

Prevalence and Clinical Characteristics of Gestational Diabetes Mellitus among Pregnant Women at 24–28 Weeks of Gestation at Vung Tau Hospital, Vietnam, In 2026

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Abstract: Objective: To determine the prevalence and describe the clinical characteristics of gestational diabetes mellitus (GDM) among pregnant women at 24–28 weeks of gestation attending antenatal care at Vung Tau Hospital, Vietnam, in 2026. Materials and Methods: A descriptive cross-sectional study was conducted among 324 pregnant women at 24–28 weeks of gestation who attended antenatal care at Vung Tau Hospital, Vietnam, between April and June 2026. Participants were selected using systematic random sampling. GDM was diagnosed using a 75-g oral glucose tolerance test (OGTT) according to the 2013 diagnostic criteria of the World Health Organization (WHO) and the International Association of Diabetes and Pregnancy Study Groups (IADPSG). Results: Among the 324 pregnant women included in the study, the prevalence of GDM was 24.4%. Women aged 18–34 years accounted for 75.9% of the study population, 53.4% had an educational level above high school, and 59.6% were employed in occupations other than government or public-sector employment. The proportions of women with a history of GDM, previous delivery of a macrosomic infant (birth weight $\geq 4,000$ g), and a family history of diabetes mellitus were 18.2%, 7.1%, and 11.1%, respectively. Conclusion: The findings provide evidence on the current prevalence of GDM and the clinical characteristics of affected pregnant women. These results may contribute to improving screening strategies, facilitating early diagnosis, and optimizing the management of GDM during antenatal care.

Keywords: Gestational diabetes mellitus; pregnant women; oral glucose tolerance test; prevalence; clinical characteristics.

INTRODUCTION

Gestational diabetes mellitus (GDM) is defined as glucose intolerance first recognized during pregnancy and is one of the most common endocrine disorders affecting pregnant women. The pathophysiology of GDM is primarily characterized by progressive insulin resistance during pregnancy accompanied by an inadequate compensatory increase in pancreatic β -cell insulin secretion, resulting in maternal hyperglycemia. If not diagnosed and appropriately managed, GDM is associated with a broad spectrum of adverse maternal and fetal outcomes, including preeclampsia, polyhydramnios, fetal macrosomia, an increased rate of cesarean delivery, neonatal hypoglycemia, and an elevated long-term risk of developing type 2 diabetes mellitus in mothers after pregnancy [López Stewart, G. 2014; Diabetes Care, 2024].

The prevalence of GDM has increased substantially worldwide, particularly following the widespread adoption of the diagnostic criteria proposed by the International Association of Diabetes and Pregnancy Study Groups (IADPSG) and endorsed by the World Health Organization (WHO). Previous studies have demonstrated that replacing the former American Diabetes Association (ADA) diagnostic criteria with the

IADPSG/WHO criteria may increase the reported prevalence of GDM by three- to four-fold within the same study population [Nguyen, T. M. H. *et al.*, 2023]. The average prevalence of GDM has been reported to be approximately 11.5% in Southeast Asia and the Western Pacific region and may reach 25% among women at high risk. Likewise, studies conducted in several Asian countries have reported prevalence rates ranging from 20% to 25%, reflecting the combined effects of rapid urbanization, lifestyle changes, increasing rates of overweight and obesity, and genetic susceptibility [Nguyen, T. M. H. *et al.*, 2023; Duncan, B. B. *et al.*, 2026].

In Vietnam, the prevalence of GDM has also increased considerably in recent years. Studies conducted between 2020 and 2025 reported prevalence rates ranging from 20.4% to 29.3% across several obstetric hospitals, including Hue Central Hospital (20.4%), Hanoi Obstetrics and Gynecology Hospital (29.17%), Tien Giang Obstetrics and Gynecology Hospital (29.3%), and Phuong Chau International Hospital (25.8%) [Nguyen, T. M. H. *et al.*, 2023; Tran, T. S. *et al.*, 2023; Mai, T. H. *et al.*, 2024]. The variation in prevalence among studies may be attributable to differences in diagnostic criteria, study

populations, and regional characteristics. Furthermore, Vietnamese women commonly exhibit a "lean-fat" phenotype, characterized by relatively high visceral adiposity despite having a normal body mass index (BMI), which contributes to increased insulin resistance and a higher risk of developing GDM [Tran, T. S. *et al.*, 2023].

