

Correlation between Thyroid-related Hormones and Preeclampsia

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الخلاصة:

الهدف: تسليط الضوء على بعض الجوانب الهرمونية للنساء الحوامل المصابات بمقدمة الارتعاج اللاتي شخص المرض لديهن عند تردهن إلى قسم النسائية والتوليد في مستشفى بغداد التعليمي.

المنهجية: أجريت الدراسة على ٩٠ امرأة حامل مصابة بمقدمة الارتعاج واللاني قسمن الى مجموعتين اعتماداً على شدة المرض؛ مجموعة الحالات المعتدلة (٣٧) ومجموعة الحالات الشديدة (٥٣). أجريت المقارنة مع (٣٠) امرأة حامل من الصحيحات كمجموعة ضابطة (Control) ومن ثم تم الحصول على عينات من الدم الوريدي من جميع المجاميع ومن ثم أخذت المصول لتحلل هرمونياً في المختبرات باستعمال اختبار ELISA test.

النتائج: بينت الدراسة وجود فروق معنوية في مستوى هرمون TSH في مجاميع الحالات المعتدلة بالمقارنة مع المجاميع الضابطة وكذلك بالنسبة إلى مجموعة الحالات الشديدة، فقد ارتفع مستوى هرمون TSH ارتفاعاً معنوياً بالمقارنة مع المجموعة الضابطة، أما بالنسبة لهرمون T3، فقد ارتفع ارتفاعاً معنوياً في الحالات المعتدلة بالمقارنة مع المجاميع الضابطة وارتفع ارتفاعاً معنوياً في مجاميع الحالات الشديدة بالمقارنة مع المجاميع الضابطة والحالات المعتدلة، أما هرمون T4، فقد ارتفع ارتفاعاً غير معنوي في الحالات الشديدة والمعتدلة دون وجود أي فروق معنوية إحصائية.

التوصيات: دراسة العلاقة بين حالة مقدمة الارتعاج وتأثيرها على افراز هرمون الغدة النخامية لـ ADH، ودراسة دور الغدة الأدرينالية (الكظرية) وافرازاتها في حالة تسم الحمل، ودراسة العلاقة بين حالة مقدمة الارتعاج وافرازات غدة ما تحت المهاد hypothalamus.

Abstract:

Objectives: In order to highlight the TSH and thyroid hormones levels in preeclamptic and healthy pregnant women.

Methodology: Ninety patients with preeclampsia were divided into two groups according to the severity of disease; those with mild disease (37 patients) and those with a severe form (53 patients). A separate group of 30 normal women were included as a normal control group. Venous blood samples were collected from all groups and the serum was obtained for hormone analysis by ELISA test. Results are expressed using SPSS for window version 11.0.

Results: Mean serum TSH levels were significantly increased in both of mild and severe preeclampsia compared with normal pregnancy, and T3 serum level showed a significant increase in mild and severe preeclamptic women compared with healthy pregnant ones without concomitant change in T4 in each group of preeclamptic women compared to normal pregnancy.

Recommendations: Studying the relationship between preeclampsia and its effect on the secretion of pituitary gland to ADH, studying the role of adrenal gland, hypothalamus and their secretions in preeclampsia.

Keywords: Thyroid-related Hormones; Preeclampsia

Introduction:

Pregnancy is a physiological process to supply adequate nutrition to the growing fetus, maternal physiological adjustment of different organ systems occur in pregnancy, which include circulatory metabolic and hormonal changes⁽¹⁾. During pregnancy, the pregnant women may be exposed to many complications, one the most common complications is preeclampsia (PE) "Toxemia of pregnancy"⁽²⁾. Preeclampsia usually occurs after 20 weeks gestation and multi-system disorder. It was classically defined as triad of hypertension, edema, and proteinuria⁽³⁾. In preeclampsia, the most affected organs are liver, kidney and brain and due to auto-intoxification, functional disorders in these organs, system are evidential⁽⁴⁾. The causes of PE are not known, but many consider the failure of trophoblast invasion in early pregnancy is precipitating factor⁽⁵⁾.

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Preeclamptic women have high incidence of hypothyroidism that might correlate with the severity of preeclampsia^(6, 7, 8). The mechanism of hypothyroidism in preeclamptic women has not been identified, but the changes in thyroid function during pregnancy are accounted for by high circulating estrogens⁽⁹⁾.

In women with preeclampsia were significantly more likely than control specimens to have high concentrations of TSH. This increment from baseline to predelivery was strongly associated with increasing soluble fms-like tyrosin kinase level in both women who developed preeclampsia⁽¹⁰⁾.

"Preeclampsia among nulliparous women is associated with a greater subsequent risk of subclinical hypothyroidism in pregnancy and women with a history of preeclampsia are at greater risk of hypothyroid function many years after preeclampsia". The study had hypothesized that excess soluble fms-like tyrosine kinase 1 in preeclampsia might be associated with reduced thyroid function during pregnancy. This condition would have an increased risk of thyroid problem later⁽¹¹⁾.

