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PREGNANCY OUTCOMES OF DIABETIC WOMEN; A SINGLE CENTER EXPERIENCE

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Introduction: Diabetes in pregnancy is associated with preterm delivery, birthweight extremes, and increased rates of congenital anomaly, stillbirth, and neonatal death. **Aim of the study:** This study aimed to determine the maternal and perinatal outcomes of diabetic pregnant women managed at Chittagong Medical College and Hospital, Chittagong Bangladesh. **Methods:** This retrospective case-control study was conducted at the department of Gynecology and Obstetrics Chittagong Medical College and Hospital, Chittagong Bangladesh. This study was conducted from the registry case details of women with Gestational Diabetes Mellitus (GDM) and Pre-gestational Diabetes Mellitus (PGDM) (Type-1 or Type-2) from January 2021 to December 2021. **Result:** A total of 133 patients were enrolled and analyzed in this study into three groups 1st Control group with 53 patients, 2nd Gestational Diabetes Mellitus (GDM) with 55 patients, and Pre-Gestational Diabetes Mellitus (PGDM) with 25 patients. There is an impact on SCBU admission; most of the babies in the control group were not admitted to SCBU, 36(65.45%) babies were not admitted, and 19(34.55%) babies were admitted to SCBU of the GDM group. Nevertheless, almost 50% of babies were admitted to SCBU of the PGDM group. **Conclusion:** Women with pregnancies complicated by diabetes had a higher incidence of adverse maternal and perinatal outcomes. Clinical recognition of diabetes in pregnancy is important because institution of therapy, and antepartum fetal surveillance can reduce the maternal and perinatal morbidity and mortality associated with the condition.

INTRODUCTION

Diabetes mellitus (DM) is a common medical pregnancy complication associated with adverse maternal and perinatal outcomes [1]. The prevalence of diabetes worldwide has doubled since 1980, and the rate in the general population paralleled the rate in pregnancy [1]. It complicates about 10% of all pregnancies globally [2]. Diabetes during pregnancy can be divided into two subtypes: presentational diabetes mellitus (PDM), type 1 (T1DM) or type 2 (T2DM), and gestational diabetes mellitus (GDM) [3]. GDM is defined as diabetes with the first onset during pregnancy [3]. GDM usually constitutes around 90% of all pregnancies complicated by diabetes, while pre-existing diabetes accounts for the remaining 10% [4]. Pregnancies complicated by diabetes are associated with a significant increase in maternal and perinatal risks [5]. Concerning pregnant women with diabetes, the risks of pre-eclampsia, cesarean section, and maternal mortality are significantly higher than in mothers without diabetes [5]. Fetuses of women with diabetes during pregnancy have an increased risk for malformations, especially congenital heart diseases and nervous system anomalies [6]. This is due to poor glycemic control during the period of organogenesis, which occurs in the first trimester of pregnancy. It is believed to be due to the adverse effects of the hyperglycemic environment on the developing fetus [7, 8]. To reduce adverse maternal and perinatal outcomes, glucose levels must be maintained at an optimal level. Compliance with therapy and astute glucose monitoring is required [9, 10]. Previous studies have documented pregnancy outcomes associated with type-1 and type-2 diabetes [11-19]. Pregnant women with type-1 diabetes tend to have higher glucose concentrations than those with type-2 diabetes and higher associated rates of preterm births and babies with large for gestational age (LGA) birthweight, most likely attributable to maternal glycemia and BMI [14]. Pregnant women with type 2 diabetes tend to be older, with higher rates of obesity, greater ethnic diversity, and more significant socioeconomic deprivation than those with type 1 diabetes. However, they also have lower glucose concentrations, fewer preterm births, and fewer LGA birthweight babies [12, 16, and 17]. Nonetheless, adverse pregnancy outcomes (congenital anomaly, stillbirth, neonatal death) have occurred at least equivalently in pregnant women with type 1 diabetes and those with type 2 diabetes [12,18,19]. Therefore, it is essential to examine the outcomes of care for women with pregnancy complicated with diabetes in our hospital and to assess if the care provided is sufficient or needs to be changed. This study aimed to determine the maternal and perinatal outcomes of diabetic pregnant women managed at Chittagong Medical College and Hospital, Chittagong Bangladesh.

