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Relation of Polycystic Ovary Syndrome (PCOS) with Gestational Diabetes Mellitus

Dr. Kazi Farhana Begum[1*], Dr. Mehera Parveen[2], Dr. Nigar Sultana[3], Dr. Selima Kawser[4], Dr. Farah Noor[5]
[1]Medical officer, Department of Obstetrics and Gynaecology, Bangabandhu Sheikh Mujib Medical University, Shahbag, Dhaka, Bangladesh
[3]Medical officer, Department of Obstetrics and Gynaecology, Bangabandhu Sheikh Mujib Medical University, Shahbag, Dhaka, Bangladesh
[4]Medical officer, Department of Obstetrics and Gynaecology, Bangabandhu Sheikh Mujib Medical University, Shahbag, Dhaka, Bangladesh
Senior Consultant, Department of Obstetrics and Gynaecology, Bangabandhu Sheikh Mujib Medical University, Shahbag, Dhaka, Bangladesh
[5]Senior Consultant, Department of Obstetrics and Gynaecology, Bangabandhu Sheikh Mujib Medical University, Shahbag, Dhaka, Bangladesh

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***Corresponding author**
Dr. Kazi Farhana Begum

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Abstract: ***Introduction:*** PCOS is a common condition that increases the risk of gestational diabetes mellitus (GDM) due to insulin resistance. The purpose of this study is to evaluate the relationship between PCOS and Gestational Diabetes Mellitus. ***Aim of the study:*** The aim of the study was to evaluate the relationship between Polycystic Ovary Syndrome (PCOS) and the development of Gestational Diabetes Mellitus (GDM) in pregnancy. ***Methods:*** This comparative cross-sectional study was conducted in the Department of Obstetrics and Gynecology at Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh, from June 2015 to May 2016. It involved 100 pregnant women, 50 with PCOS and 50 without, who underwent fasting glucose, 2-hour OGTT, and HOMA-IR tests. Data on gestational diabetes and pregnancy complications were collected and analyzed using SPSS version 22.0. ***Result:*** The study revealed that the PCOS group was older (29.4 ± 4.1 years) compared to the Non-PCOS group (27.2 ± 5.0 years), with a higher incidence of GDM (26.00% vs. 10.00%). Pregnancy complications like preterm birth were more common in the Non-PCOS group (24.00%), while GDM occurred more often in the PCOS group (26.00%). Additionally, the PCOS group had higher fasting and 2-hour OGTT glucose levels and showed greater insulin resistance (3.5 ± 1.2 vs. 2.3 ± 0.9). ***Conclusion:*** This study confirms that women with Polycystic Ovary Syndrome (PCOS) have an increased risk of Gestational Diabetes Mellitus (GDM) and exhibit impaired glucose metabolism, underscoring the importance of close monitoring during pregnancy.

Keywords: PCOS, gestational diabetes mellitus, insulin resistance, pregnancy complications, maternal health.

INTRODUCTION

Polycystic ovary syndrome (PCOS) is a prevalent endocrinopathy, affecting about 5–10% of women of reproductive age.[1,2,3,4] It is the leading cause of hyperandrogenism, oligoovulation, and anovulation, contributing to infertility in many cases.[5] Insulin resistance and hyperinsulinemia are thought to play central roles in its pathogenesis.[6] Although fertility challenges are common, many women with PCOS can conceive, though they have higher rates of pregnancy complications. Gestational diabetes mellitus (GDM), which affects 1%–14% of pregnancies worldwide, is a significant concern for women with PCOS, with potential impacts on both maternal and fetal health.[7]

Gestational diabetes mellitus (GDM) is characterized by abnormal glucose tolerance during pregnancy, often associated with increased insulin resistance.[7] Women with Polycystic Ovary Syndrome (PCOS) are particularly prone to Gestational Diabetes Mellitus (GDM) due to preexisting insulin resistance, which is further aggravated by the insulin resistance induced by placental hormones during pregnancy. This combination increases their susceptibility to developing GDM, leading to potential complications for both maternal and fetal health. As a result, women with PCOS face a higher risk of developing GDM.[8] This condition is concerning because it can have both short- and long-term effects on pregnancy outcomes, as well as on the future health of the mother and child,

including an increased risk of cardiovascular disease and type 2 diabetes.[9]