Methodology:

This study was conducted in the department of Obstetrics and Gynecology in Baghdad Teaching hospital. The study included 120 women, their ages between 17-44 years who attended clinic in a periods >20 weeks gestation suffering from elevated blood pressure and the presence of albuminuria. These women were classified into two groups; the first group includes 30 women (healthy pregnant with a mean age of 27.08 years), the second one includes 90 women who were classified according to the severity of the disease into mild PE (37) with a mean age of 30.05 years and severe (53) PE with a mean age of 28.83 years. Venous blood samples were obtained from each group. The serum was taken and used for hormone analysis in the teaching laboratories in Medical City by ELISA test. Results are expressed by using software SPSS for window version 11.0. The significance of the difference between the values from different groups is determined by using one way (ANOVA) (F-test).

Results:

The mean \pm SE serum level of TSH $\frac{\mu\text{lu}}{\text{ml}}$, T3 $\frac{\text{ng}}{\text{ml}}$, T4 $\frac{\mu\text{g}}{\text{dl}}$ in total preeclamptic group were 2.107 \pm 0.200, 2.086 \pm 0.212, and 8.914 \pm 0.736 respectively, while mean \pm SE serum levels of TSH $\frac{\mu\text{lu}}{\text{ml}}$, T3 $\frac{\text{ng}}{\text{ml}}$ and T4 $\frac{\mu\text{g}}{\text{dl}}$ in severe preeclamptic group were 2.609 \pm 0.269, 2.710 \pm 0.278 and 7.926 \pm 0.818 respectively, the means \pm SE serum levels of TSH $\frac{\mu\text{lu}}{\text{ml}}$, T3 $\frac{\text{ng}}{\text{ml}}$, T4 $\frac{\mu\text{g}}{\text{ml}}$ in mild preeclampsia group were 1.144 \pm 0.135, 0.888 \pm 0.099, 10.807 \pm 1.410 respectively, and the means \pm SE serum level of TSH $\frac{\mu\text{lu}}{\text{ml}}$, T3 $\frac{\text{ng}}{\text{ml}}$, T4 $\frac{\mu\text{g}}{\text{dl}}$ in control group were 1.116 \pm 0.144, 1.213 \pm 0.130, 8.689 \pm 1.406 respectively (Table 1). Statistical analysis shows that there was a significant increase in the level of TSH in mild preeclamptic women as compared to control (p<0.05) and severe preeclampsia (p<0.01) as compared to control too. T3 level was higher in mild preeclampsia (p<0.05) and severe

($p < 0.01$) as compared to normotensive pregnant, but T4 does not have significant changes in preeclamptic groups as compared to control.

Table 1. Comparison the serum levels of hormones (TSH, T3 and T4) between studied groups (means \pm SE)

Hormones	(1) Control n=30	(2) MPE n=37	(3) SPE n=53	(4) TPE n=90
TSH $\frac{\mu\text{lu}}{\text{ml}}$	1.116 \pm 0.144	* 1.144 \pm 0.135	** 2.609 \pm 0.269	* 2.107 \pm 0.200
T3 $\frac{\text{ng}}{\text{ml}}$	1.213 \pm 0.130	* 0.888 \pm 0.099	** 2.710 \pm 0.278	* 2.086 \pm 0.212
T4 $\frac{\mu\text{g}}{\text{dl}}$	8.689 \pm 1.406	10.807 \pm 1.410	7.926 \pm 0.818	8.914 \pm 0.736

MPE= Mild Preeclampsia; n= Number; SPE= Severe Preeclampsia; TPE= Total Preeclampsia

* significant at the level $p < 0.05$

** significant at the level $p < 0.01$

Discussion:

The significant elevation in the level of TSH in severe preeclampsia gives a good indicator that the preeclampsia is associated with an increased level of TSH in the serum, and also the level of increment in this hormone depends on the severity of disease. This result consists with a study which suggests that the abnormality in TSH might be associated with risk for developing preeclampsia⁽¹²⁾ and our findings supported the reports that preeclamptic women had a higher increment in this hormone as compared with normotensive pregnant ones. Many researches showed that women with preeclampsia had high level of TSH⁽¹³⁾. There has been an explanation of this elevation to secretion of the placental thyrotropic like peptide and increasing quartiles of pre-delivery soluble fms-like tyrosine-kinase level⁽¹⁰⁾. On the other hand, other researches showed that there was no significant increment in TSH⁽¹⁴⁾. This variation is probably due to the association of the high level of TSH combined with the presence of thyroid peroxidase antibodies and particularly strong if preeclampsia had occurred in two pregnancies⁽¹⁵⁾. The presence of thyroid peroxidase antibodies in the blood suggests that cause of thyroid disease is due to an autoimmune disorder. In autoimmune disorders, the immune system makes antibodies that attack normal tissues. These antibodies attack the thyroid gland causing inflammation and impairment of thyroid function⁽¹⁶⁾. This disorder in thyroid tissue and its function may affect significantly on the secretion level of thyroid hormone. This supports our study which appeared a highly significant level of T3 in preeclamptic women than normotensive pregnant ones and reaches the higher level in severe cases what might reflect significantly pathological changes and abnormal secretary function. The present study showed a high level of T4 in serum of preeclamptic women, but not significantly as compared with normal pregnancy women. This was inconsistent with other studies which have stated that there was no influence of parity and maternal age on thyroid function and low level at T3, T4⁽¹⁷⁾. While, others showed significantly a lower concentration of T4 and T3^(8,9). Change in results of thyroid function test induced by preeclampsia might

be consequences of the dysfunction in hypothalamic-pituitary-thyroid axis⁽³⁾. Other studies showed decreased T3 associated with higher T4 in preeclampsia due to reduced conversion of **Thyroid-related Hormones and Preeclampsia**

T4 to T3 in the liver and kidneys⁽¹⁸⁾.

