Original Article

Fetomaternal Outcomes in Gestational Diabetes Mellitus: A Single Center Cross-Sectional Study

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ABSTRACT

Background: Worldwide Gestational diabetes mellitus (GDM) is a prevalent pregnancy-related condition that affects the health of millions of women and newborns worldwide. Diagnosing and treating GDM during pregnancy is vital since it has short- and long-term adverse effect on both maternal and fetal well-being.**Objective:** To assess maternal and fetal outcomes in gestational diabetes mellitus. **Methodology:** This hospital-based observational cross-sectional study was conducted from March to August 2024 at Sylhet Women's Medical College Hospital, involving 100 women with GDM. Aged 18-45 years were diagnosed with GDM, while used while those with pre-gestational diabetes or other chronic medical conditions during pregnancy were excluded. **Results:** The mothers in this study had a mean age of 34.1±6.4 years, with the majority (52.0%) in the 31-40-year age group. The mean maternal BMI was 27.2±2.8 kg/m², with 54.0% classified as overweight and 27.0% as obese. Among those with GDM, 78.0% were multigravida, and 65.4% had a history of GDM in previous pregnancies. Besides, 55.0% had a first-degree relative with GDM, and 32.0% had a history of hypertension. A history of delivering a macrosomic child was reported by 58.8%, with prior cesarean section being the most common indication for a previous CS (57.4%). In postpartum, 74.0% of mothers experienced complications, with pre-eclampsia (51.4%) and PIH (47.3%) being the most common. Fetal complications affected 72.0% of mothers, with 41.0% delivering macrosomic newborns and 5.0% underweight. Common fetal complications included hypoglycemia (38.9%), respiratory distress syndrome (34.7%), and hyperbilirubinemia (30.6%), with 44.4% of newborns requiring NICU admission. **Conclusion:** These findings highlight the significant complications of maternal and fetal associated with GDM and underscore the need for comprehensive prenatal and postnatal care.

Keywords: Gestational diabetes mellitus, maternal and fetal outcomes, Sylhet, Bangladesh.

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Introduction

Apart from pre-existing diabetes, gestational diabetes mellitus (GDM) is defined as glucose intolerance that is initially identified during pregnancy and is unaffected by treatment.[1-3] It is a conjoint pregnancy-related complication that poses risks to the mother, fetus, and newborn, with potential lifelong effects on both mother and child.[4] Risk factors for GDM include a family history of diabetes, prior large birth weight baby, stillbirth, unexplained perinatal loss, polyhydramnios, recurrent candidiasis, obesity, and maternal age over 30. Pregnancy induces insulin resistance, and GDM develops when the beta-cell function fails to compensate.[5,6] It is also a significant risk factor for type 2 diabetes (T2DM) and cardiovascular diseases in women.[7,8] Children of mothers with diabetes during pregnancy are more likely to develop obesity and T2DM.[9,10]

Maternal obesity is an obstetric condition associated with obesity prior to pregnancy.[11] During the pregnancy period, increasing obesity rates intensify the impact of obesity-related complications, posing critical threats to maternal and fetal-neonatal health.[12,13] These issues primarily affect the mother but also the fetus, neonate, and older child. Obesity may affect the effectiveness of infertility treatments, increase the chance of miscarriage and congenital disabilities, and decrease fertility.[14,15] It also raises the risk of GDM, pregnancy-induced hypertension (PIH), cesarean delivery, macrosomia, and infections.[16,17] Changes in diet and lifestyle have led to a significant increase in the incidence of gestational diabetes mellitus.[18]

GDM during pregnancy increases risks for both mother and fetus, including higher chances of miscarriage, pre-term labor, cesarean delivery, pre-eclampsia, and shoulder dystocia[19]; and poor newborn outcomes such as macrosomia, low APGAR scores, hypoglycemia, congenital malformations, and respiratory distress syndrome.[20] Macrosomic infants face higher risks of complications such as preterm birth, shoulder dystocia, and hypoglycemia.[21] In neonates of diabetic mothers, shoulder dystocia is related to lower 1-minute APGAR scores, though 5-minute scores are comparable.[22] For early detection, the risk factors for gestational diabetes serve as valuable diagnostic tools, making it essential to identify its socio-demographic, obstetric, clinical, and lifestyle determinants. Early detection of at-risk women allows for prompt management with lifestyle modifications and control of blood glucose, reducing GDM severity and preventing complications.

