Diabetes mellitus, commonly referred to as diabetes, is a chronic metabolic disorder characterized by high blood sugar levels over a prolonged period. It arises due to either insufficient production or inadequate utilization of insulin, a hormone produced by the pancreas that regulates blood sugar levels. The pathology of diabetes involves several complex mechanisms and can be categorized into two main types: type 1 diabetes and type 2 diabetes.

Type 1 Diabetes:

Type 1 diabetes, also known as insulin-dependent diabetes or juvenile-onset diabetes, typically develops in childhood or adolescence. It occurs when the immune system mistakenly attacks and destroys the insulin-producing beta cells in the pancreas. The exact cause of this autoimmune response is not fully understood, but genetic and environmental factors are thought to play a role.

Pathophysiology of Type 1 Diabetes:

Autoimmune Destruction: The immune system targets and destroys beta cells in the pancreatic islets of Langerhans, resulting in a significant reduction or complete loss of insulin production.

Insulin Deficiency: Due to the destruction of beta cells, the pancreas produces little to no insulin, leading to an absolute insulin deficiency.

Hyperglycemia: Without sufficient insulin, glucose cannot enter cells for energy production, causing glucose to accumulate in the bloodstream, leading to hyperglycemia.

Metabolic Imbalance: In the absence of insulin, the body's cells cannot access glucose for energy, resulting in the breakdown of fats and proteins as alternative energy sources. This process leads to the production of ketones, which can cause a life-threatening condition called diabetic ketoacidosis (DKA).

Type 2 Diabetes:

Type 2 diabetes, also referred to as non-insulin-dependent diabetes or adult-onset diabetes, is the most common form of diabetes and usually develops in adulthood. It is characterized by insulin resistance and impaired insulin secretion.

Pathophysiology of Type 2 Diabetes:

Insulin Resistance: The body's cells become less responsive to the effects of insulin, primarily due to genetic factors, obesity, sedentary lifestyle, and certain medical conditions.

Impaired Insulin Secretion: The pancreas may initially compensate for insulin resistance by producing more insulin. However, over time, the beta cells may become exhausted and fail to secrete adequate amounts of insulin.

Hyperglycemia: Insulin resistance and impaired insulin secretion lead to elevated blood sugar levels, resulting in hyperglycemia.

Metabolic Dysfunction: The combination of insulin resistance, impaired insulin secretion, and elevated blood glucose levels leads to metabolic abnormalities such as increased liver glucose production, reduced glucose uptake by muscle and fat cells, and altered fat metabolism.

Other Forms of Diabetes:

There are also other forms of diabetes, including gestational diabetes, which occurs during pregnancy due to hormonal changes, and various forms of secondary diabetes caused by underlying conditions such as pancreatic diseases, hormonal disorders, or medication side effects.

It's important to note that the pathology of diabetes is complex, and this explanation provides a simplified overview. The management of diabetes involves various strategies, including lifestyle modifications, medication, insulin therapy (in type 1 diabetes and advanced type 2 diabetes), and regular monitoring of blood glucose levels.