**Short Communication**

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# The Relationship between Gestational Diabetes and Polycystic Ovary Syndrome

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## ABSTRACT

**BACKGROUND AND OBJECTIVE:** Women with polycystic ovary syndrome (PCOS) are at risk of insulin resistance and pregnancy complications. The aim of this study is to determine the relationship between gestational diabetes and polycystic ovary syndrome.

**METHODS:** This cross-sectional study was performed on 126 pregnant women with PCOS and infertility history who became pregnant after stimulation of ovulation and referred to Imam Khomeini Hospital in Ahvaz. These patients underwent screening with 75 g OGTT (Oral Glucose Tolerance Test) during the first trimester and during 24-28 weeks of gestation. They were divided into two groups of PCOS with gestational diabetes and without gestational diabetes. Variables such as age, gestational diabetes, parity and BMI were measured and the relationship between BMI and gestational diabetes was examined.

**FINDINGS:** The mean age of patients in the two PCOS groups with and without gestational diabetes was 26.09±2.03 and 27.07±3.03 years, respectively. Of the 126 pregnant women with PCOS, 30 (23.8%) patients were diagnosed with gestational diabetes in the first trimester of pregnancy and 11 (8.7%) patients during 24-28 weeks of gestation. Overall, 41(32.5%) patients had gestational diabetes and 85 (67.5%) patients did not have gestational diabetes. There was no significant difference in the mean BMI between the two PCOS groups with and without gestational diabetes.

**CONCLUSION:** The results of the study showed that more than one third of women with PCOS experience gestational diabetes during pregnancy.

**KEY WORDS:** *Polycystic ovary syndrome, Gestational diabetes, Insulin resistance, Glucose intolerance.*

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## Introduction

Gestational diabetes refers to the intolerance of glucose with different intensities, which occurs in pregnancy or is diagnosed for the first time during pregnancy. Polycystic Ovary Syndrome (PCOS) is one of the most common endocrine abnormalities and is one of the most important causes of ovarian-related infertility, with 5 – 10% of women reproductive age suffering from this issue (1, 2).

In addition to affecting fertility, this syndrome also affects metabolic and cardiovascular systems (3). PCOS is characterized by symptoms such as polycystic ovary in ultrasound, oligomenorrhea or anovulation, clinical or biochemical symptoms of hyperandrogenism, common insulin resistance, hyperinsulinemia, severe obesity, and infertility (4). Women with PCOS are at risk for pregnancy complications. Due to the fact that a large proportion of women with PCOS develop metabolic disorders such as insulin resistance, type 2 diabetes and obesity (5), metabolic disturbances may appear in the form of gestational diabetes during pregnancy (6).

Some studies have reported that the risk of gestational diabetes mellitus (GDM) in women with PCOS is higher than women without PCOS. Several studies have also shown that the prevalence of polycystic morphology and PCOS symptoms has been higher in women who had a history of GDM before (7). Since pregnancy induces insulin resistance, PCOS may play a role in increasing the incidence of GDM in pregnant women with PCOS (8). In general, it is believed that insulin resistance, hyperandrogenism and obesity play an important role in the pathophysiology of complications in PCOS (9, 10). In a meta-analysis, it has been shown that women with PCOS are at risk of adverse pregnancy complications, such as gestational diabetes (11). Another recent meta-analysis has shown that increased risk of gestational diabetes mellitus in PCOS is still not clear (12).

Insulin resistance during pregnancy occurs due to increase in growth hormone, the presence of human placental lactogen hormone, secretion of insulinase from the placenta and high levels of estrogen and progesterone (13). In non-pregnant women with PCOS, the incidence of insulin resistance is reported to be around 50–70%. Consequently, women with PCOS who are pregnant are at higher risk of developing gestational diabetes (14). Studies show that women with PCOS are at increased risk of long-term complications of both gestational diabetes and type II diabetes. Therefore, early screening of gestational diabetes in this group of patients should be done to reduce the incidence and severity of diabetes, dyslipidemia, hypertension and cardiovascular complications (15). According to the Fifth Annual Conference of American Diabetes Association on gestational diabetes risk assessment strategy in 2007, polycystic ovarian syndrome is not even included in the high-risk group (16).

However, there is evidence of increased gestational diabetes mellitus in pregnant women with PCOS. Given the complications of gestational diabetes in mother and fetus, early identification of patients prone to gestational diabetes is necessary. Therefore, screening for high-risk patients such as patients with PCOS is necessary. On the other hand, despite a history of over 40 years of research, there is still no consensus on the effective screening of gestational diabetes (17). Therefore, the aim of this study was to determine the relationship between gestational diabetes mellitus and polycystic ovary syndrome.