Methodology

Study design

In order to evaluate maternal and fetal outcomes in women with gestational diabetes mellitus, this hospital-based observational cross-sectional study was carried out at Sylhet Women's Medical College Hospital, a tertiary-level hospital in Sylhet, Bangladesh, which was purposefully selected.

Sample selection criteria

The sample size was estimated based on a study that reported a 35% prevalence of GDM in Bangladesh.[23] Using the formula $n = z^2 p(1-p)/d^2$, 100 women with GDM were enrolled in this study. Women (aged 18-45 years) were diagnosed with GDM based on a 75g OGTT, with a blood glucose level exceeding 140 mg/dL. Patients with pre-gestational or overt diabetes and those with any chronic medical disorder during pregnancy were excluded from the study.

Data collection technique

From March to August 2024, face-to-face interviews were conducted with study participants using a pretested semi-structured questionnaire at their convenience. Relevant history and clinical information were collected using the questionnaire.

Statistical analysis

Data were entered, coded, and analyzed using IBM SPSS Version 26 (New York, USA). Descriptive statistics were presented as frequency and percentage for categorical data and mean and standard deviation for continuous data. Data were presented using tables and charts.

Ethical statement

Participation was voluntary, and participants were notified of their freedom to withdraw without obligation. Confidentiality was maintained throughout the study. Ethical approval was obtained from the Institutional Review Board of Sylhet Women's Medical College, Sylhet 1000, Bangladesh (Reference: SWMC/Eth.C/IERB/20240034).

Results

Table 1 shows that the participants had a mean age of 34.1±6.4 years, with the majority (52.0%) belonging to the 31-40-year age group. Most of the women were homemakers (68.0%) and lived in urban areas (62.0%), while a small proportion (11.0%) were illiterate. The average monthly family income was 35,225.5±10,412.3 taka, with nearly half (47.0%) subsiding within the 25,001-50,000 taka range. The mean maternal body mass index (BMI) was 27.2±2.8 kg/m², with 54.0% classified as overweight and 27.0% as obese.

Table 2 shows that the majority of mothers with GDM (78.0%) were multigravida, with most (65.4%) having a history of diagnosed GDM in a previous pregnancy. 55.0% had a first-degree relative with GDM, and 32.0% had a history of hypertension. About 74.0% of mothers delivered at term, 18.0% had preterm deliveries and 8.0% delivered post-term. Regarding the mode of delivery, 61.0% underwent cesarean section (CS), 21.0% had operative vaginal delivery (OVD), and 18.0% delivered by standard vaginal delivery (NVD). A history of delivering a macrosomic child was conveyed by 58.8% of mothers. The most common indication for a previous cesarean section was a prior cesarean history (57.4%), followed by induction failure and uncontrolled GDM (13.1%), severe PIH (9.8%), and fetal distress (8.2%). (Figure 1)

Table 3 demonstrates that 74.0% of mothers experienced complications following delivery. The most prevalent complications were pre-eclampsia (51.4%), pregnancy-induced hypertension (47.3%), polyhydramnios (29.7%), and preterm labor (24.3%).