Vung Tau Hospital is a major healthcare facility providing antenatal care and pregnancy management for a large number of pregnant women in Ba Ria–Vung Tau Province. However, updated data regarding the prevalence and clinical characteristics of GDM in this population remain unavailable. Determining the prevalence and clinical characteristics of GDM among pregnant women attending this hospital would provide valuable evidence to support the implementation of effective screening programs, facilitate early diagnosis, and improve the clinical management of GDM at the local level. Therefore, this study was conducted to determine the prevalence and describe the clinical characteristics of gestational diabetes mellitus among pregnant women at 24–28 weeks of gestation attending antenatal care at Vung Tau Hospital, Vietnam, in 2026.

ĐỐI TƯỢNG VÀ PHƯƠNG PHÁP NGHIÊN CỨU AND MATERIALS AND METHODS

Study Population

The study population comprised pregnant women at 24–28 weeks of gestation who attended antenatal care at Vung Tau Hospital, Vietnam, between April and June 2026.

Inclusion Criteria

Participants were eligible for inclusion if they met all of the following criteria:

- Pregnant women at 24–28 weeks of gestation;
- Attended antenatal care at Vung Tau Hospital;
- Provided written informed consent to participate in the study;
- Underwent a 75-g oral glucose tolerance test (OGTT);
- Completed the study questionnaire and provided all required information; and
- Were enrolled in the study only once.

Exclusion Criteria

Participants were excluded if they met any of the following criteria:

- Vaginal bleeding or conditions associated with a high risk of vaginal bleeding, including threatened preterm labor, threatened miscarriage, placenta previa, or premature rupture of membranes;

- A history of psychiatric disorders that could interfere with study participation;
- Pre-existing diabetes mellitus diagnosed before pregnancy;
- Medical conditions known to affect glucose metabolism, including Graves' disease, hypothyroidism, Cushing's syndrome, hepatic insufficiency, or renal insufficiency;
- Current use of medications affecting glucose metabolism, such as corticosteroids, salbutamol, or antihypertensive agents;
- Acute illnesses, including systemic infections, pulmonary tuberculosis, viral hepatitis, or other severe acute diseases;
- Failure to complete the 75-g OGTT or Declined to participate in the study.

Study Design: This study employed a descriptive cross-sectional design.

SAMPLE SIZE AND SAMPLING METHOD

Sample Size

The sample size was calculated using the formula for estimating a single population proportion:

$$n = \frac{Z_{1-\alpha/2}^2 \times p(1-p)}{d^2}$$

where:

$Z_{1-\alpha/2} = 1.96$, corresponding to a 95% confidence level;

$p = 0.258$, based on the prevalence of gestational diabetes mellitus reported by Nguyen Thi Lan Phuong *et al.* in a 2023 study conducted in Dong Nai Province [Nguyen, T. L. P. *et al.*, 2023].

$d = 0.05$, the desired margin of error.

The minimum required sample size was 294 participants. To account for an anticipated 10% non-response or incomplete data rate, the final sample size was increased to 324 pregnant women.

Sampling Method

A systematic random sampling technique was employed.

Pregnant women attending the Department of Obstetrics and Gynecology at Vung Tau Hospital for routine antenatal care who met the eligibility criteria were invited to participate after receiving information about the study and providing informed consent.

According to hospital statistics, approximately 3,600 pregnant women at 24–28 weeks of gestation undergo GDM screening annually. During the three-month study period (April 1 to

June 30, 2026), the estimated source population was:

Thus, the estimated study population consisted of 900 eligible women, while the required sample size was 324 participants.

The sampling interval was calculated as:

$$k = \frac{N}{n} = \frac{900}{324} \approx 2.8$$

and was rounded to 3.

