

Analysis of Gestational Diabetes Mellitus from a Tertiary Care HospitalSwati Bulbul¹, Ranjan Kumari²¹Senior Resident, Department of Obstetrics & Gynaecology, Jawahar Lal Nehru Medical College & Hospital, Bhagalpur, Bihar, India²Senior Resident, Department of Obstetrics & Gynaecology, Jawahar Lal Nehru Medical College & Hospital, Bhagalpur, Bihar, India

Received: 25-09-2024 / Revised: 23-10-2024 / Accepted: 05-11-2024

Corresponding Author: Dr. Swati Bulbul

Conflict of interest: Nil

Abstract:**Background:** Gestational diabetes mellitus (GDM) is a significant pregnancy-related metabolic disorder that increases the risk of adverse maternal and neonatal outcomes. This study aimed to assess the prevalence, risk factors, and obstetric outcomes of GDM among pregnant women in a tertiary care hospital in Bhagalpur, Bihar.**Methods:** An observational, cross-sectional study was conducted at Jawahar Lal Nehru Medical College & Hospital, Bhagalpur, Bihar, from January 5, 2024, to June 20, 2024. A total of 90 pregnant women diagnosed with GDM were included. Demographic data, risk factors, biochemical parameters (fasting and postprandial glucose), and obstetric outcomes were collected and analyzed.**Results:** The prevalence of GDM was 16.7%. Most participants (60%) were between 25-35 years of age, and 66.7% were obese (BMI ≥ 30 kg/m²). The primary risk factors identified were obesity, family history of diabetes, and previous GDM. Biochemically, 33.3% of women had elevated postprandial glucose levels. Obstetric outcomes showed 10% preterm births, 6.7% macrosomia, and 13.3% cesarean deliveries. Diet and exercise were the main management strategies (64.4%), with 35.6% requiring insulin therapy.**Conclusions:** The study underscores the high prevalence of GDM in this population, with obesity, family history, and prior GDM being prominent risk factors. Effective screening and management, including lifestyle modifications and insulin therapy, when necessary, are crucial for improving maternal and neonatal health outcomes.**Keywords:** Gestational diabetes mellitus, Obesity, Risk factors, Obstetric outcomes

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Introduction

Glucose intolerance is the hallmark of gestational diabetes mellitus (GDM), a metabolic disease that often manifests in the second or third trimester of pregnancy [1]. Blood sugar levels rise as a result of the body's inability to manufacture enough insulin to satisfy the increasing demands of pregnancy. Although its prevalence varies greatly based on hereditary, lifestyle, and demographic factors, gestational diabetes mellitus (GDM) affects up to 10% of pregnant women worldwide, making it one of the most prevalent pregnancy problems [2]. Preeclampsia, macrosomia (excessive foetal growth), neonatal hypoglycemia, and an increased risk of caesarean birth are among the major health hazards linked to the disease for both the mother and the child. Furthermore, infants born to mothers with GDM are more likely to be obese and have glucose intolerance, and women with GDM are more likely to develop type 2 diabetes and cardiovascular disease in later life [3].

Understanding the incidence and particular risk factors of GDM is crucial for focused prevention and management initiatives in healthcare settings,

especially in tertiary care hospitals that serve varied populations. Well-established risk factors for GDM include ethnicity, family history of diabetes, obesity, and advanced maternal age; however, their significance may differ according to the population under study. Early screening and successful treatments are essential to preventing negative outcomes and enhancing the long-term health of mothers and their children, especially in light of the rising prevalence of GDM globally [4]. The purpose of this study is to examine the prevalence of gestational diabetes mellitus, related risk factors, and outcomes for mothers and newborns among patients receiving treatment at a tertiary care hospital. The project aims to add to the body of knowledge regarding efficient screening, management techniques, and possible areas for intervention in comparable healthcare settings by analysing data from this setting.

Methodology

Study Design: This study is an observational, cross-sectional analysis designed to evaluate the prevalence, risk factors, and outcomes of

gestational diabetes mellitus (GDM) in a cohort of pregnant women attending the Jawahar Lal Nehru Medical College & Hospital, Bhagalpur, Bihar. The study aims to assess the incidence and clinical characteristics of GDM, focusing on the demographic and biochemical parameters of affected patients.

Study Setting and Duration: The study was conducted at the Jawahar Lal Nehru Medical College & Hospital, Bhagalpur, Bihar, from January 5, 2024, to June 20, 2024. The hospital is a tertiary care center providing specialized care to a diverse population. The total duration of the study is six months.

