International Journal of Reproduction, Contraception, Obstetrics and Gynecology
Sultana N et al. Int J Reprod Contracept Obstet Gynecol. 2025 Jul;14(7):2095-2101
www.ijrcog.org
pISSN 2320-1770 | eISSN 2320-1789

DOI: https://dx.doi.org/10.18203/2320-1770.ijrcog20251953

Original Research Article

Maternal and neonatal outcome in gestational and pregestational diabetes

Nasrin Sultana[1]*, Sayeeda Pervin[1], Nargish Khanam[2], Mafruha Haque[2], Nazia Ahmed[2], Sanjana Rahman[2]

[1]Department of Obstetrics and Gynaecology, Dhaka Medical College, Dhaka, Bangladesh
[2]Department of Obstetrics and Gynaecology, Dhaka Medical College Hospital, Dhaka, Bangladesh

Received: 28 April 2025
Accepted: 04 June 2025

***Correspondence:**
Dr. Nasrin Sultana,
E-mail: drnasrinrumi@gmail.com

ABSTRACT

Background: Diabetes during pregnancy increases risks for both mother and baby, despite medical advances. This study evaluates and compares maternal and fetal outcomes in pre-gestational and gestational diabetes. The aim of the study was to evaluate the maternal and perinatal outcomes in patients with gestational and pre-gestational diabetes.
Methods: This prospective cross-sectional study was conducted at the department of obstetrics and gynecology, BSMMU, and BIRDEM, Dhaka, Bangladesh, from January 2004 to December 2005, involving 150 pregnant women divided into three groups: 50 non-diabetics, 50 with pre-existing diabetes (PDM), and 50 with gestational diabetes (GDM). Data were collected using a structured questionnaire and analysed with SPSS, applying Chi-square and t-tests.
Results: Maternal age and weight were similar across groups ($p>0.10$). Diabetic patients had significantly more pregnancy complications (66-68%) than non-diabetics (28%) ($p<0.05$), with higher insulin use in pre-gestational diabetes (90%) ($p<0.01$). Operative deliveries and post-partum issues were more common in diabetics, though not statistically significant. Pregnancy losses were higher in diabetic groups (14% and 6%) vs. none in non-diabetics ($p<0.05$). Neonatal resuscitation (65.1%, 59.6%) and morbidities (50%, 38%) were also more frequent in diabetics than in non-diabetics (42% and 20%) ($p<0.05$).
Conclusions: Well-controlled diabetes, whether pre-gestational or gestational, still poses increased maternal and perinatal risks compared to non-diabetic pregnancies, but with proper preconception management, favourable outcomes are achievable.

Keywords: Maternal outcome, Neonatal outcome, Gestational diabetes

INTRODUCTION

Diabetes Mellitus is a clinical syndrome characterized by a deficiency of, or insensitivity to, insulin, and chronic hyperglycemia is one of the most common complications during pregnancy.[1] Diabetes affects a large number of people across all social strata worldwide. The underlying cause of diabetes is either defective insulin production or resistance to its action.

Pregnancy is a highly stressful physiological condition for women during their reproductive years. From a physiological standpoint, it induces significant changes in the mother's structural, metabolic, and endocrine functions. These changes along with those from the placenta early on and the fetoplacental unit later—are adaptive, allowing the mother to nurture the developing fetus.

According to Chowdhury et al diabetes mellitus and pregnancy may be categorized into two types: Pregnancy

in diabetes (pre-gestational diabetes), which refers to abnormal glucose tolerance, in the form of diabetes or impaired glucose tolerance (IGT), present before pregnancy, and diabetes in pregnancy (gestational diabetes mellitus), which is defined as carbohydrate intolerance of variable severity with onset or first recognition during the present pregnancy.[1,2] This definition applies regardless of insulin use for treatment or whether the condition persists after pregnancy. Reclassification is needed postpartum. Preexisting diabetes (diagnosed before pregnancy) affects approximately 1-3 pregnancies per 1,000 births. Gestational diabetes mellitus (GDM) complicates 3-5% of pregnancies, although it can range from 12% in racially heterogeneous urban populations to 1% in rural, predominantly white areas.[3]

