Gestational diabetes causes and diagnosis

What gestational diabetes means

Gestational diabetes is typically defined as hyperglycemia first detected during pregnancy that does not clearly meet criteria for preexisting overt diabetes. In practical terms, it means blood glucose levels are higher than expected because the body cannot produce or use insulin effectively enough for the metabolic demands of pregnancy.

Insulin is the hormone that helps move glucose from the bloodstream into cells for energy use and storage. In pregnancy, insulin sensitivity naturally declines, especially in the second and third trimesters. This physiologic insulin resistance helps ensure a steady nutrient supply to the growing fetus. For many pregnant people, the pancreas compensates by increasing insulin production. Gestational diabetes develops when that compensation is insufficient.

GDM matters because untreated or unrecognized hyperglycemia can increase the likelihood of complications such as excessive fetal growth, neonatal hypoglycemia, cesarean birth, hypertensive disorders, and future type 2 diabetes risk. However, early recognition and coordinated care can substantially improve monitoring and outcomes.

The central cause: insulin resistance plus limited beta-cell compensation

The core pathophysiology of gestational diabetes is a mismatch between rising insulin resistance and pancreatic beta-cell capacity. Beta cells, located in the pancreatic islets, produce insulin. During pregnancy, healthy beta-cell adaptation includes increased insulin secretion and, in some individuals, expansion of beta-cell functional capacity. When this adaptive response is inadequate, glucose levels rise.

Pregnancy-related insulin resistance is not abnormal by itself. It is driven partly by placental and maternal signals that shift metabolism toward providing nutrients to the fetus. Hormones and mediators such as human placental lactogen, placental growth hormone, progesterone, cortisol, prolactin, inflammatory cytokines, and adipokines can influence insulin signaling. The result is reduced insulin-mediated glucose uptake, especially in skeletal muscle and adipose tissue.

In gestational diabetes, this physiologic resistance becomes clinically significant because the pancreas cannot increase insulin secretion enough. This may be due to underlying insulin resistance present before pregnancy, inherited beta-cell vulnerability, autoimmune or metabolic factors, or a combination of these. In many cases, GDM reveals a predisposition to dysglycemia that was not obvious before pregnancy.

Risk factors and why they matter

Some people develop gestational diabetes without any obvious risk factors, which is why routine screening is used. Still, several factors are consistently associated with higher risk. These factors do not guarantee GDM, and their presence should not be interpreted as blame; they help clinicians decide whether earlier or additional screening is appropriate.

Higher body mass index or central adiposity: Adipose tissue can increase baseline insulin resistance through inflammatory and hormonal pathways.
Family history of type 2 diabetes: Shared genetic and metabolic traits can affect insulin secretion and insulin sensitivity.
Prior gestational diabetes: A previous GDM pregnancy is one of the strongest

predictors of recurrence.
Previous infant with high birth weight: This may suggest prior unrecognized maternal hyperglycemia, although many other factors can contribute.
Polycystic ovary syndrome and insulin resistance: PCOS is frequently associated with impaired insulin signaling and may increase GDM risk.
Advanced maternal age: Insulin sensitivity and beta-cell reserve may decline with age, increasing susceptibility.
Certain ethnic or ancestral backgrounds: Population-level risk differs, likely reflecting complex genetic, social, environmental, and cardiometabolic factors.
Prediabetes or elevated glucose before pregnancy: Early dysglycemia increases the likelihood that pregnancy will unmask clinically significant hyperglycemia.

Risk assessment is also a chance to consider broader metabolic health. People who entered pregnancy with diabetes, insulin resistance, PCOS, or other metabolic disorders may need individualized screening and monitoring plans.

Placental, inflammatory, and genetic contributors

The placenta is metabolically active. It produces hormones and signaling molecules that influence maternal insulin sensitivity, lipid metabolism, appetite, and inflammatory tone. As pregnancy progresses and placental mass increases, insulin resistance generally rises. This is one reason GDM screening is commonly performed at 24 to 28 weeks' gestation, when pregnancy-related insulin resistance is more pronounced.

Inflammation is another important contributor. Low-grade chronic inflammation, often linked with adiposity and metabolic syndrome, can interfere with insulin receptor signaling. Adipokines such as leptin and adiponectin also play roles: adiponectin generally improves insulin sensitivity, while altered adipokine patterns can be associated with greater insulin resistance.

Genetics influence both sides of the equation: how strongly a person becomes insulin resistant and how effectively beta cells respond. Some genetic variants linked to type 2 diabetes overlap with GDM susceptibility. This overlap helps explain why gestational diabetes is associated with a higher lifetime risk of type 2 diabetes, even when blood glucose normalizes after delivery.

Symptoms: why screening is needed even when you feel well

Most people with gestational diabetes have no clear symptoms. When symptoms do occur, they can be nonspecific and easily overlap with normal pregnancy experiences. Increased thirst, frequent urination, fatigue, or blurred vision can occur with hyperglycemia, but these symptoms are not reliable enough to diagnose or exclude GDM.

