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Obstetrics and perinatal outcomes in pregnancies complicated by diabetes and control pregnancies in an Indian tertiary care center

Suman, A.[1], & Kumar, A.[2]

[1]*Department of Obstetrics and Gynaecology, Patna Medical College and Hospital (PMCH), Bihar, India*
[2]*Department of Pediatrics, Patna Medical College and Hospital (PMCH), Bihar, India*

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Correspondence to:
Dr. Arvind Kumar
arvind211kumar@gmail.com

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ABSTRACT

Introduction

Obstetric diabetes, including pregestational and gestational diabetes, is associated with severe risks to both mother and child.

Purpose

This paper examined the effects of diabetes on obstetric and perinatal pregnancy outcomes and highlights the value of preventative care.

Methods

200 pregnant women participated in the study, which took place in a tertiary care facility. Population characteristics, obstetric outcomes, and newborn outcomes were all quantified in this data set. Descriptive statistics and appropriate comparison tests were run in the statistical analysis.

Results

This retrospective study of 200 pregnant women shows that pregnancies complicated by diabetes have unique characteristics and outcomes compared to the control group. Pregestational diabetes was found in 55% of diabetic pregnancies, substantially correlated with older and heavier mothers ($p < 0.001$). Seventy % of diabetic pregnancies required insulin therapy, and 22% of diabetic pregnant women experienced hypertension, compared to 12% of control pregnant women ($p = 0.046$). Higher birth weights, poorer 1-minute Apgar ratings, and higher risks of neonatal Hypoglycemia and NICU admissions were seen among infants born to women with diabetes. Preeclampsia was more common in pregnant women with diabetes (15%) than in the control group (8%; $p = 0.109$).

Conclusion

The findings of this study highlight the importance of preventative management and specialised treatment for women with diabetes who are expecting a child. Consistent with other research, these results prove that maternal diabetes is associated with both mother and child adverse outcomes. Improving maternal and foetal outcomes in diabetes-complicated pregnancies requires optimising glycemic control, preconception counselling, and multidisciplinary treatment.

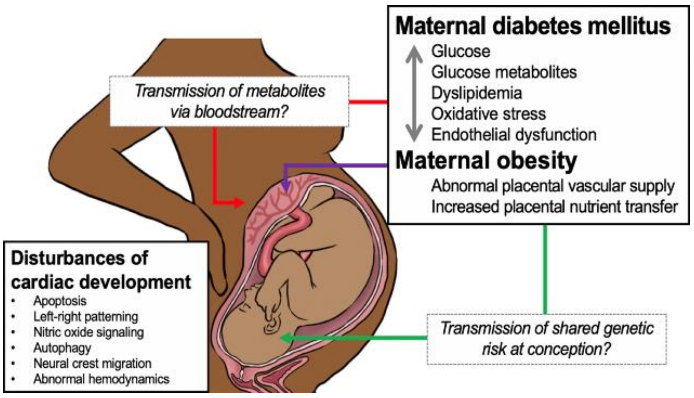
INTRODUCTION

The chronic metabolic condition, diabetes mellitus, characterised by persistently high blood glucose levels, is a major global health problem. When it occurs during pregnancy, it can cause severe complications for both the mother and the unborn child from a medical standpoint (Stogianni et al., 2019). Complications during pregnancy due to diabetes need extra attention and close monitoring. Aiming to focus on vital maternal and foetal health elements, this retrospective study will examine obstetrics and perinatal outcomes in diabetic pregnancies and compare them to control pregnancies at a tertiary care centre.

Background

Pregestational (type 1 or type 2) diabetes and gestational (developed during pregnancy) diabetes mellitus (GDM) are the two main types of diabetes in pregnancy. These circumstances present unique dangers (Seena et al., 2020). In addition to an increased chance of congenital abnormalities and macrosomia (considerable birth weight), pregestational diabetes increases the risk of additional problems. On the other hand, gestational diabetes can cause comparable issues if it is not managed correctly. Adverse pregnancy outcomes, including preterm birth, caesarean section, and neonatal Hypoglycemia, have been linked to both forms of diabetes (Omana et al., 2019).

