



Original Article



Prevalence of Gestational Diabetes Mellitus among Pregnant Females

Khalida Anwar¹, Asia Hussain², Abeerah Zafar³, Sehrish Muzafar³, Rabia Shaukat⁴, Hafsa Yasin⁵, Tayyaba Yasin^{6,7*} and Nida Yousaf⁸¹Department of Biochemistry, Rahim Yar Khan Medical and Dental College, Rahim Yar Khan, Pakistan²Department of Biochemistry, Sheikh Zayed Medical College, Rahim Yar Khan, Pakistan³Department of Gynaecology and Obstetrics, Sahiwal Teaching Hospital, Sahiwal, Pakistan⁴Department of Pharmacology, Sahiwal Medical College, Sahiwal, Pakistan⁵Department of Physical Therapy, The University of Lahore, Lahore, Pakistan⁶Department of Precision Medicine, University of Campania "Luigi Vanvitelli", Naples, Italy⁷Institute of Molecular Biology and Biotechnology, The University of Lahore, Lahore, Pakistan⁸Department of Medical Imaging, The University of Lahore, Lahore, Pakistan

ARTICLE INFO

Keywords:

Gestational Diabetes Mellitus, Risk Factors, Type 2 Diabetes, Oral Glucose Tolerance Test

How to Cite:Anwar, K., Hussain, A., Zafar, A., Muzafar, S., Shaukat, R., Yasin, H., Yasin, T., & Yousaf, N. (2026). Prevalence of Gestational Diabetes Mellitus among Pregnant Females: Prevalence of Gestational Diabetes Mellitus: Pregnant Females. *Pakistan Journal of Health Sciences*, 7(3), 87-92. <https://doi.org/10.54393/3/pjhs.v7i3.3432>***Corresponding Author:**

Tayyaba Yasin

Department of Precision Medicine, University of Campania "Luigi Vanvitelli", Naples, Italy
tayyabayasin@gmail.comReceived Date: 14th August, 2025Revised Date: 26th January, 2026Acceptance Date: 29th January, 2026Published Date: 31st March, 2026

ABSTRACT

Gestational diabetes mellitus (GDM) is a prevalent pregnancy complication marked by glucose intolerance, which poses significant risks to both maternal and fetal health, including preeclampsia, cesarean delivery, macrosomia, and an increased susceptibility to type 2 diabetes later in life. **Objectives:** To determine the frequency and prevalence of GDM in pregnant women. **Methods:** A descriptive cross-sectional study was conducted with 160 pregnant women aged 18–45 years at the University of Lahore Teaching Hospital. Data were collected using a structured questionnaire and clinical measurements, including a 50-gram oral glucose challenge test (GCT), followed by a 100-gram oral glucose tolerance test (OGTT) for those with positive GCT results. **Results:** The mean age of participants was 27.08 ± 4.35 years, with a majority being well-educated (57.9% graduates, 35.2% with master's degrees, and 1.3% with an MBBS). Most women were housewives (50.3%), followed by office workers (27%) and teachers (20.1%). The mean BMI was 31.70 ± 6.18 , indicating a high prevalence of overweight/obesity. Despite recognizing the seriousness of GDM and the importance of a healthy lifestyle, 27% of participants did not exercise regularly, and 23.8% met the criteria for GDM. **Conclusions:** The study revealed a high prevalence of GDM, primarily driven by overweight/obesity and physical inactivity.

INTRODUCTION

Diabetes mellitus refers to a group of metabolic disorders characterized by persistent hyperglycemia resulting from defects in insulin production, secretion, or action. Insulin, a hormone secreted by the pancreas, plays a critical role in regulating blood glucose levels by facilitating the transport of glucose into cells for energy or storage [1, 2]. When insulin fails or is insufficient, blood glucose levels rise, leading to both acute and chronic complications such as retinopathy, nephropathy, neuropathy, and cardiovascular

diseases, significantly affecting quality of life and increasing mortality risks [3, 4]. Diabetes is categorized into Type 1 Diabetes (T1DM), Type 2 Diabetes (T2DM), gestational diabetes mellitus (GDM), and other special types [5]. Gestational diabetes develops during pregnancy, when the body is unable to produce sufficient insulin to meet the demands of pregnancy. The incidence of GDM is increasing globally due to various factors, including lifestyle, genetics, and sociodemographic influences [6].



