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RESEARCH ARTICLE

# Insulin Resistance and its Association with Preeclampsia: A Comprehensive Analysis

**Dr. Nitin Eknath Targe**

**Assistant Professor, Department of Obstetrics and Gynecology, Jawaharlal Nehru Medical College, Sawangi (Meghe), Wardha**

## ABSTRACT

This study explores the relationship between insulin resistance and the development of preeclampsia in pregnant women. Preeclampsia, a pregnancy-related hypertensive disorder, poses significant risks to both maternal and fetal health. Recent evidence suggests that insulin resistance may play a pivotal role in the pathogenesis of preeclampsia.

We conducted a case-control study involving 200 pregnant women, 100 diagnosed with preeclampsia and 100 healthy controls. Insulin resistance was assessed using the homeostasis model assessment (HOMA-IR), along with measurements of fasting insulin and glucose levels.

The results indicated that women with preeclampsia exhibited significantly higher HOMA-IR values compared to the control group ($6.8 \pm 2.1$ vs. $3.5 \pm 1.3$, $p < 0.001$). Additionally, a higher prevalence of obesity and metabolic syndrome was noted among the preeclamptic group.

These findings suggest a strong association between insulin resistance and preeclampsia, highlighting the need for further investigation into the underlying mechanisms and potential therapeutic strategies to mitigate this risk.

**Keywords:** insulin resistance, preeclampsia, pregnancy, metabolic syndrome, HOMA-IR.

## INTRODUCTION:

Preeclampsia is a multifaceted disorder characterized by hypertension and proteinuria that occurs after the 20th week of gestation. It affects approximately 5-8% of pregnancies globally and is associated with significant maternal and fetal morbidity and mortality (1). The pathophysiology of preeclampsia remains incompletely understood, but it is believed to involve inadequate placentation, systemic inflammation, and endothelial dysfunction (2).

In recent years, insulin resistance has emerged as a potential contributing factor to the development of preeclampsia. Insulin resistance, a condition where cells become less responsive to insulin, is often linked to metabolic disorders and obesity. During pregnancy, insulin sensitivity typically decreases to ensure adequate glucose supply for the growing fetus (3). However, excessive insulin resistance may lead to adverse outcomes, including gestational diabetes and hypertensive disorders.

Several studies have demonstrated a correlation between elevated insulin levels and preeclampsia (4, 5). For instance, a meta-analysis showed that women with preeclampsia had significantly higher insulin levels compared to healthy controls, suggesting that insulin resistance may be a precursor to the development of the disorder (6). Furthermore, insulin resistance may exacerbate the inflammatory and oxidative stress pathways implicated in preeclampsia (7).

The interplay between metabolic syndrome and preeclampsia is also noteworthy. Women with pre-existing metabolic syndrome—characterized by a cluster of conditions such as hypertension, dyslipidemia, and obesity—are at increased risk for developing preeclampsia (8). Given the rising prevalence of obesity and metabolic disorders in women of reproductive age, understanding the role of insulin resistance in preeclampsia is critical for developing preventive strategies (9).



*Corresponding author: Dr Nitin Eknath Targe*

Despite the growing body of literature on this topic, there is still a need for further investigation to clarify the association between insulin resistance and preeclampsia, particularly in diverse populations. This study aims to evaluate insulin resistance in women with preeclampsia compared to healthy pregnant controls, providing insights into the potential role of insulin resistance in the pathogenesis of this condition.

**Aim and Objectives**

**Aim:** To investigate the association between insulin resistance and preeclampsia in pregnant women.

**Objectives:**

1. To compare insulin resistance levels between women diagnosed with preeclampsia and healthy pregnant controls.
2. To assess the prevalence of obesity and metabolicsyndrome in the preeclamptic population.

**Materials and Methods**

This case-control study was conducted in a tertiary care hospital over a six-month period. Inclusion criteria included pregnant women aged 18-40 years, with one group diagnosed with preeclampsia based on clinical guidelines and another group as healthy controls. Exclusion criteria encompassed women with pre-existing diabetes, chronic hypertension, or other serious medical conditions. Insulin resistance was measured using the homeostasis model assessment (HOMA-IR), calculated from fasting insulin and glucose levels. Data on body mass index (BMI) and metabolic syndrome criteria were also collected. Statistical analyses were performed using t-tests and chi-square tests to assess differences between groups.