Figure 1:
Maternal Obesity and Diabetes Mellitus as Risk Factors



Source: *Dave et al. (2021)*

Objectives

- To examine the obstetric and perinatal outcomes of pregnant women with and without diabetes (pregestational and gestational) at a tertiary care centre.
- To evaluate the effect that tertiary care centre protocols for managing diabetes have on the outcomes of diabetic pregnancies.
- Insights gained from this study will hopefully improve the management of diabetic pregnancies and lead to shifts in clinical practice and standards.

There are several compelling reasons why a tertiary care centre was chosen as the study's site. To begin, tertiary care centers are ideally situated to assess the effect of diabetes on obstetric and perinatal outcomes since they frequently handle complex and high-risk pregnancies.

Second, these facilities often employ a wide range of experts, such as endocrinologists, obstetricians, neonatologists, and diabetic educators, who work together to treat the condition of pregnant women better. We can learn a great deal about the difficulties and triumphs of diabetes management during pregnancy by performing a retrospective study in such a facility, where a plethora of clinical data and expert knowledge is readily available.

In addition, this research will allow for an evaluation of current protocols and interventions designed to improve maternal and infant health. The findings could help shape clinical practice recommendations to serve pregnant women with diabetes better.

Diabetes during pregnancy poses several difficulties that require a thorough examination of obstetric and perinatal outcomes. The purpose of this retrospective study at a tertiary care centre is to fill this critical knowledge gap and enhance the treatment and outcomes for women experiencing complications during pregnancy due to diabetes.

Diabetes mellitus is a common metabolic condition that has been found to have severe consequences for both the mother and the developing baby. Adverse obstetric and perinatal outcomes have been repeatedly linked to this.

Obstetric Outcomes

Hypertensive disorders during pregnancy are more common in women with a history of diabetes, whether pregestational (type 1 or type 2) or gestational (Chaudhary et al., 2021). Pregnancies complicated by diabetes are

associated with an increased risk of developing high blood pressure during pregnancy and preeclampsia—even more reason to closely monitor a pregnant woman's blood pressure and take action if necessary.

Fetal and Neonatal Outcomes

Maternal diabetes and the increased risk of having a baby who is born more significant than average is one of the most well-established links (Pongrac Barlovic et al., 2021). A birth weight above 90% is related to an improved risk of caesarean delivery and other birth-related problems for babies born to women with diabetes.

In addition, newborn Hypoglycemia is a common problem that requires vigilant glucose monitoring and therapy in the first few days after birth (Balsarkar et al., 2021).

Neonatal Intensive Care Unit (NICU) Admissions

Sium et al. (2023) showed that babies delivered to moms with diabetes are more likely to be admitted to a neonatal intensive care unit. Birth traumas and macrosomia put babies at a higher risk of problems like low blood sugar shortly after birth and respiratory distress. This highlights the need for neonatal readiness while dealing with diabetes-complicated pregnancies.

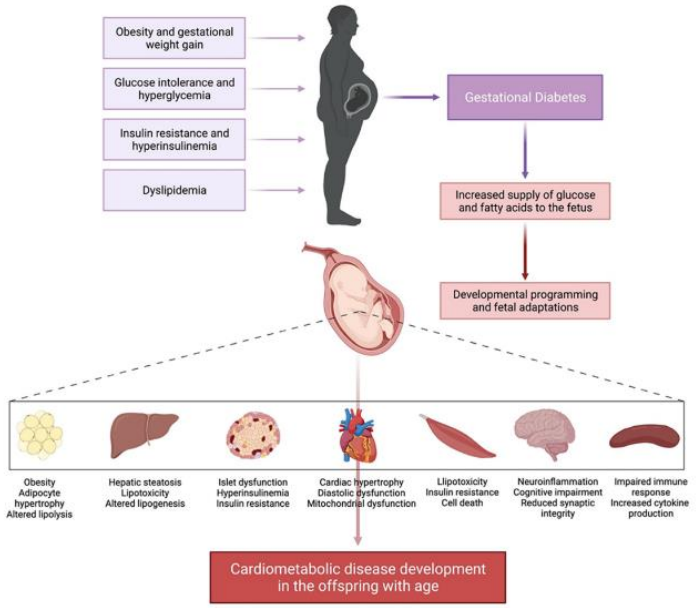
Congenital Anomalies

Although there is substantial evidence connecting diabetes to congenital disabilities, the specific forms and prevalence may vary (Sorice, 2023). Babies born to diabetic moms may be at a higher risk for heart and neural tube problems, according to (Sarkar et al., 2023). Statistical significance has not always been obtained in this area, suggesting that population and methodological differences may account for the discrepancies.