Because symptoms are often absent, laboratory screening is the standard approach. A normal-feeling pregnancy can still include elevated post-meal glucose levels. Conversely, feeling tired or thirsty does not necessarily mean gestational diabetes is present. Testing provides a structured way to identify who needs additional monitoring and support.

When gestational diabetes screening is usually done

For many pregnancies, routine screening is performed between 24 and 28 weeks of gestation. This timing aligns with the period when placental hormone effects and insulin resistance commonly intensify. However, some people are screened earlier, often at the first prenatal visit or in the first trimester, if they have risk factors suggesting possible preexisting diabetes or early dysglycemia.

Early testing may be considered for people with prior gestational diabetes, known prediabetes, obesity plus additional risk factors, a strong family history of type 2 diabetes, PCOS, or previous unexplained adverse pregnancy outcomes potentially related to hyperglycemia. The purpose of early testing is not only to detect GDM but also to identify overt diabetes that may have been present before pregnancy.

If early testing is normal, clinicians may still repeat screening at 24 to 28 weeks because insulin resistance increases as pregnancy progresses. The exact testing plan depends on local guidelines, the clinical setting, and individual risk profile.

How diagnosis is made: one-step and two-step testing

Gestational diabetes diagnosis relies on measuring blood glucose response to a glucose load. Two major strategies are widely used: a two-step approach and a one-step approach. Different countries and professional organizations use

different thresholds, so results should be interpreted by the healthcare team familiar with the applicable guideline.

Two-step approach: The first step is usually a 50-gram oral glucose challenge test. It is often done without fasting. Blood glucose is measured one hour after drinking the glucose solution. If the value is above the screening threshold, a diagnostic oral glucose tolerance test follows, commonly using 100 grams of glucose with fasting, one-hour, two-hour, and three-hour measurements.

Common thresholds for the 50-gram screening test include one-hour values around 130, 135, or 140 mg/dL, depending on the practice. Lower thresholds detect more cases but may increase false positives. For the 100-gram, three-hour oral glucose tolerance test, diagnostic criteria often require two or more abnormal values, though exact cutoffs vary. Commonly referenced Carpenter-Coustan thresholds are fasting 95 mg/dL, one-hour 180 mg/dL, two-hour 155 mg/dL, and three-hour 140 mg/dL.

One-step approach: This uses a fasting 75-gram oral glucose tolerance test with glucose measured fasting, at one hour, and at two hours. Diagnosis may be made if one or more values meets or exceeds the threshold. Commonly used thresholds include fasting 92 mg/dL, one-hour 180 mg/dL, and two-hour 153 mg/dL.

Both approaches aim to identify clinically meaningful hyperglycemia, but they differ in sensitivity, convenience, and the number of people diagnosed. Your clinician can explain which approach is being used and what your specific values mean.

Understanding test results without self-diagnosing

It is natural to search for answers as soon as you see a glucose result. However, GDM diagnosis depends on the type of test, fasting status, timing of blood draws, laboratory handling, gestational age, and the diagnostic criteria used. A single number may mean different things in different testing protocols.

If a screening test is elevated, it does not always mean gestational diabetes is confirmed. It usually means diagnostic testing is needed. If an oral glucose tolerance test is abnormal, your care team will discuss next steps, which may include nutrition counseling, home glucose monitoring, physical activity

guidance when safe, fetal growth surveillance, and, for some people, medication. Treatment decisions should be individualized; this article does not prescribe a care plan.

It can help to bring specific questions to your appointment: Which diagnostic criteria were used? Were one or more values abnormal? Do I need repeat testing? Should I monitor fasting and post-meal glucose? Are there other pregnancy conditions, such as hypertensive disorders, that need closer monitoring? Gestational diabetes can overlap with broader pregnancy risk assessment, including monitoring for conditions such as preeclampsia.

After diagnosis: what it means for the rest of pregnancy

A diagnosis of gestational diabetes usually leads to closer maternal and fetal monitoring. Many people manage glucose levels with individualized nutrition strategies and activity adjustments if medically appropriate. Others need insulin or other medication under specialist guidance. The goal is to reduce hyperglycemia while supporting adequate maternal nutrition and fetal growth.

Clinicians may monitor fetal growth, amniotic fluid, maternal blood pressure, and glucose logs. Delivery planning depends on glucose control, fetal growth, obstetric history, other medical conditions, and gestational age. Because circumstances vary, decisions about induction, medication, and monitoring should be made with the prenatal care team.

Postpartum follow-up is also important. For many people, glucose levels improve after the placenta is delivered, but the future risk of type 2 diabetes remains higher. A postpartum oral glucose tolerance test is commonly recommended, followed by long-term periodic diabetes screening. This can feel like one more task after birth, but it is a valuable opportunity for prevention and early detection.