Frequency of Prediabetes and Diabetes among Women with Polycystic Ovary Syndrome in Basrah

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Received: 15.08.2025 **Accepted: 29.12. 2025**

Abstract

Background: Polycystic ovary syndrome (PCOS) is a common endocrine disorder affecting reproductive-age women, often associated with metabolic disturbances such as insulin resistance (IR), prediabetes, and type 2 diabetes (T2D).

Aims of the study: To determine the frequency of prediabetes and diabetes among women with PCOS in Basrah.

Subjects and Methods: This is a case-control study that included 100 women diagnosed with PCOS according to Rotterdam criteria and 100 age-matched control women. Fasting plasma glucose (FPG) and glycated haemoglobin (HbA1c), testosterone, and lipid profile were measured. Prediabetes and diabetes were defined according to ADA criteria.

Results: Among the PCOS group, 52% showed normoglycemia, 29% were prediabetic, while 19% were diabetic ($P< 0.001$). FPG ($P< 0.001$) and HbA1c ($P< 0.01$) levels were significantly higher among women with PCOS compared to controls.

Conclusion: The frequency of prediabetes and diabetes is significantly higher among women with PCOS compared to control women. Thus, PCOS imposes a substantial risk for future development of T2D, and hence, cardiovascular disease risk. Early screening and metabolic monitoring among women with PCOS are crucial to prevent long-term adverse cardiovascular disease outcomes.

Keywords: Polycystic ovary syndrome, Prediabetes, Diabetes.

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Introduction

Polycystic ovary syndrome (PCOS) is one of the most common endocrine disorders affecting women of reproductive age worldwide. It is characterized by hyperandrogenism, ovulatory dysfunction, and polycystic ovarian morphology. Beyond reproductive implications, PCOS is strongly associated with metabolic disturbances, particularly insulin resistance (IR), which predisposes affected women to develop impaired glucose tolerance (IGT), prediabetes, and type 2 diabetes (T2D) [1,2]. The prevalence of IR in women with PCOS is estimated to be between 50% and 70%, significantly higher than in the general population [3].

The metabolic abnormalities observed in PCOS patients contribute substantially to their increased risk of cardiovascular disease (CVD) and T2D. Prediabetes, which includes impaired fasting glucose (IFG) and IGT, is recognized as a critical intermediate state preceding overt diabetes. Early identification and management of prediabetes in women with PCOS is essential to prevent progression to T2D and its associated complications [4,5]. Studies report a variable prevalence of prediabetes and diabetes among women with PCOS depending on diagnostic criteria, ethnicity, and obesity status, with rates generally higher compared to age-matched controls [6]

Multiple mechanisms underlie the glucose metabolism abnormalities in PCOS. Insulin resistance in PCOS is believed to be partly independent of obesity, suggesting intrinsic defects in insulin signaling pathways related to hyperandrogenism and chronic low-grade inflammation [7] Moreover, obesity exacerbates IR and metabolic risk in PCOS, amplifying the likelihood of impaired glucose metabolism. This highlights the importance of metabolic screening and lifestyle interventions in this population [8,9]

Given the high prevalence and significant health impact of glucose metabolism disorders in women with PCOS, understanding the frequency of prediabetes and diabetes in this group is crucial. It is worth mentioning that, in Basrah, PCOS, metabolic syndrome (MetS) and their clinical relationships has received considerable attention. Numerous studies have been perfomed in this aspects[10,11]. The aim of this study was to determine the frequency of prediabetes and diabetes among women with PCOS in Basrah.

Patients and methods

This is case-control study extended from May, 2024 throughout September, 2025, included 100 patients with PCOS, and 100 women as a control group. Detailed medical history gathered from participants including menstrual history, reproductive history, family history, and medications. Diagnosis of PCOS was confirmed according to the 2003 Rotterdam criteria which requires the presence any two of the following 3 findings, oligo-ovulation or anovulation, clinical and/or biochemical hyperandrogenism, and polycystic ovaries[12]. Blood pressure (BP), body mass index (BMI), waist circumference (WC) were measured in all participants. Biochemical parameters, fasting plasma glucose (FPG), glycated haemoglobin (HbA1c), Testosterone and Lipid profile determined by Cobas Integra system. The data in this study was analysed using Statistical Package for Social Science (SPSS) program version 26, and the results were expressed as mean± standard deviation and percentage. To compare two different groups, independent t-test and Chi-square test was used. $P<0.05$ was considered statistically significant.

Results

Anthropometric and physiological measurements of women with PCOS and control women are presented in Table 1. Age was not significantly different between patients with PCOS and control women, $P>0.05$. On the other hand, BMI, WC, systolic blood pressure (SBP) and diastolic blood pressure (DBP) were significantly higher among patients with PCOS in comparison to control women, $P<0.001$.

As presented in Table 2, HbA1c ($P<0.01$), FPG, Testosterone, TC, TG, and LDL-C were significantly higher among patients with PCOS than among controls, ($P<0.001$). While HDL-C was significantly lower among patients with PCOS than compared to control women, ($P<0.001$).

