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Original Research Article

A Study of Fetomaternal Outcomes in Pregnancies Complicated by Gestational Diabetes Mellitus Managed with Diet versus Insulin Therapy

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Conflict of interest: Nil

Abstract:

Background: Gestational diabetes mellitus (GDM) is a common metabolic disorder during pregnancy associated with adverse maternal and fetal outcomes. Management strategies include dietary modification and insulin therapy, depending on glycemic control.

Objective: To compare fetomaternal outcomes in pregnancies complicated by GDM managed with diet alone versus insulin therapy.

Methods: A retrospective observational study was conducted at Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar, over 8 months. A total of 100 pregnant women diagnosed with GDM were included and categorized into two groups: diet-controlled (n=60) and insulin-treated (n=40). Maternal and neonatal outcomes were analyzed using appropriate statistical methods.

Results: Women requiring insulin demonstrated higher rates of cesarean delivery (65% vs 40%, p=0.01), macrosomia (22.5% vs 8.3%, p=0.03), and neonatal complications. However, favorable outcomes were observed in both groups when adequate glycemic control was achieved.

Conclusion: Increased intervention and complication rates in the insulin group likely reflect greater disease severity. Early detection and individualized management remain key factors in improving pregnancy outcomes in GDM.

Keywords: GDM, Insulin Therapy, Diet Control, Fetomaternal Outcomes, Pregnancy.

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Introduction

Gestational diabetes mellitus (GDM) refers to abnormal glucose regulation identified for the first time during pregnancy and has emerged as a major public health concern worldwide [1]. Its rising incidence has been linked to increasing rates of obesity, delayed childbearing, and reduced physical activity [2].

The presence of GDM can adversely influence both maternal and fetal health. Women with this condition are at increased risk of hypertensive disorders, operative deliveries, and future metabolic disease, while neonates may develop complications such as excessive birth weight, hypoglycemia, and long-term metabolic abnormalities [3,4]. These outcomes are largely attributed to pregnancy-induced insulin resistance mediated by placental hormones, which alter maternal glucose metabolism [5].

Achieving and maintaining appropriate glycemic levels is the cornerstone of GDM management. In most cases, treatment begins with dietary regulation and lifestyle modification, which aim to control blood glucose without pharmacological intervention [6]. However, a subset of patients fails to achieve target glucose levels and requires insulin therapy for adequate control [7].

Women who respond to dietary management alone are generally considered to have milder forms of glucose intolerance, whereas those needing insulin often exhibit more pronounced metabolic disturbances [8]. Although insulin therapy is effective in controlling hyperglycemia, it is frequently associated with higher rates of medical intervention during pregnancy [9,10].

Fetal growth abnormalities, particularly macrosomia, are closely related to maternal glucose

levels, while neonatal hypoglycemia is a consequence of altered fetal insulin dynamics [11,12]. Despite existing evidence, region-specific data comparing outcomes between different treatment modalities remain limited, especially in the Indian context [13,14].

In view of these considerations, the present study was undertaken to compare maternal and neonatal outcomes among women with GDM managed with dietary measures versus insulin therapy.

Materials and Methods

Study Design: The present investigation was carried out as a hospital-based retrospective analytical study aimed at assessing and comparing maternal and neonatal outcomes in pregnancies complicated by gestational diabetes mellitus (GDM), based on the type of treatment received.

Study Setting: This study was conducted in the Department of Obstetrics and Gynecology at Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar. The institution serves as a tertiary care referral center and caters to a diverse population from both rural and urban areas.

Study Period: Patient records over a duration of eight months were reviewed for data collection and analysis.

Study Population: The study included 100 pregnant women diagnosed with GDM during the study period. Eligible cases were identified from hospital medical records, antenatal registers, and electronic databases.

Group Classification

Participants were categorized based on their treatment modality into two groups:

- **Diet-Controlled Group (Group A):** Included 60 women who maintained glycemic targets through dietary regulation and lifestyle modifications alone.
- **Insulin-Treated Group (Group B):** Included 40 women who required insulin therapy due to inadequate glycemic control with diet alone.

Diagnostic Criteria

The diagnosis of GDM was established using oral glucose tolerance testing (OGTT) in accordance with institutional protocols. Only women diagnosed during pregnancy without a prior history of diabetes were considered for inclusion.

