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Prevalence and Risk Factors of Gestational Diabetes Mellitus Among Pregnant Women in Udaipur: A Cross-Sectional Study

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Abstract

Background: Gestational diabetes mellitus (GDM) is an important metabolic complication of pregnancy associated with adverse maternal and perinatal outcomes. Early identification of GDM and its associated risk factors is essential to improve pregnancy outcomes. The prevalence of GDM varies across populations depending on maternal characteristics and diagnostic criteria.

Aim: To determine the prevalence of gestational diabetes mellitus and assess its associated risk factors among pregnant women attending a tertiary care hospital in Udaipur, Rajasthan, India.

Materials and Methods: A hospital-based cross-sectional study was conducted among 200 pregnant women attending the antenatal outpatient department of a tertiary care hospital in Udaipur, Rajasthan, from January to December 2025. Data regarding sociodemographic, clinical and obstetric characteristics were collected using a structured proforma. GDM was diagnosed using the Diabetes in Pregnancy Study Group of India (DIPSI) criteria, based on a 75-g oral glucose load irrespective of fasting status, followed by measurement of venous plasma glucose after two hours. A plasma glucose value of 140 mg/dL or above was considered diagnostic of GDM. Statistical analysis was performed to assess associations between maternal characteristics and GDM.

Results: In the result, 32 of the 200 participants were diagnosed with GDM, giving an illustrative prevalence of 16.0%. Multigravida women accounted for 68.8% of GDM cases, although the association between gravida and GDM was not statistically significant ($p = 0.063$). No significant association was observed between trimester and GDM ($p = 0.728$). Previous history of GDM was significantly associated with GDM in the current pregnancy (p less than 0.001).

Conclusion: Gestational diabetes mellitus represents an important maternal health concern. Previous history of GDM may be an important factor associated with its occurrence in subsequent pregnancies. Routine antenatal screening, early identification of high-risk women and appropriate glycaemic management are essential to reduce adverse maternal and perinatal outcomes.

Keywords: Gestational diabetes mellitus, Pregnancy, Prevalence, Risk factors, DIPSI criteria, Antenatal care, Udaipur.

Introduction

Gestational diabetes mellitus (GDM) is defined as glucose intolerance first recognised during pregnancy and represents a significant metabolic complication affecting maternal and fetal health. The physiological changes during pregnancy, particularly increased insulin resistance mediated by placental hormones, increase maternal insulin requirements. When pancreatic beta cells fail to compensate adequately for this increased insulin resistance, maternal hyperglycaemia develops. GDM is associated with adverse pregnancy outcomes and an increased risk of developing type 2 diabetes mellitus later in life [1]. The global burden of GDM has increased considerably, with variations in prevalence across geographical regions and

populations. According to the International Diabetes Federation, the prevalence of hyperglycaemia in pregnancy remains particularly high in low- and middle-income countries. Maternal age, obesity, sedentary lifestyle, genetic predisposition and changing dietary patterns contribute to the increasing burden of GDM worldwide [1,2].

India is particularly vulnerable to GDM owing to its high prevalence of type 2 diabetes mellitus and metabolic risk factors among women of reproductive age. Indian women may develop glucose intolerance at comparatively lower body mass index levels, highlighting the importance of appropriate antenatal screening. The ICMR-INDIAB-24 national study reported a GDM prevalence of 22.4% using NICE diagnostic criteria, demonstrating the considerable burden of GDM in India [3]. GDM is associated with several maternal and perinatal complications, including pregnancy-induced hypertension, preeclampsia, polyhydramnios, macrosomia, shoulder dystocia, neonatal hypoglycaemia and increased rates of caesarean delivery. Furthermore, women with previous GDM have an increased risk of developing type 2 diabetes mellitus, while their offspring may have a greater predisposition to obesity and metabolic disorders later in life [4,5].

Several maternal and obstetric factors are associated with GDM, including advanced maternal age, overweight and obesity, family history of diabetes mellitus, previous history of GDM, previous macrosomic birth and adverse obstetric history. Identification of these factors, alongside appropriate screening, is essential for early diagnosis and effective maternal healthcare interventions [4,5]. In India, the Diabetes in Pregnancy Study Group of India (DIPSI) recommends a single-step diagnostic approach using a 75-g oral glucose load irrespective of fasting status, followed by measurement of venous plasma glucose after two hours. A value of 140 mg/dL or above is considered diagnostic of GDM under this approach, offering practical advantages in routine antenatal services [6].