Any type of abnormal glucose tolerance negatively affects fetal growth, maternal health, and neonatal outcomes, contributing to varying degrees of maternal and perinatal morbidity and mortality. Hyperglycemia during conception and early pregnancy, particularly during organogenesis, is associated with a six-fold increase in midline defects in the developing embryo.[1] Adverse outcomes are more common among infants born to mothers with type 1 diabetes compared to the non-diabetic population.[4]

Modern medicine has made remarkable progress in the care of pregnant women with diabetes. With proper prenatal care, most diabetic mothers can now deliver healthy, normal babies. This requires active effort from the mother, including frequent clinic visits, regular blood sugar monitoring, adherence to insulin regimens, and strict dietary control.[5]

The outlook for diabetic pregnancies has vastly improved since the discovery of insulin. In the pre-insulin era, maternal mortality was almost 50%, and fetal survival rates were very low. Today, with effective diabetic management by a "high-risk team," mortality in diabetic pregnancies can be comparable to that in non-diabetic ones. In specialized centers with optimal care, perinatal mortality has been reduced to 6%, approximating that of the general population. Neonatal mortality among diabetic women is also comparable to general maternal mortality rates around 2 per 10,000. Most neonatal deaths are caused by ketoacidosis, hypoglycemia, or trauma-related hemorrhage. Maternal morbidity is closely tied to the duration of the disease; for example, retinopathy may worsen during pregnancy, and nephropathy can severely threaten both maternal and fetal health.

Despite optimal glucose control and intensive obstetric care, infants born to diabetic mothers still face increased short- and long-term morbidity.[6]

A successful outcome for both mother and baby has largely been achieved through the implementation of protocols targeting maternal glycemic regulation and assessment of fetal well-being and maturity.[7]

The main challenges in managing diabetes during pregnancy are improving pre-conception glucose control to reduce congenital malformations, adequately screening all pregnant women for diabetes, and understanding the full impact of even mild glucose elevation on maternal health, and on immediate and long-term outcomes for the fetus and child.[1]

Diabetes is a growing public health challenge globally, despite recent advances in diabetes care including improved treatments, complication prevention, self-care education, and even primary prevention strategies. In our country, diabetes during pregnancy is relatively common and is linked to an increased incidence of maternal and perinatal morbidity and mortality. While more women with established diabetes are becoming pregnant, there is still a lack of modern monitoring tools for maternal blood glucose and fetal well-being.

This study was undertaken to comparatively evaluate the maternal and neonatal outcomes of pregnancies complicated by pre-gestational and gestational diabetes mellitus, within the limited resources available at the department of obstetrics and gynecology, Bangabandhu Sheikh Mujib Medical University.

Objective

The aim of the study was to evaluate the maternal and neonatal outcomes in patients with gestational and pre-gestational diabetes.

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, Bangladesh, from January 2004 to December 2005. The study included 150 pregnant women divided into three groups: 50 non-diabetic pregnant women (Group A), 50 pregnant women with pre-existing diabetes mellitus (PDM) (Group B), and 50 pregnant women diagnosed with gestational diabetes mellitus (GDM) (Group C). Participants were selected based on specific inclusion and exclusion criteria to assess maternal and neonatal outcomes associated with different diabetic statuses during pregnancy.

Inclusion criteria

Pregnant women aged 18-40 years, singleton pregnancy, first antenatal visit within 20 weeks of gestational age, diagnosis of gestational diabetes mellitus (GDM) according to WHO diagnostic criteria, delivery at BSMMU or BIRDEM Hospital, perinatal complications observed in the first five days of life during hospital stay were included.

