



The Role of Insulin Resistance and Glucose Metabolism in Women with Pcos

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KEYWORDS

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ABSTRACT:

Background: PCOS (Polycystic ovarian syndrome) has been a widespread endocrine disorder in women of reproductive age, categorized by multiple factors contributing to its development. It is linked to issues with the menstrual cycle and reduced fertility. The menstrual dysfunction associated with PCOS is caused by either anovulation or oligo-ovulation. It leads to the cessation of menstruation, resulting in infrequent or irregular menstrual periods. PCOS is frequently accompanied by hyperinsulinemia and insulin resistance. Our study involves the estimation of PPBS (postprandial blood sugar) and FBS (fasting blood sugar) levels in patients with PCOS to gain insights in the metabolism of glucose in PCOS.

Aims & Objective: To understand how younger adult groups' glucose metabolism is affected by PCOS.

Materials and Methods: A case-control research has been performed on 50 patients with PCOS aged between 18 and 45 years, and 200 healthy women with regular menstrual cycles. The control group was carefully selected to match the PCOS group in terms of age and physical measurements. The statistical analysis has been performed by utilizing a student's t-test.

Results: The levels of FBS & PPBS have been substantially greater in women with PCOS while comparing to women who are suffering from regular menstrual cycles after a 2-hour OGTT.

Conclusion: Patients with PCOS have a higher susceptibility to developing IGT (Impaired Glucose Tolerance) and T2DM (Type 2 Diabetes Mellitus). To avoid complications, it is advisable to conduct screenings for impaired glucose tolerance and T2DM.

INTRODUCTION: PCOS is a widespread endocrine disorder in women of reproductive age, categorized by multiple causes. PCOS encompasses a diverse range of signs and symptoms that can vary in intensity and impact on reproductive, endocrine, and metabolic functions. PCOS used to be the most prevalent endocrinopathy among premenopausal women, affecting around 5 percent of this group. [1] Currently, a small percentage, ranging from 1% to 5%, of females between the ages of 15 and 25 experience PCOS [2]. This condition is linked to dysfunction of menstrual [3]

and reduced fertility [3,4]. The dysfunction of menstrual associated with PCOS is caused by either anovulation or oligo-ovulation. It leads to the transition from amenorrhea to oligomenorrhea. PCOS is a prevalent factor in the development of excessive levels of male hormones (hyperandrogenism) and the growth of excessive body hair (hirsutism). It is also linked to a higher likelihood of experiencing problems with glucose regulation and developing type 2 diabetes. [5] PCOS is frequently accompanied by hyperinsulinemia [6,7] and insulin resistance [6]. Insulin resistance has



been broadly acknowledged as a substantial factor of risk for the type 2 diabetes as well as higher levels of blood sugar development [6]. Several researches have been performed to determine the frequency of IGT and T2DM in women who are suffering from PCOS of reproductive age and living in Western countries. However, there has been a limited number of studies that have focused on the younger age group of women with PCOS. This study aims to examine the PCOS impact on the metabolism of glucose in a younger population.

MATERIALS AND METHODS:With assistance from the OB/GYN Department at Index Medical College (IMC) Indore as well as from the department's laboratory setup, this research has been performed in the Department of Biochemistry at IMC Indore. The IMC Indore ethical committee gave its approval for the study's conduct. Blood samples were taken during the study period (June 2023 – January 2024) from the study group and control participants who attended the outpatient department (OPD) of the OB/GYN department at IMC Indore. OB/GYN Department OPD patients, aged 18 to 45, who were diagnosed with PCOS based on their history and ultrasonographic findings, made up the study group. 200 typical menstruating women were used as the reference group. The study excluded participants with a diabetes mellitus history, hypertension, renal disease, thyroid disorders, dyslipidemia, or any other condition that affects blood glucose levels. Participants in the study who had a diabetes mellitus family history were not accepted. Informed consent was obtained after the subjects and controls were chosen. The people's weight and height

were recorded. BMI was computed using the following formula: Vital signs, pulse, and blood pressure were measured in both the subjects and the controls. Every vital sign was within the typical physiological range. Subjects and controls participated in an OGTT using 75 grams of glucose after receiving the appropriate instructions. A venipuncture was used to obtain a 2-milliliter sample of fasting blood under aseptic precaution for measuring FBS. 300 ml of water and 75 grams of glucose were provided for consumption. Two hours later, a venipuncture was used to obtain a blood sample for PPBS while adhering to aseptic precautions. The sample was examined using a clinical chemistry analyzer in the biochemistry lab at IMC Indore. PPBS and FBS were analyzed. Analytical Statistics The mean \pm SD has been utilized to express the outcomes. A $p < 0.05$ has been regarded as statistically significant while utilizing the student "t" test as the significance test.

