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Original Article

A comparative study of maternal and fetal outcomes in women with gestational diabetes mellitus and overt diabetes mellitus diagnosed during pregnancy: a prospective observational comparative study.

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Abstract

Objectives

To compare maternal, obstetric and neonatal outcomes among women with gestational diabetes mellitus and overt diabetes mellitus diagnosed during pregnancy.

Methods

A prospective observational comparative study was conducted among 100 pregnant women diagnosed with diabetes during pregnancy at a tertiary care hospital. Participants were categorized into two groups: 50 women with gestational diabetes mellitus and 50 women with overt diabetes mellitus. Detailed demographic, clinical, obstetric and glycaemic assessments were performed.

Results

The mean maternal age was higher among women with overt diabetes mellitus than those with gestational diabetes mellitus (30.62 ± 4.56 vs. 28.74 ± 4.21 years; p=0.036). The mean gestational age at diagnosis was significantly lower in the overt diabetes group (15.82 ± 4.71 vs. 25.16 ± 3.84 weeks; p<0.001). Fasting blood glucose, postprandial blood glucose and HbA1c were significantly higher among women with overt diabetes (p<0.001 for all). Insulin therapy was required more frequently in the overt diabetes group (82.0% vs. 36.0%; p<0.001). Preeclampsia occurred in 22.0% of women with overt diabetes compared with 8.0% with GDM (p=0.048). Caesarean delivery was also more frequent in overt diabetes (72.0% vs. 52.0%; p=0.039). Mean birth weight was higher in the overt diabetes group (3.38 ± 0.61 vs. 3.08 ± 0.48 kg; p=0.008). Neonatal hypoglycaemia (34.0% vs. 14.0%; p=0.024) and NICU admission (26.0% vs. 10.0%; p=0.043) were significantly more frequent among neonates born to women with overt diabetes.

Conclusion

Overt diabetes mellitus diagnosed during pregnancy was associated with a greater burden of maternal, obstetric and neonatal complications compared with gestational diabetes mellitus. Early diagnosis, intensive glycaemic monitoring and appropriate antenatal and intrapartum management are important for improving pregnancy outcomes.

Recommendations

Early screening for hyperglycaemia, appropriate differentiation of GDM from overt diabetes, individualized glycaemic management and close maternal and fetal surveillance should be emphasized.

Keywords: *gestational diabetes mellitus; overt diabetes mellitus; pregnancy; maternal outcome; obstetric outcome; neonatal outcome.*
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Introduction

Diabetes mellitus is one of the most common medical disorders complicating pregnancy and is associated with significant maternal and fetal morbidity [1]. Hyperglycaemia first recognized during pregnancy may represent either gestational diabetes mellitus (GDM) or overt diabetes mellitus diagnosed during pregnancy [2]. GDM is characterized by glucose intolerance with onset or first recognition during pregnancy, whereas overt diabetes mellitus refers to hyperglycaemia meeting diagnostic criteria for diabetes in the non-pregnant state and first detected during pregnancy [3]. Differentiating between

these two entities is clinically important because overt diabetes generally reflects more severe or previously unrecognized metabolic dysfunction and may carry a greater risk of adverse pregnancy outcomes [4].

GDM is associated with several maternal complications, including gestational hypertension, preeclampsia, increased rates of induction of labour and caesarean delivery [5]. It may also contribute to excessive fetal growth, macrosomia, shoulder dystocia and neonatal metabolic complications such as hypoglycaemia [6]. Although appropriate screening and glycaemic management can substantially reduce these risks, the increasing prevalence of diabetes and obesity among women of reproductive age has resulted in a growing burden of diabetes-related pregnancy complications [7].

Overt diabetes mellitus diagnosed during pregnancy is particularly concerning because women may have significant hyperglycaemia from early gestation, often before routine screening for GDM is performed [8]. Poor glycaemic control during pregnancy has been associated with an increased risk of hypertensive disorders, preterm birth, polyhydramnios, operative delivery and adverse neonatal outcomes [9]. Infants born to mothers with overt diabetes may have a higher risk of macrosomia, neonatal hypoglycaemia, respiratory morbidity and admission to the neonatal intensive care unit [10]. However, the magnitude of these risks compared with women having GDM varies between populations and may be influenced by the timing of diagnosis, severity of hyperglycaemia and adequacy of treatment [9,10].

Early identification and appropriate management of diabetes during pregnancy are therefore essential for improving maternal and neonatal outcomes. Direct comparison of women with GDM and overt diabetes mellitus diagnosed during pregnancy can help identify differences in the clinical profile, obstetric complications, mode of delivery and neonatal outcomes between the two groups. Such evidence may assist clinicians in risk stratification, antenatal surveillance and individualized management of pregnancies complicated by different degrees of hyperglycaemia. The present study aimed to compare maternal and obstetric outcomes, including maternal complications, mode of delivery and neonatal outcomes, among women with gestational diabetes mellitus and overt diabetes mellitus diagnosed during pregnancy.

