

## Biochemical study on the association of Selenium with hormone of thyroid gland in patients with thyroid disorder

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### Abstract

In this study measured serum triiodothyronine (T3), serum thyroxin<sup>1</sup>, serum thyroid-stimulated hormone (TSH), Selenium (Se) levels in 31 patients with hyperthyroidism, 26 patients with hypothyroidism and 40 control subjects. The concentration of Se was significantly lower than normal in hyperthyroidism and lower than normal in hypothyroidism. There was a negative correlation with TSH, and negative correlation with T3 and negative correlation with T4. The result of this study suggests that the concentration of Se is abnormal in thyroid disease.

**Key Words:** Hyperthyroidism, Hypothyroidism, Selenium.

### دراسة كيموحيوية في علاقة السلينيوم وهرمونات الغدة الدرقية لدى المرضى المصابين باضطرابات الغدة الدرقية .

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الخلاصة

تم في هذه الدراسة قياس عنصر (السلينيوم ) وكذلك تم قياس هرمونات الغدة الدرقية لدى المرضى المصابين بأفراط أو قلة في إفراز الغدة الدرقية .  
ومن خلال الدراسة أستنتج أن تركيز السلينيوم في مصل دم المرضى المصابين بأفراط في هرمونات الغدة الدرقية أقل من تركيزه في مصل الدم لمجموعة الضبط وكذلك تركيز السلينيوم في المرضى المصابين بقلّة إفراز هرمونات الغدة الدرقية أقل من تركيزه في مصل الدم لمجموعة الضبط. ومن خلال هذه الدراسة وجد أن: تركيز الزنك والنحاس في مصل الدم للمرضى المصابين في فرط هرمونات الغدة الدرقية أعلى من تركيز الزنك والنحاس في مصل الدم للمجموعة الأصحاء ( $P<0.001$ ).  
تركيز النحاس والزنك في مصل الدم للمرضى المصابين في قلة إفراز هرمونات الغدة الدرقية أقل من تركيز النحاس والزنك في مصل الدم للمجموعة الأصحاء ( $P<0.001$ ).  
تركيز السلينيوم في مصل الدم للمرضى المصابين في فرط وقله في إفراز هرمونات الغدة الدرقية أقل من تركيز السلينيوم في مصل الدم للمجموعة الأصحاء ( $P<0.001$ )

## Introduction.

Selenium known in plants as selenomethionine, whereas in animals selenocysteine is the major form. Four selenium atoms are covalently bound to cysteine residues in enzyme glutathione peroxidase, a second enzyme, Iodothyronine denominated type one, has been identified, and it contains one selenium atom per molecule. This Selenium-metaloenzyme plays a role in the conversion of  $T_4$  to  $T_3$  <sup>[1]</sup>. During thyroid hormone synthesis, thyroid tissue is exposed to  $H_2O_2$  making it imperative that protective systems can prevent damage to the gland <sup>[2]</sup>. This tissue protection can be achieved by Selenium-dependent products e.g. the glutathione peroxidases <sup>[3-4]</sup>.

## Material & Methods.

Two groups of thyroid dysfunction patients (all non-pregnant females) were included in this study. All samples were collected from laboratory unit in Al-Hussein General Hospital in and the private laboratories in Karbala city. The patients classified into three groups.

**1- Groups I:** - consisted of 31 patients with hyperthyroidism (mean age  $41 \pm 9.7$  yr)

**2- Groups II:** consisted of 26 patients with hypothyroidism (mean age  $41 \pm 11$  yr).

**3- Control group:** - This group consisted of 40 people (non-pregnant females) and free of symptoms of thyroid disease (hyperthyroidism and hypothyroidism) (mean of age  $40.68 \pm 11.1$  yr).

### Specimen Collection:

Fifty-seven patients with thyroid disease aged 25 to 55 yr and 40 control subjects (non-pregnant females and non-smokers). Five milliliters of venous blood were drawn from patients and control. Slow aspiration of the venous blood sample via the needle of syringe to prevent the hemolysis with tourniquet applied above the anterior. All the samples that were grossly hemolysed were neglected and other new samples were taken.

The samples were dropped into clean disposables tubes, left at room temperature for 30 min. for clotting formation and then centrifuged for 20 min. at 5000 rpm to get the blood serum.

**Experimental Evaluation of thyroid hormone (T3, T4) and TSH.**

The concentration of T3, T4, and TSH were determined by the Enzyme-linked immunoassay sorbent (ELISA technique) sandwich technique with antibody label and competitive binding.

2- Evaluation the concentration of Se (using Hitachi atomic Absorption)

**Result & Discussion :**

A total of (97) patients were studied; all of these patients were female and with age ranging between 22-55 years. A mean age of patients with hypothyroidism ( $41 \pm 11.1$ ) years, the mean age of patients with hyperthyroidism ( $41 \pm 9.7$ ) and the mean age of control group ( $40.68 \pm 11.1$ ) as shown in table (2), the serum samples used in this study.