Inclusion Criteria

Participants were selected based on the following criteria:

- Pregnant women diagnosed with GDM during the current pregnancy
- Singleton gestation
- Availability of complete clinical and laboratory data
- Management with either dietary measures alone or insulin therapy.

Exclusion Criteria

The following cases were excluded from the study:

- Women with previously diagnosed diabetes mellitus (Type 1 or Type 2)
- Multiple pregnancies (e.g., twins or higher-order gestation)
- Presence of significant chronic illnesses such as renal or cardiac disease
- Incomplete or missing medical records

Data Collection Procedure: Relevant clinical and laboratory data were obtained retrospectively from patient case sheets, antenatal records, and institutional databases. A structured data extraction format was used to ensure uniformity.

Variables Assessed

Demographic and Clinical Parameters

- Maternal age (in years)
- Body mass index (BMI, kg/m²)
- Gestational age at the time of diagnosis

Maternal Outcome Measures

- Mode of delivery (vaginal or cesarean section)
- Development of pregnancy-induced hypertension (PIH)
- Occurrence of polyhydramnios

Neonatal Outcome Measures

- Birth weight (in kilograms)
- Presence of macrosomia
- Occurrence of neonatal hypoglycemia
- Requirement for neonatal intensive care unit (NICU) admission

Operational Definitions: To maintain consistency, the following definitions were applied:

- **Macrosomia:** Birth weight exceeding 4 kilograms
- **Neonatal Hypoglycemia:** Blood glucose level below 40 mg/dL within the first 24 hours after birth
- **Pregnancy-Induced Hypertension (PIH):** Blood pressure ≥140/90 mmHg occurring after 20 weeks of gestation

Outcome Measures

Primary Outcomes

- Comparison of maternal complications between the two groups
- Comparison of neonatal outcomes between the two groups

Secondary Outcome

- Relationship between severity of GDM (based on treatment requirement) and adverse fetomaternal outcomes

Statistical Analysis: The collected data were compiled and analyzed using Statistical Package for the Social Sciences (SPSS) version 25.0.

- Continuous variables were summarized as mean with standard deviation
- Categorical variables were expressed as frequencies and percentages

For comparison between groups:

- The **Chi-square test** was applied for categorical variables
- The **independent sample t-test** was used for continuous variables

A p-value less than 0.05 was considered indicative of statistical significance.

Ethical Considerations: Ethical clearance for the study was obtained from the Institutional Ethics Committee prior to data collection. As the study involved retrospective analysis, patient identity was not disclosed, and all data were handled confidentially. No personal identifiers were included in the dataset.

Results

A total of 100 pregnant women diagnosed with gestational diabetes mellitus (GDM) were included in the analysis. Of these, 60 patients were managed with dietary modification alone (Group A), whereas 40 required insulin therapy (Group B). All cases were evaluated for both maternal and neonatal outcomes.

1. **Baseline Characteristics**

The baseline demographic parameters of the study population are summarized in **Table 1**. Women in the insulin-treated group were comparatively older and had a higher mean body mass index (BMI) than those managed with diet alone.

Table 1: Baseline Demographic Characteristics

Parameter	Diet Group (n=60)	Insulin Group (n=40)	p-value
Age (years)	26 ± 3	28 ± 4	0.04
BMI (kg/m²)	24.5 ± 2.1	27.2 ± 2.5	0.01

The observed difference in BMI between the two groups was statistically significant ($p = 0.01$), suggesting that increased BMI may be associated with a greater likelihood of requiring insulin therapy.

2. **Maternal Outcomes**

Maternal complications were more frequently observed among women who required insulin therapy, as detailed in **Table 2**.

Table 2: Comparison of Maternal Outcomes

Outcome	Diet Group (%)	Insulin Group (%)	p-value
Cesarean Section	40%	65%	0.01
Pregnancy-Induced Hypertension (PIH)	10%	25%	0.03
Polyhydramnios	8%	20%	0.04

The proportion of cesarean deliveries was significantly higher in the insulin-treated group compared to the diet-controlled group (65% vs 40%, $p = 0.01$). In addition, pregnancy-induced hypertension and polyhydramnios were more prevalent among women receiving insulin, with both differences reaching statistical significance. These findings are illustrated in **Figure 1**, which compares cesarean section rates between the two groups.

