

A review of the hybrid description of diabetes mellitus

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Elevated blood sugar levels, which are either brought on by inadequate insulin synthesis by the pancreas or by incorrect insulin usage by the body, characterize diabetes mellitus, a chronic metabolic disease. Diabetes mellitus can cause renal failure, and those with the condition are at least 10 times more likely to have to amputate a foot due to diabetes than those without it. High blood sugar levels are thought to contribute to kidney and heart problems. A rapid rate of beta cell malfunction and sequences resulting from an absolute lack of insulin hormone secretion may be used to describe type 1 diabetes mellitus. Type 1 diabetes mellitus often manifests itself in young patients, although it may also affect adults. Diabetic neuropathy, one of the most severe microvascular complications of diabetes mellitus, is characterized by a metabolic-vascular disorder that compromises the structure and function of peripheral somatic or autonomic nerves without inducing inflammation. Dehydration brought on by osmotic diuresis, which impacts hyperviscosity and a hypercoagulable condition, and elevated blood glucose levels are typical symptoms of a hyperosmolar hyperglycemic state. People with type 1 diabetes are 12 times more likely than those with type 2 diabetes to develop diabetic nephropathy.

Keywords: diabetes mellitus, diabetic neuropathy, description, hybrid, hyperosmolar hyperglycemic state

Introduction

Diabetes mellitus is a threatening metabolic condition that causes elevated blood sugar levels due to either insufficient insulin production by the pancreas or improper insulin usage by the body (1, 2). Both exocrine (which secretes digestive enzymes) and endocrine (which secretes insulin, glucagon, and somatostatin) glands are found in the pancreas (3). In comparison to other regions, developing nations have a higher prevalence of non-communicable illnesses (4).

“Non-communicable diseases” are becoming more prevalent worldwide and are affecting the majority of individuals (5, 6). The estimated global prevalence of diabetes mellitus will reach 642 million people by 2040 (7, 8). Renal failure can result from diabetes mellitus.

Moreover, diabetic foot amputations are at least 10 times more likely in patients with diabetes mellitus than in healthy individuals. Heart disease and renal disease are believed to be caused by elevated blood sugar levels. Diabetes mellitus is associated with elevated blood sugar levels, which can also

result in symptoms such as vomiting, increased appetite and thirst, a quick pulse, eye abnormalities, and others.

Uncontrolled high blood sugar levels might be the primary risk factor for serious health issues such as non-communicable diseases (9). The third largest risk factor for early mortality, after high blood pressure and smoking, is elevated blood sugar levels brought on by diabetes mellitus, according to the World Health Organization (10, 11). The goal of this review article is to explain the different types of diabetes as well as the complications associated with both type 1 and type 2 diabetes mellitus. The microvascular and microvascular complications of diabetes mellitus are also discussed in this review article.

Types of diabetes mellitus

According to a new classification, the two most common types of the disease are type 1 and type 2 diabetes mellitus, respectively, and other types of diabetes mellitus, such

TABLE 1 | Common types of diabetes mellitus.

| Types | Description |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Type 1 diabetes mellitus | Diabetes type 1 is a chronic condition commonly known as insulin-dependent diabetes in children or juvenile diabetes. In this condition, the pancreas produces almost no or very little insulin. Insulin is the hormone that the body utilizes to let glucose (sugar) into cells, where it can be used to make energy. |
| Type 2 diabetes mellitus | Type 2 diabetes is a problem with the body's capacity to regulate and use sugar (glucose) as fuel. The excessive quantity of sugar that circulates in the circulation as a result of this chronic (long-term) disease. High blood sugar levels may eventually result in issues with the immune, nervous, and circulatory systems. |
| Gestational diabetes mellitus | When a woman becomes pregnant, she may have gestational diabetes if she does not already have it. Gestational diabetes affects somewhere between 2 and 10% of pregnancies each year in the United States. Taking care of your gestational diabetes will help ensure that both you and your unborn child have healthy pregnancies. |

as gestational diabetes mellitus, are also included in the new classification.

