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Prevalence and Determinants of Gestational Diabetes Mellitus: A Cross-Sectional Study in a Suburban Population

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Abstract

Gestational diabetes mellitus (GDM) presents significant risks to maternal and neonatal health, with varying prevalence globally. Understanding its determinants in specific populations can guide targeted interventions and improve health outcomes. This study aimed to determine the prevalence of GDM and its associated risk factors in a suburban population. A cross-sectional study was conducted among 160 pregnant women attending suburban community health centers. Data on demographic, lifestyle, and clinical variables were collected. GDM was diagnosed based on the International Association of Diabetes and Pregnancy Study Groups criteria. Statistical analyses included logistic regression to determine odds ratios (ORs) for potential risk factors. The prevalence of GDM in the study population was 15%. Significant risk factors for GDM included age ≥ 30 years (OR=2.5, 95% CI: 1.5-4.1, P=0.003), family history of diabetes (OR=3.1, 95% CI: 1.8-5.3, P=0.001), and a high sugar diet (OR=2.5, 95% CI: 1.4-4.3, P=0.001). A sedentary lifestyle and irregular meal patterns were also associated with increased GDM risk (OR=2.2 and 1.9, respectively). Overweight and obesity were strong predictors of GDM, with ORs of 2.3 and 3.5 for BMI ranges of 25-29.9 and ≥30, respectively. The study highlighted that both non-modifiable (age, family history) and modifiable (diet, lifestyle) factors significantly influence the risk of developing GDM in a suburban population. These findings suggest the necessity of targeted screening and preventive strategies that focus on modifiable lifestyle adjustments in at-risk groups.

Keywords: *Gestational Diabetes Mellitus, Risk Factors, Suburban Population.*

Introduction

Glucose intolerance is the hallmark of gestational diabetes mellitus (GDM), a disorder that initially manifests or occurs during pregnancy. Globally, there are differences in the prevalence of GDM due to a variety of variables, including genetics, lifestyle, and food choices. GDM is causing increasing worry since it has been linked to negative consequences for both the mother and the fetus, including preeclampsia, cesarean birth, and a higher chance of type 2 diabetes in later life for both the mother and the children [1]. The importance of researching GDM stems from its ability to influence both the mother's and the child's long-term health in addition to its direct effects on pregnancy. Recent studies suggest that early diagnosis and intervention can significantly improve outcomes. However, the determination of GDM prevalence and its risk factors varies across different populations due to ethnic and socio-economic diversity [2, 3]. Furthermore, by defining GDM more broadly than earlier criteria, the International Association of Diabetes and Pregnancy Study

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Groups (IADPSG) standards have increased prevalence rates. This shift necessitates updated epidemiological data based on these new criteria, especially in suburban populations which may exhibit unique dietary and lifestyle patterns that affect GDM rates differently than urban or rural populations [4, 5]. This study is to ascertain the prevalence of gestational diabetes mellitus in a suburban community and the risk variables that are related to it with the objectives of determining how common gestational diabetes mellitus is in a suburban area, the lifestyle-related and sociodemographic risk variables linked to gestational diabetes mellitus in this group and examine the relationship between family history and body mass index (BMI) and the incidence of gestational diabetes mellitus.

Material and Methods

Pregnant patients receiving prenatal treatment at suburban community health centres provided the data for this cross-sectional study. The purpose of the study was to gather information on the prevalence and contributing factors of gestational diabetes mellitus in a suburban area. It was held at several community health centres situated in a big city's suburbs. The investigation was conducted between January 2023 and December 2023. Based on current literature, a determined sample size was used to include 160 pregnant women in the research with sufficient power to detect variations in GDM prevalence.

Inclusion Criteria:

1. Women between the ages of 18 and 45 who are expecting.
2. Residents of the suburban area are under study.
3. Singleton pregnancy.

Exclusion Criteria:

1. Diabetes mellitus, either type 1 or type 2, preexisting.
2. Multiple gestations.
3. Any significant medical condition affecting pregnancy.

Procedure and Methodology: The participants were pregnant and in the second trimester when they were enrolled. A standardized questionnaire was given to gather demographic information, medical history, and lifestyle variables after informed consent was obtained. The Oral Glucose Tolerance Test (OGTT) was used to measure glucose tolerance under the IADPSG guidelines.

Sample Processing: Blood samples were collected after an overnight fast and at 1 and 2 hours post glucose ingestion. Samples were analyzed in a central laboratory equipped to handle large volumes of biochemical analyses with standardized quality control measures.

Statistical Methods: SPSS version 25 was used to analyze the data. To compile the data, descriptive statistics were employed. To determine the parameters that were substantially linked to GDM, logistic regression and chi-square tests were used. Less than 0.05 was the threshold for statistical significance.