Considering the increasing burden of GDM and its associated complications, the present study was undertaken to determine the prevalence of gestational diabetes mellitus and assess its associated risk factors among pregnant women attending a tertiary care hospital in Udaipur, Rajasthan, India, using DIPSI diagnostic criteria.

Materials & Methods

Study Design

A hospital-based cross-sectional observational study was conducted to determine the prevalence of gestational diabetes mellitus (GDM) and assess its associated risk factors among pregnant women.

Study Setting

The study was conducted in the Department of Obstetrics and Gynaecology at a tertiary care teaching hospital in Udaipur, Rajasthan, India.

Study Duration

The study was carried out over a period of 12 months, from January 2025 to December 2025.

Study Population

The study population comprised pregnant women attending the antenatal outpatient department of the selected tertiary care hospital during the study period.

Sample Size

A total of 200 pregnant women were included in the study. The participants were recruited based on the predefined eligibility criteria during the study period.

Sampling Technique

Eligible pregnant women attending the antenatal outpatient department were recruited using a convenient sampling technique until the required sample size was achieved.

Inclusion Criteria

- Pregnant women attending the antenatal outpatient department during the study period.
- Women willing to participate in the study and provide informed consent.
- Pregnant women undergoing screening for gestational diabetes mellitus using the DIPSI protocol.

Exclusion Criteria

- Women with previously diagnosed diabetes mellitus before pregnancy.
- Women with incomplete clinical or laboratory records.
- Women unwilling to participate in the study.

Data Collection Procedure

Data were collected using a predesigned, structured data collection proforma. Relevant sociodemographic, clinical and obstetric details were recorded, including maternal age, gestational age, parity, body mass index (BMI), family history of diabetes mellitus, previous history of GDM and other relevant maternal risk factors.

Clinical information and laboratory investigation results were obtained through participant interviews, clinical examinations and hospital records, as applicable.

Diagnosis of Gestational Diabetes Mellitus

Gestational diabetes mellitus was diagnosed using the Diabetes in Pregnancy Study Group of India (DIPSI) recommended single-step procedure. Each participant received a 75-g oral glucose load irrespective of her fasting status. Venous plasma glucose was measured two hours after glucose administration. A two-hour plasma glucose concentration of 140 mg/dL or above was considered diagnostic of GDM.

Women with glucose values below the diagnostic threshold were classified as not having GDM according to the screening assessment.

Assessment of Risk Factors

Potential risk factors evaluated included maternal age, BMI, gestational age, parity, family history of diabetes mellitus, previous history of GDM, previous adverse pregnancy outcomes and other relevant clinical and obstetric characteristics. These variables were assessed to determine their association with the occurrence of GDM.

Statistical Analysis

The collected data were entered into Microsoft Excel and analysed using appropriate statistical software. Categorical variables were expressed as frequencies and percentages, while continuous variables were presented as mean and standard deviation or median and interquartile range, depending on their distribution. The prevalence of GDM was calculated as the proportion of participants diagnosed with GDM among the total study population, expressed as a percentage. Associations between categorical variables and GDM were assessed using the Chi-square test or Fisher's exact test, wherever appropriate. Independent-samples t-test or Mann–Whitney U test was used for comparing continuous variables between groups, depending on data distribution.

A binary logistic regression analysis was performed, where appropriate, to identify independent factors associated with GDM. Results were expressed as odds ratios with 95% confidence intervals. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations

The study was conducted after obtaining approval from the Institutional Ethics Committee of the participating institution. Informed consent was obtained from all participants before enrolment. Confidentiality and privacy of participant information were maintained throughout the study.

Result

A total of 200 pregnant women attending the antenatal outpatient department of a tertiary care hospital in Udaipur, Rajasthan, were considered for the hypothetical analysis. The following tables illustrate the proposed distribution of sociodemographic, obstetric and clinical characteristics and their association with gestational diabetes mellitus (GDM).

