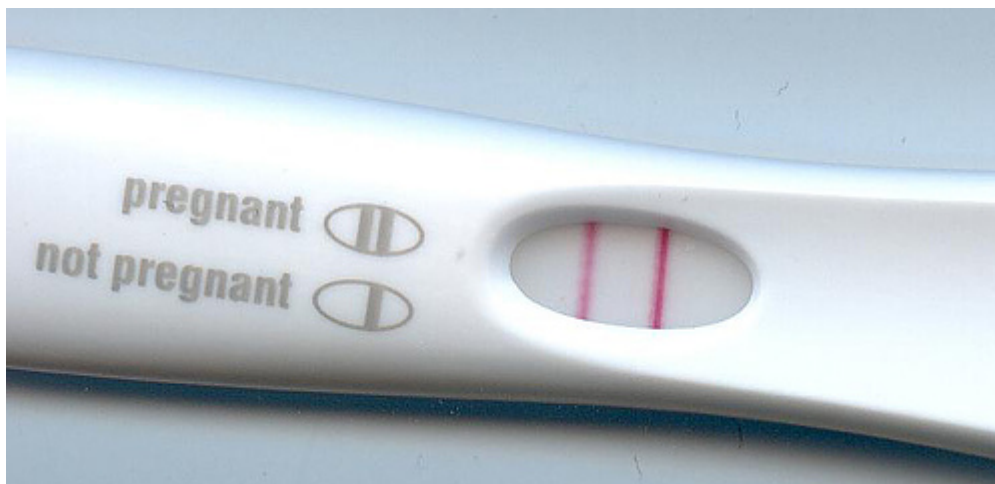


## Gestational Diabetes (Diabetes During Pregnancy) — Signs and Therapy

[See online here](#)

**Gestational diabetes is one of the most common diseases associated with pregnancy. Some of the risk factors are overweight and a prior record of diabetes within the family. You will learn everything from the definition to the diagnosis of and to therapy for gestational diabetes here.**



### Definition

Gestational diabetes is defined as the first manifestation/recognition of a disruption of glucose tolerance levels, which occurs during pregnancy and ends within 6 weeks postpartum. It is triggered by increased insulin resistance, which is caused by the pregnancy. The transition from normal glucose tolerance levels during pregnancy and gestational diabetes is smooth, and a threshold value seems not to exist.

**Nomenclature:** diabetes during pregnancy, gestational diabetes, GDM, diabetes type 4

### Epidemiology

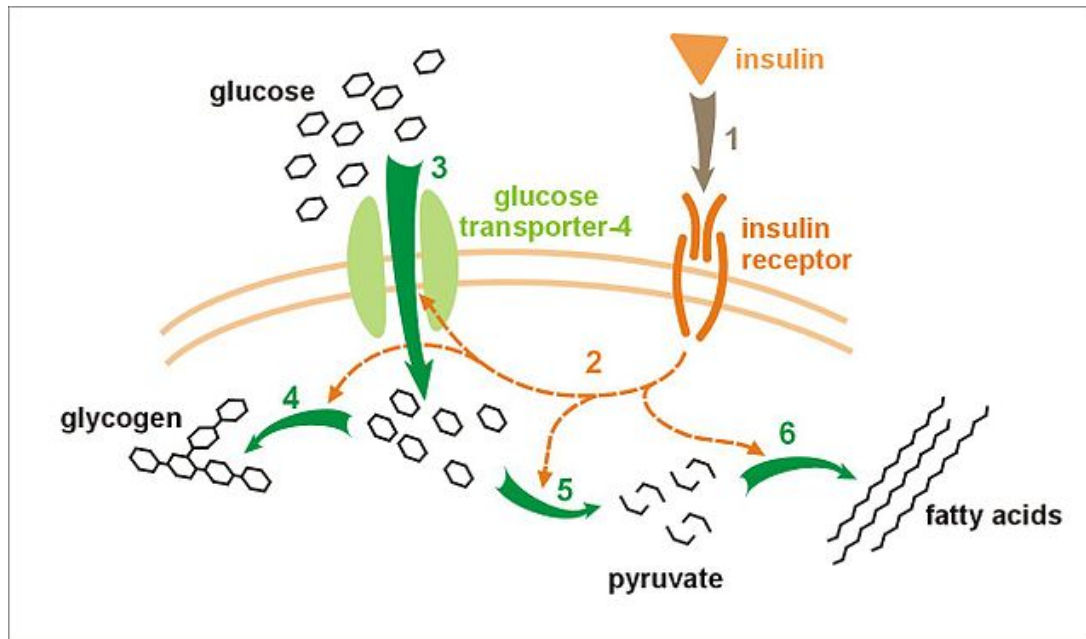
About 2% of all pregnant women have gestational diabetes. The frequency differs between the various ethnic groups: Asian and Latin American women are more likely to be affected than Caucasian women.