Table 4 demonstrates that 72.0% of mothers experienced fetal complications after delivery. Among the newborns, 41.0% were macrosomic, and 5.0% were underweight. The mean APGAR score at 1 minute was 7.9±1.3; at 5 minutes, it was 8.6±1.6. (Figure 2) Common fetal complications were hypoglycemia (38.9%), respiratory distress syndrome (34.7%), hyperbilirubinemia (30.6%), and prematurity (25.0%). A significant portion of newborns (44.4%) required admission to the NICU for the management of their complications. (Figure 3)

Table 1: Sociodemographic characteristics wise distribution of the study participants (n=100)

Attributes		Frequency (n)	Percent (%)
Maternal age groups (in years)	≤20	6	6.0
	21-30	27	27.0
	31-40	52	52.0
	>40	15	15.0
	Mean±SD	34.1±6.4	
Education	Illiterate	11	11.0
	Primary	23	23.0
	Secondary	43	43.0
	Higher Secondary	15	15.0
	Graduate	8	8.0
Occupation	Homemakers	68	68.0
	Service holders	23	23.0
	Others	9	9.0
Place of residence	Rural	38	38.0
	Urban	62	62.0
Monthly family income (in Taka)	≤25,000	25	25.0
	25,001-50,000	47	47.0
	≥50,000	28	28.0
	Mean±SD	35,225.5±10,412.3	
Maternal BMI (kg/m²)	Normal (20-24.9)	19	19.0
	Overweight (25-29.9)	54	54.0
	Obese (>30)	27	27.0
	Mean±SD	27.2±2.8	

Table 2: Pregnancy and clinical characteristics of the study participants (n=100)

Attributes		Frequency (n)	Percent (%)
Parity	Primigravida	22	22.0
	Multigravida	78	78.0
H/O of GDM in previous pregnancy (n=78)	No	27	34.6
	Yes	51	65.4
First-degree relative with GDM	No	45	45.0
	Yes	55	55.0
History of hypertension	No	68	68.0
	Yes	32	32.0
Gestational age at delivery (in weeks)	Pre-term (<37)	18	18.0
	Term (37-42)	74	74.0
	Post-term (>42)	8	8.0
Mode of delivery	NVD	18	18.0
	OVD	21	21.0
	CS	61	61.0
H/O previous macrosomic delivery (n=51)	No	21	41.2
	Yes	30	58.8

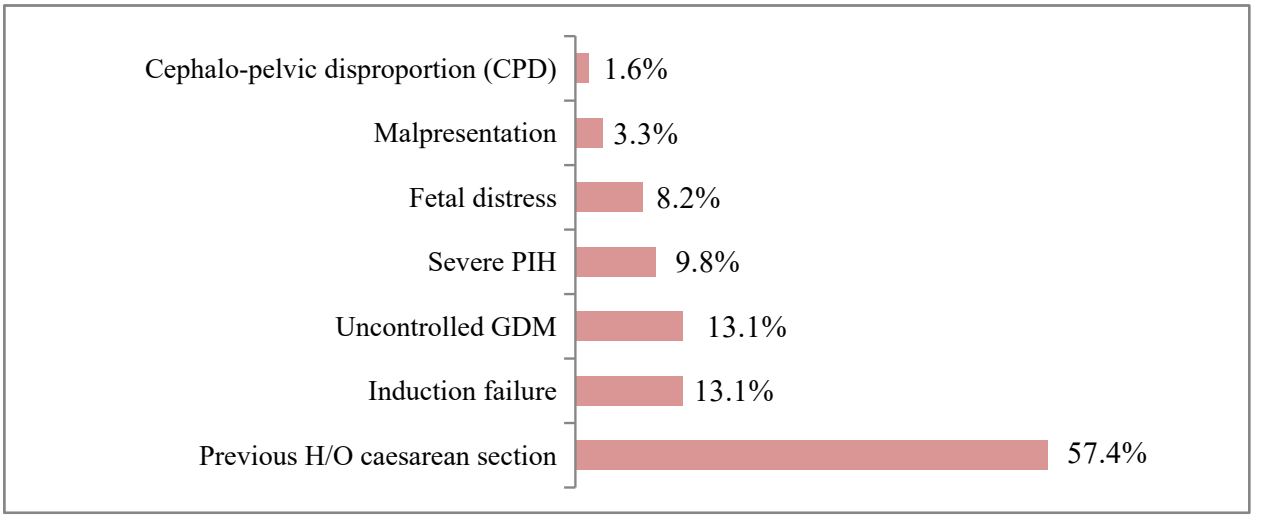

Figure 1: Indication for previous cesarean section (n=61)

