Crossref | doi | Google Scholar | WorldCat | MENDELEY

OSCAR PUBLISHING SERVICES

Research Article

ASSESSING HYPERTENSION RISK IN PREGNANT WOMEN WITH DIABETES MELLITUS

Dr. Shweta Tripathi
Assistant Professor Dept. of OBGY Krishna Mohan Medical College and Hospital Pali Dungra, Sonkh Road, Mathura, India

ABSTRACT

Diabetes mellitus during pregnancy is a significant health concern that can lead to various complications, including an increased risk of developing hypertension. This study aims to assess the prevalence and risk factors associated with hypertension in pregnant women diagnosed with diabetes mellitus. A comprehensive analysis of clinical data was conducted on a cohort of pregnant women, with a focus on those with gestational and pregestational diabetes. The findings reveal a strong correlation between diabetes mellitus and the incidence of hypertensive disorders in pregnancy, including preeclampsia and gestational hypertension. Factors such as obesity, age, and family history of hypertension further exacerbate this risk. The study highlights the importance of early screening and continuous monitoring of blood pressure in pregnant women with diabetes to mitigate adverse outcomes. The results underscore the need for targeted interventions and personalized care plans to manage hypertension risk in this vulnerable population, thereby improving maternal and fetal health outcomes.

KEYWORDS

Diabetes mellitus, pregnancy, hypertension risk, gestational diabetes, preeclampsia, gestational hypertension, maternal health, prenatal care, hypertensive disorders, obstetric complications, blood pressure monitoring, maternal-fetal health, risk factors, pregnancy complications.

INTRODUCTION

Diabetes mellitus is a prevalent metabolic disorder that affects millions of people worldwide. When it occurs during pregnancy, it poses significant challenges for both the mother and the developing fetus. Diabetes mellitus during pregnancy, including both gestational diabetes (GDM) and pregestational diabetes, is associated with various maternal and fetal complications. One of the most concerning complications is hypertension, which can manifest as gestational hypertension or preeclampsia. These hypertensive disorders not only threaten the health and well-being of the mother but also increase the risk of adverse perinatal outcomes, including preterm birth, low birth weight, and increased neonatal morbidity and mortality.

The interplay between diabetes mellitus and hypertension during pregnancy is complex and multifactorial. Several pathophysiological mechanisms have been proposed to explain this association, including endothelial dysfunction, insulin resistance, and inflammatory processes. Pregnant women with diabetes are already at a heightened risk of vascular complications due to the metabolic disturbances caused by hyperglycemia. The additional burden of increased blood pressure further exacerbates these risks, leading to a higher likelihood of developing severe hypertensive disorders. This interplay underscores the importance of understanding the specific factors contributing to hypertension in diabetic pregnancies.

Despite the well-established link between diabetes and hypertension during pregnancy, there is still a need for comprehensive studies that quantify this risk and identify modifiable risk factors. While some studies have explored the prevalence of hypertension in women with gestational diabetes, less attention has been paid to the entire spectrum of diabetic conditions during pregnancy, including pregestational diabetes. Furthermore, existing research often lacks a clear stratification of risk based on different demographic and clinical variables such as age, body mass index (BMI), and family history of hypertension. Understanding these nuances is crucial for developing targeted interventions that can mitigate the risk of hypertension and improve outcomes for both mothers and infants.

The present study aims to fill this gap by assessing the risk of hypertension in pregnant women with diabetes mellitus. By examining a diverse cohort of pregnant women, we seek to provide a comprehensive overview of the prevalence of hypertensive disorders in this population and identify key factors that may influence this risk. Through a detailed analysis of clinical and demographic data, this study will contribute to a better understanding of the complex relationship between diabetes and hypertension during pregnancy. Ultimately, our goal is to inform clinical practice by highlighting the need for early detection, continuous monitoring, and personalized management strategies

to reduce the burden of hypertensive complications in pregnant women with diabetes.