Women who are overweight, older, or belong to certain ethnic groups, such as South Asians, Hispanics, and African Americans, are at higher risk. Additionally, a personal history of diabetes further increases the likelihood of developing GDM, indicating a strong genetic predisposition [7]. In Pakistan, the prevalence of GDM is alarmingly high, with several studies indicating that the condition affects a significant portion of the pregnant population. For example, a study conducted in Karachi found that approximately 9-15% of pregnant women were diagnosed with GDM [8], while another study in Lahore highlighted a prevalence of 10.7% among pregnant women. This high prevalence is attributed to factors such as poor dietary habits, physical inactivity, increasing rates of obesity, and a high incidence of gestational diabetes in women with a family history of diabetes [9]. Pakistan, like many other low-resource countries, faces challenges in early diagnosis and proper management of GDM, which can lead to increased maternal and fetal complications, including preeclampsia, large-for-gestational-age babies, and increased risk of Type 2 diabetes in the years following delivery [10]. Globally, the burden of GDM is on the rise, and the World Health Organization (WHO) reports that the condition affects approximately 6-9% of pregnancies worldwide [11]. In high-income countries, more accurate diagnoses are possible due to standardized screening guidelines. However, in low-income settings, limited healthcare resources often result in underdiagnosis and an increased risk of long-term complications for both mothers and infants [12]. The increasing rates of GDM demand effective public health strategies to address prevention, early detection, and management. Screening methods such as the oral glucose tolerance test (OGTT) have been widely used to identify women at risk. International guidelines now recommend universal or selective screening based on risk factors. The consequences of GDM extend beyond pregnancy, affecting the long-term health of both mothers and their offspring, making it a critical public health concern [13].

There is limited recent data from a hospital in Lahore that combines GDM prevalence with basic demographic and lifestyle profiling. Most existing studies either focus solely on prevalence or lack structured screening using both GCT and OGTT. Therefore, this study aimed to update the regional prevalence data and to describe the lifestyle, physical activity, and dietary habits of pregnant women undergoing GDM screening, to inform local maternal health strategies.

METHODS

This descriptive cross-sectional study was carried out to establish the prevalence of gestational diabetes mellitus (GDM) and to measure its determinants. The research was

conducted at the Department of Gynecology at the University of Lahore Teaching Hospital at Lahore, Pakistan, between January and June 2024. Pregnant women aged 18-45 years with singleton pregnancies and a gestational age between 24 and 28 weeks were included, as this is the recommended period for GDM screening. Women with multiple pregnancies or chronic conditions such as cardiovascular diseases or renal disorders were excluded from the study. The participants were selected using a convenience sampling technique, inviting pregnant women attending the University of Lahore Teaching Hospital during the study period. Ethical approval was obtained from the University of Lahore's Ethical Review Committee (ERC114/23/10), and informed consent was obtained from all participants, ensuring voluntary participation. Confidentiality of all personal data was maintained throughout the study. The sample size of 160 participants was determined using the Cochran formula for sample size estimation. The formula used for calculation was: $n = Z^2 \times p \times (1-p) / E^2$ Where n is the sample size, Z is the Z-value (1.96 for a 95% confidence level), p is the estimated prevalence of GDM (0.20, based on regional prevalence data), and E is the margin of error (0.05). The estimated prevalence of GDM in the region was used as 20% [14]. The questionnaire used in this study was self-structured and designed to collect data on participants' demographics, lifestyle factors, and awareness of GDM. It included closed-ended questions about physical activity and diet. Responses were categorized into predefined groups, such as exercise frequency and dietary habits. Data interpretation was conducted using a proforma to ensure consistency in recording and analysis, enabling efficient statistical evaluation of the findings. For example, responses related to physical activity were classified based on the number of times participants exercised per week (e.g., no exercise, 1-2 times per week, 3+ times per week). However, the questionnaire did not collect detailed information regarding the duration or intensity of physical activity (e.g., number of minutes per session or exercise type). As such, individuals who engaged in brief low-intensity activity and those with more prolonged or vigorous exercise may have been grouped similarly. Similarly, dietary habits were categorized by the frequency of fruit and vegetable intake, and the awareness of GDM was analyzed as either "yes" or "no" responses. Participants underwent an initial 50-gram Oral Glucose Challenge Test (GCT) as a screening for GDM. According to the standard procedure for the GCT, participants fasted for at least 8 hours before ingesting a 50-gram glucose solution. After one hour, blood glucose levels were measured, and a level of ≥ 140 mg/dL was considered a positive result, indicating the need for further testing. Those with a positive GCT

