ROHINI COLLEGE OF ENGINEERING AND TECHNOLOGY
AUTONOMOUS INSTITUTION
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DEPARTMENT OF BIOMEDICAL ENGINEERING

VII Semester

OBT357 BIOTECHNOLOGY IN HEALTH CARE

UNIT- 2 CLINICAL DISEASES

2.6 Diabetes mellitus

- Diabetes mellitus, commonly known as diabetes, is a group of metabolic diseases characterized by high blood sugar levels.
- This occurs either because the pancreas doesn't produce enough insulin, a hormone that regulates blood glucose, or because the body's cells don't respond effectively to insulin.
- Over time, uncontrolled high blood sugar can lead to serious damage to various body systems, particularly the nerves and blood vessels.

