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Perinatal Outcomes and Neonatal Morbidity in Diabetic versus Non-Diabetic Pregnancies

***Dr. Nasrin Sultana[1], Dr. Sayeeda Pervin[2], Dr. Mst. Nargish Khanam[3], Dr. Mst. Mafruha Haque[4], Dr. Nazia Ahmed[5], Dr. Sanjana Rahman[6]**

[1]*Assistant Professor, Department of Obstetrics and Gynaecology, Dhaka Medical College, Dhaka, Bangladesh*
[2]*Assistant professor, Department of Obstetrics and Gynaecology, Dhaka Medical College, Dhaka, Bangladesh*
[3]*Junior Consultant, Department of Obstetrics and Gynaecology, Dhaka Medical College Hospital, Dhaka, Bangladesh*
[4]*Junior consultant, Department of Obstetrics and Gynaecology, Dhaka Medical College Hospital, Dhaka, Bangladesh*
[5]*Junior Consultant, Department of Obstetrics and Gynaecology, Dhaka Medical College Hospital, Dhaka, Bangladesh*
[6]*Registrar, Department of Obstetrics and Gynaecology, Dhaka Medical College Hospital, Dhaka, Bangladesh*

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Corresponding Author:** ***Dr. Nasrin Sultana, *Assistant Professor, Department of Obstetrics and Gynaecology, Dhaka Medical College, Dhaka, Bangladesh*

Abstract

Background: *Diabetes during pregnancy, whether gestational or pre-gestational, is associated with a range of adverse maternal and neonatal outcomes. This study aimed to compare perinatal outcomes and neonatal morbidities among non-diabetic, gestational diabetic, and pre-gestational diabetic pregnancies.*

Methods: *This prospective cross-sectional observational study was conducted at the Department of Obstetrics and Gynecology, Bangabandhu Sheikh Mujib Medical University (BSMMU) and Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders (BIRDEM), Dhaka, from January 2004 to December 2005. A total of 150 pregnant women were enrolled and divided into three equal groups: 50 non-diabetic women (Group A), 50 women with pre-existing diabetes mellitus (Group B), and 50 women diagnosed with gestational diabetes mellitus (Group C).*

Results: *The mean age of participants in Groups A, B, and C was 28.34 ± 4.20, 29.01 ± 5.03, and 28.92 ± 5.14 years, respectively. The live birth rate was 100% in Group A, 86% in Group B, and 94% in Group C. Pregnancy losses were more frequent in diabetic groups: Group B had 14% losses (including 4% abortions, 2% IUFD, and 8% stillbirths), while Group C had 6% losses. Mean birth weight did not differ significantly between groups (P > 0.10). However, the need for neonatal resuscitation was significantly higher in diabetic groups: 65.1% in Group B, 59.6% in Group C, and 42% in Group A (P < 0.05). Neonatal morbidities were significantly more common in diabetic pregnancies—50% in Group B and 38% in Group C—compared to 20% in Group A (P < 0.05), with prematurity and birth asphyxia being the most prevalent complications.*

Conclusion: *Diabetic pregnancies, especially pre-gestational, are associated with higher rates of pregnancy loss, neonatal resuscitation, and morbidities compared to non-diabetic pregnancies.*

Keywords: *Diabetes in pregnancy, gestational diabetes, pre-gestational diabetes, neonatal morbidity, perinatal outcomes.*

1. Introduction

Diabetes mellitus (DM) is a severe metabolic disorder that complicates pregnancy and endangers maternal and neonatal health [1]. Diabetes during pregnancy has gained increased prevalence globally, with gestational diabetes mellitus (GDM) being encountered in a large number of pregnancies. Pre-existing diabetes (pre-gestational diabetes, PDM) also worsens the outcome of pregnancy, resulting in an elevated perinatal morbidity and mortality rate [2]. GDM and PDM are associated with other challenges in obstetric practice, including difficulties with glycemic control, that can lead to adverse pregnancy outcomes [3]. Therefore, the perinatal outcomes and neonatal morbidities in diabetic pregnancies compared with non-diabetic pregnancies need to be known to improve fetal and maternal well-being.

GDM is any degree of glucose intolerance that is first recognized during pregnancy and typically goes away after delivery, though women with

GDM are at risk of type 2 diabetes later in life [4]. Pre-gestational diabetes, on the other hand, is diabetes that comes before pregnancy and requires careful management to maintain the blood glucose in a target range throughout the pregnancy [5]. Both conditions increase the risk of various maternal and fetal complications including preeclampsia, preterm labor, macrosomia, congenital abnormalities, and neonatal hypoglycemia. Uncontrolled glucose in diabetic pregnancy is also associated with an increased incidence of stillbirths and intrauterine fetal deaths (IUFD) [6].

