

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



Hypoglycemia

By

Dr. Nabil Lymon

Professor of Internal Medicine

Mansoura University

What is Hypoglycemia?

- Hypoglycemia means low blood sugar level. This term is used to describe a metabolic disorder, that may manifest itself in a variety of physical and psychological symptoms.

- The level of blood glucose enough to define hypoglycemia may be different for different people, in different circumstances, and for different purposes, and occasionally has been a matter of controversy. Most healthy adults maintain fasting glucose levels above 4.0 mmol/L (72 mg/dl), and develop symptoms of hypoglycemia when the glucose falls below 4 mmol/L.

- One must understand that glucose is a source of both physical (i.e., muscles) and mental (brain) energy. The brain although only 2 percent by weight of the body, requires between 50 and 60 percent of the available glucose in the body, whether awake or asleep.

What are the symptoms of hypoglycemia?

- Hypoglycemic symptoms and manifestations can be divided into those produced by the counterregulatory hormones (epinephrine /adrenaline and glucagon) triggered by the falling glucose, and the neuroglycopenic effects produced by the reduced brain sugar.

■ Adrenergic manifestations

1. Shakiness, anxiety, nervousness
2. Palpitations, tachycardia
3. Sweating, feeling of warmth (although sweat glands have muscarinic receptors, thus "adrenergic manifestations" is not entirely accurate)
4. Pallor, coldness, clamminess
5. Dilated pupils (mydriasis)
6. Feeling of numbness "pins and needles" (paresthesia)

■ Glucagon manifestations

1. Hunger, borborygmus
2. Nausea, vomiting, abdominal discomfort
3. Headache

■ Neuroglycopenic manifestations

- Abnormal mentation, impaired judgment
- Nonspecific dysphoria, moodiness, depression, crying, exaggerated concerns
- Negativism, irritability, belligerence, combativeness, rage
- Personality changes, emotional lability
- Fatigue, weakness, apathy, lethargy, day dreaming, sleep
- Confusion, amnesia, dizziness, delirium
- Staring, "glassy" look, blurred vision, double vision

- Flashes of light in the field of vision
- Automatic behavior, also known as automatism
- Difficulty speaking, slurred speech
- Ataxia, incoordination, sometimes mistaken for "drunkenness"
- Focal or general motor deficit, paralysis, hemiparesis
- Paresthesia, headache
- Stupor, coma, abnormal breathing
- Generalized or focal seizures

Symptoms during sleep

- Hypoglycemia can also happen during sleep.
Some signs of hypoglycemia during sleep include
 - Crying out or having nightmares
 - Finding pajamas or sheets damp from perspiration
 - Feeling tired, irritable, or confused after waking up

What causes hypoglycemia in people with diabetes?

1. Missed meal or Severe exercise after insulin or oral hypoglycemic agents.
2. Brittle diabetes mellitus.
3. Decreased elimination of insulin as in cases of renal failure.
4. Alcoholic beverages

How can hypoglycemia be prevented?

- To help prevent hypoglycemia, people with diabetes should always consider the following:
 1. Their diabetes medications
 2. Their meal plan
 3. Their daily activity
 4. Their use of alcoholic beverages
 5. Their diabetes management plan

Their diabetes medications

- For good diabetes management, people with diabetes should take diabetes medications in the recommended doses at the recommended times.
- In some cases, health care providers may suggest that patients learn how to adjust medications to match changes in their schedule or routine.

Their meal plan

- A registered dietitian can help design a meal plan that fits one's personal preferences and lifestyle.
- Following one's meal plan is important for managing diabetes. People with diabetes should eat regular meals, have enough food at each meal, and try not to skip meals or snacks

Their daily activity

- To help prevent hypoglycemia caused by physical activity, advices are:
 1. Checking blood glucose before sport, exercise, or other physical activity and having a snack if the level is below 100 milligrams per deciliter (mg/dL)
 2. Adjusting medication before physical activity
 3. Checking blood glucose at regular intervals during extended period of physical activity and having snacks as needed.
 4. Checking blood glucose periodically after physical activity.

Their use of alcoholic beverages

- Drinking alcoholic beverages, especially on an empty stomach, can cause hypoglycemia, even a day or two later.
- Heavy drinking can be particularly dangerous for people taking insulin or medications that increase insulin production.

Their diabetes management plan

- Intensive diabetes management-keeping blood glucose close to the normal range as possible to prevent long-term complications can increase the risk of hypoglycemia. Those whose goal is tight control should talk with a health care provider about ways to prevent hypoglycemia and how best to treat it if it occurs.

How is hypoglycemia treated?

