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Comparative Investigation of Thyroid Autoantibodies Between Type 1 and Type 2 Diabetes Mellitus Patients in Baghdad City

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Abstract

The level of thyroid autoantibodies between type 1 and type 2 diabetes mellitus patients in Baghdad City were investigated.

Fifty individuals (25 female and 25 male) with type-1 DM in the age group of 10 to 35 years and seventy (35 female and 35 male) of having type-2 DM in the age group of 33 to 60 years were investigated. A control group of twenty-five non-diabetes was included. Serum sample collected was used to estimate anti-TPO, TG and thyroid stimulating hormone antibodies (thyroid stimulating immunoglobulin TSI and thyrotropin binding inhibitory immunoglobulin TBII) by using enzyme-linked immunosorbent assay (ELISA) technique.

The results show that there is a significant ($p < 0.05$) increase in the level of thyroid peroxidase antibody (TPO-Ab) in female patients with T1DM and T2DM compared with control non-diabetes group. Furthermore, there is no significant ($p < 0.05$) difference in the level of TPO-Ab and Tg-Ab in male patients with T1DM and T2DM compared with non-diabetes group. The results of this study also demonstrate that there is a significant ($p < 0.05$) increase in the level of thyroid stimulating immunoglobulin (TSI) in male patients with T1DM compared with control non-diabetes group. In addition, there is no significant ($p < 0.05$) difference in the level of TSI in female patients with T1DM and male and female with T2DM compared with non-diabetes group. These results also illustrate that there is significant ($p < 0.05$) increase in the level of thyrotropin binding inhibitory immunoglobulin (TBII) in female and male patients with T2DM compared with control non-diabetes group. Furthermore, there is no significant ($p < 0.05$) difference in the level of TSI in female and male patients with T1DM compared with non-diabetes group.

From this study, it concluded that the presence of antithyroid peroxidase (TPO) antibodies is helpful in predicting the development of autoimmune thyroid disorders, especially hypothyroidism. Subclinical hypothyroidism has a negative influence on lipid metabolism and it is an independent risk factor for myocardial infarction.

Keywords: Thyroid Peroxidase, Thyroglobulin, Diabetes Mellitus, Antibody.

دراسة مقارنة للاجسام المضادة للدرقية بين مرضى السكري من النوع الاول والثاني في مدينة بغداد

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الخلاصة

أجريت دراسة مقارنة للاجسام المضادة للدرقية بين مرضى السكري من النوع الاول والثاني في مدينة بغداد، إذ تم اختيار خمسين شخصا (25 اناث و 25 ذكور) مصابين بمرض السكري من النوع الاول وبمجموعة عمرية بين 10 و 35 سنة، واختير سبعون شخصا (35 اناث و 35 ذكور) مصابين بمرض السكري

من النوع الثاني وبمجموعة عمرية بين 33 و60 سنة، أما مجموعة السيطرة فإنها تكونت من 25 شخصا غير مصابين بمرض السكري. استخدمت عينات المصل المجموعة لقياس الاجسام المضادة للدرقية وهي الثيرويد بيروكسيد والثايروكلوبيولين و محفزات الدرقية بتقنية التحليل المناعي المرتبط انزيميا (الاليزا). أظهرت النتائج بأن هناك ارتفاعا معنويا ($P<0.05$) في مستوى TPO للاناث المصابات بمرض السكري من النوع الاول والثاني مقارنة مع مجموعة السيطرة الغير مصابين بالسكري. علاوة على ذلك، لم يظهر هناك فرقا معنويا ($P<0.05$) في مستوى TPO و الثيروكلوبيولين في الذكور المصابين بمرض السكري من النوع الاول والثاني مقارنة مع مجموعة السيطرة الغير مصابين بالسكري. أظهرت النتائج بأن هناك ارتفاعا معنويا ($P<0.05$) في مستوى TSI للذكور المصابين بمرض السكري من النوع الاول مقارنة مع مجموعة السيطرة الغير مصابين بالسكري. بالاضافة لذلك لم يظهر هناك فرقا معنويا ($P<0.05$) في مستوى TSI في الاناث المصابات بمرض السكري من النوع الاول والثاني والذكور المصابين بالسكري من النوع الثاني مقارنة مع مجموعة السيطرة الغير مصابين بالسكري. كما اشارت النتائج بأن هناك ارتفاعا معنويا ($P<0.05$) في مستوى TBII في الذكور والاناث المصابين بمرض السكري من النوع الثاني مقارنة مع مجموعة السيطرة الغير مصابين بالسكري. علاوة على ذلك، لم يظهر هناك فرقا معنويا ($P<0.05$) في مستوى TBII في الذكور والاناث المصابين بمرض السكري من النوع الاول مقارنة مع مجموعة السيطرة الغير مصابين بالسكري. يستنتج من هذه الدراسة بان وجود الاجسام المضادة للدرقية (TPO) مفيد في التنبؤ بتطور اضطرابات المناعة الذاتية للدرقية خاصة قلة افراز الدرقية، وان قلة افراز الدرقية له تأثير سلبي على ايض الدهون وعامل خطورة لاحتشاء العضلة القلبية.

