



Research Article

Study of Gestational Diabetes and Its Risk Factors in ANC Patients

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ABSTRACT

Background: Gestational diabetes mellitus (GDM) is one of the most common metabolic complications of pregnancy, associated with adverse maternal and neonatal outcomes. Identifying its prevalence and risk factors is essential for timely diagnosis and prevention.

Material and Methods: This hospital-based cross-sectional study was conducted among 300 antenatal women between 24–28 weeks of gestation. Participants underwent a 75 g oral glucose tolerance test, and GDM was diagnosed according to WHO criteria. Maternal demographic and clinical data, including age, parity, body mass index (BMI), family history of diabetes, and past obstetric history, were recorded. Associations between risk factors and GDM were analyzed using chi-square test and logistic regression.

Results: The mean age of participants was 26.8 ± 4.2 years, and the mean BMI was 24.7 ± 3.6 kg/m². More than half were multigravida (54.0%), while 24.7% had a family history of diabetes, 8.7% had a history of GDM, and 6.3% reported macrosomia. The prevalence of GDM was 14.0% (42/300). On univariate analysis, significant associations were observed with maternal age ≥ 30 years ($p < 0.001$), BMI ≥ 25 kg/m² ($p < 0.001$), family history of diabetes ($p = 0.004$), previous GDM ($p = 0.001$), and macrosomia ($p = 0.048$). Multiparity showed a higher frequency of GDM but did not reach statistical significance. Multivariate logistic regression identified advanced maternal age (AOR = 2.7, 95% CI: 1.3–5.5), BMI ≥ 25 kg/m² (AOR = 3.4, 95% CI: 1.7–6.8), family history of diabetes (AOR = 2.1, 95% CI: 1.0–4.3), and previous GDM (AOR = 3.9, 95% CI: 1.5–10.1) as independent predictors.

Conclusion: GDM was observed in 14% of antenatal women. Advanced maternal age, overweight/obesity, family history of diabetes, and previous GDM were identified as significant predictors. Early screening and targeted interventions in high-risk women are warranted to reduce adverse outcomes.

Keywords: Gestational diabetes mellitus, antenatal women, BMI, pregnancy.

INTRODUCTION

Gestational diabetes mellitus (GDM) is defined as hyperglycaemia first recognized during pregnancy and not clearly overt diabetes outside pregnancy. The International Association of Diabetes and Pregnancy Study Groups (IADPSG) recommendations — based on the HAPO study — established widely used one-step diagnostic thresholds using a 75-g oral glucose tolerance test (OGTT) [1].

GDM is an important obstetric problem because it is associated with increased risks for the mother (pre-eclampsia, primary cesarean delivery, and future type 2 diabetes) and the offspring (macrosomia, neonatal hypoglycaemia and predisposition to later metabolic disease). Global and regional estimates indicate a substantial burden: the International Diabetes Federation and large reviews report population-level prevalences in many regions in the order of 10–15%, with variability according to population characteristics and diagnostic criteria [2,3].

Well-established maternal determinants of GDM include advanced maternal age and adiposity, while other factors such as a family history of diabetes and a prior history of GDM or macrosomia further increase risk. Meta-analytic and recent observational data consistently show a graded rise in GDM risk with increasing maternal age and body mass index (BMI) [4–6].

Regional data are critical for planning antenatal screening and prevention strategies because prevalence and the relative importance of risk factors vary by geography, ethnicity and health-system practices. In India, recent systematic syntheses report pooled national prevalence estimates of approximately 13% (range across studies), underscoring a substantial and regionally heterogeneous burden and the need for local epidemiological data to guide targeted screening [3].

The present study was undertaken to determine the prevalence of GDM and to evaluate maternal risk factors among antenatal clinic attendees in a tertiary-care setting, using the recommended 75-g OGTT and contemporary diagnostic thresholds.

MATERIAL AND METHODS

This hospital-based cross-sectional study was conducted at a tertiary care teaching hospital in India. The study included 300 antenatal women attending the outpatient antenatal clinic (ANC) during the study period.

Sample size determination: The sample size was calculated based on an assumed prevalence of GDM of 10% in the study region, with a 5% margin of error and 95% confidence interval, yielding a minimum sample of 270. To account for possible dropouts, a final sample of 300 participants was included.

Inclusion criteria

- Pregnant women aged 18–40 years
- Singleton pregnancy between 24–28 weeks of gestation
- Willingness to provide written informed consent

Exclusion criteria

- Pre-existing type 1 or type 2 diabetes mellitus
- Multiple pregnancy
- Chronic medical disorders such as renal, hepatic, or cardiac disease
- Women not willing to undergo blood glucose testing

Study procedure: Eligible participants were enrolled after obtaining informed written consent. A detailed obstetric and medical history was recorded, including age, parity, body mass index (BMI), family history of diabetes, and past obstetric complications. Physical examination findings and relevant clinical data were documented.

