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Assessment of Pregnancy Outcomes in Women with Gestational Diabetes Mellitus at a Tertiary Care Center

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Abstract

Background: *Gestational diabetes mellitus (GDM) is a common pregnancy complication associated with significant maternal and fetal risks. This study aims to evaluate pregnancy outcomes in women with GDM at a tertiary care center to inform effective management strategies.*

Aim of the study: *The aim of the study was to assess maternal and neonatal outcomes among women diagnosed with gestational diabetes mellitus.*

Methods: *This descriptive observational study was conducted at the Department of Obstetrics and Gynecology, Shaheed Suhrawardy Medical College Hospital, Dhaka, Bangladesh, from September 2018 to March 2019. One hundred pregnant women (50 with gestational diabetes and 50 non-diabetic) were enrolled based on set criteria. Data on demographics, obstetric history, clinical variables, and neonatal outcomes were collected using a pre-tested questionnaire, physical exams, and laboratory tests. Gestational diabetes and BMI were defined by standard criteria. Ethical approval and informed consent were obtained. Data were analyzed using SPSS v22.0, with $p<0.05$ considered significant.*

Results: *Among 100 participants (50 GDM, 50 non-GDM), GDM mothers had higher cesarean rates (76% vs. 42%), more postpartum complications (38% vs. 18%), and delivered heavier babies (mean 3.4 kg vs. 2.8 kg). Macrosomia (14%) and neonatal hypoglycemia (22%) occurred only in GDM group. At 5 minutes, 10% of GDM newborns had APGAR <7.*

Conclusion: *Gestational diabetes adversely affects maternal and neonatal outcomes, highlighting the need for early evaluation, glycemic control, and optimal maternal health for improved pregnancy outcomes.*

Keywords: *Gestational Diabetes, Pregnancy Outcomes, Maternal Complications.*

1. Introduction

Gestational diabetes mellitus (GDM) is a serious pregnancy complication characterized by chronic hyperglycemia first recognized during pregnancy in women without prior diabetes diagnosis. It results primarily from impaired glucose tolerance caused by pancreatic β-cell dysfunction against a background of insulin resistance, resembling type 2 diabetes in its pathophysiology, involving inadequate insulin secretion and responsiveness.

GDM affects approximately 2-10% of all pregnancies and may resolve postpartum;

however, 5-10% of these women develop overt diabetes mellitus, most commonly type 2 diabetes [1].

The global prevalence of GDM varies widely from 1% to 28%, depending on population characteristics such as ethnicity, body mass index (BMI), maternal age, family history of diabetes, screening methods, and diagnostic criteria. Eastern and South-Eastern Asia, particularly Asian populations, are at higher risk due to socioeconomic and nutritional factors [2]. At Bangabandhu Sheikh Mujib Medical University (BSMMU), prevalence rates of GDM were reported as 36% by WHO-1999 criteria and 32% by O'Sullivan criteria in the same population (n=385) [2]. South-East Asia has the highest prevalence of hyperglycemia in pregnancy at 24.2%, underscoring the importance of effective screening due to associated adverse maternal and fetal outcomes and the risk of future diabetes.

The exact etiology of GDM remains unclear but involves weight gain, pregnancy-related hormonal changes, and placental hormones that induce insulin resistance by interfering with insulin receptor signaling. This insulin resistance normally increases during the second trimester and can reach levels similar to type 2 diabetes [3]. As glucose crosses the placenta via facilitated diffusion, elevated maternal glucose results in increased fetal insulin secretion, which acts as a growth factor leading to macrosomia.

Key risk factors for GDM include advanced maternal age (>30 years), increased parity, positive family history of diabetes, previous poor obstetric outcomes, history of macrosomic infants, prediabetes, obesity, and glycosuria. High-risk mothers require glucose testing at the initial antenatal visit and again between 24-28 weeks of gestation, typically via oral glucose tolerance testing after fasting [4].

GDM poses significant risks to both mother and fetus. Maternal complications include polyhydramnios, preeclampsia, preterm labor, and antepartum hemorrhage, while fetal complications include fetal distress, meconium staining, prematurity, hypoglycemia, and increased incidence of macrosomia with congenital anomalies [5]. Macrosomia increases risks for instrumental deliveries and delivery complications such as shoulder dystocia. Neonates of diabetic mothers are prone to hypoglycemia, jaundice, polycythemia, hypocalcemia, hypomagnesemia, and respiratory distress syndrome due to immature lung development [6].