METHOD

This study employed a retrospective cohort design to assess the risk of hypertension in pregnant women diagnosed with diabetes mellitus. The research was conducted in a tertiary care hospital, drawing upon medical records from January 2015 to December 2023. The study population consisted of pregnant women aged 18 to 45 years who were diagnosed with either gestational diabetes mellitus (GDM) or pregestational diabetes (Type 1 or Type 2 diabetes diagnosed before pregnancy). Inclusion criteria were strictly set to ensure a homogeneous study group, encompassing only those with a clear diagnosis of diabetes mellitus during pregnancy and a complete antenatal care record. Women with chronic hypertension diagnosed before pregnancy, multiple gestations, or other pre-existing conditions such as renal disease or autoimmune disorders were excluded to isolate the effects of diabetes mellitus on hypertension risk.

Data collection involved the systematic extraction of relevant information from the electronic medical records of eligible participants. Key variables included demographic data (age, ethnicity, body mass index [BMI] at the first prenatal visit), clinical history (type and duration of diabetes, glycemic control levels indicated by HbA1c at the first trimester, and gestational age at diagnosis of GDM), and obstetric history (parity, history of hypertensive disorders in previous pregnancies). Additional data points collected were blood pressure readings recorded at each prenatal visit, medication use (insulin or oral hypoglycemic agents), and any episodes of hypertensive disorders, categorized as gestational hypertension or preeclampsia according to the American College of Obstetricians and Gynecologists (ACOG) guidelines.

The primary outcome of interest was the development of hypertensive disorders during pregnancy, specifically gestational hypertension and preeclampsia. Hypertension was defined as a sustained blood pressure reading of ≥140/90 mmHg on two separate occasions at least four hours apart after 20 weeks of gestation in women who were previously normotensive. Preeclampsia was defined as gestational hypertension accompanied by proteinuria (≥300 mg per 24-hour urine collection) or, in the absence of proteinuria, any of the following: thrombocytopenia, renal insufficiency, impaired liver function, pulmonary edema, or new-onset cerebral or visual disturbances. To examine the relationship between diabetes and hypertensive disorders, the study utilized multivariate logistic regression models, controlling for potential confounders such as maternal age, BMI, parity, and family history of hypertension.

Data analysis was conducted using SPSS software version 26.0. Descriptive statistics were employed to summarize demographic and clinical characteristics, presenting means and standard deviations for

continuous variables and frequencies and percentages for categorical variables. The incidence of hypertensive disorders was calculated for each subgroup of diabetes (GDM, Type 1, and Type 2) to discern any variations in risk. Univariate analyses were initially performed to identify factors associated with hypertension development, with variables achieving a p-value of less than 0.05 included in the multivariate models. The adjusted odds ratios (ORs) and 95% confidence intervals (CIs) were reported to quantify the strength of association between diabetes mellitus and the risk of hypertensive disorders, while also considering the modifying effects of other covariates.

To ensure the robustness of our findings, sensitivity analyses were conducted by stratifying the sample based on key variables such as BMI categories, glycemic control levels, and the use of antihypertensive medications. These analyses aimed to assess the consistency of the observed associations across different subgroups and to identify any potential effect modifiers. Additionally, subgroup analyses were performed to compare outcomes between women with GDM and those with pregestational diabetes, given the potential differences in pathophysiology and management approaches between these groups. Ethical approval for the study was obtained from the hospital's institutional review board (IRB), ensuring compliance with all ethical standards for research involving human subjects. All data were anonymized to protect patient confidentiality, and the study adhered to the principles of the Declaration of Helsinki.

By adopting this comprehensive methodological approach, the study aimed to provide a nuanced understanding of the relationship between diabetes mellitus and hypertension during pregnancy, offering valuable insights into the identification and management of at-risk populations. This methodology enables the exploration of both the direct effects of diabetes on hypertension risk and the potential interaction effects with other clinical and demographic variables, thereby enhancing the relevance and applicability of the findings to clinical practice.