- Signs and symptoms of hypoglycemia vary from person to person. People with diabetes should get to know their signs and symptoms and describe them to their friends and family so they can help if needed. School staff should be told how to recognize a child's signs and symptoms of hypoglycemia and how to treat it

... continued

- People who experience hypoglycemia several times in a week should call their health care provider. They may need a change in their treatment plan: less medication or a different medication, a new schedule for insulin or medication, a different meal plan, or a new physical activity plan.

Prompt Treatment for Hypoglycemia

When people think their blood glucose is too low, they should check the blood glucose level of a blood sample using a meter. If the level is below 70 mg/dL, one of these quick-fix foods should be consumed right away to raise blood glucose:

- 3 or 4 glucose tablets
- 1 serving of glucose gel-the amount equal to 15 grams of carbohydrate

... continued

- 1/2 cup, or 4 ounces, of any fruit juice
- 1/2 cup, or 4 ounces, of a regular-**not diet**-soft drink
- 1 cup, or 8 ounces, of milk
- 5 or 6 pieces of hard candy
- 1 tablespoon of sugar or honey

** Recommended amounts may be less for small children. The child's doctor can advise about the right amount to give a child.

... continued

- The next step is to recheck blood glucose in 15 minutes to make sure it is 70 mg/dL or above. If it's still too low, another serving of a quick-fix food should be eaten. These steps should be repeated until the blood glucose level is 70 mg/dL or above. If the next meal is an hour or more away, a snack should be eaten once the quick-fix foods have raised the blood glucose level to 70 mg/dL or above.

Normal and Target Blood Glucose Ranges

Normal Blood Glucose Levels in People Who Do Not Have Diabetes

Upon waking-fasting	70 to 99 mg/dL
After meals	70 to 140 mg/dL

Target Blood Glucose Levels in People Who Have Diabetes

Before meals	70 to 130 mg/dL
1 to 2 hours after the start of a meal	below 180 mg/dL

Source: American Diabetes Association. Standards of Medical Care in Diabetes-2008. Diabetes Care.

For people with diabetes, a blood glucose level below 70 mg/dL is considered hypoglycemia.

Hypoglycemia in People Who Do Not Have Diabetes

Two types of hypoglycemia can occur in people who do not have diabetes:

1. Reactive hypoglycemia, also called postprandial hypoglycemia, occurs within 4 hours after meals.
2. Fasting hypoglycemia, also called postabsorptive hypoglycemia, is often related to an underlying disease.

... continued

- Symptoms of both reactive and fasting hypoglycemia are similar to diabetes-related hypoglycemia. Symptoms may include hunger, sweating, shakiness, dizziness, light-headedness, sleepiness, confusion, difficulty speaking, anxiety, and weakness.

... continued

- To find the cause of a patient's hypoglycemia, the doctor will use laboratory tests to measure blood glucose, insulin, and other chemicals that play a part in the body's use of energy

Reactive Hypoglycemia

▣ **Diagnosis**

1. ask about signs and symptoms
2. test blood glucose while the patient is having symptoms by taking a blood sample from the arm and sending it to a laboratory for analysis.
3. check to see whether the symptoms cease after the patient's blood glucose returns to 70 mg/dL or above after eating or drinking

... continued

■ Causes and Treatment

■ The causes of most cases of reactive hypoglycemia are still open to debate. Some researchers suggest that certain people may be more sensitive to the body's normal release of the hormone epinephrine, which causes many of the symptoms of hypoglycemia. Others believe deficiencies in glucagon secretion might lead to reactive hypoglycemia.

... continued

- A few causes of reactive hypoglycemia are certain, but they are uncommon. Gastric-or stomach-surgery can cause reactive hypoglycemia because of the rapid passage of food into the small intestine. Rare enzyme deficiencies diagnosed early in life, such as hereditary fructose intolerance, also may cause reactive hypoglycemia.

... continued

To relieve reactive hypoglycemia, some health professionals recommend

- eating small meals and snacks about every 3 hours
- being physically active
- eating a variety of foods, including meat, poultry, fish, or nonmeat sources of protein; starchy foods
- eating foods high in fiber
- avoiding or limiting foods high in sugar, especially on an empty stomach

Fasting Hypoglycemia

■ Diagnosis

Fasting hypoglycemia is diagnosed from a blood sample that shows a blood glucose level below 50 mg/dL after an overnight fast, between meals, or after physical activity.

... continued

■ Causes and Treatment

Causes of fasting hypoglycemia include:

- Certain medications
- Alcoholic beverages
- Critical illnesses
- Hormonal deficiencies
- Some kinds of tumors and
- Certain conditions occurring in infancy and childhood.

