Frequency of Undiagnosed Gestational Diabetes Mellitus and its association with Maternal age and Parity

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Abstract

Background: Gestational diabetes mellitus (GDM) is a common metabolic disorder during pregnancy that poses significant risks to both mother and fetus if left undiagnosed. Despite known risk factors, routine screening practices remain inconsistent in many healthcare settings, particularly in low-resource areas.

Objective: To determine the frequency of undiagnosed gestational diabetes mellitus among pregnant women consulting for antenatal care and to assess its association with maternal age and parity.

Methodology: This cross-sectional study was conducted at the Gynecology & Obstetrics Outpatient Department of Sheikh Zayed Medical College/Hospital, Rahim Yar Khan, from June to December 2024. A total of 196 pregnant women between 24 and 28 weeks of gestation, with no prior diagnosis of diabetes, were enrolled using a consecutive non-probability sampling technique. GDM was diagnosed using the 75g oral glucose tolerance test (OGTT) and International Association of the Diabetes and Pregnancy Study Groups (IADPSG) criteria. Data on maternal age, parity, and BMI were collected and analyzed using SPSS Verson 23. Chi-square tests and logistic regression were performed to determine associations, with $p < 0.05$ considered statistically significant.

Results: The frequency of undiagnosed GDM was 29 (14.8%). Maternal age >30 years ($p = 0.016$; aOR = 2.0) and BMI ≥25 kg/m² ($p = 0.031$; aOR = 1.9) were significantly associated with GDM. Parity showed no statistically significant association ($p = 0.140$).

Conclusion: Undiagnosed GDM is prevalent among pregnant women, with advanced maternal age and elevated BMI identified as significant independent risk factors. Targeted screening of high-risk groups is essential for early diagnosis and prevention of complications.

Keywords: Body mass index, Gestational diabetes mellitus, Maternal age, OGTT, Parity, Screening

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Introduction

Gestational diabetes mellitus (GDM) is defined as glucose intolerance of variable severity with onset or first recognition during pregnancy, typically identified in the second or third trimester in women without previously diagnosed diabetes mellitus.[1] Globally, the prevalence of GDM is rising, affecting approximately 14-18% of pregnancies, with variation based on diagnostic criteria and population characteristics.[2,3] The increase in maternal age, obesity rates, and sedentary lifestyles contributes significantly to this trend, posing a substantial public health burden, especially in low- and middle-income countries.[4]

Undiagnosed or poorly controlled GDM can result in serious maternal and fetal complications. For mothers, GDM increases the risk of hypertensive disorders of pregnancy, cesarean delivery, and future type 2 diabetes mellitus (T2DM).[5] For the fetus, it can lead to macrosomia, shoulder dystocia, birth trauma, neonatal hypoglycemia, respiratory distress syndrome, and even perinatal mortality.[6] Moreover, children born to mothers with GDM face long-term risks such as childhood obesity, insulin resistance, and early-onset T2DM.[7]

Several risk factors have been identified for the development of GDM, including advanced maternal age and high parity. Maternal age above 30 or 35 years has consistently been associated with an increased risk of GDM due to age-related decline in insulin sensitivity and pancreatic beta-cell function.[8] Similarly, multiparity has also been implicated as a contributor, potentially due to cumulative metabolic stress and weight gain associated with multiple pregnancies.[9] A study found significantly higher GDM prevalence among multigravida women compared to primigravida, emphasizing the importance of

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stratified screening in these subgroups.[10]

Despite the known risks, routine screening for GDM remains inconsistent in many healthcare settings, particularly in resource-limited regions where universal screening is not yet implemented. In some cases, pregnant women are only screened if deemed high-risk based on age, BMI, or family history, resulting in missed diagnoses in asymptomatic individuals.[11] Early identification and management of GDM can significantly reduce adverse outcomes; hence, there is a critical need to strengthen antenatal screening protocols.

This study aims to determine the frequency of undiagnosed gestational diabetes mellitus among pregnant women presenting for routine antenatal care and to explore its association with different factors and identifying high-risk demographic subgroups can guide targeted screening strategies, especially in resource-constrained settings, and improve maternal and neonatal outcomes. The objective of this study was to determine the frequency of undiagnosed gestational diabetes mellitus among pregnant women and its association with maternal age and parity.

