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A review on Diabetes Mellitus

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Abstract:

A malfunction in the action or secretion of insulin, or both, can lead to diabetes mellitus (DM), a metabolic disease. Chronic hyperglycemia with abnormalities in the metabolism of proteins, fats, and carbohydrates is the result of insulin insufficiency. According to estimates, more than 200 million individuals worldwide would have diabetes mellitus (DM) by 2010, and by 2025, 300 million more will have the condition. It is the most prevalent endocrine disorder. Tissue or vascular damage develops as the condition worsens, resulting in serious diabetes consequences include ulceration, retinopathy, neuropathy, nephropathy, and cardiovascular problems. As a result, diabetes encompasses a broad spectrum of diverse illnesses. Type 1 and type 2 diabetes mellitus are the two main forms, though there are other varieties as well.

Introduction:

Weight loss is a hallmark of diabetes, which the Egyptians were the first to document. However, the word diabetes mellitus (OM) was first used by the Greek physician Aerates. Diabetes means "to pass through" in Greek, while the Latin term for honey (sweetness) is mellitus. With almost one death every ten seconds, diabetes is a leading cause of chronic illness and early death, taking more lives annually than HIV/AIDS. A chronic endocrine condition called diabetes mellitus is typified by hyperglycemia brought on by an absolute or relative insulin shortage[1,2].

Although there are other causes of diabetes, type 1 or type 2 diabetes account for the vast majority of occurrences. Insulin insufficiency and resultant hyperglycemia are caused by the autoimmune death of insulin-secreting pancreatic β-cells, which is the pathophysiology of type 1 diabetes. About 10–15% of people with diabetes have type 1 diabetes. 85–90% of people with diabetes have type 2 diabetes, which is characterized by aberrant insulin production brought on by peripheral resistance. Although type 1 diabetes often appears in childhood or adolescence and type 2 diabetes later in life, there are significant

differences in the clinical presentation and course of the two conditions, and some individuals may not be first identified as having type 1 or type 2. While type 2 diabetes increasingly appears earlier in life, even in childhood and adolescence, and occasionally only becomes accurately diagnosable over time, type 1 diabetes can occur at any age and often progresses more slowly. Both forms of diabetes exhibit elevated hepatic glucose production and reduced muscle and adipose tissue glucose absorption when left unchecked. Diabetic ketoacidosis can result from extensive biolysis in patients with type 1 diabetes. Patients with type 2 diabetes are more likely to experience a hyperosmolar non-ketotic condition rather than ketoacidosis because the residual insulin activity typically prevents biolysis and ketene formation[3,4].

Definition:

A condition when the kidneys produce a lot of urine and the body is unable to regulate the quantity of glucose (a type of sugar in the blood). When the body does not produce enough insulin or does not use it properly, this condition develops. When the body is unable to create enough insulin or use it efficiently, diabetes develops. One hormone that controls blood sugar, or glucose, is insulin. Over time, excessive blood sugar levels can cause major harm to the body's systems[5].

Classification of Diabetes mellitus:

A metabolic disease, diabetes mellitus falls into a number of categories, such as:

Type 1 diabetes:

Caused by insufficient insulin, typically as a result of beta cell death. Insulin dependence quickly develops from type 1 diabetes, which usually first appears in young people[6].

Type 2 diabetes:

Brought on by both insulin resistance and insufficient insulin secretion growth. Insulin dependency develops gradually from type 2 diabetes, which usually first appears in adulthood.

Gestational diabetes:

Pregnancy-related diabetes that typically appears in the second or third trimester

Other types:

Infections, medications, genetic flaws, and other diseases can all contribute to less prevalent forms of diabetes. Neonatal diabetes, cystic fibrosis, and maturity-onset diabetes of the young (MODY) are a few examples.

Ketosis-prone type 2 diabetes:

A distinct kind of type 2 diabetes that mainly affects people in sub-Saharan Africa and young African Americans. Although acute insulin shortage and ketosis episodes are its hallmarks, patients with this illness eventually experience remission[7,8].

Diabetes can also be categorized using blood glucose levels:

• **Normal:** Plasma glucose levels are less than 110 mg/dL while fasting and less than 140 mg/dL two hours after loading.
• **Impaired fasting glucose:** A fasting plasma glucose level of 110–126 mg/dL is considered impaired.
• **Impaired glucose tolerance:** glucose levels range from 140 to 200 mg/dL two hours after a load.
• A glucose level of at least 200 mg/dL two hours after loading is required for a provisional diagnosis of diabetes[9].

Signe and symptoms of diabetes mellitus:

Among the typical signs of diabetes are:

- **Frequent urination:** More frequent urination than normal, particularly at night.
- **Increased thirst:** Feeling very thirsty.
- **Weight loss:** Losing weight without trying.
- **Blurred vision:** Having blurry vision.
- **Fatigue:** Feeling very tired.
- **Numbness or tingling:** Feeling tingly or numb in your hands or feet.
- **Slow-healing sores:** Slowly healing cuts or ulcers.
- **Skin problems:** Experiencing infections, dry skin, or other skin conditions.
- **Vaginal or penile thrush:** Having recurring penile or vaginal yeast infections.
- **Other symptoms include:** The presence of ketenes in the urine, irritability or other mood swings[27,28].