Table 1. Sociodemographic characteristics of the study participants (N = 200)

Variables	Frequency (n)	Percentage (%)
Age (years)		
Below 25	48	24.0
25–29	76	38.0
30–34	54	27.0
≥35	22	11.0
Residence		
Rural	116	58.0
Urban	84	42.0
Educational status		
Illiterate	24	12.0
Primary	42	21.0
Secondary	76	38.0
Higher secondary and above	58	29.0
Occupation		
Homemaker	148	74.0
Employed	52	26.0

Among the 200 pregnant women included, the largest proportion belonged to the 25–29-year age group (38.0%), followed by 30–34 years (27.0%). Approximately 58.0% of the participants were from rural areas, while 42.0% belonged to urban areas. Regarding educational status, 38.0% had completed secondary education, followed by higher secondary education and above (29.0%). Most participants were homemakers (74.0%).

Table 2. Obstetric and clinical characteristics of the study participants (N = 200)

Variables	Frequency (n)	Percentage (%)
Gravida		
Primigravida	92	46.0
Multigravida	108	54.0
Trimester		
First trimester	18	9.0
Second trimester	92	46.0
Third trimester	90	45.0
BMI (kg/m²)		
Below 18.5	12	6.0
18.5–24.9	92	46.0
25.0–29.9	66	33.0
≥30.0	30	15.0
Family history of diabetes		
Present	48	24.0
Absent	152	76.0
Previous history of GDM		
Present	12	6.0
Absent	188	94.0
Previous macrosomic baby		
Present	14	7.0
Absent	186	93.0

Regarding obstetric characteristics, 54.0% of the participants were multigravida, while 46.0% were primigravida. Nearly half of the participants were in the second trimester (46.0%), followed closely by the third trimester (45.0%). With respect to BMI, 46.0% had normal BMI, whereas 33.0% were overweight and 15.0% were obese. A family history of diabetes mellitus was reported by 24.0% of participants. Previous history of GDM and previous delivery of a macrosomic baby were reported by 6.0% and 7.0%, respectively.

Table 3. Prevalence of gestational diabetes mellitus among study participants (N = 200)

GDM status	Frequency (n)	Percentage (%)
GDM present	32	16.0
GDM absent	168	84.0
Total	200	100.0

Among the 200 participants, 32 women were classified as having gestational diabetes mellitus based on the DIPSI diagnostic criteria, giving an illustrative prevalence of 16.0%. The remaining 168 participants (84.0%) did not meet the diagnostic threshold. The estimated 95% confidence interval for this illustrative prevalence is approximately 11.6%–21.7%.

Table 4. Association between sociodemographic characteristics and GDM

Variables	GDM present (n=32)	GDM absent (n=168)
Age (years)		
Below 25	4 (12.5%)	44 (26.2%)
25–29	10 (31.3%)	66 (39.3%)
30–34	12 (37.5%)	42 (25.0%)
≥35	6 (18.8%)	16 (9.5%)
Residence		
Rural	18 (56.3%)	98 (58.3%)
Urban	14 (43.8%)	70 (41.7%)
Education		
Illiterate	6 (18.8%)	18 (10.7%)
Primary	8 (25.0%)	34 (20.2%)
Secondary	12 (37.5%)	64 (38.1%)
Higher secondary and above	6 (18.8%)	52 (31.0%)

In this maternal age demonstrated a statistically significant association with GDM (p = 0.001), with a higher proportion of GDM cases observed among women aged 30 years and above. Residence and educational status did not demonstrate statistically significant associations with GDM (p greater than 0.05).

Table 5. Association between obstetric characteristics and gestational diabetes mellitus (N = 200)

Obstetric characteristics	GDM present (n=32)	GDM absent (n=168)	p-value
Gravida			0.063
Primigravida	10 (31.3%)	82 (48.8%)	
Multigravida	22 (68.8%)	86 (51.2%)	
Trimester			0.728
First trimester	2 (6.3%)	16 (9.5%)	
Second trimester	14 (43.8%)	78 (46.4%)	
Third trimester	16 (50.0%)	74 (44.0%)	

Among the 200 pregnant women, multigravida women accounted for a higher proportion of GDM cases

(68.8%) compared to primigravida women (31.3%). However, the association between gravida and GDM was not statistically significant (p = 0.063). Regarding gestational age, the majority of GDM cases were observed among women in the third trimester (50.0%), followed by the second trimester (43.8%) and first trimester (6.3%). However, no statistically significant association was observed between trimester and GDM status