Materials and methods

Study design and setting

A prospective observational comparative study was conducted at ESIC Medical College, PGIMSR and Model Hospital, Rajajinagar, Bengaluru, Karnataka, India. The institution is a tertiary teaching and referral hospital; official institutional information describes a 500-bed hospital sanctioned for 750 beds, with services including Medicine, Surgery, Paediatrics, Obstetrics and Gynaecology, emergency and critical care, and dedicated general ICU, SICU, PICU and NICU facilities. The hospital primarily serves Employees' State Insurance beneficiaries from Bengaluru and surrounding industrial areas. Recruitment and follow-up for the present study occurred through the antenatal clinic, obstetric ward, labour room and associated neonatal services. The study period was 01/06/2025 to 31/12/2025. Pregnant women diagnosed with GDM or overt diabetes mellitus during pregnancy were followed prospectively from enrolment through delivery and maternal and neonatal discharge.

Study population

Pregnant women diagnosed with diabetes mellitus during the current pregnancy and attending the antenatal clinic or admitted to the obstetric ward were considered for enrolment. Both booked and unbooked women were eligible. GDM was diagnosed according to institutional and standard diagnostic criteria, whereas overt diabetes mellitus was defined as diabetes first detected during pregnancy that met diagnostic thresholds for diabetes in the non-pregnant state. A structured proforma was used to record demographic, clinical, obstetric, glycaemic, maternal and neonatal outcome data. Participants were followed from enrolment until delivery and maternal and neonatal discharge.

Participant selection

Eligible women were recruited from the antenatal clinic and obstetric ward and classified into the GDM or overt diabetes group according to the diagnostic criteria. Recruitment continued until 50 women were included in each group. The selection method is provisionally described as consecutive sampling.

Bias

Potential selection and information bias were addressed by applying the same eligibility and diagnostic criteria to all women, using a standardized data-collection proforma,

recording clinical and glycaemic variables prospectively, and following participants through the same in-hospital observation period. Maternal and neonatal outcomes were defined in advance and abstracted using uniform clinical criteria. Recruitment from both the antenatal clinic and obstetric ward was intended to reduce over-representation of a single route of presentation, while complete follow-up to maternal and neonatal discharge reduced loss-to-follow-up bias. Statistical comparisons used the same predefined significance threshold for both groups.

Study size

The sample size was estimated using the single-proportion formula $n = Z^2p(1-p)/d^2$. In the absence of a reliable local estimate for the overall frequency of adverse outcomes among women with diabetes first identified during pregnancy, a conservative expected proportion (p) of 0.50 was used, with a 95% confidence level (Z = 1.96) and absolute precision (d) of 0.10. Thus, $n = (1.96^2 \times 0.50 \times 0.50)/(0.10^2) = 96.04$. The minimum sample was rounded to 100 women, with 50 women included in each diagnostic group for the planned comparative analysis.

Clinical assessment

Detailed history regarding maternal age, residence, socioeconomic and educational status, occupation, parity, gravida, previous obstetric history, history of previous gestational diabetes, previous history of diabetes mellitus, family history of diabetes, antenatal care and associated medical conditions was recorded. Anthropometric assessment including height, weight and body mass index was documented. General physical examination and systemic examination were performed. Maternal vital parameters, including pulse rate, blood pressure, respiratory rate, temperature and oxygen saturation, were monitored. Obstetric examination was performed to assess fundal height, fetal presentation, lie, position, fetal heart rate and other relevant findings.

Diagnosis and assessment of diabetes

All participants underwent evaluation for glycaemic status according to the institutional protocol. Blood glucose measurements, including fasting and postprandial blood glucose levels, were recorded. Glycated haemoglobin (HbA1c) was assessed where indicated, particularly in women suspected to have overt diabetes mellitus. The gestational age at diagnosis and treatment initiated were documented. Women were managed with medical nutrition therapy, lifestyle modification and pharmacological treatment, including insulin, as clinically indicated. Glycaemic control was monitored throughout pregnancy.

Investigations

Routine antenatal investigations included complete blood count, complete urine examination, blood grouping and Rh typing, renal and liver function tests, thyroid function tests where indicated, viral screening including HIV, HBsAg and VDRL, and blood glucose assessment. Specific diabetic evaluation included fasting blood glucose, postprandial blood glucose and HbA1c. Obstetric ultrasonography was performed for assessment of fetal growth, liquor volume, placental location and other relevant fetal parameters. Additional investigations were performed as clinically indicated.