Symptoms can vary depending on the type of diabetes and blood sugar level. Some people with prediabetes, type 2 diabetes, or gestational diabetes may not show any symptoms at all. Type 1 diabetes usually manifests more quickly and with more severe symptoms.
Diabetes can lead to a number of complications, including blindness, kidney failure, nerve damage, cardiovascular issues, and more[10,11].

Etiology of diabetes mellitus:

Diabetes mellitus (DM) is a metabolic syndrome brought on by a confluence of factors that impact tissue sensitivity to insulin and insulin sensitivity.

- **Insulin deficiency:** This can be absolute or relative:
- **Absolute insulin deficiency:** This may be brought on by autoimmune destruction of insulin-producing cells or genetic abnormalities in the pancreas.
- **Relative insulin deficiency:** Resistance to the action of insulin or genetic or acquired abnormalities in insulin secretion or synthesis may be the cause of this.
- **Tissue sensitivity to insulin:** A number of things, including stress, medications, and fat, can have an impact on this[12,13].

Although the precise cause of the majority of diabetes types is unknown, certain risk factors include:

- **Family history:** All forms of diabetes may be influenced by family history.
- **Genetics:** Type 1 diabetes is associated with specific genes.

- **Lifestyle factors:** Type 2 diabetes risk factors include nutrition, physical inactivity, and being overweight[14].
- **Race or ethnicity:** Type 2 diabetes risk may be elevated by race or ethnicity.
- **Obesity:** It may be more difficult to control diabetes if you are overweight or obese.
- **Physical inactivity:** Diabetes risk rises with decreased physical activity[25,26].
- **Diet**: Diabetes risk can be raised by consuming processed and red meat as well as beverages with added sugar.
- **Depression:** One important risk factor for type 2 diabetes is depression.
- **Gestational diabetes:** Pregnant women with gestational diabetes are at increased risk of acquiring diabetes in their offspring.
- **Low birth weight or preterm birth:** Diabetes is more likely to develop in babies who are born prematurely or underweight[15,16].

Diagnosis of diabetes mellitus:

Diabetes mellitus can be diagnosed using a variety of tests, including:

❖ **Fasting plasma glucose (FPG) test:**

After a minimum of eight hours of fasting over night, a blood sample is obtained. Diabetes is indicated by a fasting plasma glucose level greater than 126 mg/dL..

❖ **Oral glucose tolerance test (OGTT):**

Blood glucose levels are measured before and after consuming a sugary beverage during a two-hour test. Diabetes is indicated by a 2-hour plasma glucose level of 200 mg/dL or above.

❖ **A1C test:**

Calculates the average blood sugar levels throughout the previous two to three months. Diabetes is indicated by a result of 6.5% or above[17].

❖ **Random blood sugar test:**

• If you have severe symptoms of diabetes, you can have a blood test done at any time of day.
• Monogenic diabetes, which is brought on by a gene mutation, can also be diagnosed by genetic testing.
•Diabetes frequently manifests as blurred eyesight, frequent thirst, and recurrent vaginal and skin yeast infections[18,19,20].

Treatment of diabetes mellitus:

Treatment for diabetes mellitus depends on the type of diabetes and can include:

❖ **Insulin**

For survival, people with type 1 diabetes require insulin injections or an insulin pump. Insulin comes in a variety of forms, including as intermediate-acting, long-acting, rapid-acting, short-acting, and ultra-long-acting [31, 32, 33, and 34].

❖ **Lifestyle changes**

A healthy lifestyle is one of the most important ways to treat diabetes. This includes:

- Eating a healthy diet.
- Maintaining a healthy weight.
- Getting regular exercise.
- Limiting inactivity.
- Keeping stress under control[21,22,].

❖ **Oral medications:** Oral antihyperglycemic drugs such as metformin, sulfonylureas, and sodium-glucose co-transporters type 2 (SGLT-2) inhibitors can help control blood sugar levels in people with type 2 diabetes.

• Non-insulin injectable drugs, such as glucagon-like peptide-1 (GLP-1) receptor agonists, can be used to treat type 2 diabetes. Angiotensin-converting enzyme inhibitors or angiotensin II receptor blockers, also known as renin-angiotensin-aldosterone system blockers, and statins can be taken to avoid problems.
• Pancreas or islet cell transplant: A pancreas or islet cell transplant may be an option for certain individuals with type 1 diabetes[23,24,29,30].

Conclusion:

Diabetes has no known cure and is a slow killer. However, with appropriate knowledge and prompt treatment, its problems can be minimized. Heart attacks, kidney problems, and blindness are the three main side effects. Patients' blood glucose levels must be closely monitored in order to prevent problems. One of the challenges with strict blood glucose control is that it might result in hypoglycemia, which can cause far more serious problems than elevated blood glucose. Researchers are currently searching for different ways to manage diabetes. This study aims to provide a broad overview of the state of diabetes research at the moment. The author wants to inspire future academics to take on the problems since she thinks diabetes is one of the most difficult study issues of the twenty-first century.

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