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# DISEASES ASSOCIATED WITH GLUCOSE METABOLISM, THEIR ETIOLOGY, AND PREVENTIVE MEASURES

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**Abstract:** This article discusses diseases associated with glucose metabolism: type 1 diabetes, type 2 diabetes, gestational diabetes, and hypoglycemia. Additionally, it presents several scientific findings about glucose being the main source of energy in the human body and how its metabolic disruption can lead to serious pathological conditions. The article includes information about type 1 diabetes, which involves the autoimmune destruction of insulin-producing beta cells, and type 2 diabetes, which is associated with the progression of insulin resistance.
**Keywords:** Glucose, metabolism, type 1 diabetes, type 2 diabetes, gestational diabetes, hypoglycemia, insulin resistancetence, beta cells.

**Introduction**: Glucose is one of the most important sources of energy for the human body. Its presence in the blood and delivery to tissues are essential for the normal functioning of the organism. Disorders of glucose metabolism, decreased insulin production, or reduced sensitivity of tissues to insulin can lead to the development of various diseases. The most common of these are Type 1 and Type 2 diabetes mellitus, gestational diabetes, and hypoglycemia.

Type 1 Diabetes: Type 1 diabetes primarily results from an autoimmune disorder. The pancreatic beta cells are damaged, leading to a significant reduction or complete cessation of insulin production. As a result, glucose accumulates in the blood and cannot efficiently enter the cells, causing energy deficiency and ketone body formation. This condition usually develops in younger individuals and requires lifelong insulin therapy.

Type 2 Diabetes: In Type 2 diabetes, insulin production is preserved, but the body's tissues develop resistance to its effects. This insulin resistance is often due to impaired insulin receptors or signaling pathways. The condition typically arises from factors such as obesity, physical inactivity, poor diet, and genetic predisposition. Type 2 diabetes develops gradually and can lead to multiple complications including diseases of the eyes, kidneys, nervous system, and cardiovascular system.

Gestational Diabetes: Gestational diabetes occurs exclusively during pregnancy and usually resolves after childbirth. During pregnancy, certain hormones (progesterone, estrogen, prolactin) reduce the effectiveness of insulin, resulting in elevated blood glucose levels. If not properly managed, it can pose serious risks to both the mother and the fetus — such as preeclampsia in the mother and excessive fetal weight and complications during childbirth.

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Hypoglycemia is a condition characterized by abnormally low blood glucose levels (typically <3.9 mmol/L). Causes include incorrect use of insulin or other antidiabetic medications, delayed meals, increased physical activity, among others. Symptoms may include dizziness, sweating, rapid heartbeat, mood changes, and even loss of consciousness. Urgent medical attention is required in such cases.

Causes of Disorders Related to Glucose Metabolism

The causes of diseases related to glucose metabolism are associated with several factors and can be grouped as follows:

1. Genetic Factors

Hereditary predisposition: A family history of diabetes or other glucose regulation disorders increases the risk in subsequent generations.

Genetic mutations: Mutations in genes coding for enzymes and receptors involved in glucose metabolism may lead to metabolic disorders.

2. Endocrine System Disorders

Insulin deficiency: Dysfunction of pancreatic β-cells (as seen in type 1 diabetes) impairs the entry of glucose into cells.

Insulin resistance: Cells lose their sensitivity to insulin (commonly in type 2 diabetes).

3. Dietary and Lifestyle Factors

Unhealthy diet: Excessive consumption of sweets, fatty foods, and high-glycemic index products.

Physical inactivity: A sedentary lifestyle reduces insulin sensitivity.

Obesity: An excess of adipose tissue enhances insulin resistance.

4. Stress and Psychological Factors

Chronic stress: Elevated cortisol levels can increase blood glucose concentrations.

Sleep disorders: Disrupted hormonal balance can reduce insulin effectiveness.

5. Other Diseases and Medications

Diseases such as pancreatitis and hepatitis negatively affect glucose metabolism.

Certain medications (e.g., corticosteroids, diuretics) may raise blood glucose levels.

6. Age and Hormonal Changes

Pregnancy: Hormonal changes during pregnancy can lead to gestational diabetes.

Elderly individuals: Aging is associated with decreased insulin production and reduced cellular sensitivity to insulin.

Preventive Measures for Glucose Metabolism Disorders

1. Adopting a Healthy Diet

Prefer low glycemic index foods (e.g., oats, buckwheat, vegetables).

Limit intake of sweets, white bread, sugary drinks, and fatty foods.

Increase consumption of fruits and vegetables.

Eat small portions more frequently (4–5 meals per day).

2. Engaging in Physical Activity

At least 150 minutes per week of moderate physical activity (e.g., jogging, walking, swimming).

Encourage an active lifestyle (e.g., taking stairs instead of elevators, long walks).

3. Weight Management

Maintaining a healthy body weight is crucial, as obesity intensifies insulin resistance.

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4. Stress Management
Use stress-relieving techniques such as rest, meditation, or deep breathing.
Ensure adequate and regular sleep (at least 7–8 hours per night).
5. Screening and Medical Monitoring
Regular annual blood glucose testing, especially for individuals in high-risk groups.
Conduct oral glucose tolerance testing between 24–28 weeks of pregnancy.
6. Eliminating Harmful Habits
Avoid smoking and alcohol completely.
Do not take medications without medical supervision.
Additional Recommendations
1. Patients should fully understand their condition and maintain continuous control over their lifestyle and nutrition.
2. Advanced technologies, such as insulin pumps, continuous glucose monitors, and other medical devices, are increasingly improving the management of these diseases.
Conclusion: Glucose metabolism is one of the vital processes for energy exchange and the normal functioning of cells in the human body. Disruption of this process can lead to several serious disorders, particularly diabetes mellitus, hypoglycemia, glucosuria, insulin resistance syndrome, and other metabolic disturbances. These conditions not only impair metabolic balance but also negatively affect the cardiovascular, nervous, and renal systems. Research indicates that the primary causes of glucose metabolism disorders include improper nutrition, physical inactivity, genetic predisposition, stress, hormonal imbalances, and other risk factors. Early detection, effective monitoring, and appropriate treatment of these disorders are of critical importance.To prevent such diseases, the most effective measures include adhering to a healthy lifestyle, maintaining a balanced diet, engaging in regular physical activity, managing stress, and undergoing routine medical check-ups. Furthermore, individuals in high-risk groups are recommended to undergo continuous monitoring and participate in health-promotion programs.
Overall, diseases related to impaired glucose metabolism represent a significant challenge in modern medicine, and their timely diagnosis and prevention require a comprehensive, multidisciplinary approach.

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