Antenatal and obstetric monitoring

Pregnant women were monitored regularly throughout pregnancy for glycaemic control, blood pressure, maternal complications and fetal well-being. Antenatal visits, gestational age at diagnosis, treatment received and obstetric complications were documented. Fetal surveillance was performed using ultrasonography, fetal growth assessment, amniotic fluid assessment and non-stress testing where indicated. Particular attention was given to the development of gestational hypertension, preeclampsia, polyhydramnios, preterm labour and other pregnancy-related complications.

Intrapartum monitoring and management

During labour, maternal and fetal conditions were closely monitored. Fetal well-being was assessed using continuous or intermittent fetal heart rate monitoring according to clinical requirements. The progress of labour was monitored using the partograph. Maternal pulse rate, blood pressure, respiratory rate, oxygen saturation and blood glucose levels were monitored as appropriate. Uterine contractions, cervical dilatation and effacement, fetal head station and descent, colour of liquor and evidence of caput or moulding were assessed periodically. The mode of delivery, including spontaneous vaginal delivery, instrumental vaginal delivery or lower-segment caesarean section (LSCS), was determined according to obstetric, maternal and fetal indications.

Maternal outcome assessment

Women were monitored for maternal and obstetric complications during pregnancy, labour and the postpartum period. Maternal outcomes assessed included gestational hypertension, preeclampsia, polyhydramnios, preterm

labour, premature rupture of membranes, postpartum haemorrhage, wound infection, intensive care admission and other relevant complications. The indication for induction of labour and caesarean delivery was documented. Maternal status at discharge was also recorded.

Neonatal assessment

Following delivery, each newborn was assessed for birth weight, sex, gestational age, Apgar scores at 1 and 5 minutes, and immediate neonatal complications. Neonatal outcomes assessed included macrosomia or large-for-gestational-age status, small-for-gestational-age status, neonatal hypoglycaemia, neonatal jaundice, respiratory distress, NICU admission, stillbirth and neonatal mortality. Newborns were followed until discharge.

Outcome measures

The primary outcomes were maternal and obstetric outcomes among women with GDM and overt diabetes mellitus diagnosed during pregnancy. Maternal outcomes included mode of delivery, induction of labour, gestational hypertension, preeclampsia, polyhydramnios, preterm labour, postpartum haemorrhage, wound infection and other obstetric complications. Neonatal outcomes included birth weight, Apgar scores, neonatal hypoglycaemia, respiratory distress, jaundice, NICU admission, stillbirth and neonatal mortality. The maternal and neonatal outcomes were compared between women with GDM and overt diabetes mellitus.

Data collection and follow-up

Data were collected prospectively using a structured proforma from enrolment through delivery and until maternal and neonatal discharge. Details regarding antenatal care, glycaemic parameters, treatment, labour, mode of delivery, maternal complications and neonatal outcomes were recorded. Newborns were assessed immediately after birth and followed during the hospital stay. Mothers were counselled regarding postpartum glycaemic evaluation, healthy lifestyle, contraception, pregnancy spacing and the importance of follow-up for future risk of diabetes mellitus.

Inclusion criteria

Pregnant women diagnosed during the current pregnancy with gestational diabetes mellitus or overt diabetes mellitus, irrespective of parity or booking status, were eligible for inclusion.

Exclusion criteria

Pregnant women with diabetes mellitus diagnosed before the current pregnancy, women with significant chronic medical disorders likely to independently influence maternal or neonatal outcomes, and women in whom abnormal glucose values were attributable to acute illness or other non-diabetic conditions were excluded.

Ethical considerations

Ethical approval was obtained from the Institutional Ethics Committee, ESIC Medical College, PGIMSR and Model Hospital, Rajajinagar, Bengaluru, before commencement of the study [IEC: 032/2025; dated 03-05-2025]. Written informed consent was obtained from each participant before enrolment; consent was treated as an ethical requirement rather than an eligibility criterion. Participant privacy and confidentiality were protected throughout data collection and analysis. Clinical care followed standard institutional obstetric and diabetic management protocols.

Statistical analysis

Data were entered, tabulated and analysed using SPSS software, version 18.0 (IBM Corp., Armonk, NY, USA). Categorical variables were expressed as frequencies and percentages, while continuous variables were summarised using mean and standard deviation or appropriate descriptive statistics. The association between categorical variables was assessed using the chi-square test or Fisher's exact test, as appropriate. Continuous variables between the two groups were compared using the independent-samples *t*-test or an appropriate non-parametric test based on data distribution. A p-value <0.05 was considered statistically significant.

Results

Participant flow

A total of 120 pregnant women were assessed for eligibility. Of these, 20 were not enrolled/excluded before study entry. The specific reasons and numbers for exclusion should be completed from the screening log. One hundred women were enrolled and completed in-hospital follow-up: 50 with GDM and 50 with overt diabetes mellitus. All 100 women were included in the final analysis (Figure 1).