GDM is a common and significant condition impacting pregnancy outcomes. Mothers with GDM are at increased risk for obstetric complications and future development of type 2 diabetes, while offspring face risks of overweight, childhood obesity, and subsequent diabetes. However, GDM is reversible, and effective glycemic control improves maternal and fetal outcomes [7]. Routine blood glucose screening at antenatal visits, including testing for glycosuria and random blood glucose measurements at booking and between 26-28 weeks gestation, is recommended to enable early diagnosis and reduce morbidity [8]. Understanding the impact of GDM on pregnancy outcomes is therefore essential for guiding timely intervention and improving perinatal care.

1.1. Objective

- To assess maternal and neonatal outcomes among women diagnosed with gestational diabetes mellitus attending a tertiary care hospital.

2. Methodology & Materials

This descriptive observational study was conducted at the Department of Obstetrics and Gynecology, Shaheed Suhrawardy Medical College Hospital, Dhaka, Bangladesh, from September 2018 to March 2019. A total of 100 pregnant women were included and allocated into two groups based on their diabetic status: 50 women with gestational diabetes mellitus (Group I) and 50 non-diabetic pregnant women (Group II). Participants were selected according to predefined inclusion and exclusion criteria to assess pregnancy outcomes associated with gestational diabetes.

2.1. Inclusion Criteria

- Women with singleton pregnancy
- Gestational age greater than 28 weeks
- Women with any degree of glucose intolerance first diagnosed during pregnancy
- Availability of diabetic book and antenatal card with necessary information

2.2. Exclusion Criteria

- Known history of diabetes prior to pregnancy
- Twin or multiple pregnancies
- Gestational age less than 28 weeks
- Lack of diabetic book and antenatal card for necessary information

Data were collected using a structured, pre-tested questionnaire capturing demographic details, obstetric history, and clinical variables. Detailed history taking, physical examinations, and routine laboratory investigations were performed, with birth weights and neonatal outcomes recorded at delivery. All patients provided informed written consent prior to enrollment. Gestational diabetes mellitus (GDM) was defined according to ACOG criteria as any glucose intolerance first recognized during pregnancy. Body mass index (BMI) categories followed Asian population standards: normal (18.5–23.0 kg/m²), overweight (23.1–25.0 kg/m²), and obese (>25.0 kg/m²). Birth weights were classified as normal (2500–3999 g) and low birth weight (<2500 g).

The study adhered to the Declaration of Helsinki, with ethical approval obtained from the institutional review board; confidentiality and anonymity of patient data were maintained. Data analysis was conducted using SPSS version 22.0, employing descriptive statistics (mean ± SD, percentages), Chi-square tests for categorical variables, and Student's t-test for continuous variables, with p-values <0.05 considered statistically significant. To ensure quality, the questionnaire was pretested for clarity, and data were thoroughly checked for completeness and accuracy before analysis.

3. Results

This cross-sectional study was conducted in the Department of Obstetrics and Gynecology at Shaheed Suhrawardy Medical College Hospital (ShSMCH), Dhaka, over a period of six months.

A total of 100 pregnant women were selected and divided equally into two groups: Group I comprised 50 women diagnosed with gestational diabetes mellitus (GDM), while Group II included 50 non-diabetic or normoglycemic pregnant women.

Table 1. *Demographic Characteristics of the Study Participants (n = 100)*

Variable		Group-I (n=50)	Group-II (n=50)	P value
Age (years)	18–23	14 (28.0%)	17 (34.0%)	0.508^{ns}
	24–29	23 (46.0%)	22 (44.0%)	
	30–35	13 (26.0%)	11 (22.0%)	
	Mean ± SD	26.9 ± 8.3	25.4 ± 7.8	
Education Level	Primary	17 (34.0%)	20 (40.0%)	0.317^{ns}
	Secondary	19 (38.0%)	18 (36.0%)	
	Higher than secondary	10 (20.0%)	9 (18.0%)	
	Illiterate	4 (8.0%)	3 (6.0%)	
Economic Status	Poor class	14 (28.0%)	14 (28.0%)	0.12739^{ns}
	Middle class	30 (60.0%)	28 (56.0%)	
	Upper class	6 (12.0%)	8 (16.0%)	
Weight Status	Normal weight	24 (48.0%)	31 (62.0%)	0.031^{s}
	Overweight/Obesity	26 (52.0%)	19 (38.0%)	

Table 1 outlines the demographic distribution of the study population. Participant ages ranged from 18 to 35 years, with the majority (46%) in the 24–29 age group. Mean age was slightly higher in the GDM group (26.9 ± 8.3 years) than in the non-GDM group (25.4 ± 7.8 years), with no significant difference (p = 0.508). Educational level, economic status, and age distribution were comparable across groups. However, overweight/obesity was significantly more prevalent among GDM women (52%) compared to non-GDM (38%) (p = 0.031), suggesting a potential association with gestational diabetes.

