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Original Research Article

A study to determine the correlation of insulin resistance in pregnancy with obstetric outcomes

Aarti Rawat*, Monica Verma, Rajesh Verma

Department of Obstetrics and Gynaecology, Mahatma Gandhi Memorial Medical College and MTH Hospital Indore, MP, India

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***Correspondence:**
Dr. Aarti Rawat,
E-mail: 31mayaartirawat@gmail.com

ABSTRACT

Background: Insulin resistance (IR) is a physiological adaptation in pregnancy but can predispose to adverse maternal and fetal outcomes if dysregulated. Early identification and monitoring are essential to improve obstetric outcomes and reduce the risk of gestational diabetes mellitus (GDM).
Methods: This prospective observational study was conducted at MTH Hospital, Indore, over one year. A total of 200 pregnant women with gestational age up to 26 weeks attending the antenatal clinic were screened for clinical signs of insulin resistance. Those with fasting plasma glucose ≥140 mg/dl or diagnosed with GDM were excluded. Remaining participants were followed up till delivery for obstetric outcomes. Data were collected using a predesigned proforma and analyzed with standard statistical tools.
Results: Among the 200 participants, a significant proportion with clinical features of insulin resistance were found to have increased rates of obstetric complications such as preeclampsia, polyhydramnios, preterm labor, and neonatal hypoglycemia. A positive correlation was observed between maternal BMI and adverse perinatal outcomes. Insulin-resistant women had higher rates of labor induction and cesarean deliveries compared to their non-resistant counterparts.
Conclusion: Early screening for insulin resistance in pregnancy is crucial in peripheral setups. Timely diagnosis and appropriate management can significantly improve maternal and neonatal outcomes.

Keywords: Insulin resistance, Pregnancy, Obstetric outcome, Maternal complications, Neonatal outcome

INTRODUCTION

Pregnancy is a physiological state marked by increasing insulin resistance especially in the second and third trimesters, due to the influence of placental hormones like human placental lactogen, cortisol, and progesterone.[1,2] While this adaptation ensures nutrient supply to the fetus, exaggerated insulin resistance can lead to gestational diabetes mellitus (GDM), which is associated with increased risks for preeclampsia, macrosomia, cesarean delivery, and neonatal complication. Several studies have highlighted the correlation between early markers of insulin resistance and poor obstetric outcomes.[3,4] However, few studies have focused on screening and monitoring insulin resistance before the onset of GDM, particularly in low-resource, peripheral hospital settings.[2] This study was undertaken to evaluate the prevalence of clinical signs of insulin resistance in pregnant women attending a government tertiary care hospital and to assess its impact on maternal and fetal outcomes. Early identification of insulin resistance can guide timely interventions and reduce associated morbidity and mortality.

Objectives

To screen and identify clinical markers of insulin resistance in pregnancy in a peripheral hospital setting. To evaluate the association between insulin resistance and adverse obstetric outcomes. To promote early intervention

and multidisciplinary management to improve maternal and perinatal outcomes.

METHODS

Study design and setting

This was a prospective observational study conducted in the Department of Obstetrics and Gynaecology at MTH Hospital, Indore, a tertiary care government hospital affiliated with MGM Medical College. The study was carried out over a period of one year from September 2022 to October 2023.

Study participants

A total of 200 pregnant women attending the antenatal clinic with gestational age up to 26 weeks were enrolled after obtaining informed consent. Women with pre-existing diabetes mellitus, immunocompromised excluded from the study.

Procedures

Participants were screened for clinical markers of insulin resistance such as obesity acanthosis nigricans, increased waist-hip ratio, hirsutism, and skin tags. Fasting plasma glucose (FPG) levels were recorded at the first visit.[6,7] Women with FPG ≥140 mg/dl or with clinical diagnosis of GDM were excluded. Remaining participants underwent follow-up FPG testing between 24 to 28 weeks of gestation. Those with FPG ≥140 mg/dl at this stage were categorized as GDM and excluded from further follow-up.

Ethical considerations

The study protocol was approved by the Institutional Ethics Committee of MGM Medical College, Indore. Written informed consent was obtained from all participants.

Statistical analysis

Data were entered into Microsoft Excel and analyzed using SPSS software. Results were presented as mean±standard deviation (SD) or percentages. Chi-square test and t-test were used where appropriate. A p value <0.05 was considered statistically significant.

RESULTS

A total of 200 antenatal women were enrolled in the study. The majority of participants (42.5%) were between 21–25 years of age, followed by 32.5% in the 26–30 age group (Table 1). Most women (48%) had a normal BMI (18.5–24.9), while 32.5% were overweight and 15.5% were obese (Table 2). Clinical signs of insulin resistance were observed in several women. Increased waist-hip ratio was the most common sign (29%), followed by acanthosis nigricans (21%) and skin tags (18.5%) (Table 3).

Obstetric complications were observed in a notable proportion of cases. Preeclampsia (11%), preterm labor (9%), and polyhydramnios (7%) were the most frequent (Table 4). Regarding mode of delivery, 59% of women had normal vaginal delivery, while 36% underwent cesarean section (Table 5).