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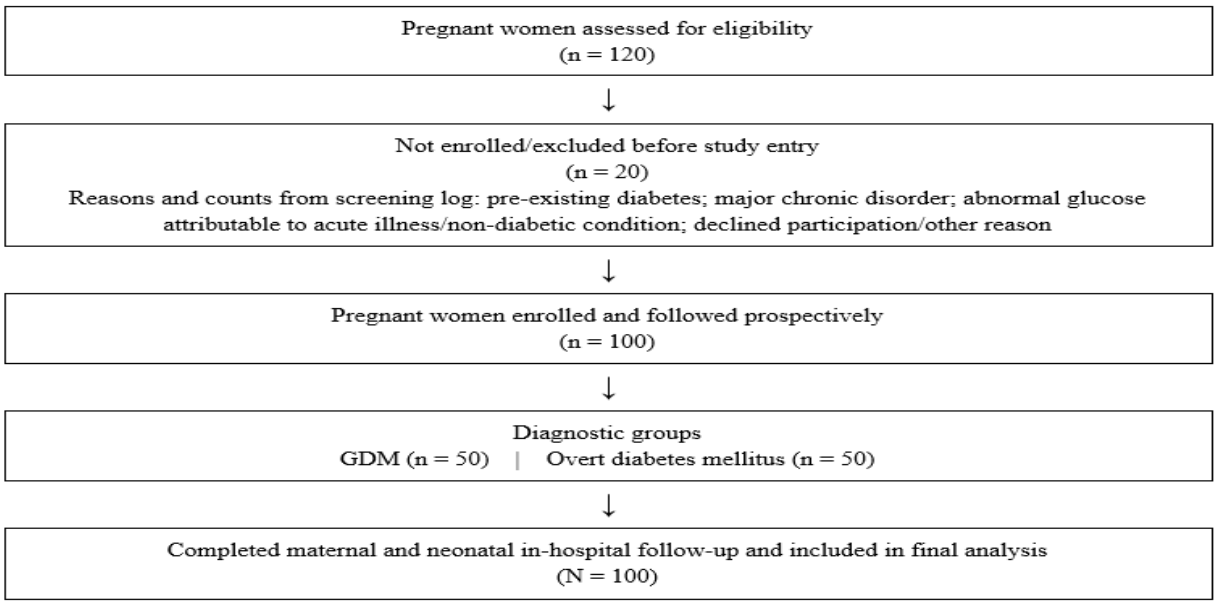
Figure 1. Participant flow through the study



Note. Screening and exclusion counts must be completed from the original screening/enrolment records before submission.

Among the 100 women included in the study, 50 (50.0%) had gestational diabetes mellitus (GDM) and 50 (50.0%) had overt diabetes mellitus. The mean maternal age was higher among women with overt diabetes mellitus than those with GDM (30.62 ± 4.56 vs. 28.74 ± 4.21 years; p=0.036). Primigravida women constituted 54.0% of the GDM group and 42.0% of the overt diabetes group, while multigravida women constituted 46.0% and 58.0%, respectively. Urban residence was reported in 62.0% of women with GDM and 68.0% of those with overt diabetes mellitus (Table 1).

Table 1: *Distribution of Study Participants According to Maternal Demographic Characteristics*

Maternal characteristic	GDM (n=50)	Overt DM (n=50)	Total (N=100)	χ^2 / t value	p-value
Age (years)					
<25	8 (16.0%)	4 (8.0%)	12 (12.0%)		
25–29	20 (40.0%)	14 (28.0%)	34 (34.0%)		
30–34	17 (34.0%)	20 (40.0%)	37 (37.0%)		
≥35	5 (10.0%)	12 (24.0%)	17 (17.0%)		
Mean age ± SD (years)	**28.74 ± 4.21**	**30.62 ± 4.56**	**29.68 ± 4.42**	**2.13**	**0.036**
Parity					
Primigravida	27 (54.0%)	21 (42.0%)	48 (48.0%)		
Multigravida	23 (46.0%)	29 (58.0%)	52 (52.0%)	1.45	0.228
Residence					

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Maternal characteristic	GDM (n=50)	Overt DM (n=50)	Total (N=100)	χ^2 / t value	p-value
Urban	31 (62.0%)	34 (68.0%)	65 (65.0%)		
Rural	19 (38.0%)	16 (32.0%)	35 (35.0%)	0.39	0.533

Note. Data are presented as n (%) unless otherwise indicated. SD = standard deviation; GDM = gestational diabetes mellitus; DM = diabetes mellitus.

The mean gestational age at diagnosis was significantly lower among women with overt diabetes mellitus compared with those with GDM (15.82 ± 4.71 vs. 25.16 ± 3.84 weeks; p<0.001). Diabetes diagnosed before 20 weeks of gestation was observed in 62.0% of women with overt diabetes compared with 6.0% of women with GDM. A previous history of diabetes was significantly more frequent in the overt diabetes group (56.0% vs. 8.0%; p<0.001), and insulin therapy was required more frequently among women with overt diabetes mellitus (82.0% vs. 36.0%; p<0.001) (Table 2).