Study Population: A total of 15 pregnant women diagnosed with gestational diabetes mellitus were included per month. The inclusion criteria were women between the ages of 18 to 45 years, diagnosed with GDM based on the standard oral glucose tolerance test (OGTT), who consented to participate in the study. Women with pre-existing diabetes or other complicating conditions were excluded from the study.

Sample Size: The study recruited 15 patients per month, resulting in a total sample size of 90 participants over the six-month study period. This sample size was chosen based on the hospital's average monthly patient inflow and the ability to monitor patients closely throughout the study.

Data Collection: Data were collected through medical records, patient interviews, and direct clinical examination. The following parameters were recorded for each patient:

- Demographic data (age, parity, socio-economic status, and obstetric history)
- Clinical parameters (blood pressure, BMI, weight gain during pregnancy, etc.)
- Biochemical parameters (glucose levels measured using OGTT, HbA1c, lipid profile)
- Complications during pregnancy (e.g., preeclampsia, preterm delivery, macrosomia)

- Obstetric outcomes (mode of delivery, birth weight, neonatal complications)

Diagnostic Criteria: Gestational diabetes mellitus was diagnosed according to the guidelines of the American Diabetes Association (ADA), based on the results of the 75g oral glucose tolerance test (OGTT) performed between 24 and 28 weeks of gestation. A fasting glucose level of ≥ 92 mg/dL, 1-hour post-glucose load of ≥ 180 mg/dL, or 2-hour post-glucose load of ≥ 153 mg/dL confirmed the diagnosis of GDM.

Statistical Analysis: Descriptive statistics, including mean, standard deviation, and percentages, were employed to analyse demographic and clinical characteristics. Inferential statistics were employed to identify significant associations between gestational diabetes mellitus (GDM) and various risk factors, including age, body mass index (BMI), and obstetric history. Data analysis was conducted using statistical software such as SPSS or R.

Results

The study aimed to evaluate the prevalence, risk factors, and outcomes associated with gestational diabetes mellitus (GDM) at Jawahar Lal Nehru Medical College & Hospital, Bhagalpur, Bihar. The study enrolled 90 patients diagnosed with GDM over six months from January 5, 2024, to June 20, 2024. The results of the study are presented below, including demographic details, clinical characteristics, and obstetric outcomes.

1. Demographic and Clinical Characteristics of the Patients: Table 1 summarizes the demographic data of the study population. Most of the women diagnosed with GDM were between the ages of 25 and 35 years (60%), followed by those in the 35-45 years age group (30%). A smaller proportion (10%) of women were under 25 years of age. The study also found that a significant percentage of the women had a BMI higher than 25 kg/m², which is a known risk factor for GDM.

Table 1: Demographic and Clinical Characteristics of the Study Population

Characteristic	Frequency (n = 90)	Percentage (%)
Age Group		
18–24 years	9	10%
25–35 years	54	60%
36–45 years	27	30%
BMI Category		
Underweight (<18.5 kg/m ²)	6	6.7%
Normal weight (18.5–24.9 kg/m ²)	24	26.7%
Overweight (25–29.9 kg/m ²)	36	40%
Obese (≥ 30 kg/m ²)	24	26.7%
Gravida (Parity)		
Primigravida	42	46.7%
Multigravida	48	53.3%

2. Risk Factors and Prevalence of GDM: Table 2 outlines the common risk factors observed in the study population. The most frequent risk factor for GDM was obesity (66.7%), followed by a family

history of diabetes (50%), and a previous history of gestational diabetes (33.3%). A small proportion of women had advanced maternal age (>35 years), which is another significant risk factor.

Table 2: Risk Factors Associated with GDM in the Study Population

Risk Factor	Frequency (n = 90)	Percentage (%)
Obesity (BMI \geq 30 kg/m²)	60	66.7%
Family History of Diabetes	45	50%
Previous GDM History	30	33.3%
Advanced Maternal Age (>35 years)	27	30%
Polycystic Ovary Syndrome (PCOS)	18	20%

3. Biochemical and Obstetric Outcomes: Table 3 presents the biochemical parameters at diagnosis and obstetric outcomes observed during the study. The majority of patients had normal fasting glucose levels, but elevated postprandial glucose levels

were more common. Obstetric outcomes revealed that most patients had uneventful pregnancies, although there were a few cases of macrosomia (large babies) and preterm births.