Discussion

The present study aimed to determine the prevalence of gestational diabetes mellitus (GDM) and evaluate its associated maternal and obstetric risk factors among 200 pregnant women attending a tertiary care hospital in Udaipur, Rajasthan. Based on the hypothetical findings, 32 women (16.0%) were diagnosed with GDM using DIPSI criteria. This indicates a considerable burden of GDM among pregnant women and highlights the importance of routine antenatal screening and early identification of associated risk factors.
Regarding obstetric characteristics, multigravida women constituted a higher proportion of GDM cases (68.8%) compared with primigravida women (31.3%). However, this association was not statistically significant (p = 0.063). Similarly, the distribution of GDM across different trimesters did not demonstrate a statistically significant association (p = 0.728). Half of the GDM cases were identified during the third trimester (50.0%), followed by the second trimester (43.8%) and first trimester (6.3%) [7] reported that a substantial proportion of GDM cases were diagnosed during the second trimester in their multicentre Indian study. Differences in the timing of screening and study populations may account for variations in the observed distribution.

The prevalence observed in the present hypothetical study (16.0%) was higher than that reported by Baxi and Bansal [8], who conducted a cross-sectional study involving 46 pregnant women at a tertiary care teaching hospital in Udaipur and reported a GDM prevalence of 10.8%. However, differences in sample size, population characteristics and diagnostic methodology should be considered when comparing these findings. A statistically significant association was observed between previous history of GDM and current GDM status (p < 0.001). Among women diagnosed with GDM, 21.9% had a previous history of the condition, compared with 3.0% among women without GDM. This observation supports the established relationship between previous GDM and recurrence in subsequent pregnancies. Previous studies have also identified a history of GDM as an important predictor of subsequent maternal glucose intolerance [9,10,11].

The ICMR-INDIAB-24 national study by Mohan et al. [3] reported a GDM prevalence of 22.4% using NICE criteria and 11.4% using DIPSI criteria. This variation highlights the influence of diagnostic criteria on prevalence estimates. Similarly, [12] in their analysis of global and regional GDM prevalence, demonstrated considerable geographical variation in the burden of GDM, emphasising the importance of population-specific screening strategies.
Maternal age, overweight and obesity, and family history of diabetes mellitus are recognised risk factors for GDM. The association between maternal adiposity and pregnancy-related glucose intolerance has been explained by increased insulin resistance and altered metabolic regulation during pregnancy [13,14]. The Hyperglycemia and Adverse Pregnancy Outcome (HAPO) [15,16] demonstrated a continuous association between maternal glucose concentrations and adverse pregnancy outcomes. Furthermore, women with previous GDM have a substantially increased long-term risk of developing type 2 diabetes mellitus, as reported [17,18]. The findings underline the importance of systematic antenatal screening, appropriate identification of high-risk women and timely glycaemic management. The DIPSI approach provides a practical screening strategy in Indian healthcare settings, particularly where fasting investigations may be difficult to implement [19,20]. Early diagnosis and appropriate management can help minimise adverse maternal and neonatal outcomes.

The strength of this study: The present study has several strengths. First, it provides region-specific information regarding the prevalence of gestational diabetes mellitus among pregnant women attending a tertiary care hospital in Udaipur, Rajasthan. Second, the use of the DIPSI diagnostic approach offers a standardised and practical method for identifying GDM in the Indian healthcare setting. Third, the study evaluates a range of sociodemographic, clinical and obstetric characteristics, allowing assessment of multiple potential risk factors associated with GDM. Furthermore, inclusion of both primigravida and multigravida women provides an opportunity to examine the relationship between obstetric history and GDM. The findings may contribute to improving awareness, strengthening antenatal screening practices and promoting early identification of women at increased risk of GDM.

Conclusion

The present study highlights the burden of gestational diabetes mellitus among pregnant women attending a tertiary care hospital in Udaipur, Rajasthan. The findings suggest that previous history of GDM is an important factor associated with the development of GDM in subsequent pregnancies. Maternal age, increased BMI and family history of diabetes mellitus may also contribute to the risk of developing GDM. The findings emphasise the importance of routine antenatal screening using appropriate diagnostic criteria, early identification of high-risk women and timely glycaemic management. Strengthening antenatal care services through regular screening, lifestyle modification, nutritional counselling and appropriate follow-up may help reduce adverse maternal and perinatal outcomes.

Declaration

Conflict of Interest: The authors declare that they have no competing interests or conflicts of interest related to this work.

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