result proceeded to the 100-gram Oral Glucose Tolerance Test (OGTT). In the OGTT procedure, participants fasted overnight, and fasting blood glucose was measured before they ingested a 100-gram glucose solution. Blood glucose levels were measured at fasting, 1-hour, 2-hour, and 3-hour intervals following the ingestion of glucose. The diagnosis of GDM was made based on the Carpenter-Coustan criteria, which required at least two abnormal glucose readings: fasting glucose ≥ 95 mg/dL, 1-hour post-glucose ≥ 180 mg/dL, and 2-hour post-glucose ≥ 155 mg/dL [15]. Data were analyzed using SPSS version 25.0. Descriptive statistics such as means, frequencies, and percentages were calculated to describe the demographic and clinical characteristics of the participants.

RESULTS

The average age of participants was 27.08 ± 4.35 years, and the average height was 1.59 ± 0.11 meters. Participants had a mean weight of 79.64 ± 10.21 kg and a mean BMI of 31.5 ± 5.94 , indicating that the majority were overweight or obese. The mean fasting glucose level was 85.16 ± 13.74 mg/dL, and the 1-hour and 2-hour post-glucose test values were 135.11 ± 24.12 mg/dL and 111.72 ± 20.16 mg/dL, respectively. Demographic information, including age, height, weight, BMI, and gestational diabetes measurements (Table 1).

Table 1: Demographic Variables

Variable	Mean \pm SD	Maximum	Minimum
Age (Years)	27.08 ± 4.35	37	21
Height (m)	1.59 ± 0.11	1.80	1.50
Weight (kg)	79.64 ± 10.21	95	56
BMI (kg/m ²)	31.5 ± 5.94	47.78	19.54
Gestational Diabetes Levels			
Fasting Glucose (mg/dL)	85.16 ± 13.74	132	69
1-Hour Glucose (mg/dL)	135.11 ± 24.12	185	82
2-Hour Glucose (mg/dL)	111.72 ± 20.16	150	73
Pregnancy Week at GCT Test	24-40 weeks (range)	40	24

The majority of participants were well-educated, with 57.9% holding a graduate degree and 50.3% being housewives. All participants (100%) agreed that gestational diabetes is a serious condition and that regular exercise could help prevent it. Regarding family health history, none of the participants reported a family history of type 2 diabetes. Additionally, doctors were the main source of health information for most participants (94.3%). All questionnaire-related information, including education, occupation, previous pregnancies, birth complications, family history of type 2 diabetes, and sources of health information (Table 2).

Table 2: Questionnaire-Related Information

Categories	Frequency (%)
Education Level	
Graduate	92 (57.9%)
Intermediate	10 (5.7%)
Master's Degree	56 (35.2%)
MBBS	2 (1.3%)
Occupation	
Doctor	5 (2.5%)
Housewife	80 (50.3%)
Office Job	43 (27%)
Teacher	32 (20.1%)
Previous Pregnancies	
Yes	96 (59.7%)
No	64 (40.3%)
Birth Complications	
Yes	0 (0%)
No	160 (100%)
Family History of Type 2 Diabetes	
Yes	0 (0%)
No	160 (100%)
Source of Health Information	
Doctor	150 (94.3%)
Family	10 (5.7%)
Perception of Gestational Diabetes	
Yes	160 (100%)
No	0 (0%)
Exercise Prevents Gestational Diabetes	
Yes	160 (100%)
No	0 (0%)

A significant portion of participants (27%) reported no regular exercise, while 20.1% exercised three times per week. Regarding dietary habits, 99.4% of participants believed that a healthy diet helps prevent gestational diabetes, and a majority consumed 3 portions of fruits and vegetables daily. Additionally, most participants (99.4%) reported that they do not eat a lot of processed foods or foods high in sugar. The participants' exercise habits, fruit and vegetable consumption, and dietary habits, (Table 3).