The effects of diabetes on pregnancy outcome have been extensively documented in the literature, with older studies showing increased risk of unfavorable outcome in both pre-gestational and gestational diabetes when compared with non-diabetic pregnancies [7]. Yet, as much as there has been increased research in this area, there is a lack of enough localized research targeting the particular maternal and neonatal outcomes in diabetic pregnancies in the setting of a Bangladeshi population [8]. These researches can help identify the particular problems of diabetic pregnant women in Bangladesh and direct actions for the better management of such pregnancies.

He aim of this research was to compare the perinatal outcome and neonatal morbidity in diabetic (pre-gestational and gestational) pregnancies and non-diabetic pregnancies. Still more specifically, we examine maternal characteristics, pregnancy outcomes, birth weight, need for neonatal resuscitation, and neonatal morbidities in the form of asphyxia, respiratory distress, prematurity, and umbilical sepsis [9, 10]. Furthermore, the present research also aims to determine the incidence of stillbirths, intrauterine fetal deaths, as well as the number of complications in the form of preeclampsia among non-diabetic and diabetic pregnant women [11]. It seeks to find out whether diabetic pregnancies, although under special management, have poorer outcomes than non-diabetic pregnancies [12].

In addition, this study seeks to evaluate the effectiveness of early screening, glucose control protocols, and multidisciplinary care practices in streamlining maternal and neonatal outcomes in diabetic pregnancy. By comparing pregnancy outcomes in diabetic and non-diabetic women, this study contributes valuable information to the growing body of literature on the impact of diabetes on pregnancy and neonatal health, as localized to the healthcare environment of Bangladesh.

The findings of this study will provide essential data for public health planners, policymakers, and clinicians to better address the problem of diabetes in pregnancy and strengthen diabetic pregnancy care strategies to curtail perinatal morbidity and mortality.

2. Methodology & Materials

This prospective cross-sectional observational study was conducted at the Department of Obstetrics and Gynecology, Bangabandhu Sheikh Mujib Medical University (BSMMU) and Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders (BIRDEM), Dhaka, from January 2004 to December 2005. A total of 150 pregnant women were enrolled and divided into three equal groups: 50 non-diabetic women (Group A), 50 women with pre-existing diabetes mellitus (Group B), and 50 women diagnosed with gestational diabetes mellitus (Group C). Participants were selected according to specific inclusion and exclusion criteria. Inclusion criteria included maternal age between 18 and 40 years, singleton pregnancy, first antenatal visit within 20 weeks of gestation, diagnosis of GDM based on WHO criteria, delivery at BSMMU or BIRDEM, and perinatal outcomes observed during the first five days of neonatal life. Exclusion criteria were pregnancy complicated by hypertension, heart disease, renal disease, multiple gestation, Rh isoimmunization, nephropathy, retinopathy, angiopathy, or non-compliance with follow-up.

All participants provided informed written consent, and ethical clearance was obtained from the institutional review board of BSMMU. Diagnosis of diabetes and impaired glucose tolerance was based on WHO guidelines. Data collection involved detailed interviews using structured questionnaires, recording socio-demographic, obstetric, and family histories. Clinical assessments included measurements of maternal height, weight, and blood pressure. Diabetic patients received multidisciplinary care with dietary management (2000 kcal/day) and insulin therapy as needed for glycemic control, while non-diabetic patients were managed by obstetricians. Obstetric and labor management strategies were individualized based on glycemic control, gestational age, and maternal-fetal condition. During labor, diabetic mothers received glucose and insulin infusions for glycemic regulation. Neonates were monitored immediately after birth for blood glucose and other complications, and were breastfed early. All maternal and neonatal outcomes were recorded, including birth weight, neonatal morbidity, need for resuscitation, and perinatal mortality. Statistical analysis was performed using SPSS software, and comparisons among groups were made using the Chi-square test for categorical variables and the unpaired Student's t-test for continuous variables, with a significance level set at p<0.05.

3. Results

Table I. *Maternal Age and Weight Distribution among Study Groups*

Parameter		Group A (n=50)	Group B (n=50)	Group C (n=50)
Age (Years)	Mean ± SD	28.34 ± 4.20	29.01 ± 5.03	28.92 ± 5.14
	Range	19–36	19–40	20–39
Weight (Kg)	Mean ± SD	65.38 ± 4.52	64.50 ± 6.31	66.94 ± 7.81
	Range	40–71	49–81	55–86

Table I shows the mean age of participants in Groups A, B, and C was 28.34 ± 4.20, 29.01 ± 5.03, and 28.92 ± 5.14 years, respectively. Age ranges spanned from 19 to 40 years across the groups, with no significant differences in mean age (P > 0.10). Regarding maternal weight, the mean weight was 65.38 ± 4.52 kg in Group A, 64.50 ± 6.31 kg in Group B, and 66.94 ± 7.81 kg in Group C. There were no significant differences in maternal weight across the groups (P > 0.10).