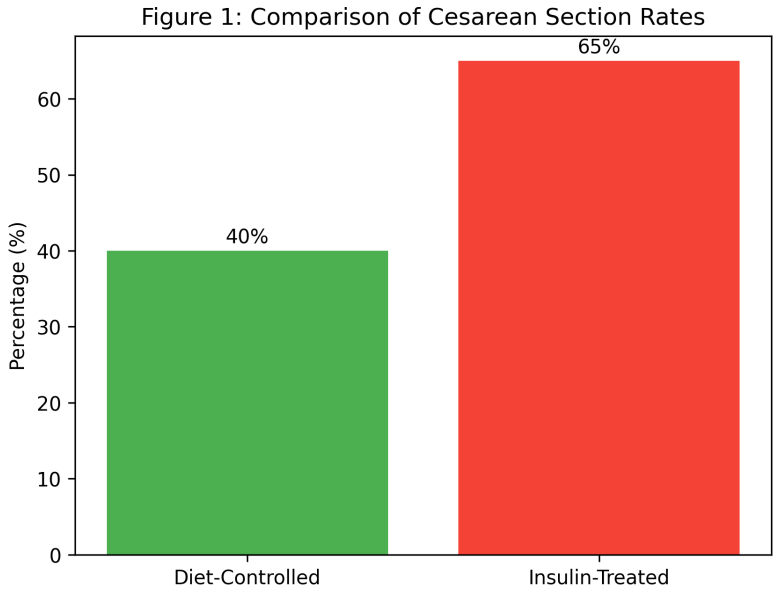

Figure 1: Comparison of Cesarean Section Rates Between Diet and Insulin Groups

3. **Neonatal Outcomes**

Neonatal outcomes demonstrated a higher frequency of complications in infants born to mothers in the insulin-treated group, as presented in **Table 3**.

Table 3: Comparison of Neonatal Outcomes

Outcome	Diet Group (%)	Insulin Group (%)	p-value
Macrosomia (>4 kg)	8.3%	22.5%	0.03
Neonatal Hypoglycemia	5%	18%	0.02
NICU Admission	10%	30%	0.01

The incidence of macrosomia was significantly greater in the insulin group compared to the diet group (22.5% vs 8.3%, p = 0.03). Similarly, neonatal hypoglycemia and NICU admissions were notably higher among infants of insulin-treated mothers. A visual comparison of these neonatal complications is provided in **Figure 2**.

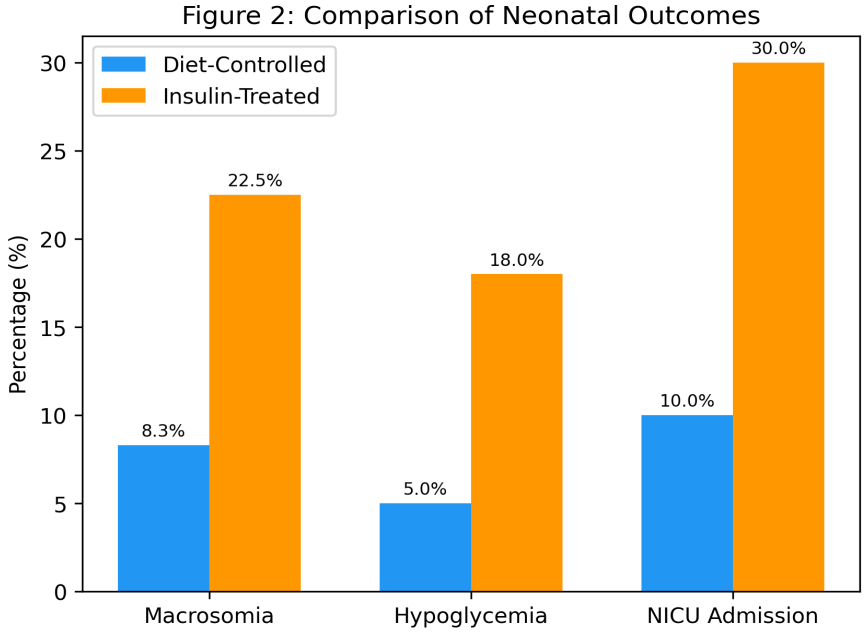

Figure 2: Comparison of Neonatal Complications (Macrosomia, Hypoglycemia, NICU Admission)