Exclusion criteria

Pregnancy with hypertension, heart disease, renal disease, multiple pregnancies, or Rh isoimmunization, presence of nephropathy, retinopathy, or angiopathy, non-compliant patients.

Prior to the commencement of this study, the thesis protocol was submitted to the ethical committee of Bangabandhu Sheikh Mujib Medical University and was approved. Informed written consent was obtained from all patients, with particular attention given to strict blood sugar control for PDM and GDM patients, who were managed at their respective institutes. Diabetes diagnosis followed the WHO expert committee criteria, with impaired glucose tolerance defined by fasting blood glucose levels of 6.0-7.9 mmol/l and post-glucose load levels of 9.0-10.9 mmol/l, while gestational diabetes was diagnosed with fasting blood glucose >8 mmol/l and post-glucose load >11 mmol/l. A total of 150 patients were included, with 50 patients selected from each of Group A, Group B, and Group C. Detailed socio-demographic, obstetrical, and family history, along with pregnancy details, were collected, and the expected delivery date was calculated via the first day of the last menstrual period and ultrasonographic confirmation. Measurements of height, weight, and blood pressure were taken. PDM and GDM patients received antepartum care from a multi-disciplinary team, while non-diabetic patients were cared for by obstetricians. Diabetic care involved diet counselling, with a recommended 2000 kcal diet, and insulin therapy when glycemic control was not achieved. Obstetric management for diabetic patients included more frequent visits, with regular assessments for complications like pre-eclampsia and infections. Labor management was based on gestational age, diabetic control, and complications, with blood sugar controlled during labor using intravenous glucose and insulin. Postpartum, patients were monitored for blood sugar, hemorrhage, and infection, while neonates received early breastfeeding and regular glucose checks for hypoglycemia. Data collection was done using a structured questionnaire from patients at BSMMU and BIRDEM, and statistical analysis was performed using SPSS software, applying Chi-square and t-tests to analyse the data.

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. 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).

Figure 1 illustrates the treatment strategies employed for managing diabetes in the study population. All patients in both Group B (pre-gestational diabetes) and Group C (gestational diabetes) received dietary regulation and exercise as the initial therapeutic approach. In addition to this, insulin therapy was required in 90% of patients in Group B, compared to 34% in Group C. The difference in insulin requirement between the groups was statistically significant (P<0.01), indicating a higher necessity for pharmacological intervention in pre-gestational diabetes.

Table 1: Maternal age and weight distribution among study groups.

Parameter		Group A (n=50)	Group B (n=50)	Group C (n=50)
Age (Year)	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

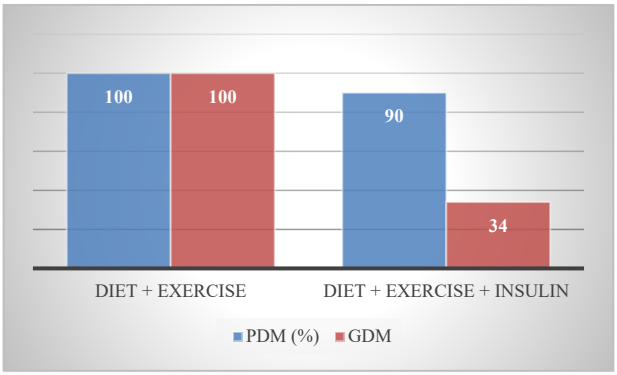

Figure 1: Treatment modalities administered to diabetic patients.

Complications were less frequent in non-diabetic pregnant women (Group A), with 28% experiencing complications, including UTI (12%), preeclampsia (6%), vulvovaginitis (6%), and preterm delivery (4%). In comparison, complications were more common among pre-gestational (Group B, 66%) and gestational (Group C, 68%) diabetic patients. UTIs were noted in 26% of Group B and 30% of Group C, and polyhydramnios occurred in 10% of both diabetic groups. Pre-eclampsia was found in 12% and 20% of Group B and C, respectively. The difference in complications across the groups was statistically significant (P<0.05).