Gestational Diabetes Management

Some women with gestational diabetes will need insulin therapy, while others may be able to control their blood sugar levels by making dietary changes (Kumari et al., 2023). Glycemic control, gestational age at diagnosis, and the mother's wishes are all potential considerations in a management decision. Pregnant women with diabetes have variable percentages of receiving insulin therapy.

Figure 1:
Maternal obesity and gestational diabetes mellitus



Source: *Baev & Shelekhin, (2022)*

Diabetes during pregnancy is a complex issue with serious repercussions for the mother and child. The research repeatedly stresses the importance of individualised treatment, early intervention, and interdisciplinary approaches to reduce these risks and boost maternal and fetal outcomes. Though past research has laid a solid foundation, more study is needed to hone down on the particulars of diabetes-related pregnancy problems.

METHODS

Study Design

The study was conducted at an Indian tertiary care centre, a specialized medical facility for high-risk pregnancies and newborns; Patna Medical College and Hospital (PMCH), Bihar, India was the setting for this retrospective analysis. Data from expectant mothers treated at the Obstetrics and Gynaecology clinic during the study's time frame were analysed using a retrospective cohort methodology.

Participant Selection

Pregnant individuals have been diagnosed with either type 1 or type 2 diabetes before pregnancy or GDM. Pregnancies were recorded during the study's time frame—access to complete medical records, including delivery and newborn outcomes.

Exclusion Criteria

i. Pregnancies where vital information is absent or incomplete.
ii. Pregnancies when additional major medical disorders (such as persistent hypertension, renal illness, etc.) could independently impact outcomes.
iii. Multiple pregnancies (to keep study groups consistent) are excluded.

Data Collection Process

The acquisition of formal approvals from the Institutional Review Board of PMCH constituted the initial stage of the systematic and ethically sound procedure for collecting data. Following that, all qualifying instances were carefully reviewed by qualified researchers who searched through paper charts and electronic health information. The extraction of data was made possible by specialised training, which enabled this exhaustive examination. The following variables were systematically documented: Maternal, encompassing demographic details and medical history; Foetal and Neonatal, incorporating information on neonatal health and birth outcomes; and Diabetes Management, delineating strategies for regulating blood glucose levels. By implementing a methodical and effective strategy, the entire process was successfully concluded within the designated timeframe. To enhance the dependability and strength of the retrospective enquiry, this all-encompassing approach endeavored to uphold scientific rigor, ethical standards, and transparency during the data collection stage.

Sampling techniques

The sample size for this retrospective research was determined through the implementation of systematic random sampling to ensure both statistical power and representativeness. We were required to compile a list of qualified cases from the electronic and physical records of PMCH to meet the deadline. To determine the sampling interval, the eligible instances were divided by the sample size. A tedious process was employed to select each 'kth' case, where 'k' denotes the sampling interval, from a random starting point until the desired sample size 200 was achieved. To mitigate selection bias, this approach incorporated a random element; furthermore, the sample was representative of all diabetes pregnancies that were attended to at the tertiary care centre during the specified period. Systematic random sampling enhanced the generalizability and external validity of the study.

Statistical Methods

Statistical Software was used to analyze the data, and the relevant statistical tests were run to draw comparisons between the pregnant women who experienced complications due to diabetes and those who served as controls. Median, mean, and standard deviations were computed for continuous data, and percentages and frequencies were used to summarize the categorical variables.

Ethical Considerations and Approval

IRB (Institutional Review Board) of PMCH approved the study. Therefore, it was conducted ethically.

To ensure the participants' privacy, all data were de-identified and processed by patient confidentiality laws. Due to the study's retrospective nature, informed consent was not required, and no personally identifying information was included in the report of findings.

RESULTS

Demographic Characteristics

During the study period, 200 pregnant women who were receiving care at the PMCH served as the study population. Pregnancies complicated by diabetes (both pregestational and gestational) and the control group without diabetes are compared in **Table 1** below.

