

**TYPE 2 DIABETES MELLITUS IN MODERN MEDICINE: DIAGNOSIS, TREATMENT AND PREVENTION**

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**Abstract**

This article analyzes the causes, development mechanisms, clinical features, complications, as well as modern methods of treatment and prevention of type 2 diabetes mellitus. Studies show that insulin resistance, unhealthy diet, and sedentary lifestyle play a key role as the main contributing factors. The article also provides recommendations for early diagnosis and effective control of the disease.

**Keywords:** diabetes mellitus, type 2 diabetes, insulin resistance, hyperglycemia, metabolic syndrome

Diabetes mellitus is one of the most pressing medical problems of the 21st century. According to the World Health Organization, the number of people suffering from diabetes is increasing year by year. In particular, type 2 diabetes accounts for approximately 90–95% of all diabetes cases. The socio-economic significance of this disease lies in its chronic course and association with severe complications.

Type 2 diabetes mellitus is a multifactorial and complex metabolic disorder that develops under the influence of multiple factors. Genetic, metabolic, and environmental factors are closely interrelated in its pathogenesis.

First of all, genetic factors play an important role. Studies show that if one or both parents have type 2 diabetes, the risk of developing this disease in their children significantly increases. This is related to genes regulating insulin production and sensitivity. However, genetic predisposition alone does not cause the disease; it develops only when combined with external factors.

Another important factor is obesity, especially abdominal (central) obesity. Adipose tissue is not only an energy reserve but also an active endocrine organ that secretes biologically active substances. These substances reduce insulin sensitivity and increase insulin resistance, making it more difficult for glucose to enter cells and leading to increased blood glucose levels.

Unhealthy nutrition is also one of the etiological factors. Regular consumption of high-calorie foods rich in rapidly digestible carbohydrates (such as sweets and refined flour products) and saturated fats disrupts energy balance, leading to weight gain and insulin resistance. In addition, insufficient intake of fiber-rich foods negatively affects glucose metabolism.

Another important factor is low physical activity. Lack of movement reduces glucose utilization in muscle tissues, which leads to increased blood glucose levels. Regular physical activity, on the contrary, improves insulin sensitivity and enhances glucose uptake by cells. Therefore, a sedentary lifestyle is one of the major risk factors for the development of type 2 diabetes.

Stress and hormonal disorders also play a significant role. Chronic stress increases the levels of cortisol and other stress hormones, which elevate blood glucose levels and reduce insulin effectiveness. Long-term stress contributes to insulin resistance. Moreover, diseases of the thyroid gland, adrenal glands, and other endocrine disorders may also disrupt glucose metabolism.

**Pathogenesis**

The pathogenesis of type 2 diabetes is a complex and multistage process based on insulin resistance and functional insufficiency of pancreatic beta cells.



At the initial stage, insulin production is preserved, but peripheral tissues (muscle, adipose, and liver cells) gradually lose sensitivity to insulin. This condition is called insulin resistance. As a result, glucose cannot effectively enter cells, leading to hyperglycemia.

To compensate, pancreatic beta cells increase insulin production, resulting in compensatory hypersecretion. Initially, this mechanism helps maintain glucose levels, but over time it leads to excessive strain on beta cells.

Prolonged hypersecretion causes gradual dysfunction and reduction in the number of beta cells. Factors such as lipotoxicity and glucotoxicity further damage these cells, resulting in insufficient insulin production.

Eventually, relative and then absolute insulin deficiency develops, which worsens hyperglycemia and accelerates disease progression. Thus, type 2 diabetes develops through the following stages: decreased insulin sensitivity, compensatory hypersecretion, beta-cell dysfunction, and insulin deficiency.

### **Clinical Features**

Type 2 diabetes often develops slowly and may remain asymptomatic in the early stages, leading to late diagnosis. It is frequently detected incidentally during routine examinations.

As the disease progresses, classic symptoms appear. One of the most common is polydipsia (excessive thirst), caused by the body's need to eliminate excess glucose. Polyuria (frequent urination) is also observed due to increased glucose excretion through the kidneys.

Patients often complain of fatigue, weakness, and reduced working capacity due to insufficient glucose supply to cells. Blurred vision may occur as a result of changes in the lens and blood vessels of the eye.

The immune system is weakened, leading to frequent infections of the skin and mucous membranes, such as fungal infections and inflammatory conditions. Slow wound healing is also a key clinical sign due to impaired circulation and regeneration. Some patients may experience weight gain or loss, as well as numbness or tingling in the extremities (neuropathy).

### **Complications**

Uncontrolled or prolonged hyperglycemia negatively affects almost all body systems. Complications are mainly associated with vascular damage and are divided into microvascular and macrovascular.

Microvascular complications include diabetic retinopathy, which affects retinal vessels and may lead to vision loss or blindness. Diabetic nephropathy results from damage to the kidney glomeruli and can lead to chronic kidney failure. Diabetic neuropathy affects nerve fibers, causing numbness, pain, or loss of sensation and may lead to diabetic foot syndrome.

Macrovascular complications involve large blood vessels and are more life-threatening. These include coronary heart disease, which increases the risk of myocardial infarction, stroke (acute cerebrovascular disorder), and peripheral arterial disease, which may lead to gangrene and limb amputation.

### **Prevention and Management**

In general, these complications significantly reduce quality of life and increase the risk of disability and mortality. Therefore, early diagnosis and continuous monitoring are essential.

Preventive measures focus on maintaining a healthy lifestyle. A balanced diet rich in vegetables, fruits, whole grains, and protein is recommended. Limiting refined carbohydrates, sugary foods, carbonated drinks, and fatty foods is essential.

Increasing daily physical activity is another key factor. Regular exercise improves insulin sensitivity, enhances metabolism, and strengthens the cardiovascular system. At least 30 minutes of daily physical activity is recommended.

Preventing obesity or reducing body weight significantly lowers the risk of developing diabetes, especially abdominal obesity.



Stress management is also important. Chronic stress disrupts hormonal balance and increases blood glucose levels. Practices such as meditation, physical activity, proper rest, and sleep help reduce stress.

### Conclusion

Type 2 diabetes mellitus is a widespread, chronic, and multifactorial disease that seriously affects various body systems. Lifestyle plays a crucial role in its development; therefore, prevention largely depends on individual behavior. Early diagnosis, effective treatment, and continuous monitoring can significantly reduce complications. Healthy nutrition, physical activity, stress management, and regular medical check-ups are the most effective preventive measures.

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