Table 3 summarizes the intra-partum maternal complications observed across the study groups. In the non-diabetic group (Group A), only 2% experienced vaginal tears and 20% underwent operative deliveries. Among pre-gestational diabetes patients (Group B), cervical tears occurred in 4.2%, vaginal tears in 2.1%, instrumental deliveries in 4.2%, and operative deliveries in 60% of cases. In the gestational diabetes group (Group C), cervical and vaginal tears were reported in 4.1% each, instrumental deliveries in 6.1%, and operative deliveries in

54% of patients. Notably, shoulder dystocia was absent in all groups. Statistical analysis using the chi-square test revealed no significant difference (P>0.10) in the occurrence of intra-partum complications across the study groups.

Table 2: Present pregnancy complications among study groups.

Complications	Group A (n=50)		Group B (n=50)		Group C (n=50)	
	No.	%	No.	%	No.	%
Present (any)	14	28.0	33	66.0	34	68.0
Abortion	0	0.0	2	4.0	1	2.0
UTI	6	12.0	13	26.0	15	30.0
Polyhydramnios	0	0.0	5	10.0	5	10.0
Preterm delivery	2	4.0	9	18.0	7	14.0
Congenital malformation	0	0.0	2	4.0	2	4.0
PIH/pre-eclampsia	3	6.0	6	12.0	10	20.0
Vulvovaginitis	3	6.0	7	14.0	5	10.0
PROM	0	0.0	1	2.0	0	0.0
Oligohydramnios	0	0.0	1	2.0	0	0.0
Absent	36	72.0	17	34.0	16	32.0

Table 3: Intra-partum maternal complications among study groups.

Complications	Group A (n=50)		Group B (n=48)		Group C (n=49)	
	No.	%	No.	%	No.	%
Cervical tear	0	0.0	2	4.2	2	4.1
Vaginal tear	1	2.0	1	2.1	2	4.1
Instrumental delivery	0	0.0	2	4.2	3	6.1
Shoulder dystocia	0	0.0	0	0.0	0	0.0
Operative delivery	10	20.0	30	60.0	27	54.0

Table 4: Post-partum maternal complications among study groups.

Complications	Group A (n=50)		Group B (n=48)		Group C (n=49)	
	No.	%	No.	%	No.	%
Present (any)	3	6.0	9	18.8	9	18.4
Primary PPH	2	4.0	2	4.2	2	4.1
UTI	1	2.0	3	6.3	1	2.1
Endometritis	0	0.0	3	6.3	0	0.0
Mastitis	0	0.0	3	6.3	1	2.1
Wound infection	0	0.0	5	10.4	6	12.2
Others	0	0.0	1	2.1	1	2.0
Absent	47	94.0	39	81.3	40	81.6

Table 5: Pregnancy outcome in different groups of patients.

Pregnancy outcome	Group A (n=50)		Group B (n=50)		Group C (n=50)	
	No.	%	No.	%	No.	%
Live Birth	50	100.0	43	86.0	47	94.0
Abortion	0	0.0	2	4.0	1	2.0
IUFD	0	0.0	1	2.0	0	0.0
Fresh Stillbirth	0	0.0	4	8.0	2	4.0

Table 4 highlights the distribution of post-partum maternal complications in the three study groups. In Group A (non-diabetic), post-partum complications were minimal, with only 6.0% of patients affected, including 4.0% with primary PPH and 2.0% with UTI. In contrast, 18.8% of Group B (pre-gestational diabetes) and 18.4% of Group C (gestational diabetes) patients experienced complications. Group B showed relatively higher occurrences of UTI,

endometritis, and mastitis (each 6.3%), wound infection (10.4%), and primary PPH (4.2%), while Group C patients experienced wound infection (12.2%), primary PPH (4.1%), UTI (2.1%), mastitis (2.1%), and other complications (2.0%). Despite these variations, statistical analysis using the chi-square test indicated no significant difference (P>0.10) in post-partum maternal complications across the study groups.