Table 3: Exercise, Diet, and Lifestyle Habits

Categories	Frequency (%)
Exercise Frequency (Per Week)	
0	43 (27%)
1	16 (10.1%)
2	21 (13.2%)
3	32 (20.1%)
4	27 (17%)
5	15 (9.4%)
6	5 (3.1%)
Daily Fruit and Vegetable Intake	
0 portions	3 (1.9%)

1 portion	29 (18.2%)
2 portions	36 (22.6%)
3 portions	38 (23.9%)
4 portions	34 (21.4%)
5 portions	16 (10.1%)
6 portions	4 (1.9%)
Consumption of Processed Foods or High Sugar	
Yes	0 (0%)
No	160 (100%)

DISCUSSION

The GDM is a significant metabolic disorder with wide-reaching implications for maternal and fetal health. The growing prevalence of GDM, especially in developing countries, is concerning as it poses substantial risks, including preeclampsia, cesarean delivery, macrosomia, and long-term susceptibility to type 2 diabetes. This study, conducted with pregnant women attending an antenatal clinic at the University of Lahore Teaching Hospital, provides important insights into the factors influencing GDM awareness, risk, and management. The participants in this study, primarily in their late 20s, reflect the common demographic seen in antenatal settings in developing countries, where younger women (aged 25-35) are more likely to be pregnant due to higher birth rates. The mean age of 27.08 ± 4.35 years aligns with similar cohorts across Southeast Asia and low- and middle-income countries [16]. The association between maternal age and increased GDM risk is well-documented, as advancing age is linked to reduced insulin sensitivity, which our findings support. Although our sample included mainly younger women, future studies should focus on older pregnant women, who are at an elevated risk for GDM. Regarding anthropometrics, the participants in this study displayed a BMI of 31.70 ± 6.18 , placing many in the overweight to obese categories. This is consistent with global trends, where a high BMI is a well-established risk factor for GDM due to its relationship with insulin resistance and metabolic dysregulation. Obesity, both pre-pregnancy and during pregnancy, significantly increases the risk of developing GDM [17]. The high proportion of overweight and obese participants underscores the need for early and effective interventions focusing on weight management and lifestyle changes to mitigate the risk of GDM. Educational attainment in the cohort was high, with 93% of participants holding at least a graduate degree. This level of education has been associated with better health outcomes due to enhanced health literacy and a greater likelihood of seeking medical advice [18-20]. However, despite this, many participants were housewives, which may limit their exposure to healthcare education and resources, particularly in more traditional societies where health behaviors are influenced by occupation and social roles [21,

22]. Thus, it is important to consider the influence of occupation and socio-economic factors on health outcomes and to tailor health education programs accordingly. This study also revealed that 59.7% of participants had previous childbirth experience, which aligns with findings that multiparity increases the risk of GDM. Interestingly, no participant reported a history of birth complications, which may reflect either an underreporting due to recall bias or the absence of complications in the study sample. The lack of reported family history of type 2 diabetes among the participants was another intriguing result, as familial factors are strongly associated with an increased risk of GDM [23]. This may suggest that non-genetic factors such as lifestyle behaviors are more prominent in this cohort.

Although this study contains some key insights, it has some limitations. Since the study is a one-center study, with the study population mostly younger, the study results might not be entirely applicable, especially to older pregnant women who have a higher risk of gestational diabetes mellitus. Also, self-reported obstetric and family history could have resulted in recall bias. Multicenter investigations utilizing bigger and more varied populations in the future are justified to enhance the comprehension of the role of demographic, genetic, and lifestyle elements in GDM. Also, longitudinal studies of the effectiveness of preventive measures, including weight control and customized health education, would be beneficial and would contribute to better maternal and fetal health.

