

Increased Risk of Ischemic Heart Disease, Hypertension, and Type 2 Diabetes in Women with Previous Gestational Diabetes MellitusMd. Rashid Anwer¹, Abdul Salik², Ramakant³¹Assistant Professor, Department of Internal Medicine, RDJM Medical College & Hospital, Muzaffarpur, Bihar, India²Assistant Professor, Department of Internal Medicine, RDJM Medical College & Hospital, Muzaffarpur, Bihar, India³HOD and Professor (MD – Medicine), Department of Internal Medicine, RDJM Medical College & Hospital, Muzaffarpur, Bihar, India

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Conflict of interest: Nil

Abstract:**Background:** Gestational diabetes mellitus (GDM) is increasingly recognized as an early indicator of future cardiometabolic disease in women.**Objectives:** To assess the risk of ischemic heart disease (IHD), hypertension, and type 2 diabetes mellitus (T2DM) in women with a history of GDM.**Methods:** A hospital-based observational comparative study was conducted at RDJM Medical College & Hospital, Muzaffarpur, from 2024–2025. Cardiometabolic outcomes in women with previous GDM were compared with women without GDM history.**Results:** Women with prior GDM had significantly higher prevalence of T2DM (42% vs 12%), hypertension (36% vs 14%), and IHD (12% vs 3%) ($p < 0.05$ for all).**Conclusion:** Previous GDM is associated with a significantly increased long-term risk of cardiometabolic disorders, emphasizing the need for structured postpartum follow-up.**Keywords:** Gestational Diabetes Mellitus, Ischemic Heart Disease, Hypertension, Type 2 Diabetes Mellitus.**DOI:** 10.25258/ijcpr.18.1.162

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Introduction

Gestational diabetes mellitus (GDM) is defined as glucose intolerance with onset or first recognition during pregnancy [1]. The prevalence of GDM has risen worldwide, paralleling increases in obesity, sedentary lifestyle, and delayed childbearing [2]. In India, the burden of GDM is particularly high, with prevalence reported between 10% and 18% depending on diagnostic criteria and population studied [3].

Traditionally considered a transient pregnancy complication, GDM is now understood to represent an early manifestation of chronic metabolic dysfunction [4]. Women with GDM exhibit underlying insulin resistance and β -cell impairment, which often persist after pregnancy and predispose them to future metabolic diseases [5,6].

Numerous epidemiological studies have established a significant association between GDM and the subsequent onset of type 2 diabetes mellitus (T2DM), indicating a 7–10-fold elevated risk in comparison to women with normoglycemic

pregnancies [7–9]. Besides diabetes, increasing evidence suggests that GDM is linked to long-term cardiovascular complications, such as hypertension and ischemic heart disease (IHD) [10–12].

Pathophysiological mechanisms linking GDM to cardiovascular disease include persistent insulin resistance, chronic inflammation, dyslipidemia, endothelial dysfunction, and shared genetic susceptibility [13,14]. Despite increasing global evidence, Indian data evaluating combined cardiometabolic outcomes following GDM remain limited, especially from eastern India.

This study was therefore conducted to evaluate the risk of ischemic heart disease, hypertension, and type 2 diabetes mellitus among women with previous GDM attending a tertiary care center in Bihar.

Materials and Methods

Study Design: Hospital-based observational comparative study.

Study Setting: RDJM Medical College & Hospital, Muzaffarpur, Bihar.

Study Duration: January 2024 to January 2025 (1 year).

Study Population: Women aged 25–45 years, at least 2 years postpartum.

Sample Size:

Total sample size: 200 women.

- **Group A (Previous GDM):** 100 women
- **Group B (Controls):** 100 women without GDM history

Inclusion Criteria

- Documented obstetric records
- Minimum 2 years since last delivery
- Informed consent provided

Exclusion Criteria

- Pre-existing diabetes or hypertension before pregnancy
- Known cardiovascular disease prior to pregnancy
- Chronic systemic illness

Data Collection

- Demographic and anthropometric measurements
- Blood pressure recording (average of two readings)
- Fasting plasma glucose, HbA1c, lipid profile
- ECG and clinical evaluation for ischemic heart disease

Statistical Analysis: Data were entered and analyzed using standard statistical software. Continuous variables were expressed as mean ± standard deviation (SD) and compared between groups using Student’s t-test. Categorical variables were presented as frequencies and percentages and analyzed using the chi-square test. Odds ratios (OR) with 95% confidence intervals (CI) were calculated to assess the strength of association between previous gestational diabetes mellitus and cardiometabolic outcomes. A p-value of less than 0.05 was considered statistically significant.