4. **Summary of Key Findings**

Overall, pregnancies complicated by GDM requiring insulin therapy were associated with a higher burden of both maternal and neonatal complications compared to those managed with diet alone. Increased rates of cesarean delivery, pregnancy-induced hypertension, and polyhydramnios were observed in the insulin-treated group. Likewise, neonatal outcomes—including macrosomia, hypoglycemia, and NICU admission—were significantly more frequent in this group. All comparisons demonstrated statistical significance ($p < 0.05$), indicating a clear relationship between the severity of GDM and adverse fetomaternal outcomes.

Discussion

The present study highlights differences in pregnancy outcomes based on the mode of management of gestational diabetes mellitus. A greater frequency of adverse maternal and neonatal events was observed among women who required insulin therapy, suggesting that these patients represent a subgroup with more severe metabolic imbalance.

Women in the insulin-treated group had relatively higher age and body mass index, both of which are recognized contributors to insulin resistance. These findings support existing evidence indicating that increased maternal adiposity is associated with worsening glucose intolerance and a higher likelihood of requiring pharmacological intervention [15,16].

The higher rate of cesarean deliveries observed in the insulin group may be explained by multiple factors, including increased fetal size, obstetric complications, and clinician preference in high-risk pregnancies. Similar trends have been described in earlier studies evaluating outcomes in women with poorly controlled or severe GDM [17].

Hypertensive disorders were also more frequently encountered in women requiring insulin. This association may be related to underlying metabolic dysfunction and vascular changes linked to hyperglycemia. Previous research has demonstrated a comparable relationship between the severity of glucose intolerance and the development of hypertensive complications during pregnancy [18].

Neonatal outcomes in this study showed a higher incidence of macrosomia among infants born to insulin-treated mothers. This can be explained by increased transplacental glucose transfer leading to enhanced fetal insulin secretion and accelerated growth. The relationship between maternal glycemic status and fetal overgrowth has been consistently reported in earlier literature [19].

Similarly, neonatal hypoglycemia was more common in the insulin group. This is likely due to persistent hyperinsulinemia in the newborn following delivery, resulting in a rapid fall in blood glucose levels. Such metabolic adaptations have been widely described in infants born to mothers with diabetes [20].

The need for neonatal intensive care was also higher among infants in the insulin group, reflecting increased neonatal morbidity. Complications such as hypoglycemia and respiratory distress may contribute to this increased requirement for specialized care [21].

Overall, the findings suggest that insulin-requiring GDM represents a clinically more severe condition. Nevertheless, appropriate management and strict glycemic control can mitigate many of these risks. Early diagnosis, regular monitoring, and timely initiation of therapy are essential components of effective care [22].

Current clinical guidelines emphasize individualized management strategies to achieve optimal outcomes. While dietary intervention remains the first-line approach, prompt escalation to insulin therapy when required is crucial in preventing complications [23].

The study also underscores the importance of patient education and adherence to treatment, as early lifestyle modifications may reduce the need for insulin in certain cases [24].

However, the study has certain limitations. Its retrospective nature restricts causal inference, and the relatively small sample size may limit generalizability. In addition, long-term outcomes for both mother and child were not assessed. Future prospective studies with larger populations are needed to further validate these findings [25].

Conclusion

In conclusion, gestational diabetes mellitus remains a significant contributor to adverse maternal and neonatal outcomes. The present study demonstrates that women who required insulin therapy experienced a higher frequency of complications, reflecting a greater severity of metabolic disturbance. However, the findings also emphasize that effective glycemic control, irrespective of the mode of treatment, plays a crucial role in reducing these risks. Early screening, appropriate classification, and timely initiation of management strategies—including medical nutrition therapy and insulin when indicated—are essential to optimize pregnancy outcomes. Strengthening antenatal care and ensuring patient adherence to treatment can further improve both maternal and neonatal health in pregnancies complicated by GDM.