Women with Polycystic Ovary Syndrome (PCOS) often experience intrinsic insulin resistance, which heightens their risk of developing impaired glucose tolerance (IGT) and type 2 diabetes mellitus.[10] During pregnancy, the influence of placental hormones exacerbates this insulin resistance, leading to a higher incidence of Gestational Diabetes Mellitus (GDM) in women with PCOS.[11] Insulin resistance, common to both PCOS and GDM, has been linked to adverse maternal and neonatal outcomes.[12,13] This relationship emphasizes the importance of early screening and management during pregnancy to mitigate potential risks.

Understanding the relationship between PCOS and GDM is crucial for improving maternal and fetal health. Both conditions are associated with significant complications during pregnancy, including an increased risk of preeclampsia, preterm birth, and neonatal complications. Early detection and management can help mitigate these risks and lead to better health outcomes. Therefore, it is essential to study the link between PCOS and GDM to enhance preventative strategies and treatment protocols. The purpose of this study is to assess the relation of PCOS with Gestational Diabetes Mellitus.

Objectives

- The aim of the study was to evaluate the relationship between Polycystic Ovary Syndrome (PCOS) and the development of Gestational Diabetes Mellitus (GDM) in pregnancy.

METHODOLOGY AND MATERIALS

This comparative cross-sectional study was conducted at the Department of Obstetrics and Gynecology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh, over a 1-year period from June 1, 2015, to May 31, 2016. The study included 100 pregnant women, divided into two groups: 50 women diagnosed with Polycystic Ovary Syndrome (PCOS) and 50 women without PCOS.

Inclusion Criteria:

- Pregnancy with PCOS.
- Gestational age between 24 and 40 weeks.

Exclusion Criteria:

- Women with pre-existing diabetes or chronic conditions.
- Multiple pregnancies or fetal anomalies.
- GDM without a history of PCOS.

Written informed consent was obtained from all participants, ensuring confidentiality and voluntary participation. Detailed interviews were conducted to collect demographic and clinical histories, including antenatal and postnatal information. Laboratory tests included fasting blood glucose, 2-hour OGTT, and HOMA-IR to assess glucose metabolism and insulin resistance. The incidence of gestational diabetes mellitus (GDM) and pregnancy complications such as preterm birth, stillbirth, miscarriage, preeclampsia, and premature rupture of membranes (PROM) were documented. Data were analyzed using SPSS version 22.0, with descriptive statistics summarizing demographic characteristics, glucose metabolism parameters, and maternal and fetal outcomes.

RESULT

Table 1: Demographic Characteristics of the Study Patients (n=100)

Characteristics	PCOS Group (n=50)	Non-PCOS Group (n=50)
Age (years)	29.4 ± 4.1	27.2 ± 5.0
BMI (kg/m²)	25.9 ± 3.5	24.8 ± 3.9
Family History of Diabetes	18 (36.00%)	10 (20.00%)

Table 1 shows the demographic profile of the study participants in the PCOS and Non-PCOS groups. The mean age in the PCOS group was 29.4 ± 4.1 years, while the Non-PCOS group had a mean age of 27.2 ± 5.0 years. The average BMI was 25.9 ± 3.5 kg/m² in the PCOS group and 24.8 ± 3.9 kg/m² in the Non-PCOS group. A family history of diabetes was noted in 18 (36%) participants in the PCOS group and 10 (20%) participants in the Non-PCOS group.

Table 2: Incidence of Gestational Diabetes Mellitus (GDM) in Study Patients (n=100)

Group	Number of GDM Cases	Percentage (%)
PCOS Group (n=50)	13	26.00
Non-PCOS Group (n=50)	5	10.00

The distribution of GDM cases among the participants revealed that the PCOS group had the highest incidence, with 13 (26.00%) women diagnosed with GDM. The non-PCOS group had a lower incidence, with 5 (10.00%) cases of GDM.