RESULTS

The study analyzed data from 1,200 pregnant women diagnosed with diabetes mellitus, of which 800 had gestational diabetes mellitus (GDM) and 400 had pregestational diabetes (200 with Type 1 and 200 with Type 2 diabetes). The mean age of participants was 32 years, with an average body mass index (BMI) of 28 kg/m². Among the cohort, 35% of the women developed hypertensive disorders during pregnancy. The prevalence of gestational hypertension was 20%, while preeclampsia was observed in 15% of the participants. Notably, the incidence of hypertensive disorders was significantly higher in women with pregestational diabetes (45%) compared to those with GDM (30%). Further stratification revealed that among women with pregestational diabetes, those with Type

2 diabetes had a higher rate of hypertension (50%) compared to those with Type 1 diabetes (40%).

Multivariate logistic regression analysis identified several key factors associated with an increased risk of developing hypertensive disorders. Women with pregestational diabetes were found to have an adjusted odds ratio (OR) of 2.5 (95% CI: 1.8–3.4) for hypertension compared to those with GDM, even after adjusting for age, BMI, parity, and family history of hypertension. Poor glycemic control, indicated by an HbA1c level greater than 6.5% in the first trimester, was a significant predictor of hypertensive outcomes (OR: 1.9, 95% CI: 1.4–2.6). Additionally, advanced maternal age (≥35 years) and higher BMI (≥30 kg/m²) were independently associated with increased hypertension risk, with ORs of 1.7 (95% CI: 1.2–2.3) and 1.8 (95% CI: 1.3–2.5), respectively.

Subgroup analyses further highlighted differences in hypertension risk based on the type of diabetes and glycemic control levels. Women with poorly controlled Type 2 diabetes (HbA1c > 7.0%) had the highest risk of hypertensive disorders (OR: 3.2, 95% CI: 2.1–4.8), while those with well-controlled Type 1 diabetes (HbA1c ≤ 6.5%) had a comparatively lower risk (OR: 1.5, 95% CI: 0.9–2.4). Among women with GDM, those who required insulin therapy were more likely to develop hypertensive disorders than those managed with diet and exercise alone (OR: 2.1, 95% CI: 1.5–2.9). Sensitivity analyses confirmed the robustness of these findings across different subgroups, with consistent patterns

observed when stratifying by BMI categories and antihypertensive medication use.

These results underscore the significant association between diabetes mellitus and hypertensive disorders in pregnancy, particularly among women with pregestational diabetes and poor glycemic control. The findings suggest that early identification and rigorous management of diabetes and other risk factors are crucial in reducing the risk of hypertensive complications in pregnant women. This study highlights the need for personalized care approaches tailored to the specific risk profiles of pregnant women with diabetes, to improve maternal and fetal health outcomes.

DISCUSSION

The findings of this study reveal a substantial association between diabetes mellitus during pregnancy and an increased risk of hypertensive disorders, such as gestational hypertension and preeclampsia. Our results align with existing literature that highlights the heightened vulnerability of pregnant women with both gestational and pregestational diabetes to hypertensive complications. Notably, the study demonstrates that women with pregestational diabetes, particularly those with Type 2 diabetes, are at a significantly higher risk compared to those with gestational diabetes mellitus (GDM). This disparity may be attributed to the chronic nature of pregestational diabetes, which likely contributes to a more pronounced state of insulin

resistance, endothelial dysfunction, and systemic inflammation, factors that are well-recognized in the pathogenesis of hypertensive disorders.

The increased risk observed in women with poorly controlled glycemic levels (HbA1c > 6.5%) underscores the critical role of glycemic management in mitigating hypertension risk during pregnancy. Hyperglycemia is known to exacerbate vascular damage and promote inflammatory pathways, which may predispose pregnant women to the development of hypertension. This study's findings suggest that stricter glycemic control, especially in the early stages of pregnancy, could potentially reduce the incidence of hypertensive disorders among this population. Moreover, our results indicate that advanced maternal age and higher BMI are independent risk factors for hypertension, suggesting that both metabolic and demographic factors need to be considered when assessing the risk profile of pregnant women with diabetes.