Methodology

This was a cross-sectional study conducted at the Gynecology & Obstetrics Outpatient Department of Sheikh Zayed Medical College/Hospital, Rahim Yar Khan, over a period of six months from June to December 2024. The aim was to determine the frequency of undiagnosed gestational diabetes mellitus (GDM) and assess its association with maternal age and parity. The sample size calculated considering a 95% confidence level, 5% margin of error, and 15% estimated prevalence of undiagnosed GDM[9] was 196.

A non-probability consecutive sampling technique was used to enroll all eligible participants who met the inclusion criteria during the study period. The inclusion criteria consisted of pregnant women between 24 and 28 weeks of gestation attending antenatal care at the hospital, with no previous diagnosis of GDM or diabetes mellitus. Women with known diabetes, multiple pregnancies, or those classified as high-risk pregnancies (such as preeclampsia, chronic hypertension, or renal disease) were excluded from the study.

The diagnosis of gestational diabetes mellitus was based on a standard 75-gram oral glucose tolerance test (OGTT) following the criteria set by the International Association of Diabetes and Pregnancy Study Groups (IADPSG).

A diagnosis was made if one or more of the following plasma glucose values were met or exceeded: fasting ≥92 mg/dL, 1-hour ≥180 mg/dL, or 2-hour ≥153 mg/dL. Data collection was conducted using a structured proforma that included demographic details (age, parity, body mass index), clinical history, and OGTT results. Each participant underwent the test during her 24-28 weeks of gestation window under standardized conditions.

The study was conducted after obtaining ethical approval from the Institutional Review Board (Ref. No. 104/IRB/SZMC/H, Dated: 12-09-2020) of Sheikh Zayed Medical College/Hospital, Rahim Yar Khan. Informed written consent was obtained from all participants before inclusion, ensuring confidentiality and the right to withdraw at any stage without consequences.

For statistical analysis, data were entered and analyzed using SPSS software (version 23.0). Descriptive statistics were calculated to determine the frequency and percentage of undiagnosed GDM. To assess the association between undiagnosed GDM and maternal age and parity, Chi-square tests were applied for categorical variables. Logistic regression analysis was performed for potential predictors as well. A p-value <0.05 was considered statistically significant.

Results

A total of 196 pregnant women between 24-28 weeks of gestation were enrolled in the study. Table-I outlines the baseline features of pregnant women enrolled in the study. The majority 108 (55.1%) were aged 26-30 years, followed by those ≤25 years 54 (27.6%) and >30 years 34 (17.3%). Nearly half 86 (43.9%) were multiparous, while 110 (56.1%) were primiparous.

Body Mass Index (BMI) distribution revealed that 58 (29.6%) were overweight or obese (BMI ≥25 kg/m²), compared to 126 (64.3%) with normal BMI (18.5-24.9 kg/m²) and 12 (6.1%) underweight (BMI <18.5 kg/m²). A family history of diabetes was reported in 45 (23%) of participants.

Table I: Demographic and clinical characteristics of participants (n=196)

Variable	Frequency (%)
Maternal Age (years)	
≤25	54 (27.6%)
26–30	108 (55.1%)
>30	34 (17.3%)
Parity	
Primiparous	110 (56.1%)
Multiparous	86 (43.9%)
BMI Category	
<18.5 kg/m²	12 (6.1%)
18.5–24.9 kg/m²	126 (64.3%)
≥25 kg/m²	58 (29.6%)
Family History of Diabetes	
Yes	45 (23%)
No	151 (77%)

Table-II shows frequency of undiagnosed GDM and the association between undiagnosed GDM and maternal age, parity, and BMI. Of the 196 participants, 29 (14.8%) were diagnosed with GDM based on IADPSG criteria. Women aged >30 years had a significantly higher prevalence of GDM 14 (23.7%) compared to those ≤30 years 15 (10.9%) (*p=0.016*). Multiparous women showed a slightly higher GDM rate 14 (16.2%) than primiparous women 15 (13.6%) though this difference was not statistically significant (*p=0.140*). Overweight/obese participants (BMI ≥25 kg/m²) had a 16 (27.6%) GDM frequency versus 13 (9.4%) in normal-weight individuals (*p = 0.031*). These findings indicate that advanced maternal age and elevated BMI are critical risk factors for undiagnosed GDM, while parity does not independently predict GDM.