Table 2: *Comparison of Obstetric Characteristics Between Women With GDM and Overt Diabetes Mellitus*

Obstetric characteristic	GDM (n=50)	Overt DM (n=50)	Total (N=100)	χ^2 / t value	p-value
Gestational age at diagnosis					
<20 weeks	3 (6.0%)	31 (62.0%)	34 (34.0%)		
20–28 weeks	41 (82.0%)	14 (28.0%)	55 (55.0%)		
>28 weeks	6 (12.0%)	5 (10.0%)	11 (11.0%)		
Mean gestational age at diagnosis (weeks)	**25.16 ± 3.84**	**15.82 ± 4.71**	**20.49 ± 6.24**	**10.98**	**<0.001**
Previous history of diabetes	4 (8.0%)	28 (56.0%)	32 (32.0%)	26.09	<0.001
Previous GDM	10 (20.0%)	8 (16.0%)	18 (18.0%)	0.26	0.608
Family history of diabetes	19 (38.0%)	27 (54.0%)	46 (46.0%)	2.59	0.108
BMI ≥25 kg/m²	32 (64.0%)	35 (70.0%)	67 (67.0%)	0.42	0.518
Insulin requirement	18 (36.0%)	41 (82.0%)	59 (59.0%)	22.03	<0.001

Note. Data are presented as n (%) or mean ± SD, as appropriate. BMI = body mass index; GDM = gestational diabetes mellitus; DM = diabetes mellitus.

The mean fasting blood glucose, postprandial blood glucose, and HbA1c levels were significantly higher among women with overt diabetes mellitus than among those with GDM. Mean fasting blood glucose was 124.7 ± 24.8 mg/dL in the overt diabetes group compared with 101.8 ± 14.6 mg/dL in the GDM group, while mean postprandial blood glucose was 171.3 ± 36.5 mg/dL and 139.6 ± 21.7 mg/dL, respectively. Mean HbA1c was also significantly higher in women with overt diabetes mellitus (7.12 ± 1.18% vs. 5.82 ± 0.42%; p<0.001) (Table 3).

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Table 3: *Comparison of Maternal Glycaemic Parameters Between the Study Groups*

Glycaemic parameter	GDM (n=50)	Overt DM (n=50)	p-value
Mean fasting blood glucose (mg/dL)	101.8 ± 14.6	124.7 ± 24.8	<0.001
Mean postprandial blood glucose (mg/dL)	139.6 ± 21.7	171.3 ± 36.5	<0.001
Mean HbA1c (%)	5.82 ± 0.42	7.12 ± 1.18	<0.001
HbA1c <6.5%	46 (92.0%)	19 (38.0%)	<0.001
HbA1c ≥6.5%	4 (8.0%)	31 (62.0%)	
Poor glycaemic control	9 (18.0%)	29 (58.0%)	<0.001

Note. Continuous data are presented as mean ± SD and categorical data as n (%). HbA1c = glycated haemoglobin; GDM = gestational diabetes mellitus; DM = diabetes mellitus.

Maternal and obstetric complications were more frequent among women with overt diabetes mellitus. Preeclampsia occurred in 22.0% of women with overt diabetes compared with 8.0% of those with GDM, representing a statistically significant difference (p=0.048). Gestational hypertension, polyhydramnios, preterm labour, premature rupture of membranes, postpartum haemorrhage, caesarean wound infection, and intensive care admission were also more frequent in the overt diabetes group, although these differences were not statistically significant (Table 4).

Table 4: *Maternal and Obstetric Complications in the Study Groups*

Maternal/obstetric outcome	GDM (n=50)	Overt DM (n=50)	Total (N=100)	χ^2 value	p-value
Gestational hypertension	5 (10.0%)	10 (20.0%)	15 (15.0%)	1.96	0.161
Preeclampsia	4 (8.0%)	11 (22.0%)	15 (15.0%)	3.90	0.048
Polyhydramnios	3 (6.0%)	9 (18.0%)	12 (12.0%)	3.18	0.074
Premature rupture of membranes	4 (8.0%)	6 (12.0%)	10 (10.0%)	0.44	0.506
Preterm labour	4 (8.0%)	10 (20.0%)	14 (14.0%)	2.99	0.084
Placental abruption	1 (2.0%)	2 (4.0%)	3 (3.0%)	0.34	0.559
Caesarean wound infection	2 (4.0%)	5 (10.0%)	7 (7.0%)	1.39	0.238
Postpartum haemorrhage	3 (6.0%)	6 (12.0%)	9 (9.0%)	1.10	0.294
ICU admission	0 (0.0%)	3 (6.0%)	3 (3.0%)	3.09	0.079

Note. Data are presented as n (%). GDM = gestational diabetes mellitus; DM = diabetes mellitus; ICU = intensive care unit.