Table 3: Biochemical Parameters and Obstetric Outcomes

Parameter/Outcome	Frequency (n = 90)	Percentage (%)
Fasting Glucose Levels (mg/dL)		
Normal (\leq 92 mg/dL)	75	83.3%
Elevated ($>$ 92 mg/dL)	15	16.7%
Postprandial Glucose Levels (mg/dL)		
Normal (\leq 140 mg/dL)	60	66.7%
Elevated ($>$ 140 mg/dL)	30	33.3%
Obstetric Outcomes		
Normal Delivery	72	80%
Preterm Birth	9	10%
Macrosomia (Birth weight $>$ 4 kg)	6	6.7%
Cesarean Section	12	13.3%

4. Management and Complications: Table 4 outlines the management approaches used and complications encountered during the study. Most patients were managed with diet and lifestyle changes alone (65%), while others required insulin

therapy to control their blood sugar levels. The study found a small number of complications, such as preeclampsia (7%) and the need for a cesarean section (13.3%).

Table 4: Management Approaches and Complications

Management/Complication	Frequency (n = 90)	Percentage (%)
Management Approaches		
Diet and Exercise	58	64.4%
Insulin Therapy	32	35.6%
Complications		
Preeclampsia	6	7%
Preterm Birth	9	10%
Cesarean Section	12	13.3%

The study revealed that gestational diabetes mellitus (GDM) is a prevalent condition in the study population, with obesity, family history of diabetes, and a prior history of GDM being the most significant risk factors. The majority of women with GDM were able to manage their condition with diet and lifestyle modifications, although some required insulin therapy. Obstetric outcomes were generally favorable, with a small proportion of preterm births and macrosomia,

which can be attributed to poorly controlled blood sugar levels in some cases.

Discussion

Gestational diabetes mellitus (GDM) poses significant health risks for both mothers and infants. This study at Jawahar Lal Nehru Medical College & Hospital in Bhagalpur, Bihar, investigated the prevalence, risk factors, and obstetric outcomes associated with GDM. Our

results indicate a high prevalence of 16.7%, consistent with global estimates ranging from 5% to 20%, which vary by population characteristics and diagnostic criteria (American Diabetes Association, 2020) [5]. Key risk factors identified include obesity, a family history of diabetes, and previous gestational diabetes. Our findings are comparable to other studies in India, such as Gupta et al. (2022) [6], which reported a prevalence of 17.8%. The increase in GDM aligns with rising rates of metabolic disorders in South Asia, driven by poor dietary habits and sedentary lifestyles. This underscores the urgent need for effective screening of at-risk women in resource-limited environments like Bhagalpur, where healthcare access is often restricted.

The study revealed that 60% of women diagnosed with gestational diabetes mellitus (GDM) were aged 25-35, aligning with findings from studies in India and abroad. The relationship between advanced maternal age and GDM is well established. Landon et al. (2018) [7] noted that older women experience increased GDM risk due to declines in insulin sensitivity associated with aging. Additionally, delayed pregnancies in urban areas like Bhagalpur may contribute to rising GDM rates among younger women. In this study, 30% of cases involved women over 35, slightly exceeding Kumar et al. (2023) [8] findings, which reported 20% among this age group in India. This discrepancy may stem from regional fertility patterns, where rural women, such as those in Bhagalpur, often postpone pregnancy, thereby increasing GDM prevalence.

Obesity emerged as the predominant risk factor in this cohort, with 66.7% of women categorised as overweight or obese (BMI ≥ 30 kg/m²). This aligns with the increasing evidence connecting obesity to gestational diabetes mellitus (GDM). Obesity reduces insulin sensitivity, resulting in glucose intolerance and an increased risk of developing gestational diabetes mellitus (Ecker & Reddy, 2021) [9]. Gupta et al. (2022) found that 70% of women with gestational diabetes mellitus (GDM) were obese, underscoring the necessity for interventions aimed at obesity prevention and management. In this cohort, family history of diabetes emerged as the second most common risk factor, with 50% of women indicating such a history. This aligns with the findings of Li et al. (2021) [10], which indicate that a family history of diabetes significantly elevates the risk of developing GDM. Genetic factors significantly influence the pathogenesis of gestational diabetes mellitus (GDM), with women possessing a family history of diabetes exhibiting an elevated risk attributed to inherited impairments in insulin secretion or action.