METHODOLOGY & MATERIALS

This retrospective case-control study was conducted at the department of Gynecology and Obstetrics Chittagong Medical College and Hospital, Chittagong Bangladesh. This study was conducted from the registry case details of women with Gestational Diabetes Mellitus (GDM) and Pre-Gestational Diabetes Mellitus (PGDM) (Type-1 or Type-2) from January 2021 to December 2021. Healthy women served as the control group. During the study period, 55 of 1594 women in the labor room registry had GDM, and 25 had PGDM. Women with PGDM were not clustered in the registry as having type-1 or type-2 diabetes. GDM was ascertained following the screening protocol using the 75g, 2-hour oral glucose tolerance test (OGTT) during the first antenatal visit for women with an adverse history of diabetes mellitus, which was repeated between weeks 24 and 28 with a negative OGTT [4].

Inclusion criteria:

- Pregnant women with Gestational Diabetes Mellitus (GDM) based on (type-1 or type 2).
- Pregnant women with Pre-Gestational Diabetes Mellitus (PGDM) based on (type-1 or type 2).

- Normal pregnant women as the control group.

Exclusion criteria:

- Patients with incomplete information.
- Patients with twin pregnancies.

A transfer sheet was used to collect relevant data, including age, weight, and height taken at the delivery time, gravidity, parity, gestational age, and history of hypertension. This was in addition to outcome parameters, namely, mode of delivery; condition of perineum after labor; birth weight, and health status of the newborn, including 1-minute Apgar score; clinically apparent congenital anomalies; and hospital admission. Data were analyzed using SPSS version 15. Mean, standard deviation, and body mass index (BMI) were computed.

RESULT

It is a retrospective case-control study; a total of 133 patients were enrolled and analyzed in this study into three groups 1st Control group with 53 patients, 2nd Gestational Diabetes Mellitus (GDM) with 55 patients, and Pre-Gestational Diabetes Mellitus (PGDM) with 25 patients. Table 1 describes the characteristics of patients; most patients were from the age range of 30 to <40 years of every group. According to gravidity 37(69.81%) patients under range 1-3 of control group, 33(60.00%) patients under range 4-6 of GDM and 11(44.00%) patients with over 7 times of PGDM. Most patients were from 1-3 parity (Table 1). Table 2 shows the hemoglobin A1c and hypertension results among pregnant patients; more than 60% of patients of both the GDM and PGDM groups showed <6.4 hemoglobin percentage, and 20% of patients of both groups showed results ≥7 hemoglobin percentage. Under the GDM group, 39(70.91%) patients were normotensive, 13(23.64%) patients were pregnancy induced, and only three patients had hypertension before pregnancy. Under the PGMD group, 13(52.00%) patients were normotensive, 7(28.00%) patients were pregnancy-induced, and only five patients had hypertension before pregnancy (Table 2). The estimated risk of birth complications and outcomes among the study population adjusted for BMI and Hypertension is shown in table 3. Most of the patients had a virginal delivery and intact condition of the perineum of all three groups. From our study result, we found that 48(90.57%) patients of the control group had a full-term infant maturity, 48(87.27%) patients of the GDM group had a full-term infant maturity, and 23(92.00%) patients of the PGDM group had a full term infant maturity. Most of the patients from all three groups had normal birth weight babies. According to infant outcome, from the control group, 50(94.34%) babies had a favourable outcome, one baby had an unfavourable outcome, and one baby had shoulder dystocia. From the GDM group, 51(92.73%) babies had a favourable outcome, and two had respiratory distress. Furthermore, from the PGDM group, 96% of babies had favourable outcomes and no other issues like birth asphyxia and shoulder dystocia (Table 3). There is an impact on SCBU admission; most of the babies in the control group were not admitted to SCBU, 36(65.45%) babies were not admitted, and 19(34.55%) babies were admitted to SCBU of the GDM group. Nevertheless, almost 50% of babies were admitted to SCBU of the PGDM group (Table 3).

Table 1: Characteristics of pregnant women enrolled in the study.

