The term **diabetes mellitus** describes a metabolic disorder of multiple etiologies characterized by chronic hyperglycemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects of insulin secretion, insulin action or both.

Types of Diabetes in Children

- Type 1 diabetes mellitus accounts for >90% of cases.
- Type 2 diabetes is increasingly recognized in children with presentation like in adults.
- Permanent neonatal diabetes
- Transient neonatal diabetes
- Maturity-onset diabetes of the young
- Secondary diabetes e.g. in cystic fibrosis or Cushing syndrome.

Etiology

- Most cases (95%) of type 1 diabetes mellitus are the result of environmental factors interacting with a genetically susceptible person. This interaction leads to the development of autoimmune disease directed at the insulin-producing cells of the pancreatic islets of Langerhans.
- These cells are progressively destroyed, with insulin deficiency usually developing after the destruction of 90% of islet cells.

Environmental factors

- Environmental factors are important, because even identical twins have only a 30-60% concordance for type 1 diabetes mellitus and because incidence rates vary in genetically similar populations under different living conditions.[19] No single factor has been identified, but infections and diet are considered the 2 most likely environmental candidates.
- **Viral infections** may be the most important environmental factor in the development of type 1 diabetes mellitus, probably by initiating or modifying an autoimmune process.
- Instances have been reported of a direct toxic effect of **infection** in congenital rubella. One survey suggests enteroviral infection during pregnancy carries an increased risk of type 1 diabetes mellitus in the offspring. Paradoxically, type 1 diabetes mellitus incidence is higher in areas where the overall burden of infectious disease is lower.
- **Dietary factors** are also relevant. Breastfed infants have a lower risk for type 1 diabetes, and a direct relationship is observed between per capita cow's milk consumption and the incidence of diabetes. Some cow's milk proteins (eg, bovine serum albumin) have antigenic similarities to an islet cell antigen.
- **Nitrosamines, chemicals found in smoked foods** and some water supplies, are known to cause type 1 diabetes mellitus in animal models; however, no definite link has been made with humans.
- The known association of increasing incidence of type 1 diabetes mellitus with distance from the equator may now have an explanation.
- **Reduced exposure to ultraviolet** (UV) light and lower vitamin D levels, both of which are more likely found in the higher latitudes, are associated with an increased risk of type 1 diabetes mellitus.[21]
- **Chemical causes**
- Streptozotocin and RH-787, a rat poison, selectively damages islet cells and can cause type 1 diabetes mellitus.

Other causes

- Additional factors in the development of type 1 diabetes mellitus include the following:
- Congenital absence of the pancreas or islet cells
- Pancreatectomy
- Pancreatic damage (ie, cystic fibrosis, chronic pancreatitis, thalassemia major, hemochromatosis, hemolytic-uremic syndrome)
- Wolfram syndrome (diabetes insipidus, diabetes mellitus, optic atrophy, deafness.
- Chromosomal disorders such as Down syndrome, Turner syndrome, Klinefelter syndrome, or Prader-Willi syndrome (the risk is said to be around 1% in Down and Turner syndromes)

Signs and symptoms

- Signs and symptoms of type 1 diabetes in children include the following:
- Hyperglycemia
- Glycosuria
- Polydipsia
- Unexplained weight loss
- Nonspecific malaise
- Symptoms of ketoacidosis

Non-emergency presentations

- Non-emergency presentations of diabetes include:
- Recent onset of enuresis in a previously toilet-trained child, which may be misdiagnosed as a urinary tract infection or the result of excessive fluid ingestion.
- Vaginal candidiasis, especially in prepubertal girls.
- Chronic weight loss or failure to gain weight in a growing child.
- Irritability and decreasing school performance.
- Recurrent skin infections.

Emergency presentations

- The usual emergency presentation of diabetic ketoacidosis in a child or adolescent includes:
- Severe dehydration.
- Frequent vomiting.
- Continuing polyuria despite the presence of dehydration.
- Weight loss due to fluid loss and loss of muscle and fat.
- Vomiting and abdominal pain, which may be misdiagnosed as gastroenteritis.
- Flushed cheeks due to the ketoacidosis.
- Acetone detected on the breath.
- Hyperventilation of diabetic ketoacidosis (Kussmaul respiration) is characterised by a high respiratory rate and large tidal volume of each breath, which gives it a sighing quality.
- Disordered sensorium (disoriented, semicomatose or rarely comatose).
- Decreased peripheral circulation with rapid pulse rate. Hypotension and shock with peripheral cyanosis (a late sign and rare in children with diabetic ketoacidosis).
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- **Diagnosis**

- *Blood glucose*
- Blood glucose tests using capillary blood samples, reagent sticks, and blood glucose meters are the usual methods for monitoring day-to-day diabetes control.
- Diagnostic criteria by the American Diabetes Association (ADA) include the following[1] :
- A fasting plasma glucose (FPG) level ≥126 mg/dL (7.0 mmol/L), *or*
- A 2-hour plasma glucose level ≥200 mg/dL (11.1 mmol/L) during a 75-g oral glucose tolerance test (OGTT), *or*
- A random plasma glucose ≥200 mg/dL (11.1 mmol/L) in a patient with classic symptoms of hyperglycemia or hyperglycemic crisis
- The criteria for diagnosis of diabetes mellitus in children and adolescents are symptoms of diabetes mellitus such as polydipsia, polyuria, and unexplained weight loss plus casual glucose concentration ≥ 200 mg/dL (11.1 mmol/L) in venous plasma, fasting glucose ≥ 126 mg/dL (7.0 mmol/L) in venous or capillary plasma, or two-hours glucose during oGTT ≥ 200 mg/dL (11.1 mmol/L) in venous plasma or capillary whole blood sample.
- Recently revised American Diabetes mellitus Association (ADA) criteria allow utilization of hemoglobin A1c (HbA1c) ≥ 6.5% for diagnosis of diabetes mellitus.

Complications of diabetes

- Acute:
- DKA
- Hypoglycemia

Long-term complications include the following:

- Retinopathy
- Cataracts
- Gastroparesis
- Hypertension
- Progressive renal failure
- Early coronary artery disease
- Peripheral vascular disease
- Peripheral and autonomic neuropathy
- Increased risk of infection

Treatment goals

- Prevent death and alleviate symptoms
- Achieve biochemical control
- Maintain growth & development
- Prevent acute complications
- Prevent or delay late-onset complications