Caesarean delivery was the most common mode of delivery in both groups and was significantly more frequent among women with overt diabetes mellitus than among those with GDM (72.0% vs. 52.0%; p=0.039). Vaginal delivery occurred in 42.0% of women with GDM compared with 24.0% of women with overt diabetes, while instrumental vaginal delivery was observed in 6.0% and 4.0%, respectively (Table 5).

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Table 5: *Association Between Mode of Delivery and Type of Diabetes*

Mode of delivery	GDM (n=50)	Overt DM (n=50)	Total (N=100)	χ^2 value	p-value
Vaginal delivery	21 (42.0%)	12 (24.0%)	33 (33.0%)		
Instrumental vaginal delivery	3 (6.0%)	2 (4.0%)	5 (5.0%)		
Caesarean delivery	26 (52.0%)	36 (72.0%)	62 (62.0%)	**4.27**	**0.039**

Note. Data are presented as n (%). GDM = gestational diabetes mellitus; DM = diabetes mellitus.

Among the 62 women who underwent caesarean delivery, the most common indication was previous caesarean section, accounting for 27.4% of cases, followed by fetal macrosomia in 25.8% and non-reassuring fetal status in 17.7%. Failed induction, cephalopelvic disproportion, severe preeclampsia, and other indications accounted for the remaining cases. The distribution of indications was broadly comparable between the GDM and overt diabetes groups (Table 6).

Table 6: *Indications for Caesarean Delivery*

Indication	GDM (n=26)	Overt DM (n=36)	Total (N=62)
Previous caesarean section	7 (26.9%)	10 (27.8%)	17 (27.4%)
Fetal macrosomia	6 (23.1%)	10 (27.8%)	16 (25.8%)
Non-reassuring fetal status	5 (19.2%)	6 (16.7%)	11 (17.7%)
Failed induction	3 (11.5%)	4 (11.1%)	7 (11.3%)
Cephalopelvic disproportion	2 (7.7%)	3 (8.3%)	5 (8.1%)
Severe preeclampsia	2 (7.7%)	2 (5.6%)	4 (6.5%)
Other indications	1 (3.8%)	1 (2.8%)	2 (3.2%)

Note. Percentages are calculated within women who underwent caesarean delivery in each group. GDM = gestational diabetes mellitus; DM = diabetes mellitus.

Neonatal outcomes demonstrated a greater burden of adverse events among women with overt diabetes mellitus. Mean birth weight was significantly higher in the overt diabetes group than in the GDM group (3.38 ± 0.61 vs. 3.08 ± 0.48 kg; p=0.008). Neonatal hypoglycaemia occurred significantly more frequently among infants born to women with overt diabetes (34.0% vs. 14.0%; p=0.024), and NICU admission was also more common (26.0% vs. 10.0%; p=0.043). Other outcomes, including large-for-gestational-age birth, preterm birth, neonatal jaundice, respiratory distress, stillbirth, and neonatal mortality, were numerically more frequent in the overt diabetes group (Table 7).

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Table 7: *Neonatal Outcomes in Women With GDM and Overt Diabetes Mellitus*

Neonatal outcome	GDM (n=50)	Overt DM (n=50)	Total (N=100)	χ^2 / t value	p-value
Mean birth weight (kg)	**3.08 ± 0.48**	**3.38 ± 0.61**	**3.23 ± 0.56**	**2.73**	**0.008**
Birth weight ≥4 kg	6 (12.0%)	13 (26.0%)	19 (19.0%)	3.07	0.080
Large for gestational age	8 (16.0%)	16 (32.0%)	24 (24.0%)	3.43	0.064
Small for gestational age	3 (6.0%)	2 (4.0%)	5 (5.0%)	0.21	0.647
Preterm birth	4 (8.0%)	10 (20.0%)	14 (14.0%)	2.99	0.084
Neonatal hypoglycaemia	7 (14.0%)	17 (34.0%)	24 (24.0%)	5.06	0.024
Neonatal jaundice	5 (10.0%)	9 (18.0%)	14 (14.0%)	1.33	0.249
Respiratory distress	3 (6.0%)	8 (16.0%)	11 (11.0%)	2.99	0.084
NICU admission	5 (10.0%)	13 (26.0%)	18 (18.0%)	4.11	0.043
Stillbirth	1 (2.0%)	2 (4.0%)	3 (3.0%)	0.34	0.559
Neonatal mortality	0 (0.0%)	1 (2.0%)	1 (1.0%)	1.01	0.315

Note. Data are presented as n (%) unless otherwise indicated. GDM = gestational diabetes mellitus; DM = diabetes mellitus; NICU = neonatal intensive care unit.