Table 5 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 6: 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

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.

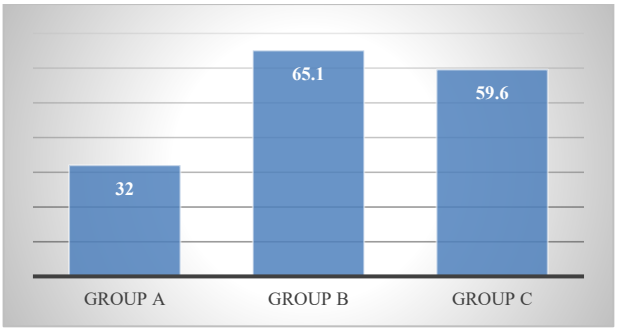

Figure 2: Frequency of resuscitation needed for newborns in different groups of patients.

Most of the newborns of pre-gestational diabetes patients (65.1%) and gestational diabetes patients (59.6%) required resuscitation after birth, compared to only 42% of newborns of non-diabetic patients. The difference in the requirement for resuscitation between diabetic and non-diabetic groups was found to be statistically significant (P<0.05).

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).

Table 7: 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

DISCUSSION

This study was conducted in the Department of Obstetrics and Gynecology, BSMMU, Dhaka, Bangladesh, from January 2004 to June 2005. A total of 150 patients were included. They were divided into three groups of fifty patients each: non-diabetic (Group A), pre-gestational diabetic (Group B), and gestational diabetic (Group C). Group A served as the control group.

The average age of patients was comparable across the three groups: 28.34 years in Group A, 29.01 years in Group B, and 28.92 years in Group C, with no statistically significant difference observed. However, Clausen et al highlighted that increasing maternal age, particularly in cases of gestational diabetes mellitus (GDM), is a recognized risk factor for adverse pregnancy outcomes.[8]

In this study, all patients were managed with a diabetic diet and exercise. Insulin was added in 90% of pre-gestational diabetic patients and in 34% of gestational diabetic patients. Thus, 10% of pre-gestational diabetic patients were treated with diet and exercise alone, while 66% of gestational diabetic patients were managed without insulin.

During the antenatal period, fewer complications were observed in non-diabetic pregnant women compared to the diabetic groups. In non-diabetic patients, the incidence of urinary tract infection (UTI) was 12%. In pre-gestational diabetes, the complications included UTI (26%), vulvovaginitis (14%), polyhydramnios (10%), preeclampsia (12%), abortion (4%), and congenital anomalies (4%).

In gestational diabetes, the recorded complications were UTI (30%), preeclampsia (20%), polyhydramnios (5%), congenital anomalies (4%), and abortion (1%).

The incidence of abortion in PDM and GDM was 2% and 1%, respectively. Todorova et al explained that pregnancies in diabetic women are characterized by increased oxidative stress, which can be harmful to the developing embryo.[9] This oxidative imbalance, associated with low selenium and high postprandial glucose levels, contributes to a higher risk of abortion.

Preeclampsia was observed in 12% of PDM, 20% of GDM, and 6% of non-diabetic patients in this study. Moore et al found a 12% incidence of preeclampsia in GDM patients compared to 8% in non-diabetic pregnancies.[10] Siddiqi et al reported a similar incidence (15.4%) among diabetic patients.[11] The risk of preeclampsia is also influenced by maternal age and the duration of pre-existing diabetes.

