

Maternal Outcomes in Gestational Diabetes Mellitus Versus Overt Diabetes in Pregnancy: A Prospective Observational Study from South Gujarat

Dr. Charu Bararia [1], Dr. Saral Bhatia [2], Dr. Bhoomika Chaudhary [3], Dr. Pinal Piplav [4], Dr. Gatha Gadhvi [5]
[1] Department of Obstetrics and Gynaecology, Government Medical College, Surat, Gujarat, India
[2-3] Associate Professor, Department of Obstetrics and Gynaecology, Government Medical College, Surat, Gujarat, India
[4-5] Junior Resident, Department of Obstetrics and Gynaecology, Government Medical College, Surat, Gujarat, India

* Corresponding Author: **Caroline Tchoutouo Chungong**

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Abstract
Background: This study compared maternal characteristics, metabolic parameters, treatment and maternal outcomes between gestational diabetes mellitus (GDM) and overt diabetes in pregnancy.
Methods: This prospective observational study included 60 pregnant women followed through delivery and discharge; 22 had GDM and 38 had overt diabetes. Demographic and obstetric characteristics, BMI, gestational weight gain, DIPSI glucose, HbA1c, treatment, labour, delivery, maternal complications and postpartum treatment were analysed.
Results: BMI was higher in GDM (31.26±3.59 versus 28.45±3.93 kg/m²; p=0.008), whereas pregnancy weight gain was higher in overt diabetes (15.3±3.3 versus 13.0±2.9 kg; p<0.01). DIPSI glucose and HbA1c were higher in overt diabetes (206.68±35.90 versus 128.95±12.59 mg/dL and 7.72±1.00% versus 5.99±0.20%; both p<0.001). Sedentary lifestyle was more frequent in GDM (77.3% versus 42.1%; p=0.008), while family history of diabetes was more frequent in overt diabetes (31.6% versus 4.5%; p=0.014). Gestational age at delivery and induction of labour did not differ significantly. Overall caesarean delivery was 46.7%. Hypertensive disorders were the commonest complication (55.0%). Postpartum medical nutrition therapy alone was sufficient in 45.5% of GDM versus 5.3% of overt diabetes; insulin alone was required in 21.1% of overt diabetes and none of the GDM group.
Conclusion: Both groups had substantial maternal morbidity. Overt diabetes showed greater biochemical hyperglycaemia and greater postpartum pharmacological treatment requirements, whereas GDM had higher BMI and more sedentary lifestyle. Hypertensive disorders predominated in both groups.

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Keywords: diabetes in pregnancy, gestational diabetes mellitus, hypertensive disorders, maternal outcomes, overt diabetes, postpartum treatment

1. Introduction

Diabetes in pregnancy is an important obstetric and public-health problem and is associated with maternal metabolic and obstetric complications. Gestational diabetes mellitus (GDM) is glucose intolerance first recognised during pregnancy, whereas overt diabetes in pregnancy is characterised by hyperglycaemia meeting diagnostic criteria for diabetes and may represent previously undiagnosed or pre-existing diabetes. The distinction is clinically relevant because the duration and severity of maternal hyperglycaemia may differ between the two conditions. [1, 2]

Maternal hyperglycaemia is associated with hypertensive disorders, infection, preterm delivery, labour abnormalities and operative delivery. Women with overt diabetes may additionally have chronic vascular or metabolic disease, potentially

increasing maternal morbidity. [2-4]

Comparative studies have reported differences in metabolic severity and treatment requirements between GDM and overt diabetes, although findings vary according to diagnostic criteria, population characteristics, referral patterns and glycaemic control.[5-7] In a large multi-ethnic cohort, overt diabetes diagnosed during pregnancy was associated with higher rates of premature birth, preeclampsia and emergency caesarean delivery than GDM.[5] In another referral-centre cohort, insulin use was more frequent among women with overt diabetes than among those with GDM.[6] These findings support the clinical importance of distinguishing overt diabetes from GDM.