### Etiology and Pathogenesis

The pathophysiology of gestational diabetes and diabetes type 2 is identical for the most part. During pregnancy, the carbohydrate metabolism changes. In the 1st trimester, increased estrogen and progesterone levels are associated with a decrease in fasting

blood sugar until 12 weeks of gestation.

From the 2nd trimester on, there is a risk for peripheral insulin resistance due to the release of anti-insulin signals from the placenta. This triggers a rise in fasting and postprandial glucose leading to the transplacental transfers of glucose into the bloodstream of the fetus. Lowered transfer of maternal amino acids and increased carbohydrate mobilization to supply fetal demands follows this. Maternal carbohydrate metabolism is diverted into fat and this increases insulin resistance. Aside from the hormonal changes during pregnancy, cytokine and adipokine may be released by adipose tissue and the placenta.



**Image:** Effect of insulin on glucose uptake and metabolism. Insulin binds to its receptor (1) on the cell membrane which, in turn, starts many protein activation cascades (2). These include: translocation of Glut-4 transporter to the plasma membrane and influx of glucose (3), glycogen synthesis (4), glycolysis (5) and fatty acid synthesis (6). By: User Meiquer, License: [CC BY-SA 3.0](https://creativecommons.org/licenses/by-sa/3.0/)

**Important:** Glucose can easily pass the placental barrier through facilitated diffusion, whereas insulin cannot.

## Risk factors

Certain risk factors facilitate the development of gestational diabetes.

- **Record of diabetes mellitus within the family**
- **Age > 30 years**
- **Overweight (BMI > 27 kg/m<sup>2</sup>)**
- **Previous pregnancies with an overweight fetus (> 4.5 g)**
- Arterial hypertonia, dyslipidemia prior to conception
- [Polycystic ovarian syndrome \(PCO-syndrome\)](#)
- Anamnesis of [CHD](#), [PAOD](#)
- Ingestion of medication against insulin (i.e., glucocorticoids)

## Symptoms and Clinical Features

## Case study

### A case study about gestational diabetes could look like this.

A 36-year-old woman in the 9th week of pregnancy is pregnant with her 2nd child. Her 1st pregnancy was uneventful and the healthy child, who was born 7 days after the due date, had a birth weight of 4280 g.

The values of the blood sugar tests in the 2nd trimester were 'marginal'. During the 1st pregnancy, she gained a total weight of 18 kg and, despite occasional sports and 'more vegetables and fruit', she was not able to lose the additional weight entirely. Her metabolism was not monitored during the pregnancy as she moved and had not found a family doctor.

With gestational diabetes, there are usually not any of the initial discomforts due to the increased blood sugar levels; therefore, it does not cause the typical clinical picture of diabetes type 1. Polydipsia, glucosuria, changes in the amount of amniotic fluid, and arterial hypertension may occur. However, possible disruption of fetal development and increased maternal risk for secondary diseases are deciding factors. Infantile malformations (**diabetic fetopathy**) are more common.

## Complications

### Maternal complications



- [Image](#): Measurement of the blood pressure of a pregnant woman. By nih.gov, License: Public Domain

Increased risk of urinary tract infections

- Development of a hypertensive disease with pre-eclampsia
- Excessive weight gain during the pregnancy
- Deterioration of existing retinopathy and diabetic nephropathy that regresses 6 weeks after delivery
- Derailment of the metabolism (hyperglycemia)

