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

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Key Words: Hyperthyroidism, Hypothyroidism, Selenium.

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Abstract:

In this study measured serum triiodothyronine (T3), serum thyroxin[1], 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.

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 أفراز 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 بقلة أفراز 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 هرمنات 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 أفراز هرمونات الغدة الدرقية أقل من تركيز النحاس والزنك في مصل الدم للمجموعة الأصحاء ($P<0.001$).

تركيز السلسنيوم في مصل الدم للمرضى المصابين في فرط وقله في أفراز هرمونات الغدة الدرقية أقل من تركيز السلسنيوم 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, Iodothyroninedenominate 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 [1]. During thyroid hormone synthesis, thyroid tissue is exposed to H_2O_2 making it imperative that protective systems can prevent damage to the gland [2]. This tissue protection can be achieved by Selenium-dependent products e.g. the glutathione peroxides [3-4].

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±9.7 yr)

2- Groups II: consisted 0f 26 patients with hypothyroidism (mean age 41±11yr).

3- Control group: - This group consisted of 40 people (non-pregnant females) and free of symptoms of thyroid disease (hyperthyroidism and hypothyroidism) (mean of age40.68±11.1yr).

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 hyemolysis 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 5000run per min. to get the blood serum.

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

1-The concentration of T3, T4, and TSH were determined by the Enzyme-linked immunoassaysorbant (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 ofpatientswith hypothyroidism **(41±11.1)** years, the mean age of patients with hyperthyroidism (41**±97**) and the mean age of control group (40.68±11.1) as show in table (2), the serums 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±0.15) are significantly lower than the mean of normal control (4.48+1.79), and The Mean concentration of serum TSH level in patient with hypothyroidism (14.5±1.84) higher than the mean of normal control (4.48+1.79). The mean concentration of serum T3 level in patient with hyperthyroidism (3.78±0.9) are significantly higher than the mean of normal control (1.11±0.317) and the mean concentration of T3 level in patient with hypothyroidism (0.35±0.105) are significantly lower than the mean of normal control (1.11±0.317).

The mean concentration of serum T4 level in patient with hyperthyroidism (23±3.94) are significantly higher than the mean of normal control (7.94±2.14**).** the mean concentration of T4level in patient with hypothyroidism (3.4±0.48) are significantly lower than the mean of normal control (7.94±2.14**)** as show in table (2)**.** This result obtained from standard curve of T4 as show in figure (3). The result shown in table (2).

Serum Selenium.

Concentration**s** of serum Se in patient with thyroid disease are summarized in table(2)**.**Serum Se was determinedin patient with hyperthyroidism, hypothyroidism andnormal control (atomic absorption).

The mean concentration of serum Selenium in patients with hyperthyroidismwas 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	
		Hyperthyroidism Group	**Hypothyroidism Group**	**Control Group**

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.

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

Discussion

During thyroid hormone synthesis, thyroid tissue is exposed to H2O2 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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