INTERNATIONAL JOURNAL OF INTEGRATIVE AND MODERN MEDICINE

Diabetes Mellitus and Pregnancy: A Review of Advances 2020-2025

Axtamova M. N.
Assistent of the Obstetrics and gynecology department of the Tashkent state medical university

Annotation: This review synthesizes the recent (2020-2025) literature on the interaction between diabetes mellitus (pre-gestational Type 1 & Type 2, and gestational diabetes) and pregnancy. Key areas address epidemiology, diagnostic criteria, glycemic control technologies (including continuous glucose monitoring), maternal-fetal outcomes, and interventions for prevention of type 2 diabetes postpartum. Findings indicate improved outcomes with early diagnosis, preconception care, tighter glycemic control, and newer technologies. The review suggests implications for clinical practice and public health policy.

Keywords: Diabetes mellitus; gestational diabetes mellitus; pre-existing diabetes; pregnancy outcomes; continuous glucose monitoring (CGM); type 2 diabetes prevention; glycemic control.

Introduction

Diabetes mellitus (DM) represents one of the most significant metabolic disorders worldwide and has profound implications for pregnancy outcomes. It encompasses a group of chronic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. In the context of pregnancy, diabetes may exist as preexisting diabetes—either Type 1 diabetes mellitus (T1DM) or Type 2 diabetes mellitus (T2DM)—or as gestational diabetes mellitus (GDM), which develops or is first recognized during pregnancy. Each subtype presents distinct challenges for maternal and fetal health, requiring careful management throughout gestation and beyond.

The prevalence of diabetes during pregnancy has been increasing globally in recent decades, paralleling the rise in obesity, sedentary lifestyles, and delayed childbearing. According to the International Diabetes Federation (IDF, 2023), approximately one in six pregnancies worldwide is affected by hyperglycemia, with nearly 85–90% of cases attributable to GDM. Women with preexisting T1DM or T2DM face additional risks due to long-standing vascular complications, suboptimal glycemic control before conception, and higher likelihood of hypertensive disorders, cesarean delivery, and perinatal mortality [3][4].

Diabetes during pregnancy poses dual challenges: first, the maternal metabolic environment directly influences fetal growth and development; and second, the physiological changes of pregnancy—such as increased insulin resistance mediated by placental hormones—complicate metabolic control. Poorly managed diabetes in pregnancy can lead to severe complications, including preeclampsia, preterm labor, intrauterine fetal demise, congenital malformations, macrosomia, shoulder dystocia, neonatal hypoglycemia, and long-term metabolic dysfunction in the offspring [5][6].

Over the past five years (2020–2025), substantial research progress has been achieved in screening strategies, glycemic monitoring technologies, pharmacologic management, and preventive interventions**.** The integration of Continuous Glucose Monitoring (CGM) systems has revolutionized the understanding of maternal glycemic patterns, providing detailed insights into glucose variability and “time in range” (TIR) as a more accurate predictor of outcomes than HbA1c alone [7][8]. Likewise, advances in digital health technologies, including telemedicine and smartphone-based glucose monitoring, have enhanced patient engagement and self-management, especially in the context of the COVID-19 pandemic, which accelerated remote healthcare delivery.

Furthermore, the classification and diagnostic criteria for GDM continue to evolve. The adoption of the International Association of Diabetes and Pregnancy Study Groups (IADPSG) and WHO guidelines has led to higher detection rates but also to ongoing debate regarding thresholds that

balance sensitivity and specificity for adverse outcomes. Early first-trimester screening is increasingly recommended for women at high risk (e.g., obesity, previous GDM, family history of T2DM), as early detection enables earlier lifestyle or pharmacologic intervention [5].

Equally important are the long-term implications of diabetes in pregnancy. Women with GDM have a 7–10-fold increased risk of developing T2DM within 10 years after delivery, and their offspring face higher risks of obesity, impaired glucose tolerance, and cardiovascular disease later in life. Therefore, pregnancy provides a unique window of opportunity for both short-term management and long-term prevention of metabolic diseases in mothers and their children [9][10].