Characteristic	Control (n=53)		GDM (n=55)		PGDM (n=25)	
	No.	%	No.	%	No.	%
Age in years						
19 to <30	15	28.30	14	25.45	5	20.00
30 to <40	30	56.60	32	58.18	16	64.00
40 to 50	8	15.09	9	16.36	4	16.00

Gravidity						
1-3	37	69.81	10	18.18	4	16.00
4-6	11	20.75	12	21.82	3	12.00
≥7	5	9.43	33	60.00	18	72.00
Parity						
1-3	32	60.38	21	38.18	5	20.00
4-6	17	32.08	4	7.27	2	8.00
≥7	4	7.55	30	54.55	18	72.00
Body mass index						
< 25	11	20.75	5	9.09	2	8.00
25	20	37.74	11	20.00	4	16.00
≥30	22	41.51	39	70.91	19	76.00

Table 2: Hemoglobin A1c and hypertension among women with gestational diabetes and pre-gestational diabetes.

Characteristic	GDM (n=55)		PGDM (n=25)	
	No.	%	No.	%
Hemoglobin A1c (%)				
< 6.4	34	61.82	15	60.00
6.4	10	18.18	5	20.00
≥ 7	11	20.00	5	20.00
Hypertension				
Normotensive	39	70.91	13	52.00
Pregnancy-induced	13	23.64	7	28.00
Pre-pregnancy hypertension	3	5.45	5	20.00

Table 3: Estimated risk of birth complication and outcomes among the study population adjusted for BMI and Hypertension.

Birth complication and outcome	Control (n=53)		GDM (n=55)		PGDM (n=25)	
	No.	%	No.	%	No.	%
Type of delivery						
Spontaneous virginal	43	81.13	37	67.27	15	60.00
Assisted	5	9.43	4	7.27	1	4.00
Cesarean	5	9.43	14	25.45	9	36.00
Condition of perineum						
Intact	41	77.36	42	76.36	23	92.00
Episiotomy	2	3.77	2	3.64	1	4.00
Tear	10	18.87	11	20.00	1	4.00
Infant maturity						
Full-term	48	90.57	48	87.27	23	92.00
Preterm	4	7.55	7	12.73	2	8.00
Post-term	1	1.89	0	0.00	0	0.00

Birth weight						
Nirmala	47	88.68	42	76.36	15	60.00
Low birth weight	4	7.55	4	7.27	1	4.00
High birth weight	2	3.77	9	16.36	8	32.00
Apgar score (1 minute)						
≥ 7a	48	90.57	43	78.18	19	76.00
< 7	5	9.43	12	21.82	6	24.00
Congenital anomalies						
Absent	51	96.23	50	90.91	24	96.00
Present	2	3.77	5	9.09	1	4.00
Infant outcome						
Favourable	50	94.34	51	92.73	24	96.00
Unfavourable	1	1.89	4	7.27	1	4.00
Stillbirth	1	1.89	1	1.82	1	4.00
Birth asphyxia	0	0.00	1	1.82	0	0.00
Respiratory distress	0	0.00	2	3.64	1	4.00
Shoulder dystocia	1	1.89	1	1.82	0	0.00
Admission to SCBU						
No	46	86.79	36	65.45	13	52.00
Yes	7	13.21	19	34.55	12	48.00

DISCUSSION

In this population-based study, we examined maternal and fetal outcomes and predisposing factors in all pregnancies complicated by diabetes. In this series, women with GDM outnumbered those with PGDM. With the prevalent high parity (more than six, which inevitably means pregnancy at an older age) and the high BMI values based on readings at the time of delivery, which serve as a proxy for obesity as well as the co-existence of hypertension, these women and their unborn infants are at higher risk of adverse pregnancy outcomes unless efforts are taken to control their diabetes. The ultimate goal of the specialized and comprehensive care provided to all pregnant women with diabetes is to maintain near-optimal blood glucose levels, which warrant safe delivery. The mean value of glycosylated haemoglobin of 6.4% or even less reflects program success in empowering 80% of diabetic women in achieving blood sugar control and averting unfavourable pregnancy outcomes except for macrosomia, cesarean delivery and admission to SCBU. Previous studies in the world found an excess risk of macrosomia among older, obese, high-parity, euglycemic pregnant women as well as pregnant women who did not meet the criteria of GDM yet had a form of glucose intolerance (glucose challenge positive but OGTT negative) [20, 21]. So in our cohort, the likelihood of macrosomia could be higher for both euglycemic and dysglycemic mothers. After controlling for the effects of age, parity, BMI and hypertension, an excess risk of fetal macrosomia, defined as a birth weight of more than 4 kg, has been observed among diabetic women. The rate of macrosomia was 16% among infants born to women with GDM, while it reached 33% among those born to women with PGDM. Other studies also reported higher rates of macrosomia and/or cases of “large for gestational age” among infants born to women with PGDM and GDM [21-27]. Rates of fetal macrosomia in association with diabetes show marked variation across studies because of the variation