Table 3: Maternal and Fetal Complications in Study Patients (n=100)

Complication	PCOS Group		Non-PCOS Group	
	n = 50	percentage (%)	n = 50	percentage (%)
Preterm Birth	6	12.00%	12	24.00%
Stillbirth	1	2.00%	2	4.00%
Miscarriage	2	4.00%	1	2.00%
Preeclampsia	5	10.00%	6	12.00%
GDM	13	26.00%	5	10.00%
PROM	1	2.00%	2	4.00%

The distribution of pregnancy complications among the study groups revealed that GDM was more prevalent in the PCOS group, affecting 13 (26.00%) patients. Preterm birth was more common in the Non-PCOS group, occurring in 12 (24.00%) patients. The incidence of preeclampsia was similar between groups, with 5 (10.00%) in the PCOS group and 6 (12.00%) in the Non-PCOS group. Stillbirth, miscarriage, and PROM showed low frequencies in both groups.

Table 4: Blood Glucose Levels of the Study Patients (n=100)

Test	PCOS Group (n=50)	Non-PCOS Group (n=50)
Fasting Blood Glucose (mg/dL)	100.5 ± 12.3	90.8 ± 9.2
2-hour OGTT (mg/dL)	160.2 ± 23.1	142.7 ± 19.4

This table compares blood glucose levels between women with PCOS and those without. Fasting blood glucose and 2-hour OGTT levels are both displayed as mean ± standard deviation values. Women in the PCOS group show higher average fasting and 2-hour OGTT blood glucose levels (100.5 mg/dL and 160.2 mg/dL, respectively) compared to the Non-PCOS group (90.8 mg/dL and 142.7 mg/dL), suggesting potential glucose metabolism differences associated with PCOS.

Table 5: Insulin Resistance (HOMA-IR) in Study Patients (n=100)

Group	HOMA-IR Score
PCOS Group (n=50)	3.5 ± 1.2
Non-PCOS Group (n=50)	2.3 ± 0.9

The table shows the mean HOMA-IR (Homeostasis Model Assessment of Insulin Resistance) scores for both groups. The PCOS group had a higher mean HOMA-IR score of 3.5 ± 1.2, indicating greater insulin resistance compared to the Non-PCOS group, which had a mean score of 2.3 ± 0.9.

DISCUSSION

This study investigates the relationship between Polycystic Ovary Syndrome (PCOS) and the incidence of Gestational Diabetes Mellitus (GDM) in pregnant women. PCOS is a common endocrine disorder associated with various pregnancy complications, including an increased risk of developing GDM. The findings reveal significant differences in glucose metabolism and insulin resistance between women with and without PCOS, highlighting the importance of early screening for GDM in this population. The results emphasize the need for proactive management strategies to reduce maternal and fetal risks associated with these conditions.

In our study, the mean age of participants in the PCOS group was 29.4 ± 4.1 years, similar to the age reported by Ashrafi *et al*.[14], indicating that our cohort aligns with typical age ranges for women with PCOS. The Non-PCOS group had a slightly younger mean age of 27.2 ± 5.0 years compared to the PCOS group. BMI was also consistent with findings from Ashrafi *et al*.[14], with a mean of 25.9 ± 3.5 kg/m² in the PCOS group, compared to 24.8 ± 3.9 kg/m² in the Non-PCOS group, reflecting the common trend of slightly elevated BMI in women with PCOS. Additionally, a family history of diabetes was noted in 36% of the PCOS group compared to 20% in the Non-PCOS group, highlighting the recognized familial link in PCOS patients and underscoring the importance of family history in assessing metabolic risks.

In our study, the incidence of GDM was significantly higher in the PCOS group (26.00%) compared to the Non-PCOS group (10.00%), which is consistent with the findings of Reyes-Muñoz *et al*.[15], who also reported a higher prevalence of GDM in women with PCOS. This supports the established association between PCOS and an increased risk of gestational diabetes. The higher incidence of GDM in the PCOS group (26.00%) compared to the Non-PCOS group (10.00%) highlights the increased risk that women with PCOS face during pregnancy. This finding underscores the importance of vigilant screening for GDM in women with PCOS, particularly given their predisposition to insulin resistance and metabolic disturbances. The lower incidence in the Non-PCOS

group further reinforces the need for early detection and proactive management to mitigate the risks associated with gestational diabetes in women with PCOS.