References

1. American Diabetes Association. Diagnosis and classification of diabetes mellitus. Diabetes Care. 2014;37(Suppl 1):S81–S90.
2. Metzger BE, Lowe LP, Dyer AR, Trimble ER, Chaovarindr U, Coustan DR, et al. Hyperglycemia and adverse pregnancy outcomes. N Engl J Med. 2008;358:1991–2002.
3. Buchanan TA, Xiang AH. Gestational diabetes mellitus. J Clin Invest. 2005;115:485–491.
4. Crowther CA, Hiller JE, Moss JR, McPhee AJ, Jeffries WS, Robinson JS, et al. Effect of treatment of gestational diabetes mellitus on pregnancy outcomes. N Engl J Med. 2005;352:2477–2486.
5. Catalano PM, Shankar K. Obesity and pregnancy: mechanisms of short term and long term adverse consequences for mother and child. BMJ. 2017;356:j1.
6. American Diabetes Association. Standards of medical care in diabetes—2021. Diabetes Care. 2021;44(Suppl 1):S200–S210.
7. National Institute for Health and Care Excellence (NICE). Diabetes in pregnancy: management from preconception to the postnatal period. London: NICE; 2015.
8. Landon MB, Spong CY, Thom E, Carpenter MW, Ramin SM, Casey B, et al. A multicenter randomized trial of treatment for mild gestational diabetes. N Engl J Med. 2009;361:1339–1348.
9. Yogev Y, Xenakis EMJ, Langer O. The association between insulin therapy and pregnancy outcome in gestational diabetes. Obstet Gynecol. 2004;104:132–138.
10. Langer O, Yogev Y, Most O, Xenakis EMJ. Glycemic control in gestational diabetes mellitus—how tight is tight enough: small for gestational age versus large for gestational age? Am J Obstet Gynecol. 2005;192:989–997.
11. Pedersen J. The pregnant diabetic and her newborn: problems and management. Acta Endocrinol Suppl (Copenh). 1952;Suppl 2:1–206.
12. Kalhan SC. Neonatal hypoglycemia. J Pediatr. 2000;136:452–454.
13. Seshiah V, Balaji V, Balaji MS, Paneerselvam A, Arthi T, Thamizharasi M, et al. Prevalence of gestational diabetes mellitus in South India (Tamil Nadu). J Assoc Physicians India. 2004;52:707–711.
14. Mohan V, Sandeep S, Deepa R, Shah B, Varghese C. Epidemiology of type 2 diabetes: Indian scenario. Indian J Med Res. 2007;125:217–230.
15. Metzger BE. Long-term outcomes in mothers diagnosed with gestational diabetes mellitus and their offspring. Diabetes. 2007;56(Suppl 1):S145–S150.
16. Kjos SL, Buchanan TA. Gestational diabetes mellitus. N Engl J Med. 1999;341:1749–1756.
17. Freinkel N. Of pregnancy and progeny. Diabetes. 1980;29:1023–1035.
18. Sibai BM. Diagnosis and management of gestational hypertension and preeclampsia. Obstet Gynecol. 2003;102:181–192.
19. Silverman BL, Metzger BE, Cho NH, Loeb CA. Impaired glucose tolerance in adolescent offspring of diabetic mothers. Diabetes Care. 1995;18:611–617.
20. Buchanan TA, Xiang AH, Page KA. Gestational diabetes mellitus: risks and management during and after pregnancy. Nat Rev Endocrinol. 2012;8:639–649.
21. Hod M, Kapur A, Sacks DA, Hadar E, Agarwal M, Di Renzo GC, et al. The International Federation of Gynecology and Obstetrics (FIGO) Initiative on gestational diabetes mellitus. Int J Gynaecol Obstet. 2015;131(Suppl 3):S173–S211.
22. Kim C, Newton KM, Knopp RH. Gestational diabetes and the incidence of type 2 diabetes: a systematic review. Diabetes Care. 2002;25:1862–1868.
23. American College of Obstetricians and Gynecologists. Gestational diabetes mellitus. Obstet Gynecol. 2018;131:e49–e64.
24. World Health Organization. Diagnostic criteria and classification of hyperglycaemia first detected in pregnancy. Geneva: WHO; 2013.
25. International Diabetes Federation. IDF Diabetes Atlas. 9th ed. Brussels: IDF; 2019.