During delivery, only a few maternal complications were observed in non-diabetic pregnancies, including a 2% incidence of vaginal tears. However, complications were more frequent among diabetic patients. In pre-gestational diabetes, delivery-related complications included cervical tear (4.2%), vaginal tear (2.1%), and instrumental delivery (4.2%). In gestational diabetes, cervical tear (4.1%), vaginal tear (4.1%), and instrumental delivery (6.1%) were observed. These increased complications are primarily due to larger fetal size associated with diabetic pregnancies.[12]

In the postpartum period, complications were notably more frequent among diabetic patients. Among those with pre-gestational diabetes, observed complications included primary postpartum hemorrhage (PPH) (6.3%), endometritis (6.3%), mastitis (6.3%), and wound infection (10.4%). In the gestational diabetes group, urinary tract infections (UTIs) occurred in 2.1% of cases, wound infections in 12.2%, and primary PPH in 4.1%. These findings underscore that wound infections remain a prevalent issue in diabetic patients postpartum, even when glycemic control is adequately maintained in a tertiary care setting.

A favourable pregnancy outcome defined as a normal live birth was achieved in 100% of non-diabetic pregnancies, compared to 84% in pre-gestational diabetes and 94% in gestational diabetes. Although these differences were not statistically significant (P>0.1), this may be attributed to the effective glycemic control maintained through intensive management by a multidisciplinary team in a tertiary care setting. A small number of stillbirths were reported in the pre-gestational (4%) and gestational diabetes (8%) groups. These findings are comparatively better than those reported by El et al, who found stillbirth rates of 6.6 per 1000 births in GDM and 28 per 1000 births in PDM, both notably higher than in control populations.[13]

The mean birth weight in gestational diabetes (2.97 kg) was slightly higher than in non-diabetic pregnancies (2.98 kg), but the difference was not statistically significant. Premature births were more frequent in pre-gestational (48.8%) and gestational (27.7%) diabetic pregnancies compared to non-diabetic pregnancies (10%). Among neonatal complications, respiratory distress syndrome occurred in 11.6% of pre-gestational and 8.5% of gestational diabetic cases.

The incidence of congenital anomalies in this study was 4% in both the pre-gestational (PDM) and gestational diabetes (GDM) groups. This aligns with findings from Moore et al who reported that major birth defects while occurring in 1-2% of the general population are 4 to 8 times more likely in women with overt diabetes and inadequate glycemic control before conception.[10] Huddle et al found a lower 1.5% rate of major congenital malformations in GDM, while Ray et al reported a 2.7% incidence.[14,15] In contrast, Roland et al observed congenital abnormalities in 12.3% of type 2 and 4.4% of type 1 pre-gestational diabetic pregnancies.[16] Casey et al emphasized the severity of this issue, noting that congenital malformations were responsible for 31.3% of infant deaths among diabetic mothers primarily linked to poor glycemic control during the critical organogenesis phase.[17]

Admission to the neonatal intensive care unit (NICU) was required in approximately 44% of pre-gestational and 29% of gestational diabetic newborns, compared to 18% in non-diabetic pregnancies. The main reasons for NICU admission were birth asphyxia and prematurity. Jahan et al observed similar trends, with higher NICU admissions among infants born to diabetic mothers.[18]

Limitations of the study

The relatively small sample size may limit generalizability of findings. The study's limited geographic scope may introduce sample bias, potentially affecting the broader applicability of the findings.