Table 2. *Mode of Delivery of Pregnant Women (n=100)*

Mode of Delivery	Group-I (n=50)		Group-II (n=50)		P value
	No.	%	No.	%	
Normal Vaginal Delivery (NVD)	12	24.0	29	58.0	0.0001*
Cesarean Section (CS)	38	76.0	21	42.0	
Total	50	100.0	50	100.0	

Table 2 presents the distribution of delivery modes among the study participants. Cesarean section was notably more frequent in Group I (gestational diabetes mellitus), accounting for 76.0% of deliveries, compared to 42.0% in Group II. Conversely, normal vaginal delivery was more common in Group II (58.0%) than in Group I (24.0%). This difference was statistically significant (p=0.0001).

Table 3. *Maternal Complications and Factors Influencing LUCS (n=100)*

Complication	Group-I (n=38)	Group-II (n=21)
Pre-eclampsia	8 (16.0%)	6 (12.0%)
Macrosomia	7 (14.0%)	0 (0%)
Fetal distress	12 (24.0%)	10 (20.0%)
Malpresentation	3 (6.0%)	5 (10.0%)
Prolonged labour	6 (12.0%)	6 (12.0%)
PROM	8 (16.0%)	5 (10.0%)
Polyhydramnios	5 (10.0%)	2 (4.0%)
UTI	15 (30.0%)	7 (14.0%)

Table 3 presents maternal complications and factors influencing lower uterine cesarean section (LUCS) among the study groups. Although the overall complication rate was higher in gestational diabetic women (Group I), no statistically significant difference was observed between the groups. Fetal distress emerged as the most frequent complication and primary indication for LUCS (seen in approximately 22 patients), followed by premature rupture of membranes (PROM), pre-eclampsia, prolonged labor, macrosomia, and urinary tract infection.

Table 4. *Post-partum Outcome of the Women (n=100)*

Outcome	Group-I (n=50)	Group-II (n=50)	P value
Recovered without complication	38 (76.0%)	45 (90.0%)	0.021
Wound infection	7 (14.0%)	2 (4.0%)	
Urinary tract infection (UTI)	8 (16.0%)	5 (10.0%)	
Post-partum hemorrhage (PPH)	4 (8.0%)	2 (4.0%)	

Table 4 shows the post-partum outcomes of the study participants. Wound infection was more common among women with gestational diabetes mellitus (GDM). A total of 83 patients recovered without complications—38 in the GDM group and 45 in the non-GDM group. The difference between the groups was statistically significant (p = 0.021).

