Section: Nursing

Original Research Article

MATERNAL AND FETAL OUTCOMES IN PREGNANCIES COMPLICATED BY GESTATIONAL DIABETES MELLITUS: A RETROSPECTIVE COHORT STUDY

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Received *: 08/07/2024*
Received in revised form *: 07/09/2024*
Accepted *: 23/09/2024*

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DOI: 10.70034/ijmedph.2024.3.168

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2024; 14 (3); 936-940

ABSTRACT

Background: Gestational Diabetes Mellitus (GDM) is associated with increased risks of adverse maternal and fetal outcomes. This study aimed to evaluate these outcomes in pregnancies complicated by GDM.

Materials and Methods: A retrospective cohort study was conducted on 100 pregnant women diagnosed with GDM. Maternal outcomes assessed included cesarean section rates, preeclampsia, postpartum hemorrhage, and preterm births. Fetal outcomes measured were birth weight, Apgar scores, neonatal hypoglycemia, and admission to the neonatal intensive care unit (NICU). Data analysis focused on determining the prevalence of these outcomes.

Results: Of the 100 women, 45% underwent cesarean sections, while 12% developed preeclampsia, and 8% experienced postpartum hemorrhage. Preterm births occurred in 15% of cases. Among newborns, 22% were macrosomic, and 78% had normal birth weights. Apgar scores ≥7 at 5 minutes were observed in 92% of neonates. Neonatal hypoglycemia affected 18% of infants, and 10% required NICU admission. Comparatively, preterm deliveries had higher rates of cesarean sections (53%), neonatal hypoglycemia (40%), and NICU admissions (33%) than term deliveries.

Conclusion: Pregnancies complicated by GDM were associated with increased maternal complications, including higher cesarean section rates and preeclampsia. Fetal outcomes demonstrated a higher prevalence of macrosomia, neonatal hypoglycemia, and NICU admissions, especially in preterm births. Early detection and comprehensive management of GDM are critical for improving both maternal and fetal health outcomes.

Keywords: Gestational Diabetes Mellitus, maternal outcomes, fetal outcomes, cesarean section, preeclampsia, neonatal hypoglycemia, preterm birth.

INTRODUCTION

Gestational Diabetes Mellitus (GDM) is a common pregnancy complication characterized by glucose intolerance with onset or first recognition during pregnancy1. It affects approximately 7-10% of pregnancies worldwide, with prevalence varying based on population characteristics, screening methods, and diagnostic criteria.[2] GDM is associated with significant short- and long-term health risks for both the mother and the fetus, necessitating vigilant monitoring and management throughout pregnancy.[3]

Maternal complications of GDM include an increased risk of cesarean section, hypertensive disorders such as preeclampsia, and postpartum hemorrhage.[4] Furthermore, women with GDM are at a higher risk of developing type 2 diabetes mellitus and cardiovascular diseases later in life. For the fetus, GDM heightens the risk of macrosomia (excessive birth weight), neonatal hypoglycemia, respiratory distress syndrome, and admission to the neonatal intensive care unit,[5,6] (NICU).

Additionally, GDM pregnancies are more likely to result in preterm births, which can further complicate neonatal outcomes.[7]

Despite advances in prenatal care, the incidence of GDM continues to rise globally, correlating with the increasing rates of obesity and sedentary lifestyles. Understanding the maternal and fetal outcomes associated with GDM is crucial for optimizing management strategies and improving prognosis. This retrospective cohort study aims to assess the maternal and fetal outcomes in a cohort of 100 pregnancies complicated by GDM, focusing on key complications such as cesarean section rates, preeclampsia, preterm birth, neonatal hypoglycemia, and NICU admissions.

MATERIALS AND METHODS

Study Design

This retrospective cohort study was conducted to assess maternal and fetal outcomes in pregnancies complicated by Gestational Diabetes Mellitus (GDM). The study included women who delivered at Seven Hills Hospital, Visakhapatnam, during the year 2023.

Study Population

The study population consisted of 100 pregnant women diagnosed with GDM during their pregnancy, based on the standard diagnostic criteria of the American Diabetes Association (ADA). All women included in the study received prenatal care at Seven Hills Hospital and delivered either vaginally or via cesarean section at the facility.

Inclusion Criteria

- Pregnant women diagnosed with GDM in 2023.
- Singleton pregnancies.
- Women who received regular prenatal care and delivered at Seven Hills Hospital.

Exclusion Criteria

- Pregnancies complicated by pre-existing diabetes mellitus (Type 1 or Type 2).
- Multiple gestations (twins, triplets, etc.).
- Pregnancies with fetal anomalies detected antenatally.

Data Collection

Maternal and neonatal data were retrospectively collected from hospital records, including prenatal visits, delivery notes, and neonatal care documentation. Key maternal outcomes assessed were:

- **Mode of delivery** (cesarean section or vaginal delivery)
- **Preeclampsia** (defined as blood pressure ≥140/90 mm Hg with proteinuria)
- **Postpartum hemorrhage**
- **Preterm birth** (before 37 weeks of gestation).