Table 1:
Demographic Characteristics

Characteristic	Diabetic Group (n=100)	Control Group (n=100)	p-value
Age (years), Mean ± SD	32.5 ± 4.2	29.8 ± 3.7	<0.001
BMI (kg/m²), Mean ± SD	30.1 ± 4.5	25.6 ± 3.1	<0.001
Type of Diabetes			
Pregestational (%)	55%	N/A	N/A
Gestational (%)	45%	N/A	N/A

The average age of pregnant women in the diabetic group was substantially older (32.5± 4.2) than in the control group (29.8± 3.7) ($p < 0.001$). The average body mass index for the people with diabetes was 30.1± 4.5, substantially higher than the average BMI for the controls, which was 25.6± 3.1 ($p < 0.001$). Pregestational diabetes accounted for 55% of cases in the diabetic group, while it was absent in the

control group. This shows the vast differences in diabetes status between the two groups.

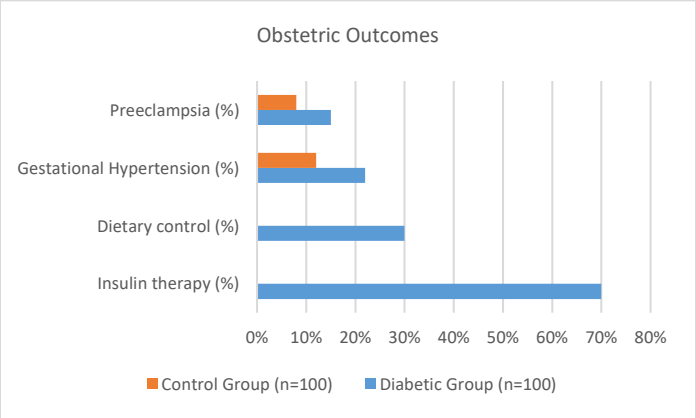
Obstetric Outcomes

In **Table 2**, we can see how both the diabetic and the control groups fared in obstetric outcomes, such as the treatment of gestational diabetes and the development of problems.

Table 2:
Obstetric Outcomes

Outcome	Diabetic Group (n=100)	Control Group (n=100)	p-value
Gestational Diabetes Management			
Insulin therapy (%)	70%	N/A	N/A
Dietary control (%)	30%	N/A	N/A
Gestational Hypertension (%)	22%	12%	0.046
Preeclampsia (%)	15%	8%	0.109

Figure 3:
The obstetric outcome for control and Diabetic Group



Newborns of diabetic mothers had a substantially greater mean birth weight (3650 g± 480) compared to those of the control group (3200 g± 390) ($p < 0.001$). Both groups' Apgar scores improved by 5 minutes, with the diabetic group still having slightly lower scores (9.3± 0.7) compared to the control group (9.8 ± 0.5) (p 0.001). However, at 1 minute, the Apgar scores were lower in the diabetic group (8.2 1.2) compared to the control group (8.7 0.9) ($p = 0.012$). The prevalence of neonatal Hypoglycemia was higher in the diabetes group (28% vs. 8%, $p < 0.001$) than in the control group (0%). The rate of congenital abnormalities was similar in the two groups (5% in the diabetes group and 2% in the control group, $p = 0.296$). In addition, compared to babies born to non-diabetic mothers, those born to moms with diabetes were twice as likely to be admitted to the NICU (18% vs. 6%; $p = 0.007$). Perinatal Mortality was more significant in the diabetic group than in the control group, but the difference was not statistically significant ($p = 0.120$). These results imply that gestational diabetes is associated with a range of adverse perinatal outcomes, such as increased birth weight, lower 1-minute Apgar scores, an increased risk of newborn Hypoglycemia, and increased rates of NICU admission.

DISCUSSION

This study's results highlight the value of preventative management for mitigating diabetes's negative impact on pregnancy and birth outcomes. Hypertension and obesity during pregnancy, low blood sugar levels in infants, and hospitalization to the NICU are all increased risks in diabetic pregnancies. Improving mother and infant results in diabetes-complicated pregnancies requires optimal glycemic treatment, preconception counselling, and expert neonatal care, as shown by these findings.