Type 1 diabetes mellitus: A rapid rate of beta cell malfunction and sequences resulting from an absolute lack of insulin hormone secretion may be used to describe type 1 diabetes mellitus. Type 1 diabetes mellitus mostly affects youngsters; however, it can sporadically affect adults as well (12).

Type 2 diabetes mellitus: More often than not, type 2 diabetes mellitus results from peripheral insulin resistance, relative insulin hormone deficiency, or insufficient insulin secretion by pancreatic beta cells. Free fatty acid and proinflammatory cytokine levels in plasma rise as a result, decreasing the amount of glucose that can enter muscle cells and increasing the amount of glucose that can be produced in the liver and the breakdown of fat (13).

Gestational diabetes mellitus: Gestational diabetes mellitus, a condition of the pancreatic beta cells that do not generate enough insulin to fulfill the increased requirements of late pregnancy, is comparable to other types of elevated blood glucose levels. While gestational diabetes mellitus frequently has normal glycosylated hemoglobin, especially in the first trimester, pre-gestational diabetes is more difficult to diagnose. The placenta secretes hormones that counteract insulin's effects. During pregnancy, the hyperglycemic hormone cortisol increases three times, and glucose may readily move from the mother's circulation to the fetus's circulation. Insulin synthesis in the fetus is stimulated by maternal hyperglycemia (14, 15). These are the three common factors that contribute to the problems (Table 1).

TABLE 2 | Common types of diabetes mellitus complications.

| Types | Description |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Diabetic retinopathy | Diabetic retinopathy is the result of blood vessel damage to the tissue in the back of the eye (the retina). Unhealthy blood sugar management is a risk factor. Early signs include floaters, blurriness, dark spots in the vision, and issues with color perception. Blindness may happen. |
| Diabetic neuropathy | If you have diabetes, you could develop diabetic neuropathy, which is a form of nerve damage. All over the body, damaged nerves can be caused by high blood sugar (glucose). Nerve damage from diabetic neuropathy most frequently occurs in the legs and feet. |
| Diabetic nephropathy | One frequent consequence of both type 1 and type 2 diabetes is diabetic nephropathy. Diabetes that is not properly managed over time might harm blood vessel clusters in your kidneys that filter waste from your blood. High blood pressure and renal damage may result from this. |
| Diabetic foot infection | Diabetes-related foot ulcers, which frequently develop on the bottom of the foot and affect 15% of people with the disease, are open sores or wounds. Six percent of people who get foot ulcers end up in the hospital because of an infection or another complication related to the ulcer. |
| Hyperosmolar hyperglycemic state | Diabetes mellitus can result in the dangerous condition known as hyperosmolar hyperglycemic syndrome (HHS). HHS happens when a person's blood glucose (sugar) levels are too high for an extended period of time, which causes acute thirst and disorientation as well as severe dehydration. |
| Diabetic ketoacidosis | A dangerous and potentially fatal diabetes consequence is diabetic ketoacidosis (DKA). The majority of people with type 1 diabetes experience DKA. Type 2 diabetics are also susceptible to DKA. DKA results from the inability of blood sugar to enter cells for use as energy when the body doesn't create enough insulin. |

Complications of diabetes mellitus

Diabetes mellitus is a progressively challenging and essentially sequential condition characterized by chronic exposure to high blood sugar levels resulting from anomalies in insulin metabolism and biological macromolecules such as carbs, lipids, proteins, and nucleic acids. The most significant cause of illness and mortality in the world is quickly rising: diabetes mellitus and its consequences. Nephropathy, neuropathy, and retinopathy are examples of the microvascular effects of diabetes mellitus, while cerebrovascular disease and cardiovascular disease are examples of the macrovascular problems (16–18).

The following sections each cover one of four typical microvascular diabetic problems, typical chronic

complications of type 2 diabetes mellitus, and typical chronic complications of type 1 diabetes mellitus.