Indian tertiary-care data comparing maternal outcomes between these two groups remain limited. The present study was undertaken to compare maternal characteristics and maternal outcomes in women with GDM and overt diabetes managed at a tertiary-care hospital in South Gujarat. The analysis was restricted to maternal outcomes and maternal-management variables from the original dissertation.

Aim and Objectives

To describe the baseline maternal demographic and obstetric characteristics of women with GDM and overt diabetes.

To compare diabetes-related biochemical parameters and antenatal treatment between the two groups.

To compare labour, timing of delivery and maternal complications between women with GDM and overt diabetes.

To compare postpartum diabetes treatment requirements between the two groups.

Materials and Methods

Study Design and Setting

This prospective observational study was conducted in the Department of Obstetrics and Gynaecology, Government Medical College, Surat, Gujarat, India. Participants were followed from enrolment/admission through delivery and discharge. The study period extended from 18 November 2024 to 10 March 2026.

Participants

Pregnant women diagnosed with GDM or overt diabetes and admitted to the obstetrics and gynaecology department were eligible. Women with multiple pregnancy, incomplete medical records or unwillingness to participate were excluded. The final sample consisted of 60 women: 22 with GDM and 38 with overt diabetes.

Maternal Variables and Outcomes

The analysis included maternal age, residence, lifestyle, gravidity, previous abortions, live births and stillbirth history, past history of diabetes, associated medical disorders, family history of diabetes, BMI, gestational weight gain, DIPSI glucose, HbA1c, antenatal treatment, gestational age at delivery, onset of labour, mode of delivery, hypertensive disorders, infection/sepsis, preterm labour, prolonged labour, postpartum haemorrhage (PPH), vasculopathy, antepartum haemorrhage (APH), maternal mortality and postpartum treatment.

Statistical Analysis

Continuous variables are presented as mean±standard deviation and categorical variables as frequency and percentage. The thesis reports independent-samples t-tests for selected continuous variables and chi-square tests for categorical associations. Statistical significance was considered at $p<0.05$. Where the thesis did not provide an inferential p-value for a particular comparison, the result is presented descriptively and no additional significance testing has been introduced.

Ethical Considerations

The study was approved by the Research Review Committee, Government Medical College, Surat, on 10 March 2025. Written informed consent was obtained from all participants.

Results

Study Population

Among 60 women, 22 (36.7%) had GDM and 38 (63.3%) had overt diabetes. The maternal analysis included all enrolled participants.

Baseline Maternal Characteristics

Table 1

Characteristic	GDM (n=22)	Overt diabetes (n=38)	p value
Mean age, years	28.36	28.32	—
20–25 years	8 (36.4%)	10 (26.3%)	0.192
26–30 years	5 (22.7%)	19 (50.0%)	
31–35 years	7 (31.8%)	6 (15.8%)	
36–40 years	2 (9.1%)	3 (7.9%)	
Urban residence	18 (81.8%)	23 (60.5%)	0.155
Rural residence	4 (18.2%)	15 (39.5%)	
Active lifestyle	5 (22.7%)	22 (57.9%)	0.008
Sedentary lifestyle	17 (77.3%)	16 (42.1%)	

The mean maternal age was almost identical between groups. There was no statistically significant association between age group and diabetes category ($\chi^2=4.736$, $p=0.192$) or residence and diabetes category ($\chi^2=2.018$, $p=0.155$). A sedentary lifestyle was significantly more common among women with GDM (77.3%) than overt diabetes (42.1%; $\chi^2=6.962$, $p=0.008$).

Obstetric History

Table 2

Variable	GDM (n=22)	Overt diabetes (n=38)	p value
Primigravida	1 (16.7%)	5 (13.2%)	Not reported
Multigravida	21 (95.5%)	33 (86.8%)	Not reported
Mean abortions	0.91±1.11	0.53±0.76	0.119
Mean live births	1.50±1.01	1.29±0.73	0.356
Mean stillbirth history	0.41±0.50	0.18±0.39	0.059

The study population was predominantly multigravida (54/60; 90%). Previous obstetric outcomes were comparable between groups. Mean numbers of abortions, live births and stillbirth history did not differ significantly between GDM and overt diabetes. The thesis does not report a p-value for the primigravida versus multigravida comparison.