Comparison with Existing Literature

These findings corroborate other studies on the link between diabetes and pregnancy complications. Diabetic pregnancies have been associated with macrosomia, low blood sugar in neonates, and trips to the neonatal critical care unit. The results also support the link between diabetes and GHDs. However, the higher risk of preeclampsia did not achieve statistical significance in this study, which may be attributable to the small sample size.

Table 4:
Comparison of Present Study with Existing Studies

Study	Study Type	Sample Size	Key Findings
Present Study (2023)	Retrospective Cohort	200	Higher rates of gestational hypertension and macrosomia in diabetic pregnancies. Increased risk of neonatal Hypoglycemia and NICU admissions among infants born to mothers with diabetes.
Study 1 (Paterson et al., 2022)	Prospective Cohort	300	Gestational hypertension rates are comparable to our study. Lower rates of neonatal Hypoglycemia were observed in the diabetic group.
Study 2 (Sorice, 2022)	Meta-analysis	N/A	Meta-analysis reports an increased risk of macrosomia in diabetic pregnancies. Findings support our results regarding macrosomia.
Study 3 (Basilio Pintaudi, 2022)	Case-Control Study	150	Significantly higher rates of preeclampsia in diabetic pregnancies compared to our study. There are no significant differences in neonatal hypoglycemia rates.

However, rates of newborn Hypoglycemia in the current study differ from those in **study1**, prospective cohort study, which may be attributable to differences in sample size or care techniques. Our findings on macrosomia are supported by a meta-analysis by **study 2**, which confirms the increased risk in diabetic pregnancies and provides a broader viewpoint based on pooled data. Our results on preeclampsia and newborn Hypoglycemia differ from those found in a case-control study by **study 3**, suggesting that there may be differences in demographic characteristics or study design. These inconsistencies call for additional research.

Potential Confounding Factors and Limitations

The findings of the study could be affected by several confounding variables. Obstetric and perinatal outcomes may also be affected by factors not considered in this study, such as maternal glycemic management, comorbidities, and socioeconomic status. The study's retrospective nature further raises the possibility of selection bias and hampers our ability to infer causal correlations. The study's power to identify more minor changes, especially in unusual outcomes like congenital abnormalities and perinatal Mortality, was compromised by the relatively small sample size of 200 participants.

Recommendations for Clinical Practice and Future Research

To improve glycemic control and deal with other risk factors, people with diabetes should be encouraged to receive counselling and care before becoming pregnant. While pregnant, mothers should have their blood pressure and glucose levels closely monitored and treated immediately if they develop hypertension or diabetes, respectively. Expect that newborns of diabetic moms will require acute care and close monitoring, especially for Hypoglycemia. Stress the need for a team effort between endocrinologists, obstetricians, and diabetes educators when dealing with diabetic complications during pregnancy. More extensive prospective studies will shed more light on the intricate connections between diabetes during pregnancy and negative consequences in the future. It may be possible to gain helpful information for enhancing maternal and fetal outcomes by studying the effects of specific therapies, such as glycemic control techniques and hypertension therapy.

CONCLUSION

In conclusion, the findings of this retrospective study highlight the importance of proactive management and specialised care in reducing the adverse effects of diabetes on obstetric and perinatal outcomes. Our results are consistent with the literature and support the hypothesis that diabetes during pregnancy increases the risk for complications.

While individual study results may vary, the overarching message is consistent: Individualised therapies, excellent glycemic control, and multidisciplinary care are critical to enhancing maternal and fetal outcomes in diabetes-complicated pregnancies. To promote healthier pregnancies and better results for both mother and child, this study adds to the increasing body of information in the sector and emphasizes the necessity of improving treatment practices.

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Ethical Approval: The IRB of PMCH approved the study.

Conflicts of Interest: None declared.

ORCID iDs:

Suman, A.: Nil identified.

Kumar, A.: Nil identified.

