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Polycystic Ovary Syndrome

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Abstract

Impaired glucose tolerance and other metabolic defects in women with polycystic ovary syndrome

Keywords: polycystic ovary, glucose tolerance, metabolic defect.

Introduction

Polycystic ovary syndrome (PCOS) is the most common endocrinopathy in women of reproductive age.[1,2] PCOS is mainly characterized by oligo- or anovulation, clinical and/or biochemical hyperandrogenism and polycystic ovaries and is the leading cause of anovulatory infertility.[3,4] However, PCOS is also associated with an array of metabolic disorders, among which impaired glucose metabolism has been a topic of intense research. Indeed, several cross-sectional and some prospective studies reported increased prevalence and incidence of impaired glucose tolerance (IGT) and type 2 diabetes mellitus (T2DM) in these patients.[5.]

Patients and Methods

This was a case–control observational study carried out on women confirmed to have PCOS based on Rotterdam criteria ([6]) who attend gynecology consultation clinic in Alomara, Alazizeah, and Baqobq hospitals. Controls were selected from healthy woman attending birth control clinic.

For all patients detailed histories (menstrual, fertility, hirsutism, acne, greasy skin, acanthosis nigricance, scalp hair loss or thinning and family history of diabetes mellitus were taken. This was followed by a full examination including general and pelvic examinations,body weight (kg), and height (cm). The BMI was calculated by dividing the weight (in kg) by the height (in m) squared to assess obesity. Systolic blood pressure (SBP) and diastolic blood pressure (DBP) were measured with a sphygmomanometer.

Blood samples for baseline measurements were collected after an overnight fast on day 2 or day 3 of the menstrual cycle in the control group and after a spontaneous bleeding episode in the PCOS group or randomly in the case of amenorrhea. The circulating levels of total testosterone, estrogen and progesterone.

Glucose, total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C), low-density lipoprotein cholesterol (LDL-C) and triglycerides (TG) were also measured.

On the same day as blood samples were collected, transvaginal ultrasonography was performed and the volume of each ovary was determined, as well as the number of small follicles in each ovary.

Immediately after baseline blood sampling, an oral glucose tolerance test (OGTT) was performed in which glucose (75 g) was administered orally and serum glucose levels were determined at 0 and 120 min. A fasting plasma glucose (FPG) of <100 mg/dL (5.6 mmol/L) and 2-h glucose during OGTT <140 mg/dL (7.8 mmol/L) were accepted as normal values .

Categories of increased risk for diabetes (prediabetes) were defined as follows: impaired fasting glucose (IFG) was diagnosed when FPG was between 100 and 125 mg/dL (5.6–6.9 mmol/L) and IGT was diagnosed when the 2-h plasma glucose (2-h PG) value during a 75 g OGTT was between 140 and 199 mg/dL (7.8–11.0 mmol/L). Diabetes mellitus was confirmed by FPG ≥126 mg/dL (7.0 mmol/L), a 2-h PG value during a 75 g OGTT of ≥200 mg/dL (11.1 mmol/L), or a random PG concentration ≥200 mg/dL (11.1 mmol/L) in the presence of symptoms.[7]

The following exclusion criteria were applied: the presence of systemic disease that could alter insulin sensitivity (such as cardiovascular disease and diabetes mellitus); women on medication for ≤6 months prior to the study (including oral contraceptives, glucocorticoids, ovulation induction agents, and estrogenic or anti-androgenic drugs or any medication for dyslipidemia or anti-obesity drugs that could alter the patient's clinical presentation or hormonal profile); women with other endocrinological abnormalities such as primary hyperprolactinemia, thyroid dysfunction, and Cushing syndrome, congenital adrenal hyperplasia and androgen producing neoplasm.

Results

Finally we collect 536 patients with PCOS and 218 control. Glucose metabolism profiles were significantly different between the groups ($P < 0.05$); the PCOS group had higher values for 2-h glucose, and MetS than those for the control group. Lipid profiles also differed significantly between the two groups; the PCOS group had higher triglyceride, total cholesterol, low-density lipoprotein (LDL) levels and cardiovascular risk (TG/HDL) than the control group as shown in Table 1. The PCOS group was associated with a greater risk (2.5-times) of IR than the control group ($P < 0.001$)

Table 1**The clinical, hormonal and metabolic parameters in patients with PCOS and control women**

Variables	PCOS	CONTROL	P-VALUE
Age (years)	29.98 ± 9.95	27.43 ±8.56	
BMI (kg/m2)	32.76 ± 5.04	24.65 ±6.97	<0.001
Total testosterone (ng/mL)	0.44 ± 0.21	0.27 ± 0.13	<0.001
Fasting glucose (FG) (mg/dL)	93.79 ± 79.55	60.85 ± 39.24	<0.001
2-h glucose (2-h G)(mg/dL)	126.44 ± 46.75	107.86 ± 23.12	<0.001
Normal GTT	62.6%	92.8%	<0.001
Prediabetes (IFG and/or IGT) <0.001	32.8	6.1%	<0.001
Type 2 diabetes mellitus	4.6%	1.1%	<0.001
Metabolic syndrome (MetS)	67.6%	27.7%	<0.001
Total cholesterol (TC) (mg/dL)	181.26 ± 44.63	162.39 ± 41.11	<0.001
Triglycerides (TG) (mg/dL)	137.73 ± 97.41	95.83 ± 61.15	<0.001
HDL (mg/dL)	31.79 ± 9.89	43.69 ± 9.68	<0.001
LDL (mg/dL)	93.65 ± 27.6	76.31 ± 21.2	<0.001
Cardiovascular risk (TG/HDL)	65.7%	23.4%	<0.001

Discussion and Conclusion

In an early case-control study in 254 patients with PCOS and 80 age- and weight-matched controls, the prevalence of IGT was 2.7 times higher in the former (31.1 vs. 14.0%, respectively).6 Moreover, 7.5% of patients with PCOS had T2DM compared with none in the women in the control group.[8]

In a more recent large study in 11,035 patients with PCOS, the prevalence of T2DM was 2.45 times higher than in age matched controls.[9]

In a meta-analysis of 13 studies that compared the prevalence of IGT between patients with PCOS and controls, IGT was 2.48 times more frequent in the former.[5] Likewise, the prevalence of T2DM was 4.5 times higher in patients with PCOS than in controls in a meta-analysis of 15 studies5 and, importantly, these differences were similar in studies that included body mass index (BMI)-matched populations.[5] Of note, it has been estimated that 15.0-35.6% of all incident cases of T2DM in white women are attributable to PCOS.[10] Metabolic syndrome, which is associated with increased risk for T2DM,[11]is also more frequent in patients with PCOS,[12.13,14.15] while, in contrast, the prevalence of impaired fasting glucose or of HbA1c levels in the prediabetic range (i.e. between 5.7 and 6.4%) appears to be low in patients with PCOS.[14,15-29].

Our data showed that impaired glucose tolerance, metabolic syndrome, and hyperlipidemia are prevalent in woman with POC, and need special attention and management to prevent future cardiovascular and macrovascular disease.

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