Diabetic retinopathy: Diabetic retinopathy is one of the most harmful microvascular effects of diabetes mellitus. Which is caused by persistently high blood sugar levels and virtually always manifests in type 1 and type 2 diabetes mellitus in the middle and late stages. Serious vision impairment, vitreous hemorrhage, and even blindness can be caused by diabetic retinopathy. Smoking, high blood pressure, and hyperglycemia all worsen diabetic retinopathy (19, 20).

Diabetic neuropathy: Diabetic neuropathy is one of the most severe microvascular complications of diabetes mellitus. It is defined as a metabolic-vascular disease that impairs the function and structure of peripheral somatic or autonomic nerves without causing inflammation. The initial indications of vasa nervorum degeneration are the predominance of vasoconstrictive agents over vasodilators and the onset of coagulation. Elevated blood sugar levels and risk factors for artery disease lead to long-term alteration of the microvascular endothelium, nerve back cells, and nerve axons (21, 22).

Diabetic nephropathy: Chronic complications of type 1 diabetes include nephropathy, which is characterized by either an increase in urinary albumin excretion or a decrease in renal glomerular filtration rate (proteinuria). End-stage renal disease is primarily brought on by diabetic nephropathy, and the prevalence of diabetes mellitus is rising quickly (23).

Diabetic foot infection: Up to 58% of diabetic foot ulcers are known to be infectious at the time of initial donation at a diabetic foot clinic, and this number rises to 8% in patients who are hospitalized for a diabetic foot ulcer. Diabetes mellitus can weaken immune system functions and compromise the host's defenses against infection. Additionally, diabetic neuropathy can prevent an individual from feeling discomfort and other sensations that would indicate a serious infection is developing. These factors all contribute to the possibility of a severe infection occurring during diabetes mellitus. Diabetes-related foot infections have been linked to poor clinical outcomes and high costs for patients and the healthcare system (24, 25).

Hyperosmolar hyperglycemic state: Dehydration from osmotic diuresis, a condition that affects hyperviscosity and makes blood more susceptible to clotting, and a high blood glucose level are common signs of a hyperosmolar hyperglycemic state.

Hyperosmolar hyperglycemic syndrome has a far lower incidence than diabetic ketoacidosis—less than 1 per 1,000 person-years. Diabetes mellitus is linked to hyperglycemic crises such as diabetic ketoacidosis and hyperosmolar hyperglycemia (26).

Diabetic ketoacidosis: The biochemical definition of diabetic ketoacidosis includes venous potential hydrogen of 200 mg/dL together with ketonemia, glucosuria, and

ketonuria. When blood glucose levels are normal, there has been partial therapy, or the patient is pregnant, diabetic ketoacidosis may very rarely occur (27).

Diabetic nephropathy: Nephropathy, defined by an increase in the excretion of urine albumin (proteinuria) or a reduction in the renal glomerular filtration rate in all types of type 1 diabetes mellitus as well as type 1 diabetes mellitus, is a common chronic consequence of diabetes mellitus. Type 1 diabetics are twelve times more likely than type 2 diabetics to develop diabetic nephropathy (28). Some common complications are discussed in [Table 2](#).

Conclusion

Elevated blood sugar levels, which are either brought on by inadequate insulin synthesis by the pancreas or by incorrect insulin usage by the body, are a defining feature of the life-threatening metabolic disease known as diabetes mellitus. Diabetes mellitus is associated with elevated blood sugar levels, which can also result in symptoms such as vomiting, increased appetite and thirst, a quick pulse, eye abnormalities, and others. Uncontrolled elevated blood sugar levels are a major risk factor for serious health issues, such as non-communicable illnesses.

The most frequent causes of type 2 diabetes mellitus are peripheral insulin resistance, a relative insulin hormone shortage, and insufficient pancreatic beta-cell production of insulin. Serious vision impairment, vitreous hemorrhage, and even blindness can be caused by diabetic retinopathy. Ketonemia, glucosuria, and ketonuria are all included in the biochemical criteria of diabetic ketoacidosis, along with venous potential hydrogen of 200 mg/dL.

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