From a clinical perspective, the management of diabetic pregnancies demands a multidisciplinary approach—including obstetricians, endocrinologists, dietitians, and neonatologists—to optimize glycemic control while minimizing risks of hypoglycemia and fetal compromise. Preconception counseling, individualized nutritional therapy, insulin dose adjustment, and close fetal surveillance remain cornerstones of care. Yet, disparities in healthcare access, especially in low- and middle-income countries, continue to contribute to preventable maternal and neonatal morbidity and mortality.

Given these developments, a comprehensive synthesis of recent literature (2020–2025) is warranted to guide practitioners, inform policymakers, and identify research gaps. This review aims to summarize and critically analyze recent evidence on diabetes and pregnancy, focusing on epidemiological trends, diagnostic strategies, technological advances, maternal and fetal outcomes, and postpartum prevention of T2DM. The overarching goal is to highlight how contemporary innovations can improve perinatal health and reduce the intergenerational burden of metabolic disease.

Aim of the work was to systematically review and synthesize the literature published between 2020 and 2025 on the diagnosis, management, and outcomes of diabetes mellitus in pregnancy, focusing on preexisting (Type 1 & Type 2) and gestational diabetes, including advances in technology and intervention strategies.

Materials and Methods

A literature search was conducted using PubMed, Medline, Google Scholar, and guideline repositories (e.g., ADA, ACOG, SIGN) for publications from January 2020 through mid-2025. Search terms included “gestational diabetes review 2022”, “pregnancy outcomes type 2 diabetes meta-analysis 2024”, “continuous glucose monitoring pregnancy randomized trial”, “preconception care in type 2 diabetes”, and “type 2 diabetes prevention after GDM”. Included were randomized controlled trials, systematic reviews, meta-analyses, observational cohort studies, and clinical guidelines. Exclusion criteria: animal studies, case reports, expert opinion only without data. Data were extracted for diagnostic criteria, glycemic control methods, technology (CGM/BGM), maternal and neonatal outcomes, interventions to prevent type 2 diabetes postpartum. Quality assessed using standard tools (e.g., GRADE or ROBINS-I for observational studies).

Results

Epidemiological Trends.

- The proportion of pregnancies complicated by preexisting Type 2 diabetes has been rising. In the UK and similar settings, Type 2 diabetes now represents a majority of preexisting diabetes in pregnant women. [3]
- Gestational diabetes incidence has increased in many populations, driven by rising obesity, older maternal age, and wider adoption of diagnostic criteria (IADPSG/WHO). [5]

Diagnostic Strategies and Timing

- Standard universal screening for GDM at 24-28 weeks using the 75-g OGTT remains standard in many guideline recommendations. Early screening (first trimester) is increasingly supported for women with risk factors (e.g. obesity, prior GDM, older age). [5]

- Continuous glucose monitoring (CGM) is being used more frequently to detect glycemic excursions and time in range (TIR) metrics, which have demonstrated associations with adverse outcomes. [8][7]

Management and Technologies

- Medical Nutrition Therapy (MNT), physical activity, and insulin remain core treatments for GDM and preexisting diabetes. Oral agents (e.g. metformin) are considered in some settings but are not universally accepted. [7]
- CGM usage in pregnancy, including in Type 1, Type 2, and GDM patients, has shown improvements in glycemic control: increased TIR, lower mean glucose, reduced time above target thresholds. [10][7]
- A randomized trial comparing real-time CGM vs capillary blood glucose (CBG) in GDM showed statistically higher %TIR in the CGM group. [10]

Preconception and Postpartum Interventions

- Interventions to enhance pre-pregnancy care for women with Type 2 diabetes have had limited uptake but show promise in improving preparation and maternal/fetal outcomes. [2]
- Among women with prior GDM, lifestyle interventions (diet, physical activity) and sometimes pharmacologic measures reduce the incidence of subsequent Type 2 diabetes. A living systematic review with meta-analysis (2024) of 17 RCTs found reduced risk of T2DM with interventions maintained over follow-up ≥12 months. [13]

