

## Assessment Levels of Some Electrolytes in Hypothyroidism Patients

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### ABSTRACT

**Background:** Hypothyroidism is one of the most common forms of thyroid dysfunction. It is influence on the value of electrolytes. **Objective** The study was designed to find out the effect of hypothyroidism on some electrolytes and total calcium levels. **Patients and materials:** A total of thirty known cases of hypothyroidism and twenty age and sex match controls were selected. Blood samples were taken from both (patients and control) to evaluate thyroid stimulating hormone (TSH) by ELISA method, as well as potassium, sodium and calcium were measured automated by Genex Elyte 4 device. **Results:** It was found the levels of total calcium and sodium were decreased significantly ( $p < 0.05$ ) cases as compare with control group, while the level of potassium was decreased no significantly ( $p > 0.05$ ) in cases than control. Also, the results were indicated to a significant negative correlation between serum TSH value and calcium level in patients. Increased the TSH levels, lower will be the levels of serum calcium, sodium and potassium levels. **Conclusion:** It was concluded the level of total calcium decreased significantly in person with hypothyroid as well as sodium was decreased.

**Key words:** Hypothyroid, Calcium, Electrolyte, Sodium.

### INTRODUCTION

Hypothyroidism is a disease of thyroid gland that characterized with low level of thyroxin hormone (T3 & T4) besides to high level of thyroid stimulating hormone (TSH). Hypothyroidism is popular among women as ten times as in men and its prevalence increases with age. The occurrence of thyroid dysfunction, by definition, is testing patients in different geographical areas, primary care clinics and in population that have not been screened previously it can be severe with obvious, or moderate to mild or can be sub-

clinical hypothyroidism. Insufficiency of thyroid hormones distresses whole metabolism of the body<sup>3,2</sup>. Electrolytes play an vital role in several body progressions, such as directing fluid levels, acid-base equilibrium (pH), nerve passage, blood coagulation and muscle tightening<sup>4</sup>. Thyroid illness is common in the general population, and the frequency increases with oldness. In India, hyperthyroidism is considered the commonest form of thyroid disorder due to the high number of Indian people who are suffering from thyroid diseases<sup>5</sup>.

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Thyroid hormone is a crucial controller of body hemodynamics, thermoregulation and breakdown. Thyroid hormones achieve a wide array of metabolic functions including directive of lipid, carbohydrate, protein, electrolyte and mineral metabolisms, whereas lipid metabolism as a result to increasing thyroid hormones is well known, while the effect on minerals and electrolytes has not been well-known and also the underlying mechanisms are not well established<sup>6</sup>. Sodium and potassium are main components of the enzyme Na<sup>+</sup>-K<sup>+</sup> ATPase, which is an enzyme present on the cell membrane that aids in the transportation of water and nutrients through the cell membrane<sup>7</sup>. Thyroid hormones order the action of sodium potassium pushes in best of the tissues. In ancient study the mortality rate was increased as outcomes of patients with electrolyte disorders, mainly hypo- and hyper natremia, which were found to be associated with, increased mortality<sup>8</sup>.

Thyroid hormones are necessary for usual development and growth of skeletal system. Thyroid dysfunction is often linked with instabilities of calcium and phosphorous homeostasis. Thyroid disorders are important cause of secondary osteoporosis. Few studies show normal serum calcium and phosphorous levels while others show decreased levels in hypothyroidism<sup>11</sup>. Even though the changes in the calcium and magnesium may be minor in thyroid disorders, these conflicts will be significant for patient in the semi-permanent<sup>12</sup>. In hypothyroidism there is a miserable turnover due to reduced utilization of calcium into the bone that pointer to decrease the blood

calcium level. In hypothyroidism increased creation of thyroid calcitonin can help the tubular reabsorption of phosphate and also favors the tubular excretion of calcium<sup>10</sup>. This study aimed to assess the levels of serum electrolytes such as sodium, potassium and calcium in hypothyroidism patients.

### MATERIAL AND METHODS

All patients with hypothyroidism who included in this study were attending the outpatient clinic. The study was performed on 30 (4 male and 26 female) hypothyroidism patients and 20 (5 male and 15 female) healthy individuals (control group). A paper of information was filled from each patient who includes name, age, sex, occupation, and family history of hypothyroidism. Blood sample (5ml) was taken from both (patient and control group) to evaluate the level of some electrolytes (sodium, potassium and calcium) by Genex Elyte 4 device according to manufactured company that approved with it. Also, thyroid stimulating hormone (TSH) was measured by ELISA technique according to procedure that provided with the kit ( ). The obtained data of study were calculated as mean  $\pm$  SD at P value less than 0.05 significant.