Insulinoma

■ Background :

Insulinomas are pancreatic islet cell tumours that secrete insulin. Most are sporadic but some patients have multiple tumours arising from neural crest tissue (multiple endocrine neoplasia).

.... Insulinoma

■ Presenting features of insulinoma :

1. Diplopia
2. Sweating, palpitations, weakness
3. Confusion or abnormal behaviour
4. Loss of consciousness
5. Grand mal seizures

.... *Insulinoma*

■ **Diagnosis**

Whipple's triad remains the basis of clinical diagnosis. This is satisfied when:

1. symptoms are associated with fasting or exercise
2. hypoglycaemia is confirmed during these episodes
3. glucose relieves the symptoms.

- **A fourth criterion – demonstration of inappropriately high insulin levels during hypoglycaemia – may usefully be added to these**

.... *Insulinoma*

- **Treatment of insulinoma :**
 1. The most effective therapy is surgical excision of the tumour, but insulinomas are often very small and difficult to localize.
 2. Medical treatment with diazoxide is useful when the insulinoma is malignant, in patients in whom a tumour cannot be located, and in elderly patients with mild symptoms. Symptoms may also remit on treatment with a somatostatin analogue, Cytotoxic drugs: doxorubicin and streptozotocin for metastatic insulinoma.

Hepatic and renal causes of hypoglycaemia

- The liver can maintain a normal glucose output despite extensive damage, and hepatic hypoglycaemia is uncommon. It is particularly a problem with fulminant hepatic failure.
- The kidney has a subsidiary role in glucose production (via gluconeogenesis in the renal cortex), and hypoglycaemia is sometimes a problem in terminal renal failure

Endocrine causes of hypoglycaemia

- Deficiencies of hormones antagonistic to insulin are rare but well-recognized causes of hypoglycaemia.
- These include hypopituitarism, isolated adrenocorticotrophic hormone (ACTH) deficiency and Addison's disease

Alcohol-induced hypoglycaemia

- Alcohol inhibits gluconeogenesis.
- Alcohol-induced hypoglycaemia occurs in poorly nourished chronic alcoholics, binge drinkers and in children who have taken relatively small amounts of alcohol.
- Since they have a diminished hepatic glycogen reserve. They present with coma and hypothermia.

Factitious hypoglycaemia

- This is a relatively common variant of self-induced disease and is more common than an insulinoma.
- Hypoglycaemia is produced by surreptitious self-administration of insulin or sulfonylureas.
- Many patients in this category have been extensively investigated for an insulinoma.
- Measurement of C-peptide levels during hypoglycaemia should identify patients who are injecting insulin
- Sulphonylurea abuse can be detected by chromatography of plasma or urine

■ Hypoglycemia When Driving

- Hypoglycemia is particularly dangerous if it happens to someone who is driving. People with hypoglycemia may have trouble concentrating or seeing clearly behind the wheel and may not be able to react quickly to road hazards or to the actions of other drivers. To prevent problems, people at risk for hypoglycemia should check their blood glucose level before driving.

- During longer trips, they should check their blood glucose level frequently and eat snacks as needed to keep the level at 70 mg/dL or above. If necessary, they should stop for treatment and then make sure their blood glucose level is 70 mg/dL or above before starting to drive again.

Hypoglycemia Unawareness

- Some people with diabetes do not have early warning signs of low blood glucose, a condition called hypoglycemia unawareness. This condition occurs most often in people with type 1 diabetes, but it can also occur in people with type 2 diabetes. People with hypoglycemia unawareness may need to check their blood glucose level more often so they know when hypoglycemia is about to occur. They also may need a change in their medications, meal plan, or physical activity routine.

- Hypoglycemia unawareness develops when frequent episodes of hypoglycemia lead to changes in how the body reacts to low blood glucose levels. The body stops releasing the hormone epinephrine and other stress hormones when blood glucose drops too low. The loss of the body's ability to release stress hormones after repeated episodes of hypoglycemia is called **hypoglycemia-associated autonomic failure**, or HAAF.

- Epinephrine causes early warning symptoms of hypoglycemia such as shakiness, sweating, anxiety, and hunger. Without the release of epinephrine and the symptoms it causes, a person may not realize that hypoglycemia is occurring and may not take action to treat it. A vicious cycle can occur in which frequent hypoglycemia leads to hypoglycemia unawareness and HAAF, which in turn leads to even more severe and dangerous hypoglycemia.

- Studies have shown that preventing hypoglycemia for a period as short as several weeks can sometimes break this cycle and restore awareness of symptoms. Health care providers may therefore advise people who have had severe hypoglycemia to aim for higher-than-usual blood glucose targets for short-term periods.

**Thank
you**