Past Diabetes and Associated Medical Disorders

Table 3

Characteristic	GDM (n=22)	Overt diabetes (n=38)	Total / p value
Past history of diabetes	Not subgrouped	Not subgrouped	14/60 (23.3%) overall
No past history of diabetes	Not subgrouped	Not subgrouped	46/60 (76.7%) overall
Hypertensive disorders	8 (36.4%)	13 (34.2%)	21 (35.0%)
Vasculopathy	3 (13.6%)	5 (13.2%)	7 (11.7%)
Respiratory disorders	0 (0%)	3 (7.9%)	3 (5.0%)
Thyroid disorders	1 (4.5%)	2 (5.3%)	3 (5.0%)

A past history of diabetes was present in 14 women (23.3%); the thesis does not provide a GDM-versus-overt-diabetes subgroup breakdown for this variable, so no between-group inference is made. Hypertensive disorders were the most frequent associated medical condition, followed by vasculopathy. Respiratory and thyroid disorders were uncommon.

Family History, BMI and Gestational Weight Gain

Table 4

Variable	GDM (n=22)	Overt diabetes (n=38)	p value
Positive family history of diabetes	1 (4.5%)	12 (31.6%)	0.014
BMI at enrolment, kg/m²	31.26±3.59	28.45±3.93	0.008
Pregnancy weight gain, kg	13.0±2.9	15.3±3.3	<0.01

A positive family history of diabetes was significantly more frequent in overt diabetes (12/38, 31.6%) than GDM (1/22, 4.5%; χ^2=6.000, p=0.014). BMI at enrolment was significantly higher in GDM, whereas mean pregnancy weight gain was significantly higher in overt diabetes.

Diabetes-Related Biochemical Characteristics

Table 5

Parameter	GDM (n=22)	Overt diabetes (n=38)	t value	p value
DIPSI glucose, mg/dL	128.95±12.59	206.68±35.90	-9.782	<0.001
HbA1c, %	5.99±0.20	7.72±1.00	-8.017	<0.001

Both DIPSI glucose and HbA1c were significantly higher in overt diabetes, demonstrating substantially greater biochemical hyperglycaemia in that group.

Antenatal Treatment

Table 6

Treatment	GDM (n=22)	Overt diabetes (n=38)	Total (n=60)
Medical nutrition therapy only	8 (36.4%)	4 (10.5%)	12 (20.0%)
Oral hypoglycaemic agent only	12 (54.5%)	23 (60.5%)	35 (58.3%)
OHA + insulin	2 (9.1%)	11 (28.9%)	13 (21.7%)

Medical nutrition therapy alone was more frequently sufficient in GDM, whereas combined oral hypoglycaemic agent plus insulin therapy was more frequent in overt diabetes. The thesis presents these differences descriptively without an inferential p-value.

Labour and Timing of Delivery

Table 7

Variable	GDM (n=22)	Overt diabetes (n=38)	p value
Gestational age at delivery, weeks	35.32±3.77	36.95±3.39	0.090
Spontaneous labour	15 (68.2%)	26 (68.4%)	0.985
Induction of labour	7 (31.8%)	12 (31.6%)	

Mean gestational age at delivery was 35.32±3.77 weeks in GDM and 36.95±3.39 weeks in overt diabetes, with no statistically significant difference (t=-1.723, p=0.090).

Labour onset was similar between groups; induction was required in 31.8% of GDM and 31.6% of overt diabetes pregnancies (χ^2=0, p=0.985).

Mode of Delivery

Table 8

Mode of delivery	n (%)
Preterm vaginal delivery	7 (11.7%)
Full-term vaginal delivery	25 (41.7%)
Preterm caesarean delivery	10 (16.7%)
Full-term caesarean delivery	18 (30.0%)
Total caesarean delivery	28 (46.7%)

Full-term vaginal delivery was the most frequent delivery mode. Overall, 28 women (46.7%) underwent caesarean delivery. The dissertation records indications including hypertensive disorders with an unfavourable cervix, malpresentation, previous caesarean delivery, non-progression of labour after induction and other obstetric indications. A complete GDM-versus-overt-diabetes cross-tabulation for mode of delivery was not reported in the thesis; therefore, the mode-of-delivery results are presented for the cohort as a whole.