All participants underwent a 75 g oral glucose tolerance test (OGTT) between 24–28 weeks of gestation, as per the WHO criteria. Plasma glucose was measured at fasting, 1 hour, and 2 hours post-glucose load. GDM was diagnosed if any one of the following thresholds was met: fasting ≥ 92 mg/dL, 1-hour ≥ 180 mg/dL, or 2-hour ≥ 153 mg/dL.

Risk factor assessment: Potential risk factors such as maternal age, parity, BMI, history of GDM in previous pregnancy, history of macrosomia, family history of diabetes, and lifestyle habits were assessed through structured interviews and clinical records.

Statistical analysis: Data were entered into Microsoft Excel and analyzed using SPSS software (version 25.0). Descriptive statistics were used to summarize demographic and clinical data. Associations between GDM and risk factors were assessed using the chi-square test for categorical variables and independent t-test for continuous variables. Logistic regression was applied to identify independent predictors of GDM. A p-value < 0.05 was considered statistically significant.

RESULTS

A total of 300 antenatal women were included in the present study. The mean maternal age was 26.8 ± 4.2 years, with the majority belonging to the 20–30 years age group. More than half of the study participants were multigravida (54.0%), while 46.0% were primigravida. The mean gestational age at the time of screening was 25.6 ± 1.3 weeks. The mean BMI was 24.7 ± 3.6 kg/m². A positive family history of diabetes was observed in 24.7%, history of GDM in a previous pregnancy in 8.7%, and history of macrosomia in 6.3% of the participants (Table 1).

The prevalence of gestational diabetes mellitus (GDM) in this cohort was 14.0% (42/300), while the remaining 86.0% had normal glucose tolerance (Table 2).

On univariate analysis, several maternal risk factors were significantly associated with GDM. Women aged ≥ 30 years showed a significantly higher prevalence of GDM compared to younger women (50.0% vs. 20.9%, $p < 0.001$). Similarly, participants with BMI ≥ 25 kg/m² had a higher risk of GDM (64.3% vs. 27.9%, $p < 0.001$). A positive family history of diabetes was also more common among women with GDM (42.9% vs. 21.7%, $p = 0.004$). Previous history of GDM (23.8% vs. 6.2%, $p = 0.001$) and macrosomia (14.3% vs. 5.0%, $p = 0.048$) were also significantly associated with the development

of GDM. Multiparity was more frequent among women with GDM, though the difference did not reach statistical significance ($p = 0.082$) (Table 3).

On multivariate logistic regression analysis, advanced maternal age (≥ 30 years; AOR = 2.7, 95% CI: 1.3–5.5, $p = 0.006$), BMI ≥ 25 kg/m² (AOR = 3.4, 95% CI: 1.7–6.8, $p < 0.001$), family history of diabetes (AOR = 2.1, 95% CI: 1.0–4.3, $p = 0.038$), and previous history of GDM (AOR = 3.9, 95% CI: 1.5–10.1, $p = 0.004$) emerged as independent predictors of GDM (Table 4).

Table 1. Baseline demographic and clinical characteristics of study participants (n = 300)

Variable	Mean $\pm$ SD / n (%)
Age (years)	26.8 $\pm$ 4.2
Gestational age at screening (weeks)	25.6 $\pm$ 1.3
BMI (kg/m ²)	24.7 $\pm$ 3.6
Parity	
- Primigravida	138 (46.0)
- Multigravida	162 (54.0)
Family history of diabetes	74 (24.7)
History of GDM in previous pregnancy	26 (8.7)
History of macrosomia	19 (6.3)

Table 2. Prevalence of gestational diabetes among study participants

Diagnosis status	n (%)
GDM	42 (14.0)
Non-GDM	258 (86.0)

Table 3. Association of maternal risk factors with GDM (n = 300)

Risk factor	GDM (n=42)	Non-GDM (n=258)	p-value
Age ≥ 30 years	21 (50.0)	54 (20.9)	<0.001
BMI ≥ 25 kg/m ²	27 (64.3)	72 (27.9)	<0.001
Family history of diabetes	18 (42.9)	56 (21.7)	0.004
Previous GDM	10 (23.8)	16 (6.2)	0.001
History of macrosomia	6 (14.3)	13 (5.0)	0.048
Multiparity	28 (66.7)	134 (51.9)	0.082

Table 4. Logistic regression analysis of independent predictors of GDM

Variable	Adjusted OR (95% CI)	p-value
Age ≥ 30 years	2.7 (1.3–5.5)	0.006
BMI ≥ 25 kg/m ²	3.4 (1.7–6.8)	<0.001
Family history of diabetes	2.1 (1.0–4.3)	0.038
Previous GDM	3.9 (1.5–10.1)	0.004

DISCUSSION

In this hospital-based cross-sectional study of 300 antenatal women, the prevalence GDM was 14.0%, and advanced maternal age (≥ 30 years), BMI ≥ 25 kg/m², family history of diabetes, and a prior history of GDM emerged as independent predictors. These findings add to the growing body of evidence that maternal adiposity and age are major, potentially modifiable drivers of GDM, while personal and family glycemic history confer additional risk.