Introduction

Diabetes mellitus and thyroid dysfunction are the most common endocrine disorders found in the adult people [1]. Thyroid diseases are also very common in the general community and are second to diabetes as the most common problem to affect the endocrine system. So it is important to estimate diabetic population considering thyroid disorders medically or clinically [2].

Although autoimmunity, in which circulating antibodies exist to many body tissue parts destroy these tissues, autoimmune thyroid disorders are known to be highly prevalent in all kinds of diabetes [3].

There are a number of auto antibodies linked with the autoimmune thyroid disorders, which are considered as either primary or secondary antibodies. Primary antibodies are directly pathogenic and often directed against cell membrane receptors, while secondary antibodies do not found to be involved in pathogenesis but can serve as useful diagnostic tools for the presence of autoimmune thyroid disorder [4].

Thyroid autoantibodies that can be found in the serum include antibodies to thyroglobulin (Tg) and thyroid peroxidase (TPO) as well as antibodies to the thyroid hormones T4 and T3 [4, 5]. Thyroid peroxidase (TPO) antibodies are one of the many secondary antibodies linked with autoimmune thyroid disorder [4].

People studies of the frequency and duration of hypo- and hyperthyroidism in adults with different kinds of diabetes are lacking [6]. Although a work has been done in patients of type 1 diabetes mellitus but linking of autoimmune thyroid disorders with type 2 diabetes mellitus has rarely been investigated [7]. Therefore, the aim of this study is to determine the level of thyroid autoantibodies in type 1 and type 2 diabetes mellitus patients in Baghdad City.

Material and Method

In this investigated study, fifty individuals (25 female and 25 male) with type-1 DM in the age group of 10 to 35 years and seventy (35 female and 35 male) of having type-2 DM in the age group of 33 to 60 years were selected. Diabetes mellitus was diagnosed by endocrinologist. The time of blood sample collection was during a two-month-period (February and March). A control group of twenty-five non-diabetes was included. Blood was collected by vein puncture and serum was stored at C. anti-TPO (Orgentec Diagnostika, Germany), TG (BioMérieux, France) and thyroid stimulating -20 hormone antibodies (thyroid stimulating immunoglobulin TSI and thyrotropin binding inhibitory immunoglobulin TBII) (Linear chemicals, Spain) were measured using enzyme-linked immunosorbent assay (ELISA) method [4, 8].

Statistical analysis: The results were analyzed statistically using analysis of variance test (ANOVA). Then, the significance between means was tested depending on Duncan Multiple Range Test using SPSS program version 17 for windows software package [9]. Quantitative variables are presented as mean \pm SD and differences between studied groups were considered significant when $p < 0.05$ [8].

Results

The results in Table-1 show that there is a significant ($p < 0.05$) increase in the level of thyroid peroxidase antibody (TPO-Ab) in female patients with T1DM and T2M compared with control non-diabetes group. Furthermore, there is no significant ($p < 0.05$) difference in the level of TPO-Ab and Tg-Ab in male patients with T1DM and T2DM compared with non-diabetes group. The mean values of TPO level are 29.04, 40.56 and 30.04 IU/mL in non-diabetic and female as well as male with T1DM, respectively. While in female and male with T2DM, the means are 32.2 and 28.914 IU/mL, respectively. The mean values of Tg-Ab are 17.4, 23.88, 19.8, 19.343 and 19.943 IU/mL in non-diabetic, female as well as male with T1DM and female as well as male with T2DM, respectively.

The results of this study also demonstrate that there is a significant ($p < 0.05$) increase in the level of thyroid stimulating immunoglobulin (TSI) in male patients with T1DM compared with control non-diabetes group. In addition, there is no significant ($p < 0.05$) difference in the level of TSI in female patients with T1DM and male and female with T2DM compared with non-diabetes group. The mean values of TSI are 129.36, 131.96 and 132.56 % in non-diabetic as well as female and male with T1DM, respectively. While in female and male with T2DM, the means of TSI are 130.657 and 128.457 %, respectively Table-2.

These results also illustrate that there is significant ($p < 0.05$) increase in the level of thyrotropin binding inhibitory immunoglobulin (TBII) in female and male patients with T2DM compared with control non-diabetes group. The TBII means are 15.76, 21.2 and 20.701 % in non-diabetic as well as female and male with T2DM, respectively. Furthermore, there is no significant ($p < 0.05$) difference in the level of TSI in female and male patients with T1DM compared with non-diabetes group. The TBII means in female and male with T1DM are 16.36 and 15.130 %, respectively Table-2.