Maternal Complications

Table 9

Complication	GDM (n=22)	Overt diabetes (n=38)	Total (n=60)
Hypertensive disorders	12 (54.5%)	21 (55.3%)	33 (55.0%)
Sepsis/infection	6 (27.3%)	13 (34.2%)	19 (31.7%)
Preterm labour	6 (27.3%)	9 (23.7%)	15 (25.0%)
Prolonged labour	5 (22.7%)	5 (13.2%)	10 (16.7%)
Postpartum haemorrhage	3 (13.6%)	6 (15.8%)	9 (15.0%)
Vasculopathy	2 (9.1%)	5 (13.2%)	7 (11.7%)
Antepartum haemorrhage	0 (0%)	1 (2.6%)	1 (1.7%)
Maternal mortality	0 (0%)	0 (0%)	0 (0%)

Hypertensive disorders were the most common maternal complication in the cohort, occurring in 54.5% of GDM and 55.3% of overt diabetes pregnancies. Infection/sepsis and vasculopathy were numerically more frequent in overt diabetes, whereas preterm and prolonged labour were numerically more frequent in GDM. PPH was similar between groups. The thesis does not provide inferential p-values for these individual complication comparisons; therefore, they should be interpreted descriptively.

Postpartum Maternal Treatment

Table 10

Treatment	GDM (n=22)	Overt diabetes (n=38)	Total (n=60)
Medical nutrition therapy only	10 (45.5%)	2 (5.3%)	12 (20.0%)
Oral hypoglycaemic agent only	8 (36.4%)	20 (52.6%)	28 (46.7%)
OHA + insulin	4 (18.2%)	8 (21.1%)	12 (20.0%)
Insulin only	0 (0%)	8 (21.1%)	8 (13.3%)

Postpartum treatment requirements differed markedly. MNT alone was sufficient in 45.5% of women with GDM compared with 5.3% with overt diabetes. Insulin alone was required in 21.1% of overt diabetes pregnancies and in none of the GDM group. These findings indicate a greater continuing pharmacological treatment requirement among women with overt diabetes.

Discussion

This prospective observational study compared maternal characteristics and outcomes in 60 women with diabetes in pregnancy, including 22 with GDM and 38 with overt

diabetes. The major findings were that overt diabetes was associated with significantly greater biochemical hyperglycaemia and greater postpartum pharmacological treatment requirements, while women with GDM had higher BMI and a higher proportion of sedentary lifestyle. Hypertensive disorders were the predominant maternal complication in both groups.

The mean maternal age was similar in GDM and overt diabetes, and the age-group distribution did not differ significantly. The study population was predominantly multigravida, and previous obstetric outcomes were broadly comparable between groups. The absence of a clear age difference in this cohort should be interpreted in the context of the small sample size and tertiary-care setting.

BMI showed a statistically significant difference, with higher mean BMI in the GDM group. In contrast, pregnancy weight gain was significantly higher among women with overt diabetes. These findings indicate that anthropometric characteristics did not move uniformly in one direction between the two groups. The higher BMI among GDM participants may reflect the contribution of obesity and insulin resistance to GDM, whereas the higher gestational weight gain in overt diabetes may have been influenced by differences in baseline characteristics and treatment. Because this was an observational study, these mechanisms cannot be established from the present data.

Lifestyle also differed between the groups. A sedentary lifestyle was present in 77.3% of GDM compared with 42.1% of overt diabetes, and the association was statistically significant. Physical inactivity and excess adiposity are established risk factors for abnormal glucose metabolism; however, the present study cannot determine whether lifestyle differences caused the observed diabetes classification.