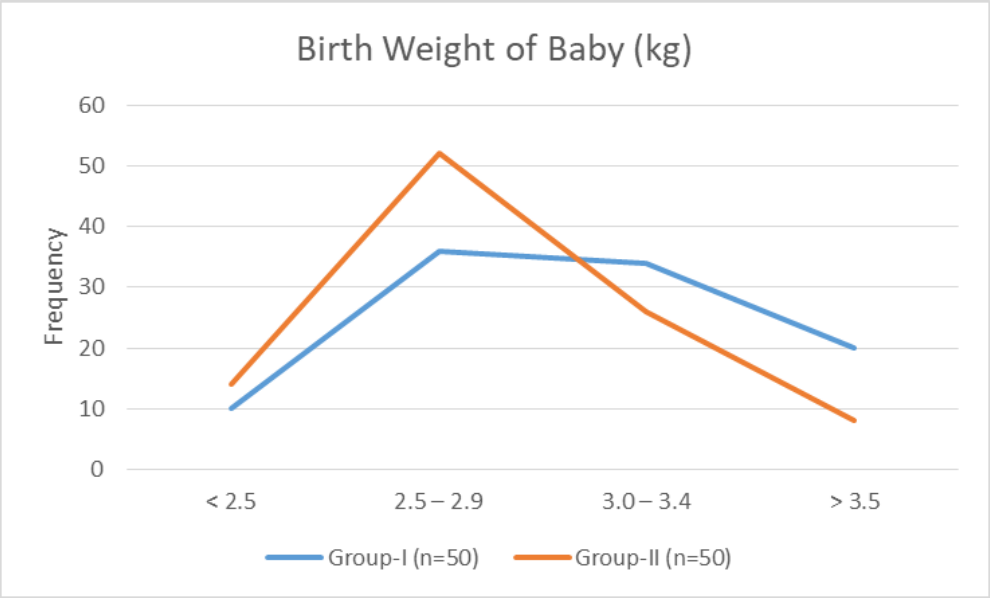

Figure 1. *Birth weight trends of neonates between groups (n=100)*

Figure 1 illustrates the birth weight distribution of neonates born to gestational diabetic (Group I) and non-diabetic (Group II) mothers. A clear trend toward higher birth weights is observed among GDM mothers, with the majority of heavier babies (>3.0 kg) belonging to this group. In Group I, 54.0% of babies weighed above 3 kg compared to 34.0% in Group II. The peak birth weight in Group II was between 2.5–2.9 kg, after which it declined sharply, indicating that non-diabetic mothers predominantly delivered within normal weight range. Notably, all macrosomic babies (>4 kg) were from the GDM group (7 cases). The mean birth weight was also significantly higher in Group I (3.4 ± 0.3 kg) than in Group II (2.8 ± 0.6 kg), with statistical significance between groups.

Table 5. *Adverse Outcome of Neonate (n=100)*

Complication	Group-I (n=50)		Group-II (n=50)		P value
	No.	%	No.	%	
Hypoglycemia	11	22.0%	0	0.0%	0.0001
Macrosomia	7	14.0%	0	0.0%	
Birth Asphyxia	6	12.0%	4	8.0%	
Hyperbilirubinaemia	8	16.0%	3	6.0%	
Congenital Anomaly	0	0.0%	0	0.0%	
Neonatal Death	1	2.0%	0	0.0%	

Table 5 presents neonatal complications in gestational diabetic (Group I) and non-diabetic (Group II) mothers. Neonates of GDM mothers experienced significantly higher rates of complications. Hypoglycemia was observed in 22.0% of Group I babies, while none were affected in Group II (p=0.0001). Macrosomia occurred in 14.0% of GDM cases, with no cases in non-GDM. Additionally, birth asphyxia (12.0% vs. 8.0%) and hyperbilirubinaemia (16.0% vs. 6.0%) were more common in Group I. One neonatal death occurred in the GDM group, while no congenital anomalies were reported in either group.

Table 6. *APGAR Score at First and Five Minutes in GDM Cases (n=50)*

APGAR Score	At First Minute No. (%)	At Five Minutes No. (%)
7–10	37 (74%)	45 (90%)
4–6	9 (18%)	3 (6%)
<4	4 (8%)	2 (4%)

Table 6 demonstrates the APGAR score distribution of newborns delivered by mothers with gestational diabetes. At the first minute of life, 74% of neonates had a reassuring score between 7–10, while 18% scored between 4–6, and 8% had a critical score below 4. By the fifth minute, improvement was noted, with 90% of neonates scoring between 7–10, 6% between 4–6, and only 4% remaining below 4. Neonates with persistently low scores were admitted to the NICU for further management.

4. Discussion

This cross-sectional study was conducted at the Department of Obstetrics and Gynaecology of Shaheed Suhrawardy Medical College Hospital, Dhaka, with the objective of determining pregnancy outcomes among women with gestational diabetes mellitus (GDM). A total of 100 patients were included—50 with GDM (Group I) and 50 non-diabetic pregnant women (Group II). Data were collected via interviews and review of medical records including OPD/IPD follow-ups, investigations, treatment papers, and hospital file notes.

The study population included women aged between 18 and 35 years, with the majority (45%) aged 24–29 years. The mean age in Group I was 26.9 ± 8.3 years and 25.4 ± 7.8 years in Group II, showing no statistically significant difference. This is in agreement with previous studies indicating most diabetic pregnancies occur in women aged ≥25 years [9-11].

In terms of education, the largest proportion of women had secondary education (37%), followed by primary (37%) and illiterate (7%). Socioeconomically, most participants were from the middle class (58%), with 60% in Group I and 56% in Group II, followed by the poor (28%) and upper class (14%). Educational status and socioeconomic factors are known to influence maternal health behavior, BMI, and nutritional status. Studies in rural Bangladesh confirmed

that higher maternal education correlates with greater antenatal care (ANC) utilization [12], while poor socioeconomic conditions, low literacy, cultural beliefs, and family size can restrict healthcare access [13]. Research from BIRDEM reported that diabetic pregnant women were generally less educated than non-diabetics [9], although higher GDM prevalence has also been reported in wealthier individuals in both urban and rural areas [14,15].