The mean Apgar scores at both 1 and 5 minutes were lower among neonates born to women with overt diabetes mellitus compared with those born to women with GDM.

The mean 1-minute Apgar score was 7.18 ± 1.18 in the overt diabetes group compared with 7.62 ± 0.91 in the GDM group (p=0.041), while the corresponding 5-minute scores were 8.22 ± 0.91 and 8.61 ± 0.62, respectively (p=0.015). An Apgar score below 7 at 1 minute was observed in 20.0% of the overt diabetes group and 10.0% of the GDM group (Table 8).

Table 8: *Comparison of Apgar Scores Between the Study Groups*

Apgar score	GDM (n=50)	Overt DM (n=50)	p-value
Apgar at 1 minute			
Mean ± SD	7.62 ± 0.91	7.18 ± 1.18	0.041
<7	5 (10.0%)	10 (20.0%)	0.161
≥7	45 (90.0%)	40 (80.0%)	
Apgar at 5 minutes			
Mean ± SD	8.61 ± 0.62	8.22 ± 0.91	0.015
<7	1 (2.0%)	4 (8.0%)	0.168
≥7	49 (98.0%)	46 (92.0%)	

Note. Data are presented as mean ± SD or n (%), as appropriate. SD = standard deviation; GDM = gestational diabetes mellitus; DM = diabetes mellitus.

Discussion

The principal finding was that overt diabetes mellitus diagnosed during pregnancy represented a clinically higher-risk metabolic phenotype than GDM. Women with overt

diabetes were older (30.62 ± 4.56 vs. 28.74 ± 4.21 years; p=0.036), were diagnosed substantially earlier (15.82 ± 4.71 vs. 25.16 ± 3.84 weeks; p<0.001), and had higher fasting glucose (124.7 ± 24.8 vs. 101.8 ± 14.6 mg/dL), postprandial glucose (171.3 ± 36.5 vs. 139.6 ± 21.7 mg/dL), and HbA1c (7.12 ± 1.18% vs. 5.82 ± 0.42%; all p<0.001). Insulin treatment was required in 82.0% of women with overt diabetes compared with 36.0% of those with GDM (p<0.001). This pattern indicates that overt diabetes was not simply GDM detected earlier; rather, it was associated with more pronounced and sustained

dysglycaemia, consistent with the clinical profile reported by Wong et al. [11] and the higher-risk phenotype summarized in the meta-analysis by Pal et al. [12]. Earlier detection in the overt diabetes group is biologically plausible because glucose concentrations already met non-pregnant diagnostic thresholds, making hyperglycaemia apparent before routine late-second-trimester GDM screening.

Maternal complications were also more frequent in the overt diabetes group. Preeclampsia occurred in 11 of 50 women (22.0%) with overt diabetes versus 4 of 50 (8.0%) with GDM (p=0.048), and caesarean delivery occurred in 72.0% versus 52.0%, respectively (p=0.039). Gestational hypertension, polyhydramnios and preterm labour were numerically more common in overt diabetes, although these comparisons did not reach statistical significance. The excess hypertensive and operative burden can be interpreted in the context of greater metabolic disturbance, longer fetal exposure to hyperglycaemia, and the higher frequency of fetal overgrowth-related concerns in women with overt diabetes. Similar patterns have been reported by Pal et al. [12], while the French nationwide study by Regnault et al. [13] also demonstrated higher risks of caesarean delivery and adverse maternal-fetal outcomes when hyperglycaemia was identified earlier in pregnancy. The present findings therefore reinforce the need to distinguish overt diabetes from conventional GDM during antenatal risk assessment.

Neonatal outcomes followed the same risk gradient. Mean birth weight was greater among infants born to women with overt diabetes (3.38 ± 0.61 vs. 3.08 ± 0.48 kg; p=0.008). Neonatal hypoglycaemia occurred in 34.0% compared with 14.0% in the GDM group (p=0.024), and NICU admission occurred in 26.0% versus 10.0% (p=0.043). Mean Apgar scores were also lower at 1 minute (7.18 ± 1.18 vs. 7.62 ± 0.91; p=0.041) and 5 minutes (8.22 ± 0.91 vs. 8.61 ± 0.62; p=0.015). These findings are compatible with prolonged fetal exposure to maternal hyperglycaemia, which promotes fetal hyperinsulinaemia and increases the probability of excessive fetal growth and postnatal glucose instability [9,10]. Wong et al. [11] similarly reported more large-for-gestational-age infants and neonatal hypoglycaemia among women with overt diabetes, and Pal et al. [12] found increased risks of macrosomia, large-for-gestational-age birth and neonatal hypoglycaemia compared with GDM.