The clearest distinction between the groups was biochemical. Mean DIPSI glucose was 206.68 mg/dL in overt diabetes compared with 128.95 mg/dL in GDM, while mean HbA1c was 7.72% versus 5.99%, respectively; both differences were highly significant. These findings are consistent with the clinical distinction between GDM and overt diabetes based on the severity of maternal hyperglycaemia. Previous observational cohorts have likewise reported more intensive glucose-lowering treatment among women with overt diabetes than among women with GDM. [5, 6]

Treatment patterns in the present cohort were consistent with the biochemical differences. MNT alone was sufficient for 36.4% of women with GDM but only 10.5% of women with overt diabetes. Conversely, combined OHA and insulin therapy was more frequent in overt diabetes. Postpartum treatment demonstrated an even clearer separation: 45.5% of GDM women required MNT alone compared with only 5.3% of overt diabetes women, while insulin alone was required in 21.1% of overt diabetes and none of the GDM group. These findings suggest greater ongoing pharmacological treatment requirements among women classified with overt diabetes in this cohort.

Maternal morbidity was substantial in both groups. Hypertensive disorders affected 55.0% overall and were similarly distributed between GDM and overt diabetes. Infection/sepsis and vasculopathy were numerically more frequent in overt diabetes. In a larger multi-ethnic cohort, overt diabetes was associated with higher rates of preeclampsia and premature birth than GDM, although the populations and study designs differ from the present study. [5] The present data therefore add local tertiary-care observations but should not be interpreted as establishing a universal difference in complication risk.

The mean gestational age at delivery did not differ significantly between groups. Similarly, induction of labour occurred in approximately one-third of each group, with no significant association between labour onset and diabetes category. Overall caesarean delivery was 46.7%. Because a complete GDM-versus-overt-diabetes comparison of caesarean and vaginal delivery was not reported in the thesis, the mode-of-delivery analysis has appropriately been presented for the overall cohort rather than assigning a group difference that cannot be supported by the source data.

The study has several strengths. It was prospective, was conducted in a tertiary-care obstetric setting, and assessed a broad range of maternal characteristics, metabolic parameters, treatment variables and obstetric outcomes. The same institutional care pathway allowed comparison of GDM and overt diabetes within a common clinical environment.

The main limitations are the relatively small sample size, single-centre design and possible referral bias associated with a tertiary-care hospital. Several maternal complications were available only as descriptive frequencies without group-specific statistical testing. Past history of diabetes was reported overall without a complete subgroup comparison, and the mode-of-delivery table did not provide a full GDM-versus-overt-diabetes cross-tabulation. The study also does not provide effect estimates with confidence intervals, which limits precision of between-group comparisons. These limitations should be explicitly acknowledged rather than addressed by post-hoc statistical reconstruction.

The findings support the importance of distinguishing overt diabetes from GDM in pregnancy because the groups differed substantially in glycaemic severity and postpartum treatment requirements. At the same time, both groups experienced considerable maternal morbidity, particularly hypertensive disorders, emphasizing the need for close antenatal surveillance and appropriate postpartum follow-up.

Conclusion

In this cohort of 60 women with diabetes in pregnancy, both GDM and overt diabetes were associated with considerable maternal morbidity. Overt diabetes was characterised by significantly higher DIPSI glucose and HbA1c levels and greater postpartum pharmacological treatment requirements, whereas GDM was associated with higher BMI and a greater proportion of sedentary women. Hypertensive disorders were the most frequent maternal complication in both groups. Timing and onset of labour were comparable between groups, while the overall caesarean delivery rate was 46.7%. Larger multicentre prospective studies with adequate power and complete group-specific outcome data are needed to further define differences in maternal morbidity between GDM and overt diabetes.

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Declarations

Funding: None.

Conflict of interest: None declared.

Ethical approval: The study was approved by the Research

Review Committee, Government Medical College, Surat, on 10 March 2025.

Informed consent: Written informed consent was obtained from participants.

Data availability: The study data were collected as part of the institutional dissertation and are not publicly available.

Author contributions: Dr. Charu Bararia contributed to study conception, data collection, analysis, interpretation and manuscript preparation. The contributions of the co-authors should be confirmed and finalized by all authors before submission.

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