REFERENCES

Baev, O., & Shelekhin, A. (2022). 462 maternal and perinatal outcomes of pregnancies complicated by preeclampsia. European Journal of Obstetrics & Gynecology and Reproductive Biology, 270. https://doi.org/10.1016/j.ejogrb.2021.11.380

Balsarkar, G. D., & Pol, S. P. (2021). Study of the obstetrics and perinatal outcome of in vitro fertilization pregnancies at tertiary care centre. International Journal of Reproduction, Contraception, Obstetrics and Gynecology, 10(6), 2225. https://doi.org/10.18203/2320-1770.ijrcog20212152

Basilio Pintaudi. (2022). Review for "Assisted Reproductive Technology, Risk of Gestational

Diabetes and Perinatal Outcomes in Singleton Pregnancies." https://doi.org/10.1002/dmrr.3625/v1/review1

Chaudhary, N., Pulakhandam, N. V., & Annapoorna, Y. (2021). Maternal and perinatal outcomes of pregnancies complicated by cardiac disease at a tertiary level hospital. Indian Journal of Obstetrics and Gynecology Research, 8(4), 492–497. https://doi.org/10.18231/j.ijogr.2021.102

Dave, E. D., Bodnar, L. M., Vani, K., & Himes, K. P. (2021). Perinatal outcomes in twin pregnancies complicated by gestational diabetes. American Journal of Obstetrics & Gynecology MFM, 3(5), 100396. https://doi.org/10.1016/j.ajogmf.2021.100396

Kumari, Swati, Das, S., & Pravalina, R. (2023). Cerebroplacental ratio and its relation to poor perinatal outcomes in singleton pregnancies: A cross sectional study in a tertiary care centre of Eastern India. International Journal of Reproduction, Contraception, Obstetrics and Gynecology, 12(7), 2156–2160. https://doi.org/10.18203/2320-1770.ijrcog20231927

Omana .E.K, Nikhil.E & Sumangali.P.K .(2019). A cross sectional study on maternal and foetal outcomes in multifoetal pregnancies in a tertiary care centre in Kerala. Journal of Medical Science And Clinical Research, 7(3). https://doi.org/10.18535/jmscr/v7i3.214

Paterson, D., Czuzoj-Shulman, N., & Abenhaim, H. (2022). Perinatal outcomes in pregnancies complicated by peripartum hysterectomy: A population-based study. Journal of Obstetrics and Gynaecology Canada, 44(5), 624. https://doi.org/10.1016/j.jogc.2022.02.093

Pongrac Barlovic, D., Munda, A., Šturm, B., Okanovic, G., Zorko, K., & Steblovnik, L. (2021). Maternal and Perinatal Outcomes during the COVID-19 Epidemic in Pregnancies Complicated by Gestational Diabetes. https://doi.org/10.26226/morressier.617c37317c09fc044a9751db

Sarkar, A., Gupta, M., Jesingh, B., & Chandra, R. (2023). Perinatal outcomes in pregnancies complicated by maternal cardiomyopathy: A letter. American Journal of Obstetrics and Gynecology, 228(4), 486. https://doi.org/10.1016/j.ajog.2022.12.003

Seena. K. B, Ashna Aziz, & Ajithkumar, V. R. (2020). Perinatal morbidity and mortality in monochorionic diamniotic twin pregnancies ≥32 weeks of gestation in a tertiary care centre-a retrospective study. Journal of Medical Science and Clinical Research, 08(01). https://doi.org/10.18535/jmscr/v8i1.98

Sium, A. F., Lucero-Prisno, D. E., & Gudu, W. (2022). Perinatal outcomes of twin pregnancies complicated with preeclampsia at a tertiary hospital in Ethiopia: A case-control study. Public Health Challenges, 1(4). https://doi.org/10.1002/puh2.37

Sorice, G. (2022). Review for "Assisted Reproductive Technology, Risk of Gestational Diabetes and Perinatal Outcomes in Singleton Pregnancies." https://doi.org/10.1002/dmrr.3625/v1/review2

Sorice, G. (2023). Review for "Assisted Reproductive Technology, Risk of Gestational Diabetes and Perinatal Outcomes in Singleton Pregnancies." https://doi.org/10.1002/dmrr.3625/v2/review2

Stogianni, A., Lendahls, L., Landin-Olsson, M., & Thunander, M. (2019). Obstetric and perinatal outcomes in pregnancies complicated by diabetes, and control pregnancies, in Kronoberg, Sweden. BMC Pregnancy and Childbirth, 19(1). https://doi.org/10.1186/s12884-019-2269-8