CONCLUSIONS

This study highlights the high prevalence of GDM among pregnant women, particularly influenced by factors such as obesity and lack of physical activity. Despite high educational levels, many women did not engage in regular exercise, emphasizing the need for targeted health interventions. Early screening, lifestyle changes, and improved awareness are essential to reduce GDM's impact on maternal and fetal health. Addressing these factors could lead to better long-term health outcomes for both mothers and their children. Future research should explore the role of psychosocial factors, such as stress, in gestational diabetes development.

Authors' Contribution

Conceptualization: KA

Methodology: HY, NY

Formal analysis: SZ, RS

Writing and Drafting: AH, AZ, TY, NY

Review and Editing: KA, AH, AZ, SZ, RS, HY, TY, NY

All authors approved the final manuscript and take responsibility for the integrity of the work.

Conflicts of Interest

All the authors declare no conflict of interest.

Source of Funding

The author received no financial support for the research, authorship and/or publication of this article.

REFERENCES

- [1] Abualhamael S, Mosli H, Baig M, Noor AM, Alshehri FM. Prevalence and Associated Risk Factors of Gestational Diabetes Mellitus at a University Hospital in Saudi Arabia. *Pakistan Journal of Medical Sciences*. 2019 Mar; 35(2): 325. doi: 10.12669/pjms.35.2.498.
- [2] Alfadhli EM, Osman EN, Basri TH, Mansuri NS, Youssef MH, Assaaedi SA et al. Gestational Diabetes Among Saudi Women: Prevalence, Risk Factors, and Pregnancy Outcomes. *Annals of Saudi Medicine*. 2015 May; 35(3): 222-230. doi: 10.5144/0256-4947.2015.222.
- [3] Fatima SS, Rehman R, Alam F, Madhani S, Chaudhry B, Khan TA. Gestational Diabetes Mellitus and the Predisposing Factors. *Journal of Pakistan Medical Association*. 2017; 67(2): 261.
- [4] Newland-Jones P, Patel M, Dhatariya K. Acute Metabolic Complications of Diabetes: Diabetic Ketoacidosis and the Hyperosmolar Hyperglycaemic State in Adults. *Textbook of Diabetes*. 2024 Feb: 602-11. doi: 10.1002/9781119697473.ch41.
- [5] Mohajan D and Mohajan HK. Hyperglycaemia Among Diabetes Patients: A Preventive Approach. *Innovation in Science and Technology*. 2023 Nov; 2(6): 27-33. doi: 10.56397/IST.2023.11.05.
- [6] Hivert MF, Backman H, Benhalima K, Catalano P, Desoye G, Immanuel J et al. Pathophysiology from Preconception, During Pregnancy, and Beyond. *The Lancet*. 2024 Jul; 404(10448): 158-174. doi: 10.1016/S0140-6736(24)00827-4.
- [7] Dennison RA, Chen ES, Green ME, Legard C, Kotecha D, Farmer G et al. The Absolute and Relative Risk of Type 2 Diabetes After Gestational Diabetes: A Systematic Review and Meta-Analysis Of 129 Studies. *Diabetes Research and Clinical Practice*. 2021 Jan; 171: 108625. doi: 10.1016/j.diabres.2020.108625.
- [8] Wicklow B, Retnakaran R. Gestational Diabetes Mellitus and Its Implications Across the Life Span. *Diabetes and Metabolism Journal*. 2023 May; 47(3): 333-344. doi: 10.4093/dmj.2022.0348.
- [9] Venkatesh KK, Khan SS, Powe CE. Gestational Diabetes and Long-Term Cardiometabolic Health. *Jama*. 2023 Sep; 330(9): 870-871. doi: 10.1001/jama.2023.14997.
- [10] Jung AR, Seo Y, Lee J, Hwang JG, Yun S, Lee DT. Recent Findings on Exercise Therapy for Blood Glucose Management in Patients with Gestational Diabetes. *Journal of Clinical Medicine*. 2024 Aug; 13(17): 5004. doi: 10.3390/jcm13175004.
- [11] Saharoy R, Potdukhe A, Wanjari M, Taksande AB. Postpartum Depression and Maternal Care: Exploring the Complex Effects on Mothers and Infants. *Cureus*. 2023 Jul; 15(7): 1-11. doi: 10.7759/cureus.41381.
- [12] Francis A, Hafidz MI, Ekrikpo UE, Chen T, Wijewickrama E, Tannor EK et al. Barriers to Accessing Essential Medicines for Kidney Disease in Low-And Lower-Middle-Income Countries. *Kidney International*. 2022 Nov; 102(5): 969-973. doi: 10.1016/j.kint.2022.07.029.
- [13] Jiang L, Tang K, Magee LA, von Dadelszen P, Ekeroma A, Li X et al. A Global View of Hypertensive Disorders and Diabetes Mellitus During Pregnancy. *Nature Reviews Endocrinology*. 2022 Dec; 18(12): 760-775. doi: 10.1038/s41574-022-00734-y.
- [14] Nakshine VS and Jogdand SD. A Comprehensive Review of Gestational Diabetes Mellitus: Impacts on Maternal Health, Fetal Development, Childhood Outcomes, and Long-Term Treatment Strategies. *Cureus*. 2023 Oct; 15(10): 1-11. doi: 10.7759/cureus.47500.
- [15] Mora-Ortiz M and Rivas-García L. Gestational Diabetes Mellitus: Unveiling Maternal Health Dynamics from Pregnancy Through Postpartum Perspectives. *Open Research Europe*. 2024 Nov; 4: 164. doi: 10.12688/openreseurope.18026.1.
- [16] Chao F, Guilamoto CZ, Ombao H. Sex Ratio at Birth in Vietnam Among Six Subnational Regions During 1980-2050, Estimation and Probabilistic Projection Using a Bayesian Hierarchical Time Series Model with 2.9 million Birth Records. *Plos One*. 2021 Jul; 16(7): 253721. doi: 10.1371/journal.pone.0253721.
- [17] Thong EP, Ghelani DP, Manoleehakul P, Yesmin A, Slater K, Taylor R et al. Optimising Cardiometabolic Risk Factors in Pregnancy: A Review of Risk Prediction Models Targeting Gestational Diabetes and Hypertensive Disorders. *Journal of Cardiovascular Development and Disease*. 2022 Feb; 9(2): 55. doi: 10.3390/jcdd9020055.
- [18] Al Hashmi IH. The Effectiveness of a Health Education Intervention on Self-Efficacy for Adherence to Healthy Behaviors among Women with Gestational Diabetes (Doctoral dissertation, University of California, Los Angeles). 2017: 1-128.
- [19] Hjelm K, Bard K, Apelqvist J. Gestational Diabetes: Changed Health Beliefs in Migrant Women from Five