The observed prevalence (14%) lies within the range reported in contemporary hospital-based series and systematic syntheses but is influenced by the screening approach and diagnostic criteria applied. The debate about one-step versus two-step screening remains relevant because the one-step (IADPSG/WHO) approach generally yields higher GDM prevalence than the two-step strategy; however, large reviews and guideline appraisals have not demonstrated clear differences in most key clinical outcomes between the two strategies, creating variability in reported prevalence across settings. [7,8] Our study used the one-step 75-g OGTT and WHO/IADPSG thresholds, which likely aligns our prevalence with other one-step studies.

Consistent with prior research, elevated maternal BMI was strongly associated with GDM in our cohort and had the largest adjusted effect size. Obesity and overweight during early pregnancy are well established risk factors for GDM through mechanisms of increased insulin resistance and chronic low-grade inflammation; multiple observational studies and pooled analyses report progressively higher GDM risk with increasing BMI. [9,10] A recent large meta-analytic synthesis quantified a measurable increase in GDM risk per unit rise in pre-pregnancy BMI, underscoring the dose–response relationship between adiposity and gestational hyperglycaemia. [10]

Advanced maternal age was another independent predictor in our study. Several population-based and cohort studies have demonstrated an incremental increase in GDM risk with maternal age, attributable to age-related declines in insulin sensitivity and β -cell reserve. This pattern has been observed across diverse populations and remains a robust non-modifiable risk marker that can nevertheless inform targeted screening. [9]

A prior history of GDM markedly increased the odds of GDM in the current pregnancy in our sample. Recurrence rates reported in the literature vary but are generally high; narrative and systematic reviews indicate recurrence risks ranging from roughly one-third to over one-half, depending on population and interpregnancy changes in weight and glycaemic status. [11,12] This emphasizes the need for preconception counselling and early antenatal surveillance in women with previous GDM.

Family history of diabetes was independently associated with GDM in our study, aligning with genetic and familial predisposition documented in prior observational work. Familial clustering reflects both inherited susceptibility and shared environmental/lifestyle influences that increase insulin resistance and the likelihood of dysglycaemia during pregnancy. [9]

The clinical importance of identifying GDM relates to known maternal and neonatal consequences. GDM is strongly associated with fetal overgrowth and macrosomia, neonatal hypoglycaemia, and other perinatal complications; uncontrolled hyperglycaemia also increases the mother's long-term risk of type 2 diabetes. Recent observational studies reaffirm the relationship between GDM and higher neonatal birth weight and perinatal morbidity, which motivates timely detection and management. [13] Our findings therefore support implementation of risk-stratified screening and timely treatment to mitigate these downstream outcomes.

From a prevention and policy perspective, several lines of evidence suggest that lifestyle interventions during pregnancy—structured dietary counseling and physical activity—can reduce the incidence of GDM and adverse maternal-neonatal outcomes when implemented effectively, particularly in high-risk women. Randomized and pooled analyses indicate that combined diet and exercise interventions are associated with reduced GDM risk and lower gestational weight gain. [14,15] mHealth and supervised programmes have also shown promise for improving adherence and reducing GDM incidence in overweight and obese pregnant women. [16] These data highlight opportunities for antenatal services to incorporate preventive counselling and supported lifestyle programmes targeted at women with elevated BMI or other risk markers identified in early pregnancy.

Strengths of the present study include a clearly defined sampling frame in a tertiary care ANC population, use of the standard 75-g OGTT for diagnosis, and multivariable adjustment to identify independent predictors. However, several limitations merit consideration. The cross-sectional design precludes causal inference and temporal assessment of weight change or lifestyle factors prior to pregnancy. Being a single-centre, hospital-based study, the findings may not be fully generalizable to community or rural populations where demographic and health-service characteristics differ. We also relied on self-reported family and obstetric history, which may be subject to recall bias. Finally, we did not capture some potentially relevant exposures such as detailed dietary intake, physical activity quantification, or biomarkers of insulin resistance, which could further elucidate mechanisms.

CONCLUSION

The present study demonstrated that the prevalence of gestational diabetes among antenatal clinic attendees was 14%, indicating a considerable burden in this population. Advanced maternal age, higher body mass index, family history of diabetes, and a previous history of GDM were found to be significant independent predictors. These findings highlight the importance of early screening and risk factor assessment in antenatal women, particularly those with identifiable risk profiles, to ensure timely diagnosis and intervention. Strengthening preventive strategies and promoting lifestyle modifications may help reduce the incidence and associated complications of GDM.

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