Detection of Type 2 Diabetes Mellitus in Serum from Women with Polycystic Ovarian Syndrome

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Abstract:

Polycystic ovary syndrome (PCOS) is one of the most common endocrine disorder. To determine the metabolic disorders in women with PCOS, (25) women with PCOS ages (15 - 47) years have been investigated and compared with (20) healthy individuals. All the studied groups were carried out to measure fasting blood sugar, (anti-GAD Ab, anti β-islet cell Ab by IFAT) and measured insulin level by ELISA. There was significant elevation in the concentration of fasting blood sugar than in control groups ($p \leq 0.05$) and there was negative results for anti-GAD Ab and anti β-islet cell Ab by IFAT test for serum of women with PCOS, while there was significant differences in the insulin level for women with PCOS compared with control groups ($p \leq 0.05$), these indicated that women with PCOS are at high risk for type -2 Diabetes mellitus and reflecting insulin resistance.

Key Words: metabolic disorders, polycystic ovary syndrome, insulin hormone.

Introduction

Polycystic ovary syndrome (PCOS) is one of the most common gynecological endocrinological disorders affecting women. Normal adolescence is accompanied by some of the recognized symptoms of PCOS like menstrual irregularities and acne [1]. Polycystic ovary syndrome is the most common cause of anovulation, affecting approximately 5% to 10% of all women of reproductive age [2, 3]. The syndrome is also associated with hyperinsulinemia, glucose intolerance, abnormal blood lipid levels, and obesity, which constitute the metabolic syndrome [4]. Insulin resistance occurs in approximately 50% to 60% of women with PCOS where as its prevalence in the general population is between 10% and 25% depending on method of assessment and mean body weight [5,6]. Insulin resistance is central to the pathogenesis of PCOS has a multifactorial, is a precursor of diabetes mellitus and is additionally associated with components of the metabolic syndrome, such as cardiovascular risk, hypertension and endothelial dysfunction, which is considered the initial step in the process of atherosclerosis and a shorter life span. Anovulatory women with PCOS are relatively hyperinsulinemic and more insulin resistant than weight - matched control subjects [7]. Women with PCOS have profound insulin resistance independent of obesity that is secondary to a unique, apparently genetic, disorder of insulin action [8]. Insulin resistance is now recognized as a major risk factor for the development of type 2 diabetes mellitus. Pancreatic β-cell dysfunction is a second important risk factor, an abnormality that is also found in PCOS. PCOS women would thus be predicted to be at increased risk for type 2 diabetes mellitus [9]. The aim of the present study was to detect of type 2 diabetes mellitus in the sera of women with polycystic ovary syndrome.

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Materials and Methods:

The study included (25) patients with polycystic ovary syndrome of ages (15 - 47) years from Baghdad Hospital who are diagnosed by ultrasound and reproductive endocrine abnormality, and (20) health blood donors taken as a healthy control group, For all the study groups fasting blood sugar(biochemical Human) Germany, anti-Glutamic Acid Decarboxylase (GAD) antibodies by using Immunoflouresent assay IFAT (Euro immune) Germany, anti β-islet cell Ab by IFAT (Euro immune) Germany and determination of insulin level of study groups by (ELISA) test DRG (Germany)were conducted.

Statistical analysis:

Comparison of paired data from the groups of subjects was done using T–test (t), while correlation between groups were analyzed using Person Chi Square. The computer program which used was SPSS v. 11.5.

Results and Discussion:

The results of the present study showed that there was significant elevation in the concentration of fasting blood sugar in PCOS group (181.16 ± 5.41) than in control groups (85.45 ± 1.83) ($p \leq 0.05$) as shown in figure (1).