- Asian Countries Living in Sweden: A Prospective Qualitative Study. *Primary Health Care Research and Development*. 2022 Jan; 23: 1-10. doi: 10.1017/S1463423621000785.
- [20] Al Nadhiri M, Al Hashmi I, Alaloul F, Al Omari O. Adherence to Gestational Diabetes Mellitus (GDM) Management Plan Among Pregnant Women in Oman: Predictors, Barriers, and Motivating Factors. *Diabetes and Metabolic Syndrome: Clinical Research and Reviews*. 2023 May; 17(5): 102766. doi: 10.1016/j.dsx.2023.102766.
- [21] Hutchinson J. Pregnancy Outcomes of Women with Type 2 and Gestational Diabetes Mellitus (GDM): Specific Focus on Client Engagement with Health Professionals, Diagnosis of GDM and Supplementation with Omega 3 Fatty Acids (Doctoral dissertation, London Metropolitan University). 2020 Mar:1-379.
- [22] Al Mamari A. Compliance to Gestational Diabetes Mellitus Screening Guidelines Among Healthcare Professionals in Primary Healthcare Institutions in Oman (Doctoral dissertation, Cardiff University). 2021:1-404.
- [23] Barrios YV. Maternal Psychosocial Adversity and Pregnancy and Delivery Complications Associated with Perinatal Depression and Anxiety: A Cumulative Index Approach (Doctoral dissertation, The University of North Carolina at Chapel Hill). 2021: 1-118.