RESULTS:200 PCOS patients and regular menstruating women were included in a case-control study. The study and control groups' ages, BMIs, FBS, and PPBS are shown in the table. Age and differences among the study as well as control groups are not statistically significant. BMI differences among the study as well as control groups are statistically significant. FBS and PPBS are higher in PCOS patients than in controls. Between cases and controls, there is a large statistically significant difference in FBS and PPBS. After two hours of OGTT, sixty nine cases (34.5percent) of PCOS have impaired tolerance of glucose, and one ninty nine cases (99%) have FBS that is higher than normal.

Table1: “Anthropometric Data of PCOS Patients and Controls”

“Parameter	Group (Mean \pm SD)		‘p’ value	
	Study	Control		
Age (Years)	33.250 \pm 5.882	30.640 \pm 5.1149	> 0.05 *	Notsignificant
BMI (kg/m ²)	33.8780 \pm 2.19540	23.6713 \pm 2.09549	< 0.05	significant

* Not Significant

Table-2: FBS and PPBS in PCOS Patients and Controls

“Parameter	Group (Mean \pm SD)		‘p’ value
	Study	Control	
PPBS (mg/dl)	128.67 \pm 10.9	120.90 \pm 7.77	<0.001 *
FBS (mg/dl)	93.10 \pm 8.27	89.36 \pm 7.79	<0.001 *”

* Highly Significant

**Table-3: “Actual number and % of PCOS and Controls with FBS and PPBS Parameters”**

“Parameter	PCOS Patients N (%)	Controls N (%)
FBS<100mg/dl	01 (5%)	200 (100%)
FBS-100 to 125mg/dl	133 (66.5%)	0
FBS>126mg/dl	66(33.0%)	0
0 PPBS<140mg/dl	00 (00%)	200 (100%)
PPBS-140 to 199mg/dl	69 (34.5%)	0
PPBS>200mg/dl	131(65.5%)	0”

DISCUSSION:The research purpose was to compare FBS and PPBS in women with PCOS and women who are normally menstruating. One significant endocrine condition that affects women's ability to reproduce is polycystic ovarian syndrome, which has a multifactorial etiology and a range of clinical indications.[8] Individuals diagnosed with PCOS are more likely to develop glucose intolerance and early-onset T2DM. According to our research, 8% of PCOS patients had PPBS (after a 2-hr OGTT) greater than or equal to 140mg/dl, and 10percent of patients had FBS levels more than 100mg/dl. Because resistance to insulin is a common feature in PCOS patients, this can lead to hyperinsulinemia, which can cause hyperglycemia and type 2 diabetes. Rised basal insulin secretion along withreduced hepatic insulin clearance are most likely the causes of hyperinsulinemia.[9] Insulin secretion is abnormally low for the level of insulin resistance in PCOS women, both obese and non-obese, suggesting pancreatic P-cell dysfunction[10,11] Ehrmann and colleagues have reported reduced postprandial insulin secretory responses in women with PCOS, which is consistent with P-cell dysfunction. They have also observed abnormalities in the entrainment of insulin secretion to an oscillatory glucose infusion. [10] P-cell dysfunction may precede glucose intolerance in PCOS.[11] The pathophysiology of the reproductive anomalies that characterize PCOS includes insulin resistance. The synthesis of ovarian steroidal hormones may be impacted by insulin resistance and hyperinsulinemia. In 50% of women with PCOC, a particular deficiency in the early stages of insulin receptor-mediated signaling has been found, known as diminished autophosphorylation.[12] In order to lower their risk of cardiovascular disease, women with PCOS should be tested for glucose intolerance, as they are more likely to create glucose intolerance and T2DM early in life. The risk factors that affect testing frequency are age, BMI, and waist circumference. In order to prevent glucose intolerance regression, women

with PCOS should undergo routine OGTT testing and close monitoring. Patients with PCOS who have IGT should undergo rigorous lifestyle modification, lose a significant amount of weight, and possibly even consider insulin-sensitizing medication.

CONCLUSION:Patients with PCOS are more likely to formT2DM and IGT. Therefore, in order to avoid complications, they should screen for T2DM and IGT.

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