A random starting number between 1 and 3 was selected by lottery. The initial participant corresponded to number 2, after which every third eligible woman was consecutively recruited (i.e., participant numbers 2, 5, 8, 11, 14,...) until the target sample size of 324 participants was achieved.

The use of systematic random sampling helped ensure the randomness and representativeness of the study sample.

Data Collection

All participants completed a standardized questionnaire designed to collect information on sociodemographic characteristics, obstetric history, and risk factors for gestational diabetes mellitus (GDM). Each participant underwent a 75-g oral glucose tolerance test (OGTT) between 24 and 28 weeks of gestation, in accordance with the diagnostic recommendations of the World Health Organization (WHO, 2013) and the International Association of Diabetes and Pregnancy Study Groups (IADPSG) [López Stewart, G. 2014; Metzger, B. E. et al., 2010].

Before undergoing the OGTT, participants were instructed to maintain their usual diet for at least three days prior to testing, fast for 8–12 hours overnight, and avoid strenuous physical activity before the test. Venous blood samples were collected at three time points: after an overnight fast (fasting), 1 hour, and 2 hours after ingestion of 75 g of anhydrous glucose. Plasma glucose concentrations were measured using an automated clinical chemistry analyzer in the hospital's certified clinical laboratory.

Gestational diabetes mellitus was diagnosed when one or more of the following plasma glucose values met or exceeded the WHO/IADPSG diagnostic thresholds: fasting plasma glucose ≥ 5.1 mmol/L, 1-hour plasma glucose ≥ 10.0 mmol/L, or 2-hour plasma glucose ≥ 8.5 mmol/L [López Stewart, G. 2014; Metzger, B. E. et al., 2010].

Study Procedure

Eligible pregnant women received detailed information regarding the study objectives and procedures before providing written informed consent. Baseline demographic and clinical data were collected using the standardized questionnaire. Participants subsequently underwent the 75-g OGTT according to the standardized protocol. Laboratory results and clinical information were recorded on standardized case report forms. Upon completion of data collection, all data were reviewed for completeness and accuracy, coded, entered into the study database, and subjected to statistical analysis.

Statistical Analysis

Data were entered using EpiData version 3.1 and analyzed with IBM SPSS Statistics version 27.0. Quantitative results were rounded to two decimal places when presented in tables and figures.

Categorical variables were summarized as frequencies (n) and percentages (%).

Continuous variables with a normal distribution were expressed as mean $\pm$ standard deviation (SD), whereas non-normally distributed variables were presented as the median and interquartile range (IQR).

The prevalence of gestational diabetes mellitus was calculated using the following formula:

Prevalence of GDM (%)

$$= \frac{\text{Number of pregnant women diagnosed with GDM}}{\text{Total number of pregnant women included in the study}} \times 100$$

Ethical Considerations

The study protocol was reviewed and approved by the Institutional Review Board (IRB)/Biomedical Research Ethics Committee of Vung Tau Hospital, Ho Chi Minh City, Vietnam, prior to participant recruitment.

The study was conducted in accordance with the ethical principles governing biomedical research involving human participants. Participants' rights, safety, privacy, and confidentiality were strictly protected throughout the study.

All study procedures were performed in accordance with the approved research protocol. Any protocol amendments were required to be submitted to and approved by the Ethics Committee before implementation. The principal investigator was responsible for overseeing the conduct of the study and ensuring compliance with all applicable ethical and regulatory requirements.