Our explanation of increased T3 and T4 levels in this report in preeclamptic women may be attributed to pathological changes in severe preeclampsia which leads to endocrinological disturbances and consequently to thyroid gland dysfunction that may affect on synthesis and secretion of T3, T4.

Recommendations:

- 1- Studying the relationship between preeclampsia and its effect on the secretion of pituitary gland to ADH.
- 2- Studying the role of adrenal gland, hypothalamus and their secretions in preeclampsia

References:

- 1- Cyril, A.; Eric, N. and Norman, J.: **Samson Wright's Applied Physiology**. 13th ed. Oxford University Press, 1983, P.P.581-5.
- 2- Dekker, G. and Robillard, P.: Preeclampsia is the Immune Maladaptation Hypothesis Still Standing, **J. Repr. Immunol**; 2007, (76): P.P.8-16.
- 3- Pankaj, D., Narendra, M. and Duru, S.: **Principles and Practice of Obstetrics on Gyneco**. 3rd ed. New Delhi publication. 2008, P.P.100-103.
- 4- Duha, D. And Konar, H.: Textbook of **Obstetrics Including Perinatology and Contraception**. 5th ed. Calcutta: New Central Book Agency (p) ltd., 2001: P.P.234-55.
- 5- Chamberlain, G. and Simpkins, P.: **A Practice of Obstetrics and Gynecology**, 3rd ed., UK: Churchill Livingstone, 2009, P.P.55-59.
- 6- Lao, T.; Chin, R. and Swaminathan, R.: Thyroid Function in Preeclampsia. **Br. J. Obstet. Gynaecol**. 1988, (95), P.P.880-3.
- 7- Lao, T., Chin, R, and Swaminathan, R.: Maternal Thyroid Hormones and Outcome of Preeclamptic Pregnancies. **Br. J. Obstet. Gynaecol**. 1990 (97): P.P.71-4.
- 8- Kaya, E., Sahin, Y., Ozkececi, Z. and Pasaoglu, H.: Relation between Birth Weight and Thyroid Function in Preeclampsia-Eclampsia. **Gynaecol. Obstet. Invest**. 1994, (37): P.P.30-3.
9. Kumer, A.; Ghosh, B. and Murthy, N.: Maternal Thyroid Hormonal Status in Preeclampsia. **Indian J. Med. Sci**. 2005, (59): P.P.57-63.

9. Fiore, K.: Preeclampsia Tied to Future Thyroid Issues. **Med. Page Today**, 2009, P.P. 339-336.

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9- Barclay, L.: Preeclampsia Linked to Hypothyroidism. **Medscape Medical News**, 2009, P.P.1-2.

10- Mustafa, M.; Ercan, A.; Mehmet, T.; Ahmet, T.; Erdal, K. and Ozguro, O.: Correlation between Maternal Thyroid Function Tests and Endothiline in Preeclampsia-Eclampsia. **J. Obstet. and Gynecol.** 1999, (94): P.P.551-555.

11- Genazaani, A.; Fioretti, P. and Peraud, L.: Plasma Thyrotrophin Levels during Pregnancy, **B. Jog An International Journal of Obstetrics and Gynaecology**, 2005, (78): P.P.177-122.

12- Mostaghel, N.; Tavanyanfar, E. and Samani, N. Association of Maternal Hypothyroidism with Preeclampsia. **Iranian Journal of Pathology**, 2008, (2): P.P.51-54.

13- Levin, R.; Vatten, L. and Horowitz, G.: Pre-eclampsia, Soluble fms-like Tyrosine Kinase 1, and The Risk of Reduced Thyroid Function. Nested Case-control and Population-based Study, **BMJ**, 2009, 339, P.4336.

14- Singhal, K. and Hossain, A.: Thyroid Function in Pre-eclampsia and Its Correlation with Maternal Age, Parity, Severity of Blood Pressure and Serum Albumin, **Indian J. Physiol Pharmacol.** 1999, 43(2): P.P.193-8.

15- Sardana, D. Nanda, S. and Kharb. S.: Thyroid Hormones in Pregnancy and Preeclampsia. **Original Investigation**, 2009, 10, P.P.168-7.

16- Rahman, H.; Chowdhury, M. and Alam, M.: Serum Thyroxine and Trilodothyronine Levels in Normal Pregnancy and Pre-Eclampsia, **Journal Teach Associa. RMC, Rajshahi**, 2007.