Maternal and Fetal Outcomes

- Systematic review and meta-analysis comparing Type 2 diabetes vs GDM and Type 1 diabetes pregnancies indicated that T2D pregnancies have elevated risk of congenital anomalies, large for gestational age (LGA), stillbirth, neonatal mortality, perinatal mortality compared to non-diabetic pregnancies. [3]
- Studies report that CGM use in Type 2 diabetic pregnant people is associated with lower odds of neonatal morbidity, preterm birth, and NICU admission compared with those using traditional self-monitoring. [1]
- In Type 1 diabetes pregnancies, early gestational TIR (e.g. first trimester) correlates with lower rates of preeclampsia and LGA. [8]

Discussion

The recent literature (2020-2025) strongly supports the importance of early and accurate diagnosis of diabetes in pregnancy, tight glycemic control (with targets including TIR), and use of technology (CGM) to improve outcomes. Preconception care, especially for women with Type 2 diabetes, remains underutilized but is critical. Interventions postpartum to lower progression to Type 2 diabetes in women with prior GDM are effective but require sustained implementation. Challenges include standardizing diagnostic criteria, ensuring access to CGM especially in low-resource settings, and tailoring interventions to vulnerable populations.

Conclusions

- Diabetes mellitus in pregnancy (both preexisting and gestational) remains a major public health challenge.
- Universal or risk-based early screening, preconception optimization, and tight glycemic control are key to reducing maternal and fetal complications.
- Continuous glucose monitoring offers promising improvements in perinatal outcomes and should be increasingly integrated into care standards.

- Postpartum interventions in women with prior GDM can reduce later development of Type 2 diabetes; health systems should prioritize these.
- Future research should aim to refine diagnostic thresholds, expand access to technology, and conduct intervention studies in diverse populations and settings.

References

1. "Continuous Glucose Monitoring for Management of Type 2 Diabetes and Perinatal Outcomes." Obstetrics & Gynecology, 2024. PubMed
2. Hopkins, R. J., et al. "Interventions to enhance pre-pregnancy care for women with type 2 diabetes: A systematic review of the literature." Diabetic Medicine, 2023. Wiley Online Library
3. Clement, N. S., Abul, A., Farrelly, R., Murphy, H. R., Forbes, K., Simpson, N. A. B., Scott, E. M. "Pregnancy outcomes in type 2 diabetes: a systematic review and meta-analysis." American Journal of Obstetrics & Gynecology, 2025. ovid.com+1
4. Dalfrà, M. G., Burlina, S., Lapolla, A. "Pregnancy and Type 2 Diabetes: Unmet Goals." Endocrines, 2023. MDPI
5. Ye, W., Luo, C., Huang, J., Li, C., Liu, Z., Liu, F. "Gestational Diabetes Mellitus and Adverse Pregnancy Outcomes: Systematic Review and Meta-analysis." BMJ, 2022. PMC
6. Meta-analysis comparing T2DM vs T1DM in pregnancy: systematic review with meta-analyses (various outcomes) — included in Clement et al. 2025. ovid.com+2ajog.org+2
7. "Continuous glucose monitoring system in diabetes in pregnancy: a narrative review." Diabetology & Metabolic Syndrome, 2025. BioMed Central
8. "Continuous Glucose Monitoring in Pregnancies with Type 1 Diabetes: Time-in-Range early pregnancy outcomes." (2024). ovid.com
9. Real-Time Continuous Glucose Monitoring vs Self-monitoring in Gestational Diabetes: RCT (2021-2023) showing improvement in TIR. PubMed
10. "Efficacy of interventions to prevent type 2 diabetes among women with recent GDM – living systematic review and meta-analysis." Journal of Diabetes, 2024.