivary calcium levels is done in this study.

## MATERIALS AND METHODS

The study consisted of 30 hypothyroid patients and 30 controls. Female patients between 30-50 years of age who were hypothyroid and were under medication (eltroxin) with normal T3 and T4 levels but without calcium supplementation were included under the study group. Postmenopausal females those suffering from any other coexistent systemic diseases were excluded from the study group. Healthy female volunteers of 30-50 years without any systemic diseases were included under control group.

2ml of venous blood was collected in a test tube containing anticoagulant from both the groups under aseptic conditions. The blood was centrifuged at 3500 rpm for 3 minutes. Unstimulated salivary sample was collected through spitting method from same patient. One hour prior to collection of saliva the patient was instructed not to eat anything.

With the help of liquizyme, calcium reagent and auto analyser, salivary and serum calcium levels were estimated. Calcium reagent kit consisted of arsenazo III reagent and calcium standard. Arsenazo III is chemically stable and has a very high affinity for calcium in a neutral ph range.

### Statistical Analysis

Mean values of salivary and serum calcium levels were analyzed through unpaired t test.

## RESULTS

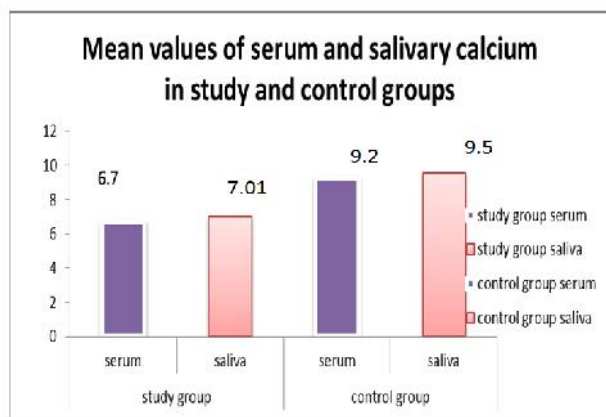
The mean serum calcium in hypothyroid patients ( $6.700 \pm 0.25$ ) was less than that in controls ( $9.244 \pm 0.24$ ) which was

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statistically significant ( $p < 0.0001$ ) (Table:1). The mean salivary calcium in hypothyroid patients ( $7.012 \pm 0.32$ ) was significantly ( $p < 0.0001$ ) less than controls ( $9.592 \pm 0.22$ ). The mean serum calcium and salivary calcium in hypothyroid patients and in controls were almost same with a mean difference of 0.3 which was statistically insignificant ( $p = 0.4$ ).

**Table1** Graph Showing The Mean Values Of Serum And Salivary Calcium



**Table 2** showing mean and standard deviation values of serum calcium and salivary calcium.

Parameter	Control (mean± standard deviation)	Study group (mean± standard deviation)	P value
Serum calcium	9.244±0.24	6.700±0.25	<0.0001****
Saliva calcium	9.592±0.22	7.012±0.32	<0.0001****
P value	0.297(ns)	0.459(ns)	

## DISCUSSION

Thyroid gland produces T3 & T4, which play a pivotal role in maintaining homeostasis of thermogenic, mineral and metabolic activities of human body and also help in cell differentiation during development.<sup>1,2,3</sup> Hypothyroidism is a condition in which there is decreased production of T3 and T4 hormones due to decreased activity of thyroid gland leading to decreased metabolic rate. The mean annual incidence rate of hypothyroidism is up to 4 per 1000 women, 1 per 1000 men.<sup>3,4</sup> The significant decrease in mean serum calcium level in hypothyroid patients seen in the present study are consistent with the studies conducted by Ala eldin *et al* and studies carried out by B. Suneel *et al*.<sup>3</sup> Usually hypocalcemia is associated with hypothyroidism because low levels of PTH and low levels of calcitriol cause decreased absorption of calcium from intestine, it promotes the tubular re absorption of phosphate favouring tubular excretion of calcium.<sup>4,5,6</sup> Calcitonin plays an important role in blood calcium levels as it reduces the calcium levels by acting on bone, kidney, intestine.<sup>7,8</sup> In the bone, calcitonin stimulates osteoblastic activity and deposition of calcium. In intestine, prevents absorption from intestine into the blood and a depressed turnover due to impaired mobilization of calcium into the bone thus leading to decrease in blood calcium level.<sup>9,10</sup> Considering the applications of saliva, as a highly effective diagnostic tool in systemic conditions, virus infections, screening and early diagnosis of malignancies, Present study aimed to evaluate the salivary calcium levels in hypothyroid patients showed a significant decrease in mean salivary calcium level when

compared to control group. Statistically insignificant difference between saliva and serum calcium ( $p > 0.4$ ) suggests that both can be used parallelly with equivalent efficiency. The results are of no revelation as saliva is considered as an ultra-filtrate of serum.<sup>11,12</sup>

Protein composition of serum and saliva are same. 27% of whole saliva proteins are found in serum but varies with molecular function and biological process. Hormone levels in saliva accurately represent the amount of hormone delivered to receptors in the body, unlike serum which represents hormone levels that may or may not be delivered to receptors of the body. Clinically, it is far more relevant to test the amount of hormones delivered to the tissue receptors as this is a reflection of the active hormone levels of the body<sup>13</sup>. Thus making saliva a surrogate of blood in diagnostic application but with added advantage of being noninvasive, safe and easy method.<sup>14,15</sup> Moreover saliva can be used for long term and frequent monitor of patient health status, without much anguish.

## CONCLUSION

Saliva is a biological fluid that offers several opportunities in diagnosis. In our study it is proved that salivary calcium levels decreased synchronously with serum levels in hypothyroid patients crafting saliva as an adjuvant diagnostic tool.

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