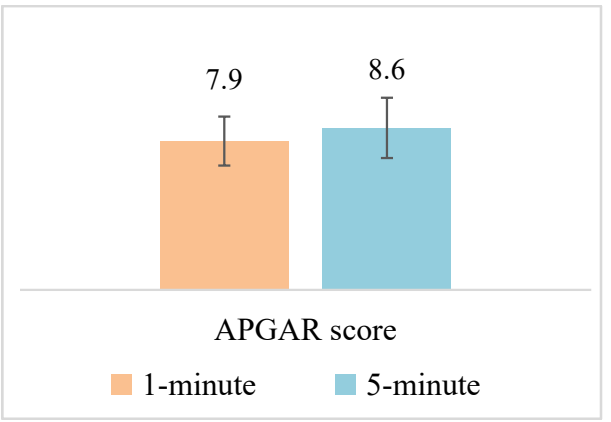

Figure 2: APGAR score of the newborn (n=97)

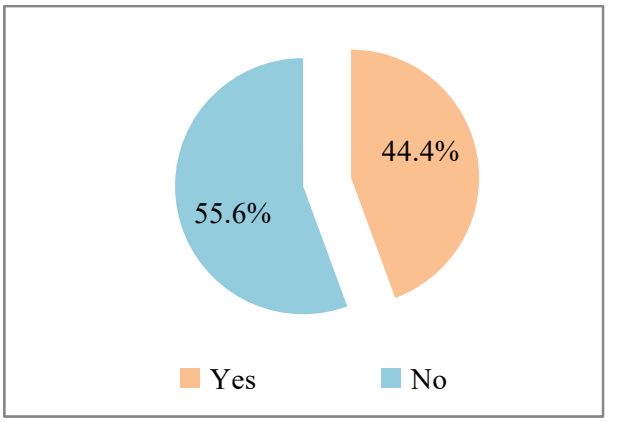

Figure 3: NICU admission (n=72)

Table 3: Maternal outcomes of the study participants (n=100)

Maternal outcomes		Frequency (n)	Percent (%)
Maternal complications during delivery	No	26	26.0
	Yes	74	74.0
Maternal complications (n=74)	Pre-eclampsia	38	51.4
	Pregnancy-induced hypertension	35	47.3
	Polyhydramnios	22	29.7
	Pre-term labour	18	24.3
	Wound infection	13	17.6
	Prolong labour	8	10.8
	Postpartum haemorrhage	4	5.4
	Intrauterine growth restriction (IUGR)	3	4.1
	Sepsis	1	1.4
	*Multiple responses		

Table 4: Fetal outcomes of the study participants (n=100)

Fetal outcomes		Frequency (n)	Percent (%)
Fetal complication after delivery	No	28	28.0
	Yes	72	72.0
Birth weight at the 1st hour	Underweight (<2.5 kg)	5	5.0
	Normal weight (2.5-4.0 kg)	54	54.0
	Macrosomia (>4 kg)	41	41.0
	Mean±SD	4.2±1.1	
Fetal complications (n=72)	Hypoglycemia	28	38.9
	Respiratory distress syndrome	25	34.7
	Hyperbilirubinemia	22	30.6
	Prematurity	18	25.0
	Perinatal mortality	6	8.3
	Sepsis	5	6.9
	Intrauterine death	3	4.2
	Shoulder dystocia	1	1.4
	Congenital anomaly	1	1.4
	*Multiple responses		