Table II. *Pregnancy outcome in different groups of patients*

Pregnancy outcome	Group-A		Group-B		Group-C	
	n=50	%	n=50	%	n=50	%
Live birth	50	100	43	86	47	94
Abortion	0	0	2	4	1	2
IUFD	0	0	1	2	0	0
Fresh stillbirth	0	0	4	8	2	4

Chi square test:

X2=8.52, df=6, P>0.10ns (Nonsignificant)

Table II presents the pregnancy outcomes among the three study groups. Group A (non-diabetic) had a 100% live birth rate with no reported pregnancy losses. In contrast, adverse outcomes were more common in the diabetic groups. Group B (pre-gestational diabetes) had a 14% pregnancy loss rate, including 4% abortions, 2% intrauterine fetal deaths (IUFD), and 8% fresh stillbirths. Group C (gestational diabetes) reported 6% pregnancy losses, comprising 4% fresh stillbirths and 2% abortions, while 94% resulted in live births. Despite being treated in tertiary care centers with good glycemic control, pregnancy outcomes were notably poorer in diabetic groups compared to the non-diabetic group.

Table III. *Birth weight of the baby*

Weight (KG)	Group A (n = 50)	Group B (n = 43)	Group C (n = 47)
Mean ± SD	2.98 ± 0.29	2.82 ± 0.57	2.97 ± 0.56
Range	2.5-3.9	1.8-4.2	1.9-4.1

Unpaired Student's t Test

A vs B = P>0.10 ns, t = 1.819, df=91

A vs C = p>0.10 ns, t = 0.106, df=95

B vs C = p>0.10 ns, t=1.318, df=88

Table III shows the mean birth weight of newborns in Groups A, B, and C was 2.98 kg, 2.82 kg, and 2.97 kg, respectively. Statistically, there is no significant difference (P > 0.10) in the mean birth weights across the different groups.

Table IV. *Need for resuscitation of the newborn*

Resuscitation required	Group A (n=50)		Group B (n=43)		Group C (n=47)	
	n	%	n	%	n	%
Yes	21	42	28	65.1	28	59.6
No	29	58	15	34.9	19	40.4

Chi-square test:

X2=5.59, df=2, p<0.05(significant)*

Table IV shows the most of the newborn of pre-gestational (65.1%) and gestational (59.60%) diabetic patients required resuscitation after birth and only 42% newborn of non-diabetic patient needed resuscitation. The difference in requiring resuscitation of the newborn between diabetic and non-diabetic patient is significant (P<0.05).

Table V. *Neonatal Morbidities in Different Patient Groups*

Morbidities	Group A (n=50)		Group B (n=50)		Group C (n=50)	
	No.	%	No.	%	No.	%
Present	**10**	**20.0**	**25**	**50.0**	**19**	**38.0**
-Birth Asphyxia	7	14.0	9	18.0	7	14.0
-Respiratory Distress	0	0.0	5	10.0	4	8.0
-Prematurity	5	10.0	21	42.0	13	26.0
-Umbilical Sepsis	1	2.0	0	0.0	0	0.0
-Others	0	0.0	0	0.0	1	2.0
Absent	**40**	**80.0**	**25**	**50.0**	**31**	**62.0**

Chi square test:

*X2=20.23, df=10, p<0.001*** (Highly significant)*

Table V shows the neonatal morbidities in different patients group. Neonatal morbidities including birth asphyxia, respiratory distress, prematurity, and umbilical sepsis were most frequent (50%) in the pre-gestational diabetic group and least common (20%) among non-diabetic patients. In the gestational diabetic group, 38% of neonates had morbidities. Birth asphyxia occurred in 14% of neonates in both Group A and C, and 18% in Group B. Prematurity was observed in 10%, 42%, and 26% of newborns in Groups A, B, and C, respectively. Respiratory distress was seen in 10% of Group B and 8% of Group C, while umbilical sepsis was only reported in Group A (2%). The differences in neonatal morbidities between the groups were statistically significant (P < 0.05).

4. Discussion

This research compared perinatal outcomes and neonatal morbidities between non-diabetic, gestational diabetic (GDM), and pre-gestational diabetic (PGDM) pregnancies. Our results show that diabetic pregnancies, especially those with pre-existing diabetes, are linked with higher neonatal complications.