**Biochemical parameters Serum TSH, T3 and T4 levels**

Serum TSH, T3 and T4 were determined in hyperthyroidism, hypothyroidism and normal control (immunoassay). The mean concentration of serum TSH level in patient with hyperthyroidism ( $0.198 \pm 0.15$ ) are significantly lower than the mean of normal control ( $4.48 \pm 1.79$ ), and The Mean concentration of serum TSH level in patient with hypothyroidism ( $14.5 \pm 1.84$ ) higher than the mean of normal control ( $4.48 \pm 1.79$ ). The mean concentration of serum T3 level in patient with hyperthyroidism ( $3.78 \pm 0.9$ ) are significantly higher than the mean of normal control ( $1.11 \pm 0.317$ ) and the mean concentration of T3 level in patient with hypothyroidism ( $0.35 \pm 0.105$ ) are significantly lower than the mean of normal control ( $1.11 \pm 0.317$ ). The mean concentration of serum T4 level in patient with hyperthyroidism ( $23 \pm 3.94$ ) are significantly higher than the mean of normal control ( $7.94 \pm 2.14$ ). the mean concentration of T4 level in patient with hypothyroidism ( $3.4 \pm 0.48$ ) are significantly lower than the mean of normal control ( $7.94 \pm 2.14$ ) as shown in table (2). This result obtained from standard curve of T4 as shown in figure (3). The result shown in table (2).

**Serum Selenium.**

Concentrations of serum Se in patient with thyroid disease are summarized in table (2). Serum Se was determined in patient with hyperthyroidism, hypothyroidism and normal control (atomic absorption).

The mean concentration of serum Selenium in patients with hyperthyroidism was significantly lower than control ( $0.34p<0.001$ ). The mean concentration of Se in patients with hypothyroidism was significantly lower than control ( $0.53p<0.001$ ) and there was a negative correlation with TSH ( $-0.00081 p<0.001$ ), and negative correlation with T3 ( $-0.24359 p<0.001$ ) and negative correlation with T4 ( $-0.34735 p<0.001$ ) and negative correlation ( $-0.348$ ) with Zn and negative correlation ( $- 0.372$ ) with Cu. as show in table (1).

**Table (1) the Correlation Coefficients between T3, T4, TSH, and Se**

	T3	T4	TSH	Se
T3	r 1.00000	r 0.91891 <0.0001	r-0.80201 <0.0001	r -0.243 0.0265
T4	r 0.91891 <0.0001	r 1.00000	r - .077174 <0.0001	r-0.3473 0.0013
TSH	r - 0.80201 <0.0001	r - .077174 <0.0001	r 1.00000	r - 0.00081 r 1.000 0.9942
Se	r - 0.24359 <0.0265	r - 0.34735 0.0013	-0.00081 r 0.9942	

### **Comparison between hyperthyroidism, hypothyroidism and control groups.**

The comparison between the concentrations of selenium in patients with hyperthyroidism are summarized in table (2), the concentration of Selenium decrease in patients with hyperthyroidism and hypothyroidism when compare with control group.

Table (2) comparison between patients with hyperthyroidism, hypothyroidism and control group.

		<b>Hyperthyroidism Group</b>	<b>Hypothyroidism Group</b>	<b>Control Group</b>
<b>Number of patient</b>	<b>(n)</b>	<b>31</b>	<b>26</b>	<b>40</b>
<b>Mean of age</b>	<b>(year )</b>	<b>41±9.7</b>	<b>41±11.1</b>	<b>40.68±11.1</b>
<b>Total T3</b>	<b>(ng/mL)</b>	<b>3.78±0.9</b>	<b>0.35±0.105</b>	<b>1.11±0.317</b>
<b>Total T4</b>	<b>ug/dL</b>	<b>23±3.94</b>	<b>3.4±0.48</b>	<b>7.94±2.14</b>
<b>TSH</b>	<b>uIU/mL</b>	<b>0.198±0.15</b>	<b>14.5±1.84</b>	<b>4.48±1.79</b>
<b>Se</b>	<b>ug/dL</b>	<b>0.34±0.33</b>	<b>0.53±0.28</b>	<b>0.89±0.4</b>

### *Discussion*

During thyroid hormone synthesis, thyroid tissue is exposed to H<sub>2</sub>O<sub>2</sub> making it imperative that protective systems can prevent damage to the gland. This tissue protection can be achieved by selenium-dependent products, e.g. the glutathione peroxidase. Serum levels of (Se) are considered to depict the adequacy regarding GPx levels and activity. In addition to this, the determination of selenoproteins, e.g. selenoprotein P (SePP), can deliver further information on the adequacy of Se levels [8].

### *Conclusions*

- 1- The concentration of Serum Selenium in patients with hyperthyroidism lower than the control group (p<0.001).
- 2- The concentration of Selenium in patients with Hypothyroidism lower than the control group (p<0.001).

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