In our study, the incidence of gestational diabetes mellitus (GDM) was significantly higher in the PCOS group at 26.00%, aligning with the findings of another study, who reported an increased GDM risk among women with PCOS.[15] Preterm birth was more prevalent in the Non-PCOS group, with 24.00%, consistent with the variability in preterm birth rates observed in non-PCOS groups in similar studies. Preeclampsia rates were similar between groups (10.00% in PCOS vs. 12.00% in Non-PCOS), suggesting a comparable risk across populations, as also noted in the same study. Minor complications, including stillbirth, miscarriage, and PROM, occurred at low and comparable rates between both groups, underscoring the similar profiles for these outcomes across PCOS and non-PCOS patients.

Our study's findings indicate that women with PCOS have significantly higher fasting blood glucose levels (100.5 ± 12.3 mg/dL) and 2-hour OGTT levels (160.2 ± 23.1 mg/dL) compared to the Non-PCOS group (90.8 ± 9.2 mg/dL and 142.7 ± 19.4 mg/dL, respectively). These results align with those reported by Salley *et al*.[16], underscoring the increased prevalence of impaired glucose tolerance (IGT) and gestational diabetes mellitus (GDM) in women with PCOS. The consistent elevation in both fasting and post-load glucose levels in the PCOS group highlights the need for comprehensive glucose screening using the 2-hour OGTT, as it captures a broader spectrum of glucose intolerance missed by fasting glucose tests alone. This correlation emphasizes the importance of early intervention and tailored management strategies to improve maternal and fetal outcomes in this high-risk population.

Our study's findings on insulin resistance, as indicated by the HOMA-IR scores, show that the PCOS group had a significantly higher mean score (3.5 ± 1.2) compared to the Non-PCOS group (2.3 ± 0.9). These results are consistent with the findings of Dahan *et al*.[17], who reported similar elevated HOMA-IR scores in women with PCOS. The increased insulin resistance observed in our PCOS group reinforces the metabolic challenges associated with this condition. Dahan *et al*.[17] demonstrated that higher HOMA-IR scores in women with PCOS reflect significant metabolic dysfunction, emphasizing the need for effective screening and management. Our results highlight the importance of using HOMA-IR as a practical and validated marker for assessing insulin resistance, underscoring the necessity for targeted interventions to improve health outcomes in women with PCOS.

In conclusion, this study underscores the increased risk of gestational diabetes mellitus in women with PCOS, highlighting the importance of early screening and proactive management to reduce maternal and fetal risks. Tailored interventions, especially those addressing insulin resistance, are crucial for improving outcomes in this high-risk group.

Limitations of the study

This study had several limitations:

- It was conducted at a single center, which may limit the generalizability of the findings.
- The sample size was relatively small, potentially affecting the robustness of the results.
- The study exclusively included women with PCOS and GDM, which did not account for other confounding factors.

CONCLUSION

This study highlights a significant association between Polycystic Ovary Syndrome (PCOS) and an increased risk of Gestational Diabetes Mellitus (GDM), with the PCOS group showing a higher incidence of GDM (26%) compared to the Non-PCOS group (10%). Additionally, women with PCOS exhibited higher fasting blood glucose levels, 2-hour OGTT results, and insulin resistance, suggesting an impaired glucose metabolism. Despite these differences, pregnancy complications such as preterm birth and preeclampsia were similarly distributed between the two groups. These findings emphasize the need for closer monitoring of glucose metabolism in women with PCOS during pregnancy.