Data are expressed as Mean±SD , @ P<0.01, * P<0.001

Table 3 demonstrates that the frequencies of prediabetes and diabetes among women with polycystic ovary syndrome (PCOS) 29% and 19%, respectively, $P < 0.001$)

Discussion

Polycystic ovary syndrome is complex condition occur in women during reproductive age and consider the most common endocrine disorder in that age [13]. In the present study, the prevalence of prediabetes and diabetes among women with PCOS was found to be 29% and 19%, respectively, which were significantly higher than the control group. These findings highlight the increased risk of dysglycemia among women with PCOS. The elevated frequency of prediabetes and diabetes in the PCOS group may be attributed primarily to IR, a core pathophysiological feature of PCOS. IR impairs glucose uptake and contributes to compensatory hyperinsulinemia, which not only promotes hyperandrogenism but also increases the burden on pancreatic β-cells. Over time, this compensatory mechanism may fail, leading to impaired fasting glucose and ultimately T2D[14,15]. These findings are in agreement with other studies that reported a 2- to 4-fold increased risk of impaired glucose metabolism among women with PCOS compared to the general female population[16,17]. It has been found that progression rates from normoglycaemia to IGT or overt T2D is aggravated with existence of PCOS. Women with PCOS should be tested regularly for early detection of abnormal glucose tolerance[18]. This emphasizes that impaired glucose regulation in PCOS is not merely related to BMI but is also driven by the intrinsic metabolic abnormalities associated with the syndrome[19].

Furthermore, the increased HbA1c levels observed in PCOS patients support the presence of chronic glycemic dysregulation, even in women not fulfilling the diagnostic criteria for diabetes. The identification of 29% of patients as prediabetic underlines the necessity of early screening and subsequent lifestyle and therapeutic intervention to prevent progression to overt T2D[20,21]. In addition, Early detection and lifestyle or therapeutic interventions may substantially reduce the risk of future CVD and metabolic complications[22,23].

Among women with PCOS, BMI and WC were distinctly higher than control group. These findings could be due to increased androgen levels[24]. This is in agreement with other study conducted in Duhok, Iraq[25]. On the other hand, another study conducted in Turky found no

significant differences between PCOS women and control women[26].

The present study found significantly elevated testosterone levels among PCOS women compared to the control group. This could be attributed to the oxidative stress that can promote androgen production by up regulating the expression of testosterone synthesis-related enzymes. This is regarded a critical factor in the increments of testosterone in PCOS[27]. In addition, Obesity sensitizes thecal cells to LH and stimulation and amplifies functional ovarian hyperandrogenism by upregulating ovarian androgen production [28]. These observations are in agreement with results of Panidis et al [28] and Elias [29].

With regard to lipid profile, the present showed that the existence PCOS is associated with significantly higher TC, TG, and LDL-C and significantly lower HDL-C levels. Dyslipidemia in PCOS may be explained by the presence of hyperinsulinemia and hyperandrogenism. This promotes adipocytes to undergo lipolysis mediated by catecholamine and free fatty acids (FFAs) release into the circulation. FFAs lead to very low-density lipoprotein cholesterol production, leading to hypertriglyceridemia, which, in turn, leads, via the reverse cholesterol transfer pathway, to low HDL-C and high LDL-C levels. The consequent androgenic upregulation of adipocytes promotes PCOS-related dyslipidemia [30].

In conclusion, this study demonstrates a distinctly higher frequencies of both prediabetes and diabetes in association with the existence of PCOS. These findings reinforce the strong metabolic component of PCOS, particularly its close association with IR and impaired glucose metabolism. The elevated levels of FPG HbA1c observed among women PCOS sheds a light on high risk of the subsequent development of T2D. Therefore, early and periodic monitoring of women with PCOS seems vital with regard to glycemic and metabolic derangements.

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Table 1. Socio-demographic and physiological characteristics among the study groups

Characteristic	women with PCOS (n=100)	Control group (n=100)
Age (year)	27.20 ± 5.65 ^{NS}	26.90 ± 5.85
BMI (kg/m^2)	27.06 ± 2.24*	24.04 ± 2.17
WC (cm)	89.05 ± 4.37*	85.28 ± 3.70
SBP (mmHg)	128.31 ± 13.69*	119.15 ± 15.36
DBP (mmHg)	90.69 ± 3.24 *	79.33 ± 3.49

Data are expressed as Mean ± SD, *: P<0.001

Table 2. Biochemical parameters among the study groups

Parameters	Women with PCOS (n=100)	Control women (n=100)
FPG (mg/dL)	121.31 ± 12.92*	101.91 ± 12.18
HbA1c (%)	5.61 ± 0.81$^@$	5.24 ± 0.80
Testosterone ng/dL	63.96 ± 17.74 *	47.06 ± 9.83
TC (mg/dL)	140.25 ± 30.21 *	124.06 ± 29.88
TG (mg/dL)	167.48 ± 33.92 *	135.68 ± 26.21
HDL-C (mg/dL)	49.95 ± 9.11 *	56.06 ± 12.18
LDL-C (mg/dL)	106.37 ± 12.62 *	85.57 ± 19.27

Table 3. Frequency of prediabetes and diabetes among women with PCOS

Parameters	No.	%
Normal	52 *	52%
Pre-Diabetics	29	29%
Diabetics	19	19%

***: P<0.001** **X^2 =17.18**