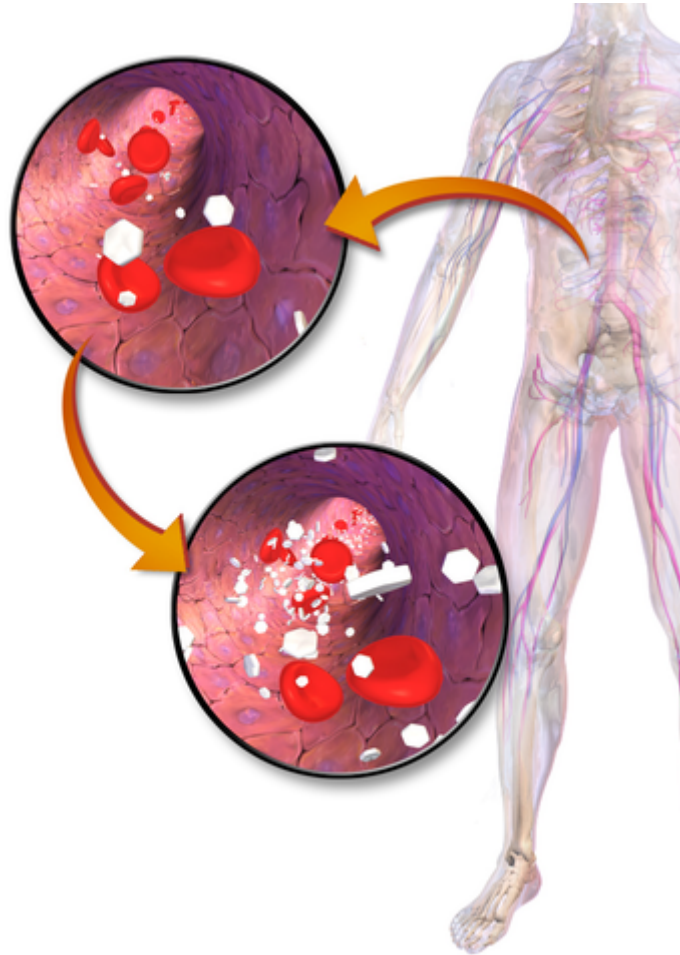
### Fetal complications

The organ that is most commonly affected by diabetic fetopathy is the heart leading to the development of anomalies such as atrial and ventral septal defects, transposition of the great arteries, and tetralogy of Fallot. Other systems involved include the nervous

and renal systems, and the formation of abdominal wall defects may occur. The risk of malformations increases with the level of HBA<sub>1c</sub>.

Growth restriction and disturbances of the blood circulation in the placenta are also common. The resulting undersupply can lead to intrauterine death.

Growth acceleration and fetal obesity are seen in 15–45% of cases.



- [Image](#): Diabetes and high blood sugar. By: BruceBlaus, License: [CC BY 3.0](#)

**Hyperglycemia** → polyuria (**polyhydramnios**), excessive insulin production and **macrosomia** of the child → increased the size and weight of the fetus can cause problems at birth (example: shoulder dystocia).

- **Pulmonary malfunctions** through premature lungs
- Malfunctions of the liver (**hyperbilirubinemia**).
- Fetal beta cells of the pancreas adapt to the mother's high glucose levels and react with hyperplasia and more secretion of insulin → this state lasts for a short amount of time, even after the placenta has been detached. It is the cause of **hypoglycemia** in a newborn child.
- **Polycythemia** triggered by the hyperglycemia-induced release of fetal erythropoietin. It may also be the cause of hyperbilirubinemia.
- **Caudal regression syndrome** (rare): malformation of the lower body half.
- Fetal programming: increased risk of developing adiposis, diabetes type 2

# Diagnosis

To diagnose gestational diabetes, an **oral glucose tolerance test** should be performed (OGTT); first screening, then as a 75-g OGTT.

1. **Screening:** 50g of glucose is poured into 200 ml of water, not dependent on the time of day or sobriety, and the glucose level in venous plasma is measured.
2. **75-g OGTT:** If the blood glucose level according to the screening is >135 mg/dL, 75 g of glucose should be poured into 300 ml of water and ingested within 10 minutes. Diagnostical threshold values in venous plasma are as follows.

Time	Threshold values in venous plasma
Fasting blood sugar	95 mg/dL
after 1 hour	180 mg/dL
after 2 hours	155 mg/dL
after 3 hours	140 mg/dL

## Screening for gestational diabetes

All pregnant women should be screened for gestational diabetes between 24–28 weeks gestation. Women at high-risk should be screened in the 1st trimester and again at 24–28 weeks if negative in the 1st trimester.

### Note! Risk factors for gestational diabetes

- Previous history of gestational diabetes
- Obesity (BMI > 30 kg/m<sup>2</sup>)
- Advanced maternal age (> 35 years)
- Ethnicities: African-American, Hispanic
- History of an infant with macrosomia



50 g oral glucola



Blood glucose 1 h later



Value of  $\geq 140$  mg/dL is a positive screen

Image by Lecturio

If patient screens positive, a 3-h GTT is performed to diagnose gestational diabetes.

### 3 h GTT involves:

- A fasting blood sugar test
- A 100-g glucose drink
- 1 h, 2 h, and 3 h blood draws

# Management

Dietary modification is the first-line method for the management of diabetes. If diabetes is not controlled by diet, then oral hypoglycemic or insulin is needed.

**Important!** All women diagnosed with gestational diabetes should be screened for overt diabetes in the postpartum period.

75-g OGTT, 2 h test at 6–12 weeks postpartum

Women with gestational diabetes have a 15–50% lifetime risk of developing diabetes.

## Blood glucose level target values

Sober	< 90 mg/dL
1 h postprandial	< 140 mg/dL
2 h postprandial	< 120 mg/dL

For the first 2 weeks, attempts to attain the target values via diet should be made (switch to carbohydrates that are slowly absorbed and avoidance of industrial sugars, products made of superfine flour, etc). If this approach fails, therapy with human insulin is possible.

**Important:** therapy with oral diabetics is contraindicated! Frequent examinations of the metabolism (i.e., daily blood sugar profiles) and sonographic examinations should be performed in order to monitor the normal development of the fetus.

## Development of Gestational Diabetes

There is approx. a 50% risk for the mother to develop gestational diabetes again in another pregnancy. Additionally, the risk of developing diabetes mellitus type 2 is increased as well.

If the blood glucose levels are well-adjusted, premature induction of labor or C-section is unlikely.

## References

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