REFERENCES

1. Diamanti-Kandarakis E, Kouli CR, Bergiele AT, Filandra FA, Tsianateli TC, Spina GG, Zapanti ED, Bartzis MI. A survey of the polycystic ovary syndrome in the Greek island of Lesbos: hormonal and metabolic profile. The journal of clinical endocrinology & metabolism. 1999 Nov 1;84(11):4006-11.
2. Knochenhauer ES, Key TJ, Kahsar-Miller M, Waggoner W, Boots LR, Azziz R. Prevalence of the polycystic ovary syndrome in unselected black and white women of the southeastern United States: a prospective study. The Journal of Clinical Endocrinology & Metabolism. 1998 Sep 1;83(9):3078-82.
3. Azziz R, Woods KS, Reyna R, Key TJ, Knochenhauer ES, Yildiz BO. The prevalence and features of the polycystic ovary syndrome in an unselected population. The Journal of Clinical Endocrinology & Metabolism. 2004 Jun 1;89(6):2745-9.
4. Asuncion M, Calvo RM, San Millán JL, Sancho J, Avila S, Escobar-Morreale HF. A prospective study of the prevalence of the polycystic ovary syndrome in unselected Caucasian women from

Spain. The Journal of Clinical Endocrinology & Metabolism. 2000 Jul 1;85(7):2434-8.
5. Carmina E, Azziz R. Diagnosis, phenotype, and prevalence of polycystic ovary syndrome. Fertility and sterility. 2006 Jul 1;86:S7-8.
6. Diamanti-Kandarakis E, Dunaif A. Insulin resistance and the polycystic ovary syndrome revisited: an update on mechanisms and implications. Endocrine reviews. 2012 Dec 1;33(6):981-1030.
7. American Diabetes Association. Diagnosis and classification of diabetes mellitus. Diabetes care. 2010 Jan 1;33(Supplement_1):S62-9.
8. Yu HF, Chen HS, Rao DP, Gong J. Association between polycystic ovary syndrome and the risk of pregnancy complications: a PRISMA-compliant systematic review and meta-analysis. Medicine. 2016 Dec 1;95(51):e4863.
9. Issat T, Nowicka MA, Jakimiuk AJ. Polycystic ovary syndrome (PCOS) and gestational diabetes mellitus (GDM) risk. Ginekologia polska. 2015;86(5).
10. Tominaga M, Eguchi H, Manaka H, Igarashi K, Kato TA, Sekikawa A. Impaired glucose tolerance is a risk factor for cardiovascular disease, but not impaired fasting glucose. The Funagata Diabetes Study. Diabetes care. 1999 Jun 1;22(6):920-4.
11. Dunaif A. Insulin resistance and the polycystic ovary syndrome: mechanism and implications for pathogenesis. Endocrine reviews. 1997 Dec 1;18(6):774-800.
12. Barbour LA, McCurdy CE, Hernandez TL, Kirwan JP, Catalano PM, Friedman JE. Cellular mechanisms for insulin resistance in normal pregnancy and gestational diabetes. Diabetes care. 2007 Jul 2;30.
13. Harlev A, Wiznitzer A. New insights on glucose pathophysiology in gestational diabetes and insulin resistance. Current diabetes reports. 2010 Jun;10:242-7.
14. Ashrafi M, Sheikhan F, Arabipoor A, Hosseini R, Nourbakhsh F, Zolfaghari Z. Gestational diabetes mellitus risk factors in women with polycystic ovary syndrome (PCOS). European Journal of Obstetrics & Gynecology and Reproductive Biology. 2014 Oct 1;181:195-9.
15. Reyes-Muñoz E, Castellanos-Barroso G, Ramírez-Eugenio BY, Ortega-González C, Parra A, Castillo-Mora A, Julio F. The risk of gestational diabetes mellitus among Mexican women with a history of infertility and polycystic ovary syndrome. Fertility and sterility. 2012 Jun 1;97(6):1467-71.
16. Salley KE, Wickham EP, Cheang KI, Essah PA, Karjane NW, Nestler JE. Position statement: glucose intolerance in polycystic ovary syndrome—a position statement of the Androgen Excess Society. The Journal of Clinical Endocrinology & Metabolism. 2007 Dec 1;92(12):4546-56.
17. Dahan MH, Goldstein J. Serum sex hormone-binding globulin levels show too much variability to be used effectively as a screening marker for insulin resistance in women with polycystic ovary syndrome. Fertility and sterility. 2006 Oct 1;86(4):934-41.