Discussion

For women pregnancy is a stressful physiological condition for women, and diabetes mellitus is a significant medical disorder that poses risks to both the mother and fetus, with long-term implications for their health.[24] In this study, the participants had a mean age of 34.1±6.4 years, with the majority (52.0%) in the 31-40-year age group. Most women were homemakers (68.0%) and lived in urban areas (62.0%), while a small percentage (11.0%) were illiterate. The mean maternal BMI was 27.2±2.8 kg/m², with 54.0% classified as overweight and 27.0% as obese. A study in Bangladesh found significant associations between GDM and factors such as age group, parity, maternal obesity, first-degree relatives with diabetes, previous history of GDM, and recurrent abortion. Older age, multi-parity, overweight, and obesity were identified as the predominant risk factors for GDM in this study.[25] A study in western Kenya found that the majority of participants with GDM were in the 30-34 years age group (54, 51%), more than half had secondary education (54, 52%), and most were overweight, with a BMI of 25-29.9 kg/m² (59, 56%).[26] In pregnancy, BMI and GDM align with previous research. Overweight or obese women may experience reduced insulin sensitivity, leading to hyperglycemia or lack of physical exercise, contributing to GDM.[27,28]

The majority of GDM mothers (78.0%) were multigravida, and most of them (65.4%) had previously been diagnosed with GDM. Furthermore, 55.0% had a first-degree family with GDM, while 32.0% had a history of hypertension. 74.0% of the women gave birth on time, 18.0% gave birth prematurely, and 8.0% gave birth after the due date. Regarding the delivery procedure, 61.0% endured CS, 21.0% had OVD, and NVD delivered 18.0%. Most women (80%) delivered at a gestational age of >37 weeks, while 20% delivered at <37 weeks. Cesarean section was performed in most cases (92%).[25] The most frequent reason for a previous cesarean section was a past cesarean (57.4%), followed by induction failure and uncontrolled GDM (13.1%), severe PIH (9.8%), and fetal distress. In Bangladesh studies, factors related to GDM were advanced age, high BMI, family history of DM, high parity, high household income, hypertension, total year of schooling, and history of ANC.[17,23,29]

Regarding maternal outcomes, 74.0% of mothers experienced complications following delivery. The most prevalent complications were pre-eclampsia (51.4%), pregnancy-induced hypertension (47.3%), polyhydramnios (29.7%), and preterm labor

(24.3%). A prospective observational study in Bangladesh found that most women experienced maternal complications, including pre-eclampsia and postpartum hemorrhage.24 A study in India found that the incidence of polyhydramnios was 36.7%, preeclampsia occurred in 16.7%, and preterm labor was present in 10.0% of patients with gestational diabetes mellitus. These findings were comparable to those in our study.[5]

Regarding fetal complications, 72.0% of mothers experienced issues after delivery. Among the newborns, 41.0% were macrosomic, and 5.0% were underweight. The mean APGAR score was 7.9±1.3 at 1 minute and 8.6±1.6 at 5 minutes. The most common fetal complications included hypoglycemia (38.9%), respiratory distress syndrome (34.7%), hyperbilirubinemia (30.6%), and prematurity (25.0%). For the purpose management of their complications, notably, 44.4% of newborns required NICU admission. Neonatal outcomes were worse in babies born to GDM-positive mothers, with higher rates of macrosomia and lower APGAR scores at one minute. Fetal outcomes were significantly poorer in the GDM group, with increased incidences of macrosomia, hypoglycemia, and hyperbilirubinemia. Consequently, NICU admissions were also more frequent among the newborns of GDM-positive mothers.[17,30]

Conclusion

In conclusion, this study explores the significant change maternal and fetal outcomes associated with gestational diabetes mellitus(GDM). Most women delivered at term, with a high rate of cesarean sections, and common postpartum complications included pre-eclampsia and pregnancy-induced hypertension. Fetal outcomes showed higher rates of macrosomia, lower APGAR scores, and metabolic complications like hypoglycemia and respiratory distress syndrome, leading to higher NICU admissions. Early detection, monitoring, and management of GDM are essential to improving outcomes for both mothers and newborns.

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