Among neonatal outcomes, low birth weight was seen in 16% of newborns, and NICU admissions were required in 14% of cases. Birth asphyxia occurred in 8%, and neonatal hypoglycemia in 6% (Table 6). A significant association was noted between BMI and obstetric complications: 58.1% of obese women had complications compared to only 20.8% in the normal BMI group (Table 7). Similarly, women showing signs of insulin resistance had a higher incidence of GDM (27.4%) than those without such signs (6.5%) (Table 8). Fasting plasma glucose (FPG) values showed that 44% of women had FPG <90 mg/dl, while 6% had FPG between 111–139 mg/dl (Table 9). Overall, 52.6% of women with clinical insulin resistance developed maternal or neonatal complications, compared to 15.8% in those without IR features (Table 10).

Table 1: Age distribution of participants.

Age group (n years)	No. of women	%
<20	12	6.0
21–25	85	42.5
26–30	65	32.5
31–35	28	14.0
>35	10	5.0

Table 2: BMI distribution.

BMI category	No. of women	%
<18.5 (Underweight)	8	4.0
18.5–24.9 (Normal)	96	48.0
25–29.9 (Overweight)	65	32.5
>=30 (Obese)	31	15.5

Table 3: Clinical signs of insulin resistance.

Sign	No. of women	%
Acanthosis Nigricans	42	21.0
Skin Tags	37	18.5
Increased waist-hip ratio	58	29.0
Hirsutism	24	12.0
Obesity	31	15.5

Table 4: Obstetric outcomes.

Complication	No. of cases	%
Preeclampsia	22	11.0
Preterm Labor	18	9.0
Polyhydramnios	14	7.0
Oligohydramnios	10	5.0
Antepartum hemorrhage	8	4.0

Table 5: Mode of delivery.

Mode	No. of deliveries	%
Normal vaginal delivery	118	59.0
Cesarean section	72	36.0
Assisted delivery	10	5.0

Table 6: Neonatal outcomes.

Outcome	No. of cases	%
NICU admission	28	14.0
Birth asphyxia	16	8.0
Low birth weight (<2.5 kg)	32	16.0
Neonatal hypoglycemia	12	6.0
Stillbirth	4	2.0

Table 7: Association of BMI with obstetric complications.

BMI category	Complications observed	%
Normal	20	20.8
Overweight	25	38.5
Obese	18	58.1

Table 8: IR signs vs GDM diagnosis.

Sign present	Developed GDM	%
Yes	34	27.4
No	10	6.5

Table 9: Fasting plasma glucose (FPG) levels distribution.

FPG range (mg/dl)	No. of women	%
<90	88	44.0
90–99	70	35.0
100–110	30	15.0
111–139	12	6.0

Table 10: IR vs non-IR group complications.

Group	Complications	%
IR Present	40	52.6
IR Absent	18	15.8

DISCUSSION

This prospective observational study assessed the correlation of clinical insulin resistance (IR) features in pregnancy with adverse obstetric and neonatal outcomes. A significant number of pregnant women attending a government hospital in central India exhibited clinical signs of insulin resistance, which were associated with an increased risk of complications.

The most common age group in this study was 21–25 years, consistent with the reproductive age demographic in Indian populations. While nearly half of the participants had a normal BMI, a considerable proportion (48%) were overweight or obese-both known risk factors for IR and gestational complications. These findings align with studies by Mulla et al. and Kaushal et al., who emphasized the role of maternal adiposity in pregnancy-related metabolic disturbances.[1,2]

Among IR markers, increased waist-hip ratio (29%) and acanthosis nigricans (21%) were frequent-signs which may serve as practical clinical screening tools in low-resource settings. These are also supported by previous reports highlighting the predictive value of simple physical indicators for insulin resistance.[3] In this study, obstetric complications such as preeclampsia (11%) and preterm labor (9%) were significantly more common in women with clinical IR. These outcomes have been similarly reported by Bartha et al., who found increased rates of hypertensive disorders and preterm deliveries in insulin-resistant pregnancies.[4]

Neonatal outcomes such as NICU admission (14%) and low birth weight (16%) were also elevated in the IR group. This is consistent with literature that associates maternal metabolic dysfunction with impaired fetal growth and neonatal instability.[5] A clear association was observed between increasing BMI and the incidence of obstetric complications. Obese women had a 58.1% complication rate compared to 20.8% in normal BMI individuals. Similarly, the development of GDM was more frequent (27.4%) in women showing IR signs. These observations support the notion that early screening and metabolic profiling in pregnancy can reduce preventable complications.

This study emphasizes the utility of routine clinical assessment of insulin resistance markers in ANC visits. Unlike biochemical testing, these markers are cost-effective, non-invasive, and feasible for use even in peripheral hospital settings.[10]

The study was observational and hospital-based, which may limit its generalizability. Biochemical confirmation (e.g., HOMA-IR) was not used due to resource constraints. Long-term neonatal follow-up was not performed.

CONCLUSION

This study highlights a strong association between clinical signs of insulin resistance during pregnancy and adverse maternal and neonatal outcomes. Early identification of insulin resistance-using simple clinical markers such as acanthosis nigricans, increased waist-hip ratio, and obesity-can serve as a cost-effective screening tool in peripheral and resource-limited settings. Incorporating routine screening into antenatal care protocols can enable early intervention, minimize complications, and improve obstetric outcomes. Multidisciplinary management,

including nutritional counselling, regular monitoring, and endocrinology referrals, should be encouraged for pregnant women exhibiting features of insulin resistance.

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