## Methods

After being approved by the ethics committee of Ahvaz Jundishapur University of Medical Sciences with ethics code IR.AJUMS.REC.1392.207, this cross – sectional study was carried out in 2011 – 2012 among 126 pregnant women who referred to the Pregnancy Care Clinic of Imam Khomeini Hospital in Ahvaz. Women with PCOS with infertility history who became pregnant after ovulation stimulation were selected and after receiving informed consent from patients, they were screened by 75-gram oral glucose tolerance test in the first trimester and during 24-28 weeks of gestation.

For screening, the patient was fasting for 8 hours. First, fasting blood glucose was first measured, they were given 75 g oral glucose dissolved in water and one – hour and two – hour blood glucose were measured. The one – hour and two – hour fasting blood glucose thresholds were 92, 180, and 153 mg/dl, respectively. If one of these measurements was above the threshold, gestational diabetes was confirmed (16). Patients with PCOS who had gestational diabetes in the first trimester were given treatment regimen for controlling gestational diabetes. In case glucose was modified, insulin was administered in accordance with blood glucose. Pregnant women with PCOS were selected based on Rotterdam criteria and if they had at

least two of the following items, including hyperandrogenism, hirsutism, ovarian dysfunction, polycystic ovarian morphology in ultrasound, they were included (18). The exclusion criteria were pregestational pregnancy or overt pregnancy that included fasting blood glucose above 126 mg/dl or glucose higher than 200 mg/dl after taking two – hour 75-gram glucose or nbA1c>=6.5, history of gestational diabetes, metformin use and dissatisfaction. The measured variables included age, gestational diabetes, parity and BMI, which were compared in two groups of PCOS with gestational diabetes and without gestational diabetes. Data were analyzed by SPSS 18 software using t-test and chi-square test. $P<0.05$ was considered significant.

## Results

The mean age of patients in both PCOS groups with and without gestational diabetes was 26.09±2.03 and 27.07±3.03 years, respectively. The mean BMI in two groups of PCOS with and without gestational diabetes was 25±5.9 and 26.2±3.2 kg/m$^2$, respectively (p=0.3). Of 41 patients with gestational diabetes, 26(63.4%) patients were uniparous and the rest were multiparous. Of 85 non-diabetic patients, 61(71.8%) patients were uniparous and the rest were multiparous. The type of parity was not statistically significant between PCOS groups with and without gestational diabetes (p=0.1). Of 126 pregnant women with PCOS, 30(23.8%) women had disorder in GTT in the first trimester of pregnancy and 11(8.7%) patients had gestational diabetes during the 24-28 weeks of pregnancy. Other patients did not have gestational diabetes. In total, 41 patients (32.5%) had gestational diabetes (Table 1).

**Table 1. Glucose levels in pregnant women with PCOS (n=126)**

| Screening | Blood sugar | Value (mg/dl) Mean±SD | Min-Max |
|---|---|---|---|
| First trimester | Fasting | 81.11±13.06 | 60–127 |
| | 1–hour | 124.48±30.14 | 70–187 |
| | 2–hour | 110.88±30.47 | 60–198 |
| 24-28 weeks of pregnancy | Fasting | 80.57±10.33 | 62–140 |
| | 1–hour | 127.80±30.48 | 70–200 |
| | 2–hour | 114.88±26.15 | 60–201 |

## Discussion

In this study, the incidence of gestational diabetes in mothers with PCOS in the first trimester of pregnancy was 23.8%, while the rate was 8.7% during the 24-28 weeks of pregnancy, which includes a total of 32.5% of patients. There was no significant difference between BMI and gestational diabetes in this study.

In two studies in 2007 and 2011, the incidence of gestational diabetes in pregnant women with PCOS was reported to be about 10% (18, 19). In the study of Kelefltimur, the prevalence of impaired glucose tolerance in women with PCOS was 17.4% (20). Chen et al. in their study in China found that 20.5% were affected by impaired glucose tolerance (21). In a study by Turhan et al. on 174 pregnant women, 38 (21.8%) women had PCOS (22).

The incidence of gestational diabetes mellitus in women with PCOS in all of these studies is lower than the present study. Kousta et al. (23) in their study reported the rate of gestational diabetes in patients with PCOS to be 52%. In a study in Sweden by Anttila et al. (24), the prevalence of gestational diabetes mellitus in women with PCOS was 45%, which is more than the present study. In the study of Turhan et al., the main predictor of gestational diabetes was weight gain, while in the present study, BMI was similar in both PCOS groups with and without gestational diabetes in the first trimester of pregnancy (22).

The difference in the incidence of gestational diabetes in this study may be affected by diet, lifestyle, race and native feeding habits during pregnancy, which requires further studies to confirm in other populations. Given that over one third of women with PCOS during pregnancy are diagnosed with gestational diabetes, screening for gestational diabetes is necessary from the first trimester of pregnancy.

**Conflict of Interest:** No conflicts of interest.

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