Several adverse outcomes showed clinically important numerical differences without conventional statistical significance. Birth weight ≥4 kg occurred in 26.0% of the overt diabetes group versus 12.0% of the GDM group (p=0.080), large-for-gestational-age birth in 32.0% versus 16.0% (p=0.064), and preterm birth in 20.0% versus 8.0% (p=0.084). Respiratory distress was also more frequent in overt diabetes (16.0% vs. 6.0%; p=0.084). These results should not be interpreted as evidence of equivalence; the study included only 50 women per group and therefore had limited precision for infrequent outcomes. The direction of effect is nevertheless consistent with larger studies and systematic evidence [12,13]. The absence of statistical significance for rare outcomes such as stillbirth and neonatal mortality is particularly compatible with limited event counts rather than proof that the risks are identical between groups.

Taken together, the results suggest that classification of hyperglycaemia during pregnancy has practical prognostic value. Women meeting criteria for overt diabetes required more intensive treatment and experienced a greater burden of maternal and neonatal morbidity than women with GDM. A plausible explanation is the combination of earlier onset, greater severity and longer duration of hyperglycaemic exposure, which can affect maternal vascular adaptation, placental function and fetal metabolic responses. These observations support early pregnancy glucose testing in women at risk, prompt recognition of overt diabetes, individualized glycaemic therapy, intensified surveillance for hypertensive disorders and fetal overgrowth, and planned neonatal glucose monitoring after delivery [4,9,10].

Generalizability: The findings should be interpreted in the context of the single-centre design and relatively small sample size of 100 women. The study population may not fully represent women with diabetes in pregnancy from different geographical, socioeconomic or healthcare settings. Furthermore, the findings may not be directly generalizable to women with severe pre-existing metabolic complications or pregnancies managed in specialized diabetic centres. Nevertheless, the study provides clinically relevant information regarding the differences in maternal, obstetric and neonatal outcomes between women with GDM and overt diabetes mellitus diagnosed during pregnancy and highlights the importance of early diagnosis, adequate glycaemic control and appropriate antenatal surveillance.

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Conclusion

Pregnancy complicated by overt diabetes mellitus diagnosed during pregnancy was associated with a greater burden of maternal, obstetric and neonatal complications compared with gestational diabetes mellitus. In the present study, women with overt diabetes were more likely to have earlier diagnosis, higher fasting and postprandial blood glucose levels, higher HbA1c values and greater insulin requirements. Preeclampsia and caesarean delivery were more frequent among women with overt diabetes, while neonatal hypoglycaemia and NICU admission were also significantly higher. These findings highlight the importance of early identification of overt diabetes, close monitoring of glycaemic control, appropriate antenatal surveillance and timely management to reduce adverse maternal and neonatal outcomes.

Limitations

The study was conducted at a single tertiary-care centre with a relatively small sample size of 100 participants, which may limit the generalizability of the findings. The observational design limits the ability to establish causal relationships between the type of diabetes and maternal or neonatal outcomes. Potential differences in the duration and severity of hyperglycaemia, treatment adherence and glycaemic control during pregnancy may also have influenced outcomes. Furthermore, the study did not include long-term maternal metabolic follow-up or long-term assessment of neonatal outcomes after hospital discharge.

Recommendations

Pregnant women should undergo appropriate screening for hyperglycaemia early in pregnancy, with timely identification of women who meet criteria for overt diabetes mellitus. Women diagnosed with overt diabetes should receive closer antenatal surveillance and individualized glycaemic management, including nutritional counselling, lifestyle modification and pharmacological therapy when indicated. Regular monitoring of maternal blood glucose, HbA1c where appropriate, blood pressure and fetal growth should be emphasized. Delivery planning should be individualized according to glycaemic control, fetal growth, maternal complications and obstetric indications. Particular attention should be given to prevention and early detection of neonatal hypoglycaemia and other complications, with appropriate neonatal monitoring and NICU facilities available for high-risk pregnancies.

Abbreviations

GDM, gestational diabetes mellitus; **ODM**, overt diabetes mellitus; **BMI**, body mass index; **FBS**, fasting blood sugar; **PPBS**, postprandial blood sugar; **HbA1c**, glycated haemoglobin; **NICU**, neonatal intensive care unit; **LGA**, large for gestational age; **SGA**, small for gestational age; **LSCS**, lower-segment caesarean section; **PROM**, premature rupture of membranes; **PPH**, postpartum haemorrhage; **IUD**, intrauterine death; **RBS**, random blood sugar; **SD**, standard deviation.

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Conflict of interest

The authors declare no conflict of interest.

Author contributions

Concept and design of the study, results interpretation, review of literature and preparing first draft of manuscript. Statistical analysis and interpretation, revision of manuscript. - Design of the study, results interpretation, review of literature and preparing first draft of manuscript, revision of manuscript. - Design of the study, results interpretation, review of literature and preparing first draft of manuscript. Statistical analysis and interpretation, revision of manuscript

Data availability

Data are available upon reasonable request from the author.

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