Hyperglycemia in diabetes

Overview

High blood sugar (hyperglycemia) affects people who have diabetes. Several factors can contribute to hyperglycemia in people with diabetes, including food and physical activity choices, illness, nondiabetes medications, or skipping or not taking enough glucose-lowering medication.

It's important to treat hyperglycemia, because if left untreated, hyperglycemia can become severe and lead to serious complications requiring emergency care, such as a diabetic coma. In the long term, persistent hyperglycemia, even if not severe, can lead to complications affecting your eyes, kidneys, nerves and heart.

Symptoms

Hyperglycemia doesn't cause symptoms until glucose values are significantly elevated — usually above 180 to 200 milligrams per deciliter (mg/dL), or 10 to 11 millimoles per liter (mmol/L). Symptoms of hyperglycemia develop slowly over several days or weeks. The longer blood sugar levels stay high, the more serious the symptoms become. However, some people who've had type 2 diabetes for a long time may not show any symptoms despite elevated blood sugar levels.

Early signs and symptoms

Recognizing early signs and symptoms of hyperglycemia can help you treat the condition promptly. Watch for:

- Frequent urination
- Increased thirst
- Blurred vision
- Fatigue
- Headache

Later signs and symptoms

If hyperglycemia goes untreated, it can cause toxic acids (ketones) to build up in your blood and urine (ketoacidosis). Signs and symptoms include:

- Fruity-smelling breath
- Nausea and vomiting
- Shortness of breath
- Dry mouth
- Weakness
- Confusion
- Coma
- Abdominal pain

When to see a doctor

Call 911 or emergency medical assistance if:

- You're sick and can't keep any food or fluids down, and
- Your blood glucose levels are persistently above 240 mg/dL (13 mmol/L) and you have ketones in your urine

Make an appointment with your doctor if:

- You experience ongoing diarrhea or vomiting, but you're able to take some foods or drinks
- You have a fever that lasts more than 24 hours
- Your blood glucose is more than 240 mg/dL (13 mmol/L) even though you've taken your diabetes medication
- You have trouble keeping your blood glucose within the desired range

Causes

During digestion, your body breaks down carbohydrates from foods — such as bread, rice and pasta — into various sugar molecules. One of these sugar molecules is glucose, a main energy source for your body. Glucose is absorbed directly into your bloodstream after you eat, but it can't enter the cells of most of your tissues without the help of insulin — a hormone secreted by your pancreas.

When the level of glucose in your blood rises, it signals your pancreas to release insulin. The insulin, in turn, unlocks your cells so that glucose can enter and provide the fuel your

cells need to function properly. Any extra glucose is stored in your liver and muscles in the form of glycogen.

This process lowers the amount of glucose in your bloodstream and prevents it from reaching dangerously high levels. As your blood sugar level returns to normal, so does the secretion of insulin from your pancreas.

Diabetes drastically diminishes the effects of insulin on your body, either because your pancreas is unable to produce enough insulin (type 1 diabetes) or because your body is resistant to the effects of insulin or doesn't produce enough insulin to maintain a normal glucose level (type 2 diabetes). As a result, glucose tends to build up in your bloodstream (hyperglycemia) and may reach dangerously high levels if not treated properly. Insulin or other drugs are used to lower blood sugar levels.

Risk factors

Many factors can contribute to hyperglycemia, including:

- Not using enough insulin or oral diabetes medication
- Not injecting insulin properly or using expired insulin
- Not following your diabetes eating plan
- Being inactive
- Having an illness or infection
- Using certain medications, such as steroids
- Being injured or having surgery
- Experiencing emotional stress, such as family conflict or workplace challenges

Illness or stress can trigger hyperglycemia because hormones produced to combat illness or stress can also cause your blood sugar to rise. Even people who don't have diabetes may develop hyperglycemia during severe illness. But people with diabetes may need to take extra diabetes medication to keep blood glucose near normal during illness or stress.

Complications

Long-term complications

Keeping tight control of your blood sugar can help prevent many diabetes-related complications. Long-term complications of untreated hyperglycemia can include:

- Cardiovascular disease

- Nerve damage (neuropathy)
- Kidney damage (diabetic nephropathy) or kidney failure
- Damage to the blood vessels of the retina (diabetic retinopathy), potentially leading to blindness
- Clouding of the normally clear lens of your eye (cataract)
- Feet problems caused by damaged nerves or poor blood flow that can lead to serious skin infections, ulcerations, and in some severe cases, amputation
- Bone and joint problems
- Teeth and gum infections

Emergency complications

If blood sugar rises high enough or for a prolonged period of time, it can lead to two serious conditions.

- **Diabetic ketoacidosis.** Diabetic ketoacidosis develops when you don't have enough insulin in your body. When this happens, sugar (glucose) can't enter your cells for energy. Your blood sugar level rises, and your body begins to break down fat for energy.

  This process produces toxic acids known as ketones. Excess ketones accumulate in the blood and eventually "spill over" into the urine. Left untreated, diabetic ketoacidosis can lead to a diabetic coma and be life-threatening.

- **Hyperglycemic hyperosmolar state.** This condition occurs when people produce insulin, but it doesn't work properly. Blood glucose levels may become very high — greater than 600 mg/dL (33 mmol/L). Because insulin is present but not working properly, the body can't use either glucose or fat for energy.

  Glucose is then spilled into the urine, causing increased urination. Left untreated, diabetic hyperglycemic hyperosmolar state can lead to life-threatening dehydration and coma. Prompt medical care is essential.

Prevention

The following suggestions can help keep your blood sugar within your target range:

- **Follow your diabetes meal plan.** If you take insulin or oral diabetes medication, it's important that you be consistent about the amount and timing of your meals and snacks. The food you eat must be in balance with the insulin working in your body.
- **Monitor your blood sugar.** Depending on your treatment plan, you may check and record your blood sugar level several times a week or several times a day. Careful

monitoring is the only way to make sure that your blood sugar level remains within your target range. Note when your glucose readings are above or below your goal range.

- **Take your medication as prescribed by your health care provider.**
- **Adjust your medication if you change your physical activity.** The adjustment depends on the blood sugar test results and on the type and length of the activity.

By Mayo Clinic Staff