RESULTS

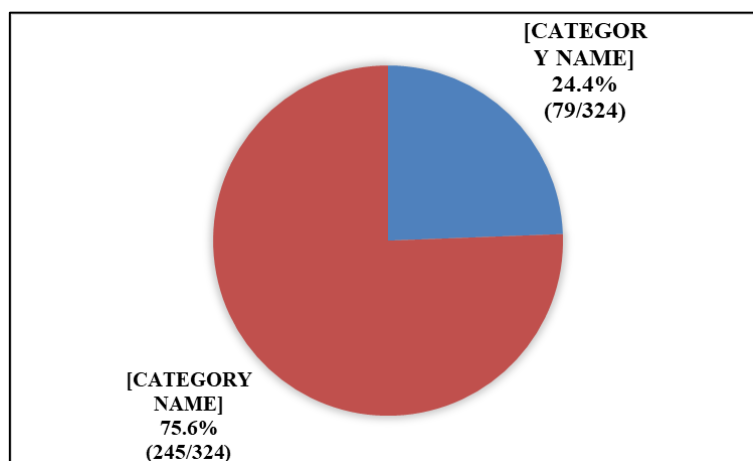


Figure 1: Prevalence of Gestational Diabetes Mellitus among Pregnant Women.

Screening using the 75-g oral glucose tolerance test (OGTT) at 24–28 weeks of gestation showed that the prevalence of gestational diabetes mellitus

(GDM) was 24.4%, whereas 75.6% of the participants did not meet the diagnostic criteria for GDM.

Table 1. Sociodemographic Characteristics of the Study Participants

Variable	n (%)
Age group (years)	
18–34	246 (75.9)
35–49	78 (24.1)
Occupation	
Government/public-sector employee	131 (40.4)
Other occupations	193 (59.6)
Educational level	
≤ High school	151 (46.6)
> High school	173 (53.4)

Abbreviations: n, number of participants.

Among the 324 pregnant women included in the study, 75.9% were aged 18–34 years, which was approximately 3.3 times the proportion of women aged 35–49 years (24.1%). Regarding educational attainment, 53.4% of participants had completed education beyond high school, while 46.6% had a

high school education or lower. With respect to occupation, women employed in occupations other than government or public-sector employment accounted for 59.6% of the study population, compared with 40.4% who were government or public-sector employees.

Table 2. Obstetric History of Pregnant Women at 24–28 Weeks of Gestation

Variable	n (%)
History of stillbirth	
Yes	20 (6.2)
No	304 (93.8)
History of miscarriage	
Yes	24 (7.4)
No	300 (92.6)
Previous delivery of an infant weighing $\geq 4,000$ g	
Yes	23 (7.1)
No	301 (92.9)
History of gestational diabetes mellitus	
Yes	59 (18.2)
No	265 (81.8)
Family history of diabetes mellitus	

Yes	36 (11.1)
No	288 (88.9)
History of hypertension	
Yes	11 (3.4)
No	313 (96.6)

Abbreviations: *n*, number of participants.

Regarding obstetric and medical history, 18.2% of participants reported a previous history of gestational diabetes mellitus, while 11.1% had a family history of diabetes mellitus. Histories of miscarriage, stillbirth, and previous delivery of an

infant weighing $\geq 4,000$ g were reported by 7.4%, 6.2%, and 7.1% of participants, respectively. A history of chronic hypertension was reported in 3.4% of the study population.

Table 3. Clinical Risk Factors Among Pregnant Women at 24–28 Weeks of Gestation

Variable	n (%) or Median (IQR)
Polycystic ovary syndrome (PCOS)	
Yes	31 (9.6)
No	293 (90.4)
Physical activity	
Regular	206 (63.6)
Irregular	118 (36.4)
Consumption of sugary foods/drinks	
≥ 3 times/week	43 (13.3)
< 3 times/week	281 (86.7)
Frequent insomnia	
Yes	126 (38.9)
No	198 (61.1)
Frequent use of smartphones/computers	
Yes	305 (94.1)
No	19 (5.9)
Gestational hypertension	
Yes	32 (9.9)
No	292 (90.1)
Height (cm)	158.0 (7.0)
Weight (kg)	55.0 (10.0)
Pre-pregnancy BMI category	
Underweight	31 (9.6)
Normal weight	239 (73.8)
Overweight/Obesity	54 (16.7)

Abbreviations: *BMI*, body mass index; *IQR*, interquartile range; *PCOS*, polycystic ovary syndrome; *n*, number of participants.