Regarding maternal complications and delivery, the GDM group had a higher rate of complications, though differences between groups were not statistically significant. The leading cause for cesarean section (C/S) was fetal distress, followed by premature rupture of membranes (PROM), preeclampsia, and prolonged labor. A significant difference in birth weight was observed: 14% of babies weighed over 3.5 kg, with 10 in Group I and 4 in Group II. All 7 macrosomic infants (birth weight >4 kg) were born to mothers with GDM. The mean birth weight was significantly higher in the GDM group (3.4 ± 0.3 kg vs. 2.8 ± 0.6 kg). Over half (54%) of GDM mothers delivered babies weighing >3 kg, compared to 34% in non-diabetics, indicating a significant association between GDM and increased birth weight.

Several studies corroborate these findings. Risk factors for GDM—such as advanced maternal age, obesity, and previous macrosomia—were also linked to increased oral glucose tolerance test (OGTT) values [16,17]. These factors, along with chronic maternal illnesses, influence both the delivery mode and neonatal birth weight. A BIRDEM-based study found that diabetic mothers had higher anthropometric measures, which could account for larger birth weights [9]. Birth weight is further influenced by maternal BMI, nutritional status, pregnancy weight gain, haemoglobin levels, parity, and metabolic disorders [18].

The current study also found more adverse neonatal outcomes in the GDM group: 22% of babies experienced hypoglycemia, 12% had birth asphyxia, and 16% developed hyperbilirubinemia. These findings align with other studies reporting increased neonatal complications in GDM pregnancies, including hypoglycemia (27%), prematurity (31%), birth asphyxia (11%), jaundice (6%), and macrosomia (17%) [7]. Another study showed significantly higher rates of macrosomia and congenital anomalies in babies of diabetic mothers, as well as increased neonatal admissions [19].

Postpartum persistence of abnormal glucose tolerance (AGT) was higher in GDM women (50%), especially those with high BMI, advanced maternal age, and insulin use during pregnancy [4]. Despite treatment, adverse maternal and neonatal events were more frequent in women with persistent AGT.

Diabetes frequently coexists with obesity, hypertension, and dyslipidemia, exacerbating pregnancy risks. Women with low pre-pregnancy BMI (<18) are prone to delivering low-birth-weight infants, while those with high BMI (>24) tend to have macrosomic babies [18]. Increased glucose availability to the fetus due to maternal hyperglycemia can result in excessive fetal weight gain, particularly in the third trimester. Therefore, the timing of delivery also impacts birth weight significantly [18].

In summary, this study reinforces the association between GDM and adverse maternal and neonatal outcomes, including higher rates of cesarean section, macrosomia, and neonatal complications. These findings support the need for early detection and effective glycemic control to improve pregnancy outcomes.

5. Limitations of the Study

This study has several limitations:

- The sample size was relatively small.
- The study population was selected from a single hospital in Dhaka city; therefore, the findings may not accurately represent the overall population of the country. A larger-scale study is needed to draw more definitive conclusions.
- The study was conducted in a tertiary care hospital, which may not reflect the situation in primary or secondary healthcare settings.
- Samples were selected using a purposive sampling method, which may introduce the possibility of personal bias.

6. Conclusion

This study has shown that gestational diabetes is associated with a high risk of adverse outcomes. On comparison between groups, the complication rate was higher among women with GDM. The most common complications and indications for caesarean section were fetal

distress, PROM, pre-eclampsia, and prolonged labour. In the GDM group, seven babies were found to have macrosomia; 22.0% of the babies developed birth hypoglycemia, 12.0% had birth asphyxia, and 16.0% developed hyperbilirubinemia. We will focus on what we believe to be the most important contributing factors: the genetic background of the mother and baby, maternal age, nutritional status, and access to prenatal care. In this study, no significant rate of low birth weight (LBW) was identified.

However, the incidence of high birth weight was higher among mothers with a history of diabetes and obesity. Among safe motherhood advocates, antenatal care (ANC) has been downplayed in recent years as an intervention for reducing maternal mortality. This is largely due to a better understanding of the causal pathways leading to maternal deaths, particularly the absence of effective management for obstetric complications.

Since ANC and postnatal care (PNC) are essential for reducing the risks associated with pregnancy and delivery, efforts should be made to improve maternal healthcare-seeking behavior, taking into account women's socio-cultural beliefs and practices. Achieving optimal pre-pregnancy weight, ensuring nutritional support, encouraging physical activity, and maintaining control of diabetes and other chronic conditions are crucial. Efforts to monitor progress in antenatal care coverage have generally focused on quantifiable aspects such as the number and timing of visits, as well as the characteristics of ANC users and non-users.

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