in the characteristics of the population studied, the extent of glycemic control and the adopted definition of macrosomia. In this study, the rate of macrosomia associated with GDM was found to be much lower than the 41% reported from the Netherlands, where fetal macrosomia was defined as birth weight above the 90th percentile; and the 28% reported among Asian Indian mothers, where a large baby was defined as one weighing >3.5 kg. However, the rates in our study were slightly higher than the 14% reported from Denmark by Jensen et al, who defined macrosomia as a birth weight of more than 4.5 kg [24, 28 & 29]. Ethnicity by itself affects macrosomia [30]. Macrosomia has been reported among 25% of Turkish women with mild pregnancy-induced carbo-hydrate intolerance managed only by diet modification, which is contrary to the situation in our cohort, where insulin was needed by all pregnant women [31]. In our study, 26% of women with GDM and 37% of those with PGDM had a CD. This represented a threefold to fourfold increase when compared to controls. Among women with PGDM, the rate of CD was lower than the 45% reported in the UAE [23]. In maternal diabetes, macrosomia is the main reason for CD. Mathew et al found that macrosomia doubled the risk of CD [20]. Studies that reported higher rates of macrosomia also reported higher rates of CD [16, 19]. A review of the literature concluded that among diabetic women, CD intends to avoid complications [32]. This is very much true as diabetic women in this study who had a vaginal delivery had a lower tendency toward perineum tear. The incidence of preterm labour in association with diabetes varies from less than 10% among Asians 30% and 40% in Caucasians [24, 27, 33, and 34]. In our cohort, 87.27% of women with GDM and 92.00% of women with PGDM were able to carry their fetuses to full term. Newborns of diabetic women were significantly more likely to be admitted to SCBU for specialized care. Nearly a quarter of these infants had an Apgar score of less than 7 at 1 minute, which justified admission especially if a lower Apgar score was recorded thereafter. Furthermore, it is only among this group that birth asphyxia and respiratory distress were reported, in addition to the relatively higher rates of birth defects. This study relied on a retrospective review of records of delivery rooms and linkage to records of diabetic clinics to extract relevant information. This approach limited our knowledge of the condition of newborns in terms of Apgar score after 1 minute and status at discharge to determine the outcome. Findings indicate that many of the unfavourable pregnancy outcomes of diabetes in women and infants have not been brought under control despite the comprehensive care provided.

Limitations of the study: Every hospital-based study has some limitations and the present study undertaken is no exception to this fact. The limitations of the present study are mentioned. Therefore, the results of the present study may not be representative of the whole of the country or the world at large. The number of patients included in the present study was less in comparison to other studies. Because the trial was short, it was difficult to remark on complications and mortality.

CONCLUSION AND RECOMMENDATIONS

Obesity in pregnancies complicated by diabetes, especially type 1 diabetes, where obesity is now more prevalent, was found to be associated with increased risk of LGA neonates. That weight gain during pregnancy was lower among the pregnancies complicated by diabetes and that the frequency of LGA, or other complications, except for delivery by Cesarean Section, was not elevated in the group with gestational diabetes, indicated that this model of antenatal diabetes care delivered mainly by specialist diabetes nurses may have contributed to the improved outcomes for GDM, and for pre-gestational type 1 and type 2 diabetes, except for level of HbA1c in the last trimester, which could be lower in women withT1DM, as could the prevalence of LGA

children. The increased prevalence of LGA in T1DM despite better maternal BMI compared to T2DM, and mostly good glycemic control warrants increased clinical attention and further investigation.

CONFLICT OF INTEREST: None declared

ETHICAL APPROVAL: The study was approved by the Institutional Ethics Committee.

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