Table 1- Thyroid peroxidase and thyroglobulin antibodies levels in patients type 1 and type 2 diabetes mellitus.

Parameter Group		Thyroid Peroxidase antibody (IU/mL)	Thyroglobulin antibody (IU/mL)
		Control	c 29.04 \pm 3.872
T1DM	Female	a 40.56 \pm 5.980	a 23.88 \pm 3.558
	Male	c 30.04 \pm 2.735	b 19.8 \pm 2.592
T2DM	Female	b 32.2 \pm 3.912	b 19.343 \pm 3.593
	Male	c 28.914 \pm 4.094	b 19.943 \pm 3.363

Values are means \pm SE.

Similar letters indicate no significant differences and different letters indicate significant differences at $P < 0.05$.

Table 2-Thyroid stimulating hormone antibodies level in patients with type 1 and type 2 diabetes mellitus.

Group		Parameter	Thyroid stimulating immunoglobulin TSI (%)	Thyrotropin binding inhibitory immunoglobulin TBII (%)
Control			a 129.36 ± 4.136	a 15.76 ± 2.371
T1DM	Female		ab 131.96 ± 4.992	a 16.36 ± 2.243
	Male		b 132.56 ± 5.419	a 15.130 ± 2.193
T2DM	Female		a 130.657 ± 6.915	b 21.2 ± 3.763
	Male		a 128.457 ± 4.918	b 20.701 ± 3.826

Values are means ± SE.

Similar letters indicate no significant differences and different letters indicate significant differences at $P < 0.05$.

Discussion

Diabetes mellitus is a complex and multifactorial disorder. The metabolic dysregulation linked with diabetes causes secondary pathophysiologic problems in many organ systems that impose a heavy load of pathologic effects from macrovascular and microvascular complications [2].

People with type 1 diabetes mellitus (T1DM) have antibodies which attack other tissues in the human body, including the thyroid gland. Thyroid antibodies can either turn on the thyroid which lead to hyperthyroidism, or turn off the thyroid which cause hypothyroidism [5]. Associations between type 2 diabetes and thyroid disorder are less common, but one cross-sectional study showed increased hypothyroidism prevalence in patients with type 2 diabetes and proposed that thyroid screening may be necessary in these patients [6].

In this study the increase in the level of TPO-Ab and Tg-Ab in T1DM patients is come to agree with [10] who found that the prevalence of positive thyroid peroxidase (TPO) antibodies has been found in 80% of individual with type 1 diabetes and increased TSH levels and between 10 and 20% in those diabetic patients having normal TSH levels. On the other hand, it has been demonstrate that anti-TPO antibodies in type 2 diabetics was 42.3% whereas it was 12% in control group [11]. The presence of significantly higher positive thyroid auto-antibodies in type 2 DM people indicate the important effect of autoimmunity in the development of thyroid dysfunction among type 2 DM [2].

Furthermore, it has been found that anti-TPO were more clear in female and that autoimmune thyroid disorders (ATD) and even hypothyroidism may accompany T1DM [8]. This finding is accordance with [12] who illustrate the presence of anti-TPO antibody in women was about seven

times greater than men and that autoimmune thyroid diseases affect women from 2 to 4 times more than men.

Hypothyroidism is more common in females than males. Patients with positive TPO might may to develop thyroid disease. This statement matches with my work. Thyroperoxidase being responsible for iodination of tyrosine moieties is essential for active thyroid hormone T4 and T3 synthesis. When inhibited by anti TPO Abs, the active T4, T3 synthesis declines, resulting in low level of T4, T3 and there is an opposite elevated in TSH level, with increased anti TPO level and duration leads to deterioration of thyroid work from sub clinical disorder to fully manifest clinical hypothyroidism [4]. Type 2 diabetes mellitus patients have a higher prevalence of thyroid disorders because patients with single organ specific autoimmune dysfunction are usually at risk of other autoimmune disorders. Thyroid disorders affect mainly diabetes. Diabetes mellitus appears to influence thyroid function at two sites; firstly at the level of hypothalamic control and TSH release from pituitary gland and secondly at the conversion of T4 to T3 in the other tissues [7]. In brief, the results of the present work significant variation in frequency of thyroid disorder in different age groups in both forms of diabetes (Type 1 and Type 2) [11].

From this study, it is concluded that the presence of anti-thyroid peroxidase (TPO) antibodies is useful in predicting the development of autoimmune thyroid diseases, especially hypothyroidism. Subclinical hypothyroidism has a negative influence on fat metabolism and it is an independent risk factor for myocardial infarction.

In addition, because of the importance of normal thyroid function, it is advisable to investigate the auto-thyroid disease and hypothyroidism at the onset of T1DM in children, mainly those who above 12 years of age.

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