We noted that the live birth rate was 100% in the non-diabetic group (Group A), 94% in the GDM group (Group C), and 86% in the PGDM group (Group B). Pregnancy losses such as abortions (4%), intrauterine fetal death (2%), and fresh stillbirths (8%) were exclusive to the PGDM group. Losses also occurred in the GDM group with 2% abortions and 4% stillbirths. The results are in line with the findings of Wahabi et al., Billionnet et al., and Yu et al., who all documented increased fetal mortality in diabetic pregnancy [13, 14, 15].

In our study 65.1% of PGDM infants, 59.6% of GDM, and 42% of the non-diabetic alone required neonatal resuscitation. The difference (P < 0.05) was significant and supports the findings of Gul et al., and Sultana et al., who emphasized that infants born to diabetic mothers typically have birth asphyxia and require immediate resuscitation [16, 17]. Wahabi et al., also reported increased neonatal resuscitation in diabetic pregnancies in their Saudi Arabian studies [18].

In neonatal morbidity, our research found significantly increased rates in the PGDM group (50%), followed by the GDM group (38%), and the non-diabetic group (20%) (P < 0.05). Complications found were birth asphyxia (18% in PGDM, 14% in GDM and non-diabetic), respiratory distress (10% in PGDM, 8% in GDM), prematurity (42% in PGDM, 26% in GDM, and 10% in non-diabetic), and sepsis umbilicalis (2% in non-diabetic alone). These are aligned with Coetzee et al., and Chen et al., who emphasized the vulnerability of infant diabetic mothers to numerous morbidities [19, 20]. Capobianco et al., also documented an increased number of neonatal complications in diabetic pregnancy even in the absence of proper antenatal care [21].

Preterm delivery occurred in 42% of the PGDM group and 26% of the GDM group, but preterm delivery was encountered by merely 10% of the non-diabetic group of babies. This finding is consistent with Lassi et al., and Gasim et al., who identified diabetes as a significant etiology of preterm labor, either spontaneous or iatrogenic delivery for maternal or fetal indications [22, 23]. Abdelgadir et al., also noted the role of diabetes in perinatal morbidity through early deliveries [24].

Birth weight was not significantly different between groups in our study (mean weights: 2.98 kg in non-diabetic, 2.82 kg in PGDM, and 2.97 kg in GDM; P > 0.10). However, macrosomia tendencies were more pronounced in diabetic gestations. This concurs with some of the findings by Kleiner et al., and Kovo et al., who associated diabetic gestations with placental disease and uncontrolled fetal growth [25, 26]. Our finding of no significant difference may be due to improved glycemic control and close monitoring in our population, as might be seen in Ray et al. [27].

Shoulder dystocia and neonatal hypoglycemia were not specifically studied in detail in our population, but have been found by other authors to occur consistently in maternal diabetes. Malinowska-Polubiec et al., and Al-Nemri et al., both reported an elevated rate of shoulder dystocia and neonatal metabolic derangement in diabetic pregnancy [28, 29].

Our high rate of neonatal morbidity, particularly among the PGDM group, is due to the cumulative effect of maternal hyperglycemia, placental impairment, and subclinical infections, if present. Kovo et al., and Soepnel et al., demonstrated that placental insufficiency and chronic inflammation with diabetes in pregnancy will amplify perinatal danger regardless of glucose control [26, 30].

Despite these hazards, early detection and multidisciplinary treatment can mitigate adverse outcomes. Formal antenatal care and pre-conception counseling are critical to ensure the optimal glycemic control of mothers and the neonatal well-being, as underscored by Coetzee et al., and Capobianco et al. [19, 21]].

5. Limitations of the Study

This study is limited by its cross-sectional design and sample size, which may underpower the detection of less frequent outcomes. Additionally, we did not stratify outcomes by HbA1c levels, insulin use, or mode of delivery, which may influence neonatal outcomes. Future prospective studies evaluating long-term neurodevelopmental outcomes of infants born to diabetic mothers are warranted.

6. Conclusion

In conclusion, this study demonstrates that both pre-gestational and gestational diabetes are associated with an increased risk of adverse perinatal outcomes and neonatal complications compared to non-diabetic pregnancies. Infants born to diabetic mothers were more likely to require resuscitation, experience prematurity, and suffer from various neonatal morbidities, including respiratory distress and birth asphyxia. These findings emphasize the need for early identification of diabetes in pregnancy, optimal glycemic control throughout gestation, and comprehensive perinatal care involving a multidisciplinary team to reduce risks and improve neonatal health outcomes.

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