Regarding clinical risk factors and lifestyle characteristics, 9.6% of participants had a history of polycystic ovary syndrome (PCOS), while 9.9% had gestational hypertension. Lifestyle assessment showed that 94.1% of participants reported frequent use of smartphones or computers, 38.9% experienced frequent insomnia, 13.3% consumed sugary foods or beverages at least three times per week, and 63.6% engaged in regular physical activity.

The distribution of pre-pregnancy BMI indicated that 16.7% of participants were overweight or

obese, whereas 73.8% had a normal BMI and 9.6% were underweight. The median height and weight of the study population were 158.0 cm (IQR, 7.0) and 55.0 kg (IQR, 10.0), respectively.

DISCUSSION

In the present study, the prevalence of gestational diabetes mellitus (GDM) among pregnant women at 24–28 weeks of gestation was 24.4%, indicating that nearly one in four participants met the diagnostic criteria established by the World Health Organization (WHO, 2013) and the International Association of Diabetes and Pregnancy Study

Groups (IADPSG). This finding highlights the growing burden of GDM in the local population and is consistent with the global upward trend in hyperglycemia during pregnancy, particularly in Asian countries and the Southeast Asian region [López Stewart, G. 2014; López Stewart, G. 2014; Wang, H. et al., 2022].

Compared with previous studies conducted in Vietnam, the prevalence observed in the present study is comparable to that reported by Nguyen Thi Lan Phuong et al. in Long Khanh (25.8%) [Nguyen, T. L. P. et al., 2023], Hua Thanh Nhan and Ngo Van Truyen in Can Tho (25.8%) [Hua, T. N. et al., 2023], and Hoang Thi Lan Huong et al. at Hue Central Hospital (20.4%) [Hoang, T. L. H. et al., 2023]. Similar prevalence rates have also been reported at Tien Giang Obstetrics and Gynecology Hospital (29.3%) [Le, N. B. et al., 2021] and Dong Nai General Hospital (29.5%) [Le, X. M. P. et al., 2026]. In contrast, our estimated prevalence was substantially higher than those reported by Thach S. Tran et al. in Ho Chi Minh City (6.1%) [Tran, T. S. et al., 2023] and Bui Chung Thuy et al. at Da Nang Hospital for Women and Children (15.8%) [Meharry, P. M. et al., 2019].

Internationally, the prevalence of GDM in our study is comparable to that reported in China and India, where rates generally range from 20% to 25% [Gao, C. et al., 2019; Liu, Q. et al., 2023], but exceeds those reported in many European and North American countries, where the prevalence is typically below 12% [Luo, R. et al., 2024]. These differences are likely attributable, at least in part, to variations in diagnostic criteria. Our study adopted the WHO 2013/IADPSG criteria using a 75-g oral glucose tolerance test (OGTT), under which GDM is diagnosed when at least one plasma glucose value meets or exceeds the diagnostic threshold. In contrast, many studies conducted in Western countries continue to use the traditional two-step screening approach based on the Carpenter–Coustan or National Diabetes Data Group (NDDG) criteria, which generally identify fewer cases of GDM [López Stewart, G. 2014; López Stewart, G. 2014].

The relatively high prevalence of GDM observed in this study may be explained by several factors. First, the implementation of the WHO 2013/IADPSG diagnostic criteria has been shown to improve the detection of mild abnormalities in glucose metabolism compared with earlier diagnostic criteria [Kim, C. 2010]. Second, a

considerable proportion of participants in our study were aged 35 years or older, had a history of GDM, or were overweight or obese before pregnancy, all of which are well-established risk factors for GDM [Mittal, R. et al., 2025]. In addition, rapid urbanization, changes in dietary patterns, and reduced levels of physical activity may further contribute to increasing insulin resistance and the subsequent development of GDM.

The findings of this study indicate that GDM represents an important public health concern in the local setting. Routine universal screening using the 75-g OGTT at 24–28 weeks of gestation should therefore be maintained to facilitate early detection, timely intervention, and appropriate management of GDM, thereby reducing adverse maternal and neonatal outcomes.

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