

# Diabetes Mellitus: Disease Control and Diabetes Screening and Prevention after a Pregnancy Complicated by Gestational Diabetes

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## Abstract

**Background:** Women with gestational diabetes mellitus (GDM) are at an increased risk for developing metabolic syndrome, type 2 diabetes mellitus (T2DM), and cardiovascular disease. In this review, we will discuss postpartum cardiovascular and diabetes risk in women with a history of GDM and different ways to improve postpartum screening.

**Methods:** This review involves a comprehensive literature review on gestational diabetes and postpartum risk for cardiovascular disease and diabetes mellitus as well as post-partum screening methods.

**Results:** Cardiovascular risk post-partum is potentiated by increased inflammatory markers leading to worsening atherosclerosis and cardiovascular events downstream. Decreased insulin sensitivity and  $\beta$  cell compensation, recurrent GDM, maternal factors such as pre and post-partum weight gain and lactation may contribute to T2DM risk. Postpartum glucose testing is essential in screening women as hyperglycemia in pregnancy has long term effects on both cardiovascular disease and diabetes risk on the mother.

**Conclusion:** Long and short term improvement to post-partum glucose testing is essential to decreasing cardiometabolic and diabetes risk in women with gestational diabetes mellitus.

**Keywords:** Cardiovascular disease; OGTT; Gestational diabetes mellitus; Hyperglycemia; Postpartum screening; Type 2 diabetes mellitus

## Introduction

Gestational diabetes mellitus (GDM) is defined as glucose intolerance developed during pregnancy.<sup>1</sup> As with type 2 diabetes mellitus (T2DM), the incidence of GDM is growing; GDM currently affects an estimated 5–10% of pregnancies in the United States, with approximately 250,000 new cases each year.<sup>2</sup> Not only has there been a steady increase in the prevalence of GDM over the past 20 years, but the rising national trends of advanced maternal age, obesity, and decreased physical activity will contribute to a further increase in the prevalence of GDM in years to come [1].

The diagnosis of GDM bears associated short-term and long-term risks for both the infant and mother. The correlation between GDM and macrosomia, neonatal hypoglycemia, birth trauma, and subsequent overweight in the offspring has been well-established.<sup>4</sup> For the mother, GDM is associated with increased risk of hypertensive disorders, cesarean delivery, and other perinatal complications.<sup>5</sup> Furthermore, 30% of women with GDM remain glucose intolerant after delivery, and over half ultimately receive the diagnosis of overt diabetes.<sup>6</sup> The risks of T2DM in pregnancies subsequent to an index pregnancy with GDM are amplified beyond those incurred by GDM alone.

The first step in long-term risk management of women with GDM is postpartum glucose tolerance testing. Groups such as the American College of Obstetrics and Gynecology (ACOG) and the American Diabetes Association (ADA) recommend that women with GDM receive care 6–12 weeks after delivery to assess blood pressure, body mass index (BMI), and metabolic profile, in addition to routine postpartum concerns [2]. Women are additionally recommended to visit their primary care provider (PCP) within a year of delivery; PCPs may perform further metabolic testing, recommend pharmacologic therapy, and utilize lifestyle modalities to promote weight loss, which has been shown to reduce the onset of diabetes, as demonstrated in the Diabetes Prevention Program.

Despite these recommendations, data reveal that less than 50% of

women with GDM partake in any form of postpartum glucose testing. Our goal is to use a public health and health services perspective to discuss barriers to optimal postpartum care for women with GDM, review evidence based interventions, and offer recommendations for a multi-level approach for serving this important and growing population [3].

## Barriers to diabetes postpartum care

Receipt of appropriate postpartum glucose testing is contingent upon returning for postpartum care. Others have reported extensively on barriers to receiving postpartum care, and we will highlight issues unique to women with GDM. Indeed the social, financial, and structural barriers to receiving postpartum care additionally serve as barriers to receiving diabetes-specific care. Such barriers include out-of-pocket costs, lack of health insurance, appointment wait times, childcare availability, transportation costs, demanding work schedules, and lack of supported parental leave. Additional barriers specific to completing the postpartum oral glucose tolerance test (OGTT) can be divided into patient characteristics and beliefs, inadequate provider training, and ineffective system-level practices, which are discussed below [4].

Several studies have sought to identify individual characteristics associated with postpartum appointment attendance and OGTT completion in women with GDM. Patients who are Asian, older,

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nulliparous, or with medication-controlled GDM are more likely to return for testing. Risk factors for poor follow up include Latina ethnicity, public insurance, less education, and lower health literacy. Low health literacy has a well-studied association with inadequate health service utilization, and in this particular population, limited literacy/numeracy could limit T2DM risk estimation or result in confusion regarding instructions. Among women who report to understand their future T2DM risk but do not complete their OGTT, many express anxiety about receiving a T2DM diagnosis, citing fears of diabetes complications and needing lifelong insulin.