**Results**

**Table 1: Comparison of HOMA-IR Values in Study Groups**

| Group | HOMA-IR (Mean ± SD) | p-value |
|---|---|---|
| Preeclampsia | 6.8 ± 2.1 | <0.001 |
| Healthy Controls | 3.5 ± 1.3 | |

**Table 2: Prevalence of Obesity and Metabolic Syndrome**

| Condition | Preeclampsia (%) | Healthy Controls (%) | p-value |
|---|---|---|---|
| Obesity (BMI ≥30) | 40 | 15 | <0.001 |
| Metabolic Syndrome | 35 | 10 | <0.001 |

The data revealed that women with preeclampsia exhibited significantly higher HOMA-IR values compared to controls. Moreover, the prevalence of obesity and metabolic syndrome was notably higher in the preeclamptic group.

**Discussion**

This study underscores the significant association between insulin resistance and preeclampsia. Our findings indicate that women diagnosed with preeclampsia had markedly higher HOMA-IR values compared to healthy pregnant women, aligning with previous studies that identified insulin resistance as a potential risk factor for developing this condition (10, 11). The elevated levels of fasting insulin in preeclamptic women may reflect an underlying metabolic dysfunction that predisposes them to hypertensive disorders.

Moreover, the higher prevalence of obesity and metabolic syndrome among the preeclamptic group reinforces the notion that metabolic health plays a crucial role in pregnancy outcomes. Research indicates that obesity and insulin resistance can lead to chronic low-grade inflammation, which may contribute to the endothelial dysfunction observed in preeclampsia (12, 13). The relationship between insulin resistance, obesity, and preeclampsia suggests that interventions

aimed at improving metabolic health before and during pregnancy could mitigate the risk of developing preeclampsia (14).

Given the increasing prevalence of obesity and metabolic syndrome in women of reproductive age, it is essential to consider these factors in prenatal care. Early identification of women at risk through screening for insulin resistance could facilitate timely interventions, such as lifestyle modifications and closer monitoring during pregnancy (15).

While our study provides valuable insights, it is not without limitations. The single-center design may affect the generalizability of the findings, and further research in diverse populations is warranted. Additionally, longitudinal studies are needed to determine causality and the long-term implications of insulin resistance on maternal and neonatal health.

**Conclusion**

Insulin resistance is significantly associated with preeclampsia, as evidenced by higher HOMA-IR values and a greater prevalence of obesity and metabolic syndrome in affected women. These findings highlight the importance of monitoring metabolic health in pregnant women and suggest that addressing insulin resistance may play a vital role in reducing the incidence of preeclampsia. Future research should focus on intervention strategies that target insulin resistance to improve pregnancy outcomes.

**References**


1. Roberts JM, et al. Preeclampsia: a disease of the placental interface. Am J Obstet Gynecol. 2006 ;195(2):1-10.
2. Tsamandas AC, et al. The role of endothelial dysfunction in preeclampsia. J Obstet Gynaecol. 2005;25(4):329-35.
3. Catalano PM, et al. The impact of gestational diabetes on maternal and child health. J Clin Endocrinol Metab. 2006;91(3):2-7.
4. Hauth JC, et al. Insulin resistance in pregnancy and its relationship to preeclampsia. Obstet Gynecol. 2005;106(4):839-44.
5. Montaldo E, et al. Insulin levels and preeclampsia risk: a systematic review and meta-analysis. Diabetologia. 2006;49(4):588-97.
6. Korkmaz L, et al. Association between insulin resistance and the development of preeclampsia. J Clin Endocrinol Metab. 2005;90(3):12-15.
7. Kuhl C, et al. Insulin and pregnancy. Am J Obstet Gynecol. 1998;179(5):1464-71.
8. Negrato CA, et al. Metabolic syndrome and preeclampsia: An emerging risk factor. Diabetol Metab Syndr. 2006;3:2.
9. Goharkhay N, et al. Obesity and preeclampsia: an overview of the underlying mechanisms. J Matern Fetal Neonatal Med. 2005;18(5):237-43.
10. Zhou Y, et al. Insulin resistance in pregnancy and its relationship with pregnancy outcomes. J Matern Fetal Neonatal Med. 2005;17(2):121-6.
11. Mazzarini L, et al. Insulin resistance in pregnancy: A risk factor for adverse outcomes. J Perinat Med. 2006;34(2):137-41.
12. Myatt L, et al. Obesity, inflammation, and pregnancy complications. J Obstet Gynaecol. 2005; 25(6):573-81.
13. Kuhl C, et al. Insulin resistance and gestational diabetes mellitus: A review. Horm Metab Res. 20 06;38(5):338-43.
14. Sacks DA, et al. The role of insulin resistance in the development of gestational diabetes. Curr Diab Rep. 2005;5(1):19-25.
15. O'Sullivan EP, et al. The role of maternal insulin resistance in preeclampsia. Clin Endocrinol (Oxf). 2005;62(4):392-8.