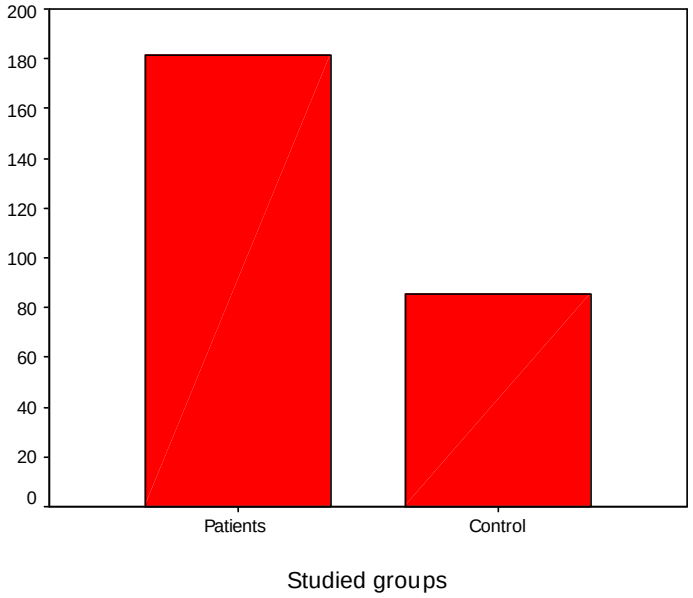
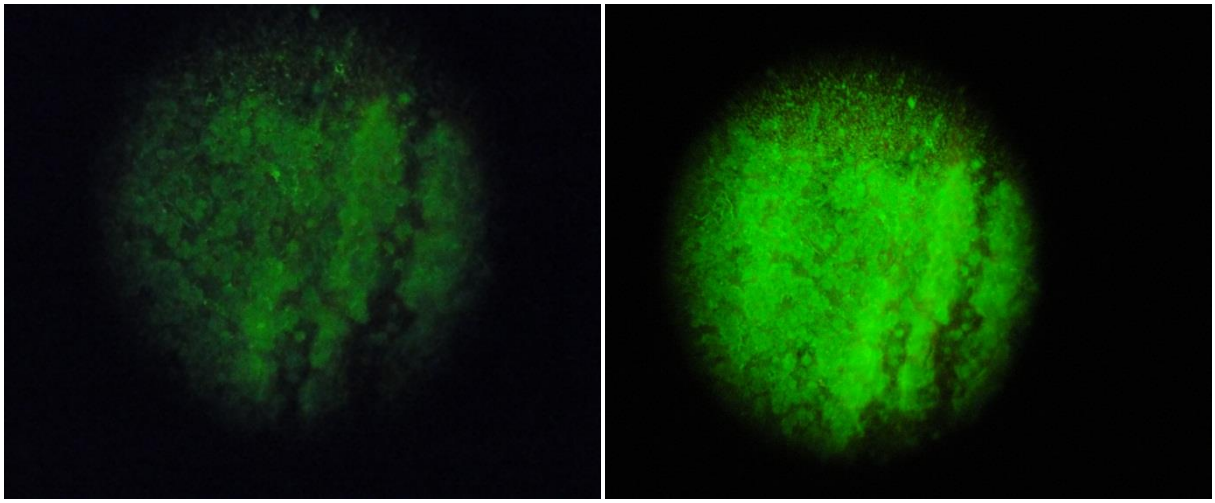


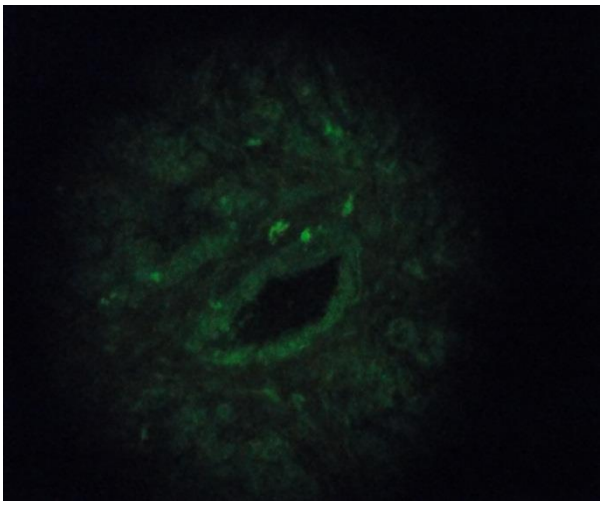
Figure (1): mean level of blood sugar concentration (mg/dl) in the sera of women with PCOS and control groups

Whereas, there were negative results for anti-GAD Ab and anti β-islet cell Ab by IFAT test for serum of women with PCOS, these indicates that all patients with PCOS are negative for type 1 Diabetes mellitus and at high risk for type 2 Diabetes mellitus because these Abs (anti-GAD and anti-β-islet cell Ab) used as differential diagnosis between type 1 and type2 Diabetes mellitus as shown in figure (2a, b) and figure (3a, b).