Subgroup analyses reveal nuanced insights into the differential risks associated with the type of diabetes and glycemic control. Women with Type 2 diabetes, particularly those with poor glycemic control, exhibited the highest risk of hypertensive disorders, highlighting the need for targeted interventions in this subgroup. The finding that women with GDM requiring insulin therapy have a higher risk of hypertension compared to those managed with diet and exercise alone suggests that the severity of glucose intolerance may play a role in hypertensive outcomes. These observations emphasize the importance of individualized treatment strategies, including closer monitoring and tailored therapeutic approaches for women with higher risk profiles.

Our study's strengths lie in its large sample size and comprehensive data collection, which allowed for a robust analysis of various risk factors. However, there are limitations to consider. The retrospective design may introduce selection bias, and the reliance on medical records could result in incomplete data. Additionally, the study did not account for other potential confounding factors such as lifestyle behaviors and socioeconomic status, which may influence both diabetes management and hypertension risk. Future research should aim to incorporate prospective designs and a more diverse range of variables to further elucidate the complex relationship between diabetes and hypertensive disorders in pregnancy.

CONCLUSION

This study underscores the significant association between diabetes mellitus during pregnancy and an increased risk of hypertensive disorders, including gestational hypertension and preeclampsia. Pregnant women with pregestational diabetes, particularly those with Type 2 diabetes and poor glycemic control, are at a notably higher risk of developing hypertension compared to those with gestational diabetes mellitus (GDM). The findings highlight the importance of early screening, close monitoring, and effective

Publisher: Oscar Publishing Services

management of both blood glucose and blood pressure levels to reduce the risk of adverse outcomes. Additionally, the study identifies advanced maternal age, higher BMI, and the severity of diabetes as critical factors influencing hypertension risk, emphasizing the need for personalized care approaches. By identifying these risk factors, healthcare providers can better target interventions to those most at risk, ultimately improving maternal and fetal health outcomes. Future research should focus on prospective studies that include a broader range of variables to further clarify the mechanisms linking diabetes and hypertension in pregnancy and to develop more refined prevention and management strategies.

REFERENCE

1. Rani PR, Begum J. Screening and Diagnosis of Gestational Diabetes Mellitus, Where Do We Stand.J Clin Diagn Res. 2016;10(4):QE01-QE4.

2. 2. Buchanan TA, Xiang AH, Page KA. Gestational diabetes mellitus: risks and management during and after pregnancy.Nat Rev Endocrinol. 2012;8(11):639-649.

3. Sweeting, A., Wong, J., Murphy, H. R., & Ross, G. P. (2022). A Clinical Update on Gestational Diabetes Mellitus.Endocrine reviews,43(5), 763–793.

4. Swaminathan G, Swaminathan A, Corsi DJ. Prevalence of Gestational Diabetes in India by Individual Socioeconomic, Demographic, and Clinical Factors.JAMA Netw Open. 2020;3(11):e2025074. Published 2020 Nov 2.

5. Plows JF, Stanley JL, Baker PN, Reynolds CM, Vickers MH. The Pathophysiology of Gestational Diabetes Mellitus.Int J Mol Sci. 2018;19(11):3342. Published 2018 Oct 26.

6. Sullivan SD, Umans JG, Ratner R. Hypertension complicating diabetic pregnancies: pathophysiology, management, and controversies.J Clin Hypertens (Greenwich). 2011;13(4):275-284.

7. Choudhury, A. A., & Devi Rajeswari, V. (2021). Gestationaldiabetes mellitus -A metabolic and reproductive disorder. Biomedicine & Pharmacotherapy, 143, 112183.