CONCLUSION

The study concludes that pregnancy with diabetes, whether pre-gestational or gestational, is associated with clear antepartum, intrapartum, postpartum, and perinatal complications, resulting in increased maternal and perinatal morbidity compared to non-diabetic pregnancies. No significant difference in outcomes was observed between the two diabetic groups. However, if diabetes is well controlled, it is no longer a barrier to a successful pregnancy, and diabetic mothers have a fair chance of delivering healthy babies, especially when management begins in the preconception period. The findings suggest the need for further studies comparing maternal and perinatal outcomes in women who are normoglycaemic before conception with those who are not, as well as with non-diabetic pregnant populations.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Janjen C, Greenspoon JS, Palmer SM. Current Obstetric and Gynecologic Diagnosis and Treatment. USA: Mc Graw Hill. DeCherney AH, Nathan L, editors. 2003;315-25.
2. Chowdhury TA, Pathan MF. Pregnancy in Diabetes. In: Mahtab H, Latif ZA, Pathan MF, editors. Diabetes Mellitus - A hand book for professionals Dhaka: Diabetic association of. Bangladesh, BIRDEM; 2001:167-178.
3. Diabetes Prevention Program (DPP). 2004. Available at: http://www.adobe.com/prodendex/acrobat /readstep.htm. Accessed on 20 March 2006.
4. Penney GC, Mair G, Pearson DW, Scottish Diabetes in Pregnancy Group listed on page 318. Outcomes of pregnancies in women with type 1 diabetes in Scotland: a national population-based study. BJOG: an Int J Obstet Gynaecol. 2003;110(3):315-8.
5. Weiss P. Diabetes and Pregnancy. 2002. Available at: http://www.parentsplace.com. Accessed on 20 March 2006.
6. Uvena-Celebrezze J, Catalano PM. The infant of the woman with gestational diabetes mellitus. Clinical Obstetrics and gynecology. 2000;43(1):127-39.
7. Gabbe SG, Quilligan EJ. General obstetric management of the diabetic pregnancy. Clinical Obstetrics and Gynecology. 1981;24(1):91-105.
8. Clausen TD, Mathiesen E, Ekbom P, Hellmuth E, Mandrup-Poulsen T, Damm P. Poor pregnancy outcome in women with type 2 diabetes. Diabetes Care. 2005;28(2):323-8.
9. Todorova K, Ivanov S, Mazneĭkova V, Genova M. Glucooxidative stress and spontaneous abortion in pregnant women with diabetes mellitus type 1. Akusherstvo i Ginekologiia. 2005;44(4):3-10.
10. Moore TR. Diabetes Mellitus and Pregnancy. 2005. Available at: http://www.emedicine.com/linkus.htm. Accessed on 07 July 2006.
11. Siddiqi T, Rosenn B, Mimouni F, Khoury J, Miodovnik M. Hypertension during pregnancy in insulin-dependent diabetic women. Obstet Gynecol. 1991;77(4):514-9.
12. Leipold H, Worda C, Schwindt J, Kautzky-Willer A, Bancher-Todesca D, Husslein P. Severe diabetic fetopathy despite strict metabolic control. Wiener Klinische Wochenschrift. 2005;117.
13. El Mallah KO, Narchi H, Kulaylat NA, Shaban MS. Gestational and pre-gestational diabetes: comparison of maternal and fetal characteristics and outcome. Int J Gynecol Obstet. 1997;58(2):203-9.
14. Huddle KR. Audit of the outcome of pregnancy in diabetic women in Soweto, South Africa, 1992-2002. South African Med J. 2005;95(10):789-94.
15. Ray JG, Vermeulen MJ, Shapiro JL, Kenshole AB. Maternal and neonatal outcomes in pregestational and gestational diabetes mellitus, and the influence of maternal obesity and weight gain: the DEPOSIT* study. Qjm 2001;94(7):347-56.
16. Roland JM, Murphy HR, Ball V, Northcote-Wright J, Temple RC. The pregnancies of women with type 2 diabetes: poor outcomes but opportunities for improvement. Diabetic Medicine. 2005;22(12):1774-7.
17. Casey BM, Lucas MJ, McIntire DD, Leveno KJ. Pregnancy outcomes in women with gestational diabetes compared with the general obstetric population. Obstet Gynecol. 1997;90(6):869-73.
18. Jahan P, Begum F, Shamsuddin L. Comparative study of perinatal outcome of pregnancy with diabetes mellitus, gestational diabetes mellitus and non-diabetes. DS (Child) H. J. 2003;19(2):44-51.

Cite this article as: Sultana N, Pervin S, Khanam N, Haque M, Ahmed N, Rahman S. Maternal and neonatal outcome in gestational and pregestational diabetes. Int J Reprod Contracept Obstet Gynecol 2025;14:2095-101.