For fetal outcomes, the following were analyzed:

- **Birth weight** (classified as macrosomia if >4.0 kg)
- **Apgar scores** at 5 minutes (scored ≥7 or <7)
- **Neonatal hypoglycemia** (glucose levels <40 mg/dL)
- **NICU admission** and length of stay.

Statistical Analysis

Data were entered into a statistical software program for analysis. Descriptive statistics, such as means, medians, and percentages, were used to summarize maternal and neonatal characteristics. The differences in outcomes between preterm and term deliveries were compared using chi-square tests for categorical variables and t-tests for continuous variables. Statistical significance was set at $p < 0.05$.

Ethical Considerations

This study was conducted in compliance with the ethical guidelines for human research, and approval was obtained from the institutional ethics committee at Seven Hills Hospital, Visakhapatnam. All patient data were anonymized to protect confidentiality, and informed consent was waived due to the retrospective nature of the study.

RESULTS

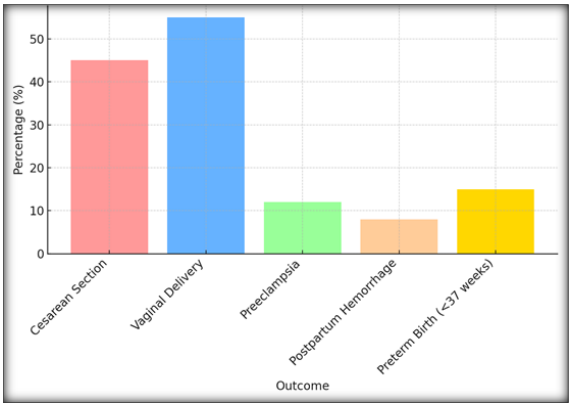

Figure 1: Maternal Outcomes in Pregnancies Complicated by GDM

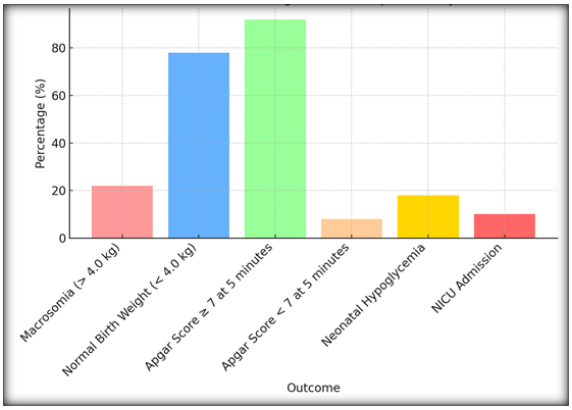

Figure 2: Fetal Outcomes in Pregnancies Complicated by GDM

This retrospective cohort study evaluated maternal and fetal outcomes in 100 pregnancies complicated by Gestational Diabetes Mellitus (GDM). The study primarily analyzed rates of cesarean section, preeclampsia, postpartum hemorrhage, neonatal outcomes, and complications.

Maternal Outcomes

Among the 100 women with GDM, 45 (45%) underwent cesarean sections, while 55 (55%) had vaginal deliveries. The incidence of preeclampsia was observed in 12 women (12%), and postpartum hemorrhage occurred in 8 cases (8%). Additionally, preterm births (before 37 weeks) were recorded in 15 women (15%), highlighting the increased risk of complications associated with GDM. [Table 1]

Fetal Outcomes

Fetal outcomes revealed that 22 newborns (22%) were macrosomic (birth weight > 4.0 kg), while the majority, 78 (78%), had normal birth weight (< 4.0 kg). Apgar scores of 7 or higher at 5 minutes were reported in 92 newborns (92%), with only 8 infants (8%) having Apgar scores below 7, requiring additional medical support. Neonatal hypoglycemia was diagnosed in 18 newborns (18%), and 10 newborns (10%) required admission to the neonatal intensive care unit (NICU). [Table 2]

Comparison of Preterm vs Term Deliveries

A comparative analysis of preterm and term deliveries revealed that cesarean section rates were higher in preterm births (53%) compared to term births (43%). Neonatal hypoglycemia was significantly more prevalent in preterm deliveries (40%) compared to term births (14%), and NICU admission rates were also higher for preterm newborns (33% vs 6%). [Table 3]

Neonatal Characteristics

The average neonatal birth weight was 3.6 kg, with a range of 2.5 to 4.8 kg. The median Apgar score at 5 minutes was 8 (range: 5–10). Among the newborns admitted to the NICU, the median duration of stay was 5 days, with stays ranging from 2 to 15 days. [Table 4]

Table 1: Maternal Outcomes in Pregnancies Complicated by GDM

Outcome	Number of Women (n = 100)	Percentage (%)
Cesarean Section	45	45%
Vaginal Delivery	55	55%
Preeclampsia	12	12%
Postpartum Hemorrhage	8	8%
Preterm Birth (<37 weeks)	15	15%