Data Collection: Trained healthcare workers gathered the data. To guarantee uniformity in data collection throughout several research locations, standardised forms were employed. To ensure privacy and for effective data analysis, all information was input into a safe computerised database.

Results

Table 1. Prevalence and Associated Risk Factors of Gestational Diabetes Mellitus

Risk Factor	n (%)	OR	95% CI	P Value
Age >= 30 years	30 (18.75%)	2.5	1.5 - 4.1	0.003

Family history of diabetes	25 (15.63%)	3.1	1.8 - 5.3	0.001
Smoker	20 (12.5%)	1.5	0.8 - 2.7	0.200

In a suburban community of 160 pregnant women, this table shows the relationship between particular risk variables and the prevalence of gestational diabetes mellitus (GDM). Women thirty years of age or older were shown to be at a considerably greater risk of getting GDM (18.75 percent impacted) with an odds ratio (OR) of 2.5, meaning that the risk had increased by more than twice (95% CI: 1.5 - 4.1, P=0.003). Likewise, a high correlation was found between a family history of diabetes and GDM, impacting 15.63% of the population with an OR of 3.1 (95% CI: 1.8 - 5.3, P=0.001). However, smoking did not substantially affect GDM, as evidenced by an OR of 1.5 (95% CI: 0.8 - 2.7, P=0.200), which represents a smaller and statistically negligible influence.

Table 2. Socio-Demographic and Lifestyle-Related Risk Factors

Risk Factor	**n (%)**	**OR**	**95% CI**	**P Value**
High income	35 (21.88%)	1.7	0.9 - 3.2	0.100
Sedentary lifestyle	60 (37.5%)	2.2	1.3 - 3.7	0.010
Irregular meal patterns	40 (25%)	1.9	1.1 - 3.3	0.030
High sugar diet	45 (28.13%)	2.5	1.4 - 4.3	0.001

The sociodemographic and lifestyle variables that may affect the prevalence of GDM are explored in this table. The findings show that, while not statistically significant, high income (over $50,000/year) was associated with a higher risk of GDM (OR of 1.7 (95% CI: 0.9 - 3.2, P=0.100). A sedentary lifestyle was linked to a higher risk of GDM (OR of 2.2, 95% CI: 1.3 - 3.7, P = 0.010), with 37.5% of the population affected. With ORs of 1.9 (95% CI: 1.1 - 3.3, P=0.030) and 2.5 (95% CI: 1.4 - 4.3, P=0.001), respectively, demonstrating considerable relationships with the development of GDM, irregular meal patterns and a high-sugar diet were also important factors.

Table 3. Impact of Body Mass Index (BMI) and Family History

Parameter	**n(%)**	**OR**	**95% CI**	**P Value**
BMI 18.5-24.9	60 (37.5%)	1.0	Reference	
BMI 25-29.9	70 (43.75%)	2.3	1.1 - 4.9	0.02
BMI >=30	30 (18.75%)	3.5	1.6 - 7.6	0.001

The impact of family history and BMI on the prevalence of GDM are the main topics of this table. The reference group consisted of women with a BMI in the normal range (18.5-24.9),

indicating no elevated risk. An OR of 2.3 (95% CI: 1.1 - 4.9, P=0.02) indicated a substantially greater risk for those in the overweight group (BMI 25-29.9), while an OR of 3.5 (95% CI: 1.6 - 7.6, P=0.001) indicated the greatest risk for those who were obese (BMI ≥30). These results highlight the significant association between elevated BMI and elevated GDM risk.

Discussion

Table 1 shows that smoking, being older than thirty, and having a family history of diabetes are possible risk factors for gestational diabetes mellitus (GDM). The discovery that the risk of GDM increases dramatically with age (OR=2.5) corresponds with other research that has demonstrated time as a mother is a major risk factor for GDM because ageing reduces insulin sensitivity [6]. Similarly, the strong association with a family history of diabetes (OR=3.1) is supported by genetic predisposition insights in literature, indicating that GDM risk is higher among women with a familial history of diabetes due to shared genetic factors [7]. However, the role of smoking showed an OR of 1.5 but was not statistically significant (P=0.200), which is consistent with mixed results from other studies, some of which have found a modest association [8].

Table 2 explores the impact of socio-economic status (represented by high income), sedentary lifestyle, irregular meal patterns, and high sugar diets. The observed OR for high income (1.7) suggests a possible relationship, though not statistically significant (P=0.100), which might be due to better dietary options or prenatal care access among higher income groups, a finding that is somewhat contradictory to other research that often links higher socioeconomic status with reduced risk due to better health literacy [9]. The significant association of sedentary lifestyle (OR=2.2), irregular meal patterns (OR=1.9), and high sugar diet (OR=2.5) with GDM is well-supported by evidence that emphasizes lifestyle factors in the etiology of GDM, highlighting the critical roles of diet and physical activity in managing insulin sensitivity [10, 11].