Results

A total of 200 women were included in the study, comprising 100 women with a history of gestational diabetes mellitus (GDM group) and 100 women without GDM history (control group). All participants completed clinical evaluation and laboratory investigations, and the data were included in the final analysis.

Baseline Characteristics of Study Participants:

The baseline demographic and anthropometric characteristics of the study population are summarized in Table 1. The mean age of women in the GDM group was 34.8 ± 4.6 years, while that of the control group was 33.9 ± 4.3 years, with no statistically significant difference between the groups (p = 0.18). The mean body mass index (BMI) was significantly higher in the GDM group (27.6 ± 3.1 kg/m²) compared to controls (24.8 ± 2.9 kg/m², p < 0.001). A positive family history of diabetes was observed in 48% of women in the GDM group versus 22% in the control group, which was statistically significant (p < 0.001).

Table 1: Baseline Characteristics of the Study Participants

Parameter	GDM Group (n=100)	Control Group (n=100)	p-value
Age (years)	34.8 ± 4.6	33.9 ± 4.3	0.18
BMI (kg/m ²)	27.6 ± 3.1	24.8 ± 2.9	<0.001
Family history of diabetes (%)	48	22	<0.001

Comparison of Glycemic and Lipid Parameters:

The comparison of glycemic and lipid parameters between the two groups is presented in Table 2. Women with previous GDM had significantly higher mean fasting plasma glucose levels (126 ± 18 mg/dL) compared to controls (98 ± 14 mg/dL, p < 0.001). Similarly, mean HbA1c levels were significantly elevated in the GDM group (6.7 ±

0.9%) versus the control group (5.4 ± 0.6%, p < 0.001).

Lipid profile analysis revealed significantly higher mean LDL cholesterol levels in the GDM group (142 ± 22 mg/dL) compared to controls (118 ± 20 mg/dL, p < 0.001). Mean HDL cholesterol levels were significantly lower in women with previous GDM (42 ± 6 mg/dL) than in the control group (48 ± 7 mg/dL, p < 0.001).

Table 2: Comparison of Glycemic and Lipid Parameters

Parameter	GDM Group	Control Group	p-value
Fasting plasma glucose (mg/dL)	126 ± 18	98 ± 14	<0.001
HbA1c (%)	6.7 ± 0.9	5.4 ± 0.6	<0.001
LDL cholesterol (mg/dL)	142 ± 22	118 ± 20	<0.001
HDL cholesterol (mg/dL)	42 ± 6	48 ± 7	<0.001

Prevalence of Cardiometabolic Outcomes: The prevalence of type 2 diabetes mellitus, hypertension, and ischemic heart disease in both groups is shown in Table 3. Type 2 diabetes mellitus was diagnosed in 42% of women in the GDM group compared to 12% in the control group, and this difference was statistically significant ($\chi^2 = 21.6, p < 0.001$). Women with previous GDM had a 5.32-fold higher risk of developing T2DM (OR = 5.32; 95% CI: 2.60–10.89).

Hypertension was observed in 36% of women with prior GDM compared to 14% of controls, showing

a significant association ($\chi^2 = 13.1, p < 0.001$). The odds of developing hypertension were 3.45 times higher in the GDM group (OR = 3.45; 95% CI: 1.70–7.02).

Ischemic heart disease was identified in 12% of women with previous GDM, whereas only 3% of women in the control group had evidence of IHD. This difference was statistically significant ($\chi^2 = 5.0, p = 0.025$), with an odds ratio of 4.41 (95% CI: 1.22–15.9).

Table 3: Prevalence of Cardiometabolic Outcomes

Outcome	GDM Group (%)	Control Group (%)	χ^2 value	p-value	Odds Ratio (95% CI)
Type 2 diabetes mellitus	42	12	21.6	<0.001	5.32 (2.60–10.89)
Hypertension	36	14	13.1	<0.001	3.45 (1.70–7.02)
Ischemic heart disease	12	3	5.0	0.025	4.41 (1.22–15.9)

Graphical Representation of Cardiometabolic Outcomes: A graphical comparison of the prevalence of major cardiometabolic outcomes between the GDM and control groups is illustrated

in Figure 1. The figure demonstrates a consistently higher burden of type 2 diabetes mellitus, hypertension, and ischemic heart disease among women with a history of gestational diabetes.

