

Diagnostic Values of Diabetes Mellitus and their Risk Assessment from Insulin to Lifestyle

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Description

Diabetes mellitus is a chronic metabolic disorder characterized by elevated blood glucose levels resulting from either insulin deficiency, insulin resistance, or both. It affects millions of people worldwide and presents significant challenges to healthcare systems globally. Type 1 diabetes, also known as Insulin-Dependent Diabetes Mellitus (IDDM), typically develops during childhood or adolescence. It occurs due to autoimmune destruction of pancreatic beta cells, leading to an absolute deficiency of insulin. Patients with type 1 diabetes require lifelong insulin therapy for survival. Type 2 Diabetes formerly referred to as Non-Insulin-Dependent Diabetes Mellitus (NIDDM), usually develops in adults, although it is increasingly diagnosed in children and adolescents. It is characterized by insulin resistance, where cells fail to respond effectively to insulin, and relative insulin deficiency. Lifestyle factors such as obesity, physical inactivity, and poor dietary habits contribute significantly to the development of type 2 diabetes. Management involves lifestyle modifications, oral medications, injectable therapies, and sometimes insulin. Gestational Diabetes Mellitus (GDM) occurs during pregnancy when hormonal changes and insulin resistance lead to glucose intolerance. While it often resolves after childbirth, women with GDM are at higher risk of developing type 2 diabetes later in life.

Family history plays a significant role in the development of type 1 and type 2 diabetes, although the precise genetic mechanisms are complex. Excess body weight, particularly visceral adiposity, increases the risk of insulin resistance and type 2 diabetes. Lack of physical activity contributes to insulin resistance and is a modifiable risk factor for type 2 diabetes. Diets high in refined carbohydrates, sugars, and saturated fats can contribute to obesity and insulin resistance. Type 1 diabetes results from autoimmune destruction of pancreatic beta cells, although the triggers for this immune response remain unclear. Pregnancy-related hormonal changes can increase insulin resistance, leading to gestational diabetes in susceptible women. Excessive urination, often accompanied by polydipsia (increased thirst), is a common early symptom of diabetes mellitus. Increased hunger despite adequate food intake may occur, especially in type 1 diabetes due to cellular starvation. Unexplained weight loss can occur in type 1 diabetes due to the breakdown of fat and muscle tissues for energy. Chronic fatigue and lethargy are common due to cellular energy depletion and metabolic imbalances. High blood glucose levels can cause temporary changes in lens shape, leading to blurred vision. Impaired immune function and reduced blood flow in diabetes can delay wound healing and increase the risk of infections. Nerve damage can cause tingling, numbness, or pain in the extremities, particularly in long-standing diabetes.

Diabetes can cause damage to the blood vessels in the retina, leading to diabetic retinopathy and potential vision loss. Diabetes is a leading cause of chronic kidney disease (diabetic nephropathy) and end-stage renal failure. Peripheral neuropathy affects sensory, motor, and autonomic nerves, leading to pain, numbness, and gastrointestinal disturbances. Foot ulcers and lower limb amputations are more common in patients with peripheral neuropathy, poor circulation, and impaired wound healing. Diabetes significantly increases the risk of coronary artery disease, myocardial infarction, stroke, and peripheral vascular disease. High blood pressure is common in individuals with diabetes and contributes to the risk of cardiovascular complications. Diabetes alters lipid metabolism, leading to elevated triglycerides, low HDL cholesterol, and increased risk of atherosclerosis. It increases the risk of bacterial and fungal skin infections, as well as conditions like diabetic dermopathy and acanthosis nigricans. Poorly controlled diabetes is associated with an increased risk of periodontal disease, tooth decay, and oral infections. Living with diabetes can cause significant psychological distress, including depression, anxiety, and eating disorders.

A fasting plasma glucose level of ≥ 126 mg/dL on two separate occasions confirms the diagnosis of diabetes. An Oral Glucose Tolerance Test (OGTT) measures blood glucose levels after fasting and again two hours after consuming a glucose solution. A glucose level of ≥ 200 mg/dL two hours post-glucose load indicates diabetes. Hemoglobin A1c (HbA1c) test measures average blood glucose levels over the past 2-3 months. An HbA1c level of $\geq 6.5\%$ is indicative of diabetes. A random plasma glucose level of ≥ 200 mg/dL in individuals with classic symptoms of hyperglycemia (polyuria, polydipsia, unexplained weight loss) suggests diabetes.

The first-line medication for type 2 diabetes, metformin improves insulin sensitivity and reduces hepatic glucose production. These medications stimulate insulin secretion from pancreatic beta cells and are often used in combination with metformin. Type 1 diabetes requires lifelong insulin therapy, often delivered through multiple daily injections of insulin pump therapy. Some individuals with type 2 diabetes may eventually require insulin therapy if oral medications fail to adequately control blood glucose levels. For severely obese individuals with type 2 diabetes, bariatric surgery may lead to significant weight loss and improvement or remission of diabetes. Diabetes mellitus is a complex and challenging metabolic disorder that requires a multifaceted approach to management. Through a combination of lifestyle modifications, medication therapy, regular monitoring, and patient education, individuals with diabetes can lead fulfilling lives while minimizing the risk of long-term complications.