From a provider perspective, ACOG best practices include counseling women with GDM about their higher lifetime risk of cardiometabolic disease [5], as well as ensuring that these women undergo postpartum glucose screening. The ADA recommends women with a history of GDM receive education about lifestyle modification. While the recommendations are well established, the literature suggests room for improvement in provider knowledge and implementation.

Limited access to care and inadequate obstetric-primary care transitions pose system-level barriers to long-term diabetes prevention and management. In many states, Medicaid coverage for the mother extends to only 60 days postpartum. Subsequent care may require women to pay out of pocket, which poses a cost burden that likely deters mothers from pursuing long-term health care. While new mothers are encouraged to seek health care through systems such as the Affordable Care Act, enrollment can be challenging and may not occur in a timely manner. Thus, for women in underserved communities in particular, many of whom may not have physician contact prior to or between pregnancies, it can be especially difficult to focus on primary prevention [6].

### Care transition is also suboptimal

A 2014 study showed that among women with Medicaid, 65% of those with a pregnancy complicated by GDM or hypertensive disorders had a postpartum obstetric visit within three months of delivery, and only 56.6% visited a primary care doctor within a year.<sup>30</sup> This clearly represents an opportunity for improving care coordination, especially since an estimated 44.9% of the nation's births are covered by Medicaid each year [7]. Furthermore, of women who do see a PCP after delivery, many fail to disclose a pregnancy complicated by GDM. While this gap could be ameliorated by better communication, transitional health care between obstetricians/gynecologists and PCPs remains inconsistent in both frequency and efficacy.

### Lifestyle modification

The CDC DPP trial demonstrated that lifestyle modification reduced the chances of developing T2D by 60% when compared with those in the placebo group. The study groups included individuals at high risk for developing T2D by virtue of having had GDM. Several other studies using the DPP model demonstrated that a 7% weight reduction via lifestyle modification could significantly decrease the risk of developing T2D. DPP has been found to be an effective technique to induce behavioral changes and weight reduction, and reduce cardiometabolic risk factors in general, especially for individuals with a history of GDM.

### Gestational diabetes mellitus and type 2 diabetes mellitus risk

GDM is any form of glucose/carbohydrate intolerance with first onset or recognition during pregnancy. The US Preventive Services Task Force recommends routine antenatal glucose screening for GDM

between 24 and 26 weeks of gestation [8]. Two to 10% of pregnancies in the United States are affected by GDM, which confers a 35% to 60% risk of developing T2D during the subsequent 10 to 20 years.

### Referral to the National Diabetes Prevention Program

Several reports have documented numerous barriers to attending postnatal clinical appointments and program interventions. The most cited barriers to participation include inaccurate patient contact information, lack of child care, work or school obligations, and lack of access to transportation. Participation in postpartum DPPs would likely be hampered by similar barriers. To overcome these potential barriers, we suggest that the increased number of remote, distance, or online CDC-recognized DPPs created in response to the pandemic-related change in healthcare delivery might mitigate or remove some of the obstacles and thus facilitate participation in postpartum DPPs.

### Discussion

Many medical organizations including the American Diabetes Association have encouraged healthcare practitioners (HCPs) to refer their high-risk patients to a lifestyle-change program, such as the one offered through the National DPP. A recent study showed that HCPs who were familiar with lifestyle-change DPPs and aware of available programs were more likely to make DPP referrals [9]. There is also evidence that patients who were referred to a lifestyle-change program by their HCP were more likely to join the program. Unfortunately, according to the CDC, 80% of patients with prediabetes mellitus have no knowledge of their diagnosis, and only 5% of patients with prediabetes mellitus or at high risk of T2D receive referrals to a program for lifestyle change. Currently, after a GDM-affected pregnancy, to evaluate persistent or recurrent glucose intolerance, the postdelivery recommendation is to perform an oral glucose tolerance test (OGTT) between 4 and 12 weeks after delivery and subsequent serial OGTTs at 1-to-3-year intervals.

Up to 70% of individuals with GDM will develop T2D in the absence of intervention.<sup>6</sup> GDM is associated with higher rates of preeclampsia, cesarean delivery, fetal macrosomia, neonatal hypoglycemia, hyperlipidemia, shoulder dystocia, birth trauma, and stillbirth. Moreover, the offspring from GDM-affected pregnancies have an increased risk for childhood and adult-onset obesity. Decreasing the risk of T2D and perhaps the recurrence of GDM is a desirable and realizable DPP goal for public health [10].

### Conclusion

To decrease the GDM-associated risk of developing T2D, routine postpartum care should include a recommendation that the affected individual participates in a CDC-recognized DPP.

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