### RESULTS

The study results showed that the high incidence of hypothyroidism was in female (86%) versus in male was (14%), and results showed 12 (40%) case out of 30 at age less or equal 50 years and only 18 cases (60%) were above 50 years, also the control group was in the same age range as showed in table (1).

**Table 1: The frequency of gender and age among patients and control**

Gender		
	Frequency No	Percentage %
<b>Patients</b>		
Male	4	14%
Female	26	86%
<b>Control</b>		
Male	5	25%
Female	15	75%

Age		
<b>Patients</b>		
<50 years	12	40%
>50 years	18	60%
<b>Control</b>		
<50 years	9	45%
>50 years	11	55%

The results show the mean value of electrolytes (Na & Ca) were decreased significantly ( $P < 0.05$ ) in hypothyroidism patients as compared with control as showed

in table ( 2 & 3 ), while the level of potassium decreased non significantly ( $P > 0.05$ ) as illustrated in table (4).

**Table 2: The mean value of calcium (mmol/L) in patients and controls**

Groups	Mean	SD	SE
Patients	1.55	0.45	0.08
Controls	2.62	0.11	0.02
$P < 0.05$			

**Table 3: The mean value of sodium (mmol/L) in patients and controls**

Group	Mean	SD	SE
Patients	139.98	2.96	0.54
Controls	144.55	3.97	0.88
$P < 0.05$			

**Table 4: The mean value of potassium (mmol/L) in patients and controls**

Group	Mean	SD	SE
Patients	4.20	0.55	0.1
Controls	4.59	0.5	0.11
$P > 0.05$			

On the other hand, the correlation between TSH level and (calcium & sodium) value was significant, and there is no significant

correlation between TSH and serum Potassium as explained in table (5).

**Table 5: Pearson's correlation between various parameters and TSH**

TSH	Pearson factor
Calcium	- 0.719
Sodium	- 0.468
Potassium	0.249

## DISCUSSION

The present study included 30 people suffering from hypothyroidism (4 male, 26 female) as compare with 20 person healthy (5 male, 15 female) as control group. Hypothyroidism can be lead to a variety of clinical states, including congestive heart failure, electrolyte

disturbances and unconsciousness. In clinical practice, Hypornatremia is the greatest electrolyte abnormality<sup>12</sup>. Thyroid hormones are central regulator of body hemodynamics, thermo regulation and metabolism. Therefore, it has an effect on renal hemodynamics, glomerular filtration and electrolyte behavior.

In current study there was high significant decrease in serum calcium levels in hypothyroidism patients (p 0.001) as shown in table (2 ), this study was agreed with<sup>9</sup> were itemized (a significant decrease in serum calcium of hypothyroidism patients than control). This is predominantly due to the little levels of Parathyroid hormone and small levels of calcitonin in hypothyroidism. The one role of thyroxin is to regulate blood calcium level by freeing calcium from cells, by diminishing thyroxin level in blood stream. A study done by<sup>13</sup> in animal model concludes that renal calcium excretion was elevated in rats with high levels of TSH. In current study the serum sodium levels in hypothyroidism patients were markedly decreased as compared to control group, whereas serum potassium level was found to be decreased no significantly in hypothyroidism patients as compared with control group. Water and nutrients can cross the cell membrane with the present of Na-K ATPase enzyme. The key components of Na-K ATPase enzyme are potassium and Sodium. Thyroid hormones police the movement of sodium potassium deflates in most of the tissues. Hypothyroid patients could gain weight as a result to gathering of water inside the cell, which will lead to edema; the last one was caused due to low level of potassium<sup>7</sup>.

Also correlated the levels of serum electrolyte (calcium, sodium, potassium) with the level of TSH, serum calcium and sodium were significant correlated with TSH (p<0.05), but serum potassium was no significant correlated with TSH (p>0.05) this study was agreed with<sup>14</sup> who was found a significant correlation of serum calcium, sodium and potassium with TSH levels.

### CONCLUSION

In this study verified that hypothyroid patient's indication serum electrolyte disorders such as low calcium and sodium levels.

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