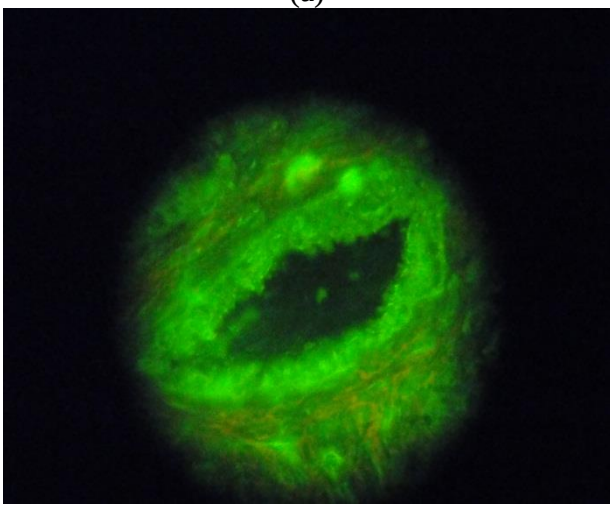


(a) (b)

Figure(2): Negative anti-GAD Ab (a) and positive anti-GAD Ab(b)by IFAT test for serum of women with PCOS.



(a)



(b)

Figure (3): Negative anti β-islet cells Ab(a) and positive anti β-islet cells Ab(b)by IFAT test for serum of women with PCOS.

While there were significant differences in the insulin level for women with PCOS (9.90 ± 0.40) compared with control groups (3.20 ± 0.26) ($p \leq 0.05$), these indicated that women with PCOS have higher serum insulin level and may reflect increased risk for development of type 2 Diabetes mellitus in the future as a result of insulin resistance.

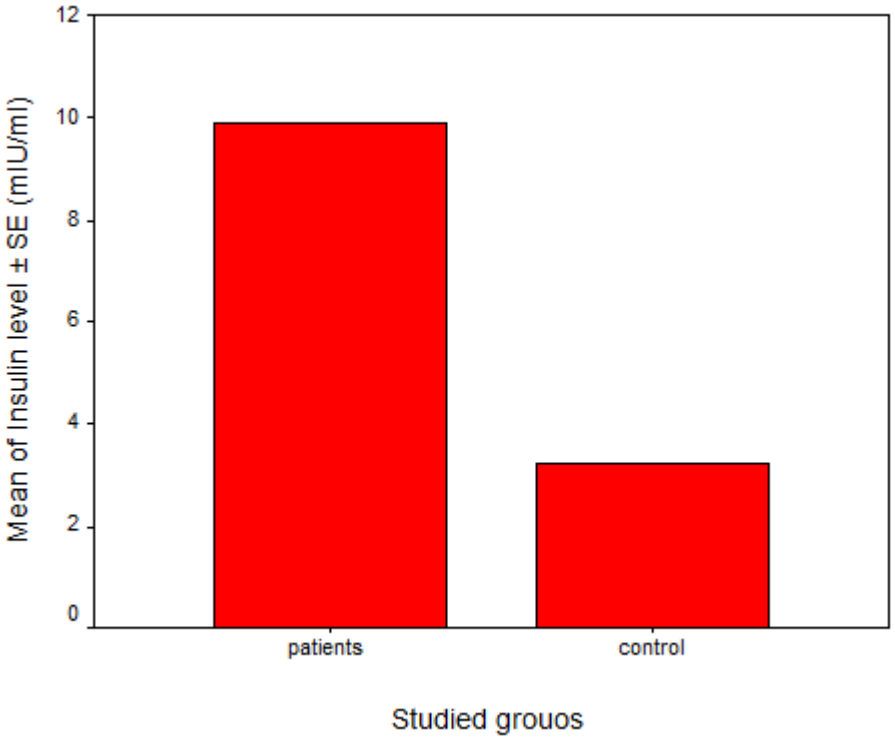


Figure (4): mean level of insulin (mlU/ml) in serum of women with PCOS and control groups