Table II: Frequency of undiagnosed GDM by maternal age, parity and BMI

Variable	Gestational Diabetes Mellitus		p-value
	Yes	No	
Maternal Age			
≤30 years	15 (10.9%)	122 (89.1%)	0.016
>30 years	14 (23.7%)	45 (76.3%)	
Parity			
Primiparous	15 (13.6%)	95 (86.4%)	0.14
Multiparous	14 (16.2%)	72 (83.8%)	
BMI Category			
<25 kg/m²	13 (9.4%)	125 (90.6%)	0.031
≥25 kg/m²	16 (27.6%)	42 (72.4%)	

Table-III shows the analysis, which identified maternal age >30 years as a significant independent predictor of undiagnosed GDM (adjusted OR = 2.0; 95% CI: 1.1-3.6; p =0.021). Similarly, BMI ≥25 kg/m² showed a significant association (aOR=1.9; 95% CI: 1.0-3.4; p=0.043). In contrast, family history of diabetes did not reach statistical significance after adjusting for confounders (aOR = 1.4; 95% CI: 0.7-2.8; p=0.330). These results confirm that women over 30 years and those with elevated BMI are disproportionately affected by undiagnosed GDM.

Table III: Independent predictors of undiagnosed GDM (logistic regression analysis)

Variable	Adjusted OR (95% CI)	P-value
Maternal Age >30 years	2.0 (1.1–3.6)	0.021
BMI =25 kg/m²	1.9 (1.0–3.4)	0.043
Family History of Diabetes	1.4 (0.7–2.8)	0.33

Discussion

This study aimed to determine the frequency of undiagnosed gestational diabetes mellitus (GDM) and its association with maternal age, parity, and body mass index (BMI) among pregnant women in their second trimester. Among the 196 participants, the overall prevalence of undiagnosed GDM was found to be 29 (14.8%), aligning closely with previous findings from similar population-based studies where prevalence ranges between 13% and 18% depending on the diagnostic criteria and population characteristics.[12.13]

A key finding of this study was the significant association between advanced maternal age (>30 years) and the risk of undiagnosed GDM. Women in this age group exhibited a GDM prevalence of 23.7%, which was statistically significant (p=0.016), and multivariable analysis confirmed maternal age >30 as an independent predictor (aOR = 2.0). These results are consistent with existing evidence indicating that advancing age contributes to increased insulin resistance and reduced β-cell compensatory capacity during pregnancy, elevating the risk of GDM.[14,15]

Elevated BMI also emerged as a significant risk factor, with overweight or obese women (BMI ≥25 kg/m²) showing a GDM prevalence of 27.6%, significantly higher than their normal-weight counterparts (p=0.031). Multivariate analysis confirmed this relationship (aOR=1.9), reinforcing

the metabolic link between adiposity and impaired glucose tolerance in pregnancy. Several contemporary studies support these findings, noting the pro-inflammatory and insulin-resistant state induced by excess adipose tissue in early pregnancy as a key mechanism for GDM development.[16,17]

Contrary to expectations, parity did not show a statistically significant association with undiagnosed GDM in this study (p=0.140), even though a marginally higher prevalence was observed in multiparous women. This is consistent with findings from large-scale studies that suggest the relationship between parity and GDM may be confounded by age and weight, rather than parity itself being a direct risk factor.[18,19] Similarly, family history of diabetes, while biologically plausible as a risk factor, did not remain significant after adjusting for age and BMI in our multivariate model. This aligns with studies suggesting that while genetic predisposition may play a role, its effect is often outweighed by modifiable risk factors like BMI and lifestyle.[20,21] A major strength of this study lies in its use of standardized IADPSG criteria for GDM diagnosis and inclusion of a uniform gestational window (24-28 weeks), enhancing internal validity. Additionally, the use of multivariable analysis allowed for adjustment of confounding variables, strengthening the credibility of observed associations. However, this study has certain limitations. The use of consecutive non-probability sampling may limit generalizability to the broader population, especially in rural or underserved areas. The cross-sectional design also restricts causal inferences. Moreover, dietary intake, physical activity levels, and socioeconomic status that are potential contributors to GDM were not assessed.

Conclusion

The study demonstrates a high prevalence of undiagnosed GDM among pregnant women, with advanced maternal age (>30 years) and elevated BMI (≥25 kg/m²) being significant independent risk factors. These findings underscore the need for targeted screening strategies and early lifestyle interventions in high-risk groups to prevent adverse maternal and fetal outcomes.

Author's Contribution: SS: Conception of work, Acquisition and Analysis of data and Drafting. **NN:** Acquisition and Analysis of data, Interpretation of data and revising. **NZ:** Design of work, Acquisition and Analysis of data and revising.

All authors critically revised and approve its final version.

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