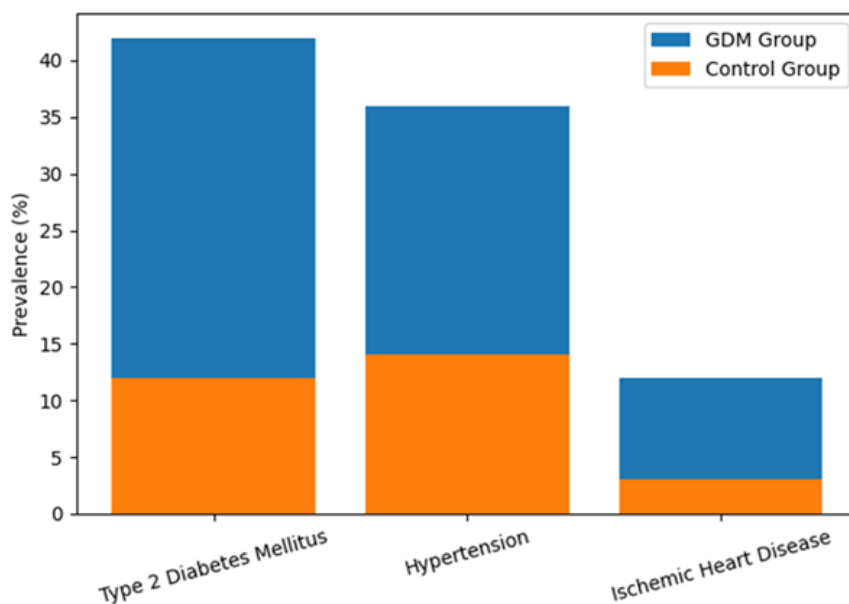


Figure 1: Comparison of Cardiometabolic Outcomes Between GDM and Control Groups

Summary of Results

Overall, the results indicate that women with previous gestational diabetes mellitus have significantly higher body mass index, poorer glycemic control, adverse lipid profiles, and a markedly increased prevalence of type 2 diabetes mellitus, hypertension, and ischemic heart disease when compared to women without GDM history.

Discussion

The present study demonstrates a significantly increased risk of type 2 diabetes mellitus, hypertension, and ischemic heart disease among women with a history of gestational diabetes mellitus. These findings reinforce the growing body of evidence that GDM is not a transient pregnancy-related condition but rather an early marker of long-term cardiometabolic vulnerability.

Women with prior gestational diabetes mellitus (GDM) in this study demonstrated a significantly increased prevalence of type 2 diabetes mellitus, aligning with extensive population-based studies indicating a markedly heightened lifetime risk of diabetes subsequent to GDM [15,16]. Chronic insulin resistance and advancing pancreatic β -cell dysfunction post-pregnancy are regarded as fundamental mechanisms driving this progression [17]. Failure to recover from metabolic issues in the postpartum period can lead to early signs of glucose intolerance and diabetes.

Hypertension was significantly more common in women with prior GDM compared to controls. This observation supports earlier findings suggesting a strong association between GDM and future hypertensive disorders [18]. Shared pathophysiological pathways such as endothelial dysfunction, chronic inflammation, increased arterial stiffness, and adverse lipid profiles may explain this relationship [19]. These mechanisms collectively promote vascular damage and elevate long-term cardiovascular risk.

The heightened incidence of ischaemic heart disease in the GDM group underscores the cardiovascular consequences of gestational dysglycemia. Numerous longitudinal cohort studies have indicated that women with a history of gestational diabetes mellitus (GDM) exhibit a higher prevalence of coronary artery disease and significant adverse cardiovascular events, irrespective of the progression to type 2 diabetes [20,21]. This implies that GDM may function as an independent cardiovascular risk factor.

The clustering of metabolic abnormalities, such as dyslipidaemia, hyperglycemia, and hypertension, noted in women with a history of gestational diabetes mellitus (GDM), reinforces the concept that GDM serves as an initial indicator of metabolic syndrome [22]. These abnormalities accelerate atherosclerotic processes, consequently elevating the risk of ischaemic heart disease at a comparatively younger age.

The findings of this study underscore the importance of long-term follow-up and cardiovascular risk assessment in women with prior GDM. Current evidence supports early postpartum screening, sustained lifestyle modification, and targeted preventive strategies to reduce future cardiometabolic morbidity [23,24]. Incorporating GDM history into routine cardiovascular risk stratification may allow for earlier intervention and improved long-term outcomes.

Overall, this study adds to the existing literature by providing region-specific evidence from eastern India and highlights the urgent need for structured

postpartum surveillance programs for women affected by gestational diabetes mellitus [25].

Conclusion

Women with a history of gestational diabetes mellitus have a significantly increased risk of developing type 2 diabetes mellitus, hypertension, and ischemic heart disease. Structured postpartum follow-up, lifestyle modification, and early cardiovascular risk screening are essential to reduce future disease burden.

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