Different studies have reported different prevalence rates of insulin resistance in women with PCOS. The result of this study is in agreement with other studies, in one study the investigators have suggested that insulin resistance is universal in these women, others are of the opinion that it is present in no more than 40% to 70% of cases [11, 12]. In one report we found a high prevalence of non-insulin dependent diabetes mellitus (NIDDM) in women who had a wedge resection of the ovary performed some years previously and showed an increase in NIDDM on death certificates of women who had PCOS [13Another report showed the presence of intense insulin resistance in adolescents with PCOS regardless of body composition or abdominal obesity [14]. It is likely that body fat distribution plays an important role in PCOS women and their insulin resistance is connected very tightly with upper body adiposity [15]. It is important to recognize that PCOS women are at high risk for type 2 diabetes and for cardiovascular disease because of their increased prevalence of glucose intolerance [16, 17]. It has been suggested that a family history of diabetes worsen insulin secretion and glucose tolerance in PCOS. Consistent with this hypothesis, showed that a first degree relative with diabetes was associated with an increased risk of glucose intolerance in PCOS women. However, the

prevalence of glucose intolerance in PCOS, even in those women without a first degree relative with diabetes, was still much greater than that reported in the general U.S population and was significantly higher than that in control women [18, 19]. The factors associated with glucose in tolerance in PCOS, age, BMI, Waist/ hip ratios, and family history of diabetes, were identical to those in other population. An underlying genetic defect conferring insulin resistance and perhaps B-cell dysfunction interacts with environmental factors worsening insulin resistance [20, 21]. Studies on the molecular mechanisms of insulin resistance in PCOS suggests that the peripheral insulin resistance in these patients may be due to a post-binding defect in insulin receptor-mediated signal transduction, specifically, a dysregulation of insulin receptor phosphorylation and consequently decreased tyrosine kinase activity of the receptor, inhibition of normal signaling and a significant decrease in insulin responsiveness. Serine phosphorylation also appears to increase the activity of P450c17α, the key regulatory enzyme in androgen [22, 23].

Conclusion:

PCOS women are at significantly increased risk for impaired glucose tolerance and type 2 diabetes mellitus at different ages.

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التحري عن داء السكري النمط الثاني في مصول النساء المصابات بمتلازمة المبيض المتعدد الاكياس

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الخلاصة:

تعد متلازمة المبيض المتعدد الاكياس احدى متلازمات الاضطرابات الهرمونيه الاكثر شيوعا. ولغرض التحري عن الاضطرابات الايضيه في النساء المصابات بمتلازمة المبيض المتعدد الاكياس تم التحري عن 25 امرأة باعمار تتراوح من 15-47 سنه وتمت المقارنه مع 20 امرأة سليمه كمجاميع سيطرة. خضعت جميع عينات الدراسة الى قياس مستوى السكر بالدم، اضداد حامض الكلوتامك، اضداد خلايا بيتا وقياس مستوى الانسولين بالدم باستخدام تقنيات التألق المناعي والامتزاز المناعي المرتبط بالانظيم. لوحظ هنالك ارتفاع معنوي في تركيز السكر بالدم ($p \leq 0.05$) مقارنة بمجاميع السيطرة واظهرت جميع مصول النساء قيد الداسة نتائج سالبة بالنسبة لاضداد حامض الكلوتامك وخلايا بيتا، في حين لوحظ هنالك فرق معنوي ($p \leq 0.05$) في مستوى الانسولين في مصول تلك النساء مقارنة بمجاميع السيطرة. تشير هذه الدراسة بأن النساء ذوات المبيض المتعدد الاكياس تكون ذات خطورة عالية وعلاقة بتطور داء السكر النوع الثاني كنتيجة لمقاومة الانسولين.