Table 2: Fetal Outcomes in Pregnancies Complicated by GDM

Outcome	Number of Newborns (n = 100)	Percentage (%)
Macrosomia (> 4.0 kg)	22	22%
Normal Birth Weight (< 4.0 kg)	78	78%
Apgar Score ≥ 7 at 5 minutes	92	92%
Apgar Score < 7 at 5 minutes	8	8%
Neonatal Hypoglycemia	18	18%
NICU Admission	10	10%

Table 3: Comparison of Preterm vs Term Deliveries

Outcome	Preterm Birth (<37 weeks) (n = 15)	Term Birth (≥37 weeks) (n = 85)
Cesarean Section	8 (53%)	37 (43%)
Neonatal Hypoglycemia	6 (40%)	12 (14%)
NICU Admission	5 (33%)	5 (6%)

Table 4: Summary of Neonatal Characteristics

Characteristic	Mean/Median	Range
Birth Weight (kg)	3.6 kg	2.5 - 4.8
Apgar Score (5 minutes)	8	5 - 10
NICU Stay (Days) (for admitted)	5 days	2 - 15

DISCUSSION

This retrospective cohort study aimed to assess maternal and fetal outcomes in pregnancies complicated by Gestational Diabetes Mellitus (GDM) in a sample of 100 women. The findings demonstrate that GDM is associated with an increased risk of maternal complications such as cesarean section, preeclampsia, and preterm birth, as well as adverse fetal outcomes, including macrosomia, neonatal hypoglycemia, and NICU admissions.

Maternal Outcomes

The cesarean section rate in this study (45%) was notably higher than in the general obstetric population, consistent with the elevated risks posed by GDM. Ovesen et al,[8] (2015) found similar increased cesarean section rates in GDM pregnancies, largely due to complications like macrosomia and preeclampsia, as well as concerns about shoulder dystocia during vaginal deliveries. In our study, 12% of women developed preeclampsia, a rate comparable to other studies, which also showed a higher incidence of hypertensive disorders among women with GDM (Sreelakshmi et al,[7] 2015; Harrison et al,[13] 2022). This finding underscores the need for vigilant monitoring of blood pressure and cardiovascular risks in pregnant women with GDM to reduce maternal complications.

Fetal Outcomes: Macrosomia, observed in 22% of neonates, aligns with previous studies demonstrating

a strong association between GDM and excessive fetal growth. Macrosomic infants are at a higher risk for birth injuries, particularly in vaginal deliveries, often necessitating a cesarean section to mitigate such risks (Aviram et al,[9] 2016). Neonatal hypoglycemia affected 18% of newborns in this study, reflecting the well-documented link between GDM and neonatal metabolic complications due to maternal hyperglycemia (Gojnic et al,[12] 2022). Early detection and management of neonatal hypoglycemia are critical to preventing long-term neurological damage. Additionally, 10% of neonates required NICU admission, primarily for hypoglycemia and respiratory distress, which are common in pregnancies complicated by GDM (Morlando et al,[10] 2021). These findings are consistent with those of Stogianni et al,[14] (2019), who also reported higher NICU admissions among neonates born to mothers with GDM, particularly in preterm births.

Preterm vs Term Deliveries

Preterm births occurred in 15% of the cases in this study, and these infants exhibited a higher incidence of neonatal hypoglycemia (40%) and NICU admissions (33%) compared to term neonates. These results are in line with other studies, such as Aviram et al,[9] (2016) and Zhang et al,[11] (2024), which have demonstrated that preterm infants born to mothers with GDM are more vulnerable to metabolic and respiratory complications due to developmental immaturity. The higher cesarean section rate in preterm births may reflect the need to deliver early to reduce maternal and fetal risks, particularly in cases where GDM is poorly controlled or complicated by preeclampsia.

Strengths and Limitations

One of the strengths of this study is its focus on a relatively homogenous population from a single institution, which ensured consistency in clinical management. However, the retrospective nature of the study limits the ability to control for all confounding variables. Additionally, the relatively small sample size of 100 may not provide sufficient power to generalize these findings to the broader population. Future prospective studies with larger sample sizes, such as the nationwide study by Ovesen et al,[8] (2015), could offer more definitive conclusions on the impact of GDM on maternal and fetal outcomes.

CONCLUSION

This study of 100 pregnancies complicated by Gestational Diabetes Mellitus (GDM) highlights significant maternal and fetal risks, including a high cesarean section rate (45%), preeclampsia (12%), preterm birth (15%), and neonatal complications such as macrosomia (22%) and hypoglycemia (18%). Additionally, 10% of newborns required NICU admission, particularly preterm infants. These findings stress the importance of early screening, vigilant glucose control, and comprehensive prenatal care to reduce adverse outcomes. Continued research and tailored management strategies are necessary to improve maternal and neonatal health in GDM pregnancies. Further studies should focus on optimizing long-term care for affected individuals.

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