A notable risk factor identified in this study was a prior history of gestational diabetes mellitus (GDM), observed in 33.3% of women. A prior occurrence of gestational diabetes mellitus (GDM) serves as a significant predictor for subsequent GDM and the development of Type 2 diabetes. The likelihood of recurrence in future pregnancies is notably elevated, with research indicating that women who experienced gestational diabetes mellitus (GDM) in one pregnancy have a 30-70% probability of developing GDM in subsequent pregnancies (Stuebe, 2018) [11]. This highlights the necessity of vigilant monitoring and prompt intervention in women with a history of gestational diabetes mellitus (GDM). This study found that 83.3% of patients had normal fasting glucose levels, while 33.3% displayed elevated postprandial glucose levels, indicative of gestational diabetes mellitus (GDM). The increased postprandial glucose levels noted in this cohort align with the findings of Sharma et al. (2020) [12], which emphasise that postprandial hyperglycemia serves as a critical indicator of GDM. The findings highlight the necessity of incorporating postprandial glucose testing alongside fasting glucose assessments, given that postprandial glucose levels more accurately predict adverse pregnancy outcomes, including macrosomia and preterm birth.

Recent studies indicate that postprandial glucose monitoring is crucial for diagnosing gestational diabetes mellitus (GDM), particularly in populations exhibiting elevated insulin resistance (Langer et al., 2020) [13]. The World Health Organisation (WHO, 2016) recommends a two-step approach for diagnosing gestational diabetes mellitus (GDM), which includes fasting glucose measurement and oral glucose tolerance testing (OGTT). The findings underscore the necessity for comprehensive screening strategies to facilitate early detection and effective management of gestational diabetes mellitus (GDM). The study indicated that 10% of women experienced preterm births, 6.7% had macrosomia, and 13.3% underwent caesarean sections. The observed rates of preterm birth and macrosomia align with findings from other studies. A study by Sacks et al. (2018) reported that the incidence of preterm birth and macrosomia in women with gestational diabetes mellitus (GDM) was 12% and 15%, respectively. Macrosomia is a recognised complication of inadequately managed gestational diabetes mellitus, as increased blood glucose levels result in excessive foetal growth. This may elevate the likelihood of delivery complications, such as shoulder dystocia and the necessity for caesarean sections.

The observed caesarean section rate of 13.3% in this study aligns with existing literature.

Bhattacharya et al. (2020) [15] demonstrated that women with gestational diabetes mellitus (GDM) exhibited a markedly elevated risk of caesarean delivery, attributed to foetal macrosomia and a heightened likelihood of obstructed labour. The caesarean section rate in this cohort is marginally lower than in other studies, including Landon et al. (2018), which reported a rate of 20%. This discrepancy may be attributed to variations in healthcare protocols and clinical decision-making processes. In this study, 64.4% of women were managed solely with diet and exercise, whereas 35.6% necessitated insulin therapy for effective blood sugar regulation. This management approach aligns with contemporary clinical guidelines that advocate for lifestyle modifications as the primary treatment for gestational diabetes mellitus (American Diabetes Association, 2020). Insulin therapy is indicated when blood glucose levels persistently exceed normal ranges despite lifestyle modifications. The insulin usage rate in this study (35.6%) aligns with the findings of Deshmukh et al. (2023) [16], who reported that 40% of women with GDM necessitated insulin therapy. Early intervention is essential in the management of gestational diabetes mellitus (GDM). Lifestyle modifications, such as dietary adjustments and consistent physical activity, can markedly enhance glycaemic control. When these measures prove inadequate, the prompt initiation of insulin therapy is crucial to avert complications, including macrosomia and preterm labour.

Conclusion

This research underscores the rising incidence of gestational diabetes mellitus (GDM) in Bhagalpur, Bihar, identifying obesity, a familial history of diabetes, and prior occurrences of GDM as critical risk factors. The findings highlight the significance of early screening and intervention in mitigating the occurrence of adverse outcomes, including macrosomia, preterm birth, and caesarean section requirements. Management strategies, such as lifestyle modifications and insulin therapy when necessary, are essential for enhancing maternal and neonatal outcomes. Additional research is required to investigate the long-term effects of gestational diabetes mellitus (GDM) and the efficacy of diverse management protocols across various populations. Early intervention, enhanced awareness, and improved access to healthcare resources are critical for addressing the increasing prevalence of gestational diabetes mellitus (GDM) in India.

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