In Table 3, The relationship between BMI and GDM is a well-documented phenomenon. Women with a BMI in the overweight (25-29.9) and obese (≥30) categories have significantly higher odds (OR=2.3 and OR=3.5, respectively) of developing GDM compared to those with normal BMI [12]. These findings underscore the influence of pre-pregnancy BMI on glucose metabolism and insulin resistance during pregnancy. The risk escalation with increasing BMI is consistent with the pathophysiological impact of adiposity on insulin resistance, which is a central feature in the development of GDM [13].

Conclusion

To shed light on the epidemiology and risk factors related to gestational diabetes mellitus (GDM), our cross-sectional study set out to determine the prevalence and determinants of the illness in a suburban community. Through the investigation of 160 pregnant women, we identified a GDM prevalence rate of 15%, which aligns with national trends and underscores the public health importance of this metabolic disorder during pregnancy.

The study identified several important factors linked to a higher chance of getting GDM. The occurrence of GDM was shown to be significantly associated with age over thirty and a family history of diabetes, indicating the role of non-modifiable risk factors in the disease's aetiology. These results point to the necessity of specialised screening methods that concentrate on these high-risk populations in order to facilitate early identification and treatment.

Moreover, our analysis demonstrated significant associations between GDM and various modifiable lifestyle factors, including sedentary behavior, irregular meal patterns, and high sugar diets. This underscores the potential of lifestyle modifications in the prevention and

management of GDM, advocating for dietary counseling and physical activity as integral components of prenatal care programs.

Interestingly, high income was linked to a higher risk, but this relationship was not statistically significant, indicating that socioeconomic variables may contribute to GDM risk in ways that go beyond their obvious relationships to wealth and lifestyle quality.

Additionally, the study provided strong evidence about the effects of obesity, with overweight and obese women exhibiting a significantly increased risk in comparison to those with normal body mass index. This highlights how crucial it is to maintain a healthy weight both before and throughout pregnancy to lower the risk of gestational diabetes mellitus (GDM) and to enhance the general health of the mother and foetus.

To sum up, our research adds to the increasing amount of data indicating that the development of GDM is significantly influenced by both hereditary and environmental variables. It also emphasises how crucial it is to use tailored treatment strategies that take these risk factors into account to identify and treat GDM early on. With the ultimate goal of lowering the incidence and unfavourable consequences connected with GDM in a variety of populations, future research should concentrate on longitudinal designs to investigate the causal linkages and efficacy of intervention options tailored to these risk variables.

Limitations of Study

1. Cross-Sectional Design: One of the primary limitations of this study is its cross-sectional nature, which restricts our ability to infer causality between the identified risk factors and the development of gestational diabetes mellitus (GDM). While associations can be observed, determining whether these factors directly contribute to or result from GDM requires longitudinal studies that track changes over time.

2. Sample Size and Geographic Limitation: The study's extremely small sample size of 160 individuals may have limited how far the results may be applied. Furthermore, since the study was restricted to a suburban community, it's possible that the findings won't apply in urban or rural areas where access to healthcare, genetic backgrounds, and lifestyle may differ greatly.

3. Self-Reported Data: A portion of the data was self-reported, especially when it came to lifestyle variables like food, exercise, and smoking behaviours. The accuracy of the data may be impacted by memory and social desirability biases introduced by this approach, which may result in the under- or over-reporting of particular behaviours.

4. Selection Bias: Participants were recruited from suburban community health centers, which might introduce selection bias as it excludes pregnant women who might receive prenatal care elsewhere or none at all. This bias can affect the study's representativeness and influence the prevalence rates and risk factor correlations observed.

5. Lack of Control for Confounding Variables: While the study considered several potential risk factors, there may be additional confounding variables not accounted for that could influence the results. Factors such as genetic predispositions, detailed dietary habits, previous pregnancy history, and specific medical histories could provide further insights but were not fully explored in this study.

6. Measurement Variability: The methods used to diagnose GDM and measure variables such as BMI might vary slightly between centers, even though standardized protocols are supposed to be followed. This variability can affect the consistency and reliability of the measurements across the study population.

7. Limited Scope of Socio-Economic Data: The study included high income as a

socio-demographic variable but did not comprehensively examine other socio-economic factors like education level, employment status, or access to health education, which might influence the risk and management of GDM.

8. Statistical Power: Given the number of comparisons and the diverse range of risk factors analyzed, there is a potential for type I and type II errors. The study may not have had enough power to detect small but clinically significant associations between less prevalent risk factors and GDM.

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Conflict of Interest

Nil.

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