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Fetomaternal Outcome of Pregnancy in Women with Gestational Diabetes Mellitus

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ABSTRACT

Introduction: Gestational diabetes mellitus (GDM) is associated with increased maternal and fetal complications. This study aimed to evaluate the fetomaternal outcomes in women with GDM, considering glycemic control as a key factor. **Methodology:** A case series at Gulab Devi Hospital's Obstetrics and Gynecology Department in Lahore for six months involved 82 pregnant women with GDM, selected through non-probability consecutive sampling. Maternal and fetal outcomes, including pre-eclampsia, cesarean delivery, preterm birth, and neonatal hypoglycemia, were documented. Research utilized SPSS version 20 for data analysis, with Chi-square tests to determine associations ($p \leq 0.05$ significance threshold). **Results:** Among the participants, pre-eclampsia occurred in 24.4%, polyhydramnios in 47.6%, cesarean delivery in 68.3%, and postpartum hemorrhage in 6.1%. Preterm birth was noted in 22.0%, neonatal hypoglycemia in 20.7%, macrosomia in 14.6%, and NICU admission in 40.2%. **Conclusion:** GDM is linked to high rates of maternal and fetal complications, with neonatal hypoglycemia and congenital anomalies significantly associated with poor glycemic control. Strict monitoring and management of blood glucose levels are essential to improving pregnancy outcomes.

INTRODUCTION

Gestational diabetes mellitus (GDM) is pregnancy-related glucose intolerance, typically appearing in the later stages of pregnancy. The prevalence of GDM ranges from 1 to 28% globally.[1-2] Riaz et al. found a gestational diabetes mellitus frequency of 11.8% in all pregnancy trimesters in Pakistan, regardless of risk factors.[3] In 2017, globally, 21.3 million births (16.2%) were affected by hyperglycemia, mostly due to gestational diabetes mellitus (GDM). Factors like age over 25, pre-pregnancy BMI >27 kg/m2, BMI >30 kg/m2 during pregnancy, family diabetes history, pregnancy-induced hypertension, and prior baby weight of 4.5kg increase the risk of hyperglycemia during pregnancy.[4-5]

GDM prevalence rises with age and high BMI. Screening for GDM in high-risk pregnancies is crucial. Nutrition aims to provide for both mother and fetus, maintaining normoglycemia and preventing ketosis.[6-7] In a US study, regular exercise, a nutritious diet, and not smoking were identified as key factors in reducing the risk of GDM.[8] Complications of gestational diabetes mellitus encompass maternal risks like pre-eclampsia, polyhydramnios, abruptio placentae, postpartum hemorrhage, shoulder dystocia, caesarean delivery issues, impaired healing, recurrent GDM, and future type 2 diabetes concerns.[8-9]

Fetal outcomes can involve intrauterine death, respiratory distress, hypoglycemia, congenital malformations, hyperbilirubinemia, increased risk of macrosomia, and potential future obesity or diabetes for the infants.[1,10] This study aimed to outline fetal and maternal outcomes linked with gestational diabetes mellitus. While various publications have discussed pregnancy outcomes with gestational diabetes, there is a lack of local data. The study's findings will enhance our practice and guide future local implementations. Increasing incidence of gestational diabetes is straining healthcare systems, highlighting the urgency for increased awareness.

METHODOLOGY

The study was conducted in the Department of Obstetrics and Gynecology at Gulab Devi Hospital, Lahore, over a

period of six months following the approval of the synopsis. It employed a descriptive case series design, utilizing a non-probability consecutive sampling technique. The sample size was calculated based on a single population proportion, assuming a prevalence of gestational diabetes mellitus (GDM) of 11.8%, a 95% confidence level, a 7% margin of error, and a design effect of 1. The final calculated sample size was 82.[3]

The study included pregnant women aged 18-45 years with gestational age over 22 weeks diagnosed with GDM. Participants had to attend regular antenatal checkups with singleton pregnancies. Both primigravida and multigravida women with newly diagnosed or recurrent GDM were eligible. Exclusion criteria were women with pre-existing medical conditions like asthma, epilepsy, hypertension, thyroid dysfunction, anemia, or heart diseases, diabetes before pregnancy, or receiving corticosteroid therapy.

Upon receiving ethical approval, the study included 82 pregnant women with GDM. Data on demographics, clinical status, and outcomes, such as maternal conditions and fetal results, were collected after informed consent. Maternal outcomes evaluated encompassed pre-eclampsia, cesarean delivery, and postpartum hemorrhage, while fetal outcomes included preterm birth, congenital anomalies, and NICU admission based on gestational age.

The data collected for analysis in SPSS v25 included quantitative variables like age, weight, gravidity, parity, and gestational age assessed using mean and standard deviation. Qualitative variables (e.g., glycemic control, treatment regimen, maternal and fetal outcomes) were presented as frequencies and percentages. Stratification by glycemic control (good vs. poor) was done to examine its impact on outcomes. Post-stratification Chi-square tests assessed the association between GDM control and fetomaternal outcomes, with $p \leq 0.05$ considered significant.

RESULTS

The mean maternal age was 32.48±7.82 years, weight averaged 71.71±15.59 kg, gravidity averaged 2.96±1.36, and parity averaged 2.18±1.51. The mean gestational age at data collection was 31.21±5.61 weeks. In terms of glycemic control, 58.5% had good control, while 41.5% had poor control. For treatment, 19.5% received no treatment, 24.4% managed through lifestyle changes, 29.3% needed insulin, and 26.8% used metformin. A history of GDM was noted in 47.6%, while 52.4% had no prior GDM history.

The table 2 summarizes outcomes in women with gestational diabetes. Maternal complications included pre-eclampsia (24.4%), polyhydramnios (47.6%), abruptio placenta (1.2%), shoulder dystocia (8.5%), cesarean delivery (68.3%), and postpartum hemorrhage (6.1%). Fetal outcomes: preterm birth (22.0%), intrauterine fetal death (2.4%), RDS (11.0%), low APGAR scores (13.4%). Neonatal outcomes: hypoglycemia (20.7%), anomalies (3.7%), hyperbilirubinemia (11.0%), macrosomia (14.6%), SGA (15.9%), LGA (1.2%). NICU admission needed for 40.2% newborns.

Most feto-maternal outcomes showed no significant association with glycemic control. However, neonatal hypoglycemia (p=0.006) and congenital anomalies (p=0.036) were significantly higher in women with poor GDM control. This underscores the need for strict glycemic management to reduce neonatal complications.

Table 1

Frequency distribution of different variables (n=82)

Variables		Frequency	Percent
Mother's age	Mean age (years)	32.48±7.82	
Mother's weight	Mean weight (kg)	71.71±15.59	
Gravidity	Mean gravidity	2.96±1.36	
Parity	Mean parity	2.18±1.51	
Gestational age	Mean gestational age (weeks)	31.21±5.61	
GDM control	Good	48	58.5%
	Poor	34	41.5%
Treatment type	None	16	19.5%
	Lifestyle modifications	20	24.4%
	Insulin	24	29.3%
	Metformin	22	26.8%
History of GDM	Yes	39	47.6%
	No	42	52.4%

Table 2

Frequency distribution of feto-maternal outcomes (n=82)

Feto-maternal outcomes		Frequency	Percent
Pre-eclampsia	Yes	20	24.4%
	No	62	75.6%
Polyhydramnios	Yes	39	47.6%
	No	43	52.4%
Abruptio placenta	Yes	1	1.2%
	No	81	98.8%
Shoulder dystocia	Yes	7	8.5%
	No	75	91.5%
Cesarean delivery	Yes	56	68.3%
	No	26	31.7%
PPH	Yes	5	6.1%
	No	77	93.9%
Preterm birth	Yes	18	22.0%
	No	64	78.0%
IUD	Yes	2	2.4%
	No	80	97.6%
RDS	Yes	9	11.0%
	No	73	89.0%
Low APGAR score	Yes	11	13.4%
	No	71	86.6%
Neonatal hypoglycemia	Yes	17	20.7%
	No	65	79.3%
Congenital anomaly	Yes	3	3.7%
	No	79	96.3%
Hyperbilirubinemia	Yes	9	11.0%
	No	73	89.0%
Macrosomia	Yes	12	14.6%
	No	70	85.4%
Large for gestational age	Yes	1	1.2%
	No	81	98.8%
Small for gestational age	Yes	13	15.9%
	No	69	84.1%
NICU admission	Yes	33	40.2%
	No	49	59.8%

Table 3

Stratification of GDM control with respect to feto-maternal outcomes

Feto-maternal outcomes		GDM control		p-value
		Good	Poor	
Pre-eclampsia	Yes	10(50.0%)	10(50.0%)	0.373
	No	38(61.3%)	24(38.7%)	
Polyhydramnios	Yes	24(61.5%)	15(38.5%)	0.599
	No	24(55.8%)	19(44.2%)	
Abruptio placenta	Yes	1(100.0%)	0(0.0%)	0.397
	No	47(58.0%)	34(42.0%)	
Shoulder dystocia	Yes	5(71.4%)	2(28.6%)	0.469

	No	43(57.3%)	32(42.7%)	
Cesarean delivery	Yes	32(57.1%)	24(42.9%)	0.707
	No	16(61.5%)	10(38.5%)	
PPH	Yes	2(40.0%)	3(60.0%)	0.385
	No	46(59.7%)	31(40.3%)	
Preterm birth	Yes	10(55.6%)	8(44.4%)	0.771
	No	38(59.4%)	26(40.6%)	
IUD	Yes	1(50.0%)	1(50.0%)	0.804
	No	47(58.8%)	33(41.3%)	
RDS	Yes	4(44.4%)	5(55.6%)	0.363
	No	44(60.3%)	29(39.7%)	
Low APGAR score	Yes	8(72.7%)	3(27.3%)	0.305
	No	40(56.3%)	31(43.7%)	
Neonatal hypoglycemia	Yes	5(29.4%)	12(70.6%)	0.006
	No	43(66.2%)	22(33.8%)	
Congenital anomaly	Yes	0(0.0%)	3(100.0%)	0.036
	No	48(60.8%)	31(39.2%)	
Hyperbilirubinemia	Yes	7(77.8%)	2(22.2%)	0.214
	No	41(56.2%)	32(43.8%)	
Macrosomia	Yes	7(58.3%)	5(41.7%)	0.988
	No	41(58.6%)	29(41.4%)	
Large for gestational age	Yes	0(0.0%)	1(100.0%)	0.232
	No	48(59.3%)	33(40.7%)	
Small for gestational age	Yes	7(53.8%)	6(46.2%)	0.708
	No	41(59.4%)	28(40.6%)	
NICU admission	Yes	18(54.5%)	15(45.5%)	0.547
	No	30(61.2%)	19(38.8%)	

DISCUSSION

Gestational diabetes mellitus (GDM) is a significant contributor to adverse pregnancy outcomes, impacting both maternal and fetal health. In this study, the most frequently observed maternal complications included pre-eclampsia (24.4%), polyhydramnios (47.6%), cesarean delivery (68.3%), and postpartum hemorrhage (6.1%). These findings align with previous studies that report an increased risk of hypertensive disorders and excessive amniotic fluid in GDM pregnancies due to insulin resistance and endothelial dysfunction.[17-18]

Cesarean delivery rates were notably high, consistent with prior research indicating that GDM pregnancies are more likely to require surgical intervention due to fetal macrosomia, labor dystocia, and failed induction of labor.[19]

Among fetal outcomes, preterm birth (22.0%) was a notable finding, which is in line with studies showing that women with GDM are more likely to deliver before 37 weeks due to complications such as pre-eclampsia and poor glycemic control.[20-21]

The incidence of neonatal hypoglycemia (20.7%) was also significant, which is expected as fetal hyperinsulinemia leads to rapid postnatal glucose depletion after delivery.[22]

Additionally, NICU admissions (40.2%) were high, supporting existing literature that suggests neonates of GDM mothers require closer monitoring due to respiratory distress, metabolic instability, and birth complications.[23]

Macrosomia (14.6%) and large-for-gestational-age infants (1.2%) were observed at lower rates than some previous reports, though still a concern. This may be due to improved management strategies, including dietary modifications and pharmacologic interventions that help regulate fetal growth.[24-25]

Conversely, small-for-gestational-age (15.9%) infants were also present, indicating that GDM pregnancies can lead to both excessive and restricted fetal growth, potentially due to placental insufficiency or medical interventions aimed at controlling hyperglycemia.[26]

Congenital anomalies were observed in 3.7% of neonates, which is consistent with studies that suggest maternal hyperglycemia in early pregnancy can increase the risk of cardiovascular and neural tube defects.[27]

Hyperbilirubinemia (11.0%) was another common complication, supporting evidence that infants of diabetic mothers have an increased risk of jaundice due to polycythemia and hepatic immaturity.[28]

In Rafiq's study of 200 diabetic pregnant women, findings showed that 54% had C-sections, 5% had oligohydramnios, 9% experienced postpartum hemorrhage, 2% had intrauterine deaths, 60.2% required NICU care, and 10.5% resulted in perinatal deaths. Antenatal complications included hypertension (22%), UTI (17.5%), and shoulder dystocia (8%).[9]

In a study by Fareed et al., 47% of women with GDM had polyhydramnios, 44% developed preeclampsia, 31% experienced prematurity, 27% had neonatal hypoglycemia, 11% faced birth asphyxia, and 6% developed jaundice. Fetal macrosomia was present in 17% of infants, and 2% of babies had congenital deformities.[11]

Aktar et al. found that women with GDM had maternal issues including gestational hypertension (3.6%), preeclampsia (2.4%), PROM (4.9%), recurrent UTI (12.3%), and high cesarean rates (85.3%). Fetal problems included large for gestational age (1.4%), IUGR (2.0%), neonatal hypoglycemia (2.7%), hyperbilirubinemia (12.0%), and congenital anomalies (4.0%).[12]

A recent study by Jani and colleagues found various maternal complications, including polyhydramnios, antepartum and postpartum hemorrhage, sepsis, wound infection, and urinary tract infection. Most common neonatal issues were hypoglycemia, prematurity, and macrosomia.[13]

In their study, Patel and Jadav identified common maternal complications like preeclampsia (16.7%), polyhydroamnious (36.7%), and uteroplacental insufficiency (8.3%). Fetal complications included pre-maturity (18.3%), macrosomia (5.8%), respiratory distress syndrome (10.0%), hyperglycemia (14.2%), hyperbilirubinemia (15.8%), congenital anomaly (6.7%), NICU admission (21.7%), and perinatal mortality (10.0%).[14]

In their 2024 study, Zhang et al. found that placental abruption occurred in 0.3% of pregnant women with GDM.[15]

In a study by Fuka et al. (2020), it was found that 24.7% of women with GDM had hypoglycemic infants, 23.1% had macrosomic infants, 15.9% had small for gestational age babies, and 12.9% had infants with low Apgar scores (<7 at 5 min).[16]

This study has several limitations. The small sample size (n=82) and single-center design limit generalizability. Data reliance on hospital records and patient reports may introduce bias. Key confounders like socioeconomic status and pre-pregnancy BMI were not accounted for. Long-term neonatal follow-up was lacking, preventing

assessment of future metabolic risks. Additionally, differentiation between early- and late-onset GDM was not made, which may have distinct implications. Future multicenter studies with larger cohorts and extended follow-up are needed for a more comprehensive understanding of GDM-related complications.

CONCLUSION

This study emphasizes the significant impact of gestational diabetes mellitus (GDM) on maternal and fetal outcomes. Women with GDM faced increased risks of complications like pre-eclampsia, polyhydramnios, cesarean delivery, and neonatal issues, including preterm birth, neonatal hypoglycemia, and NICU admissions. Inadequate glycemic control led to a higher likelihood of adverse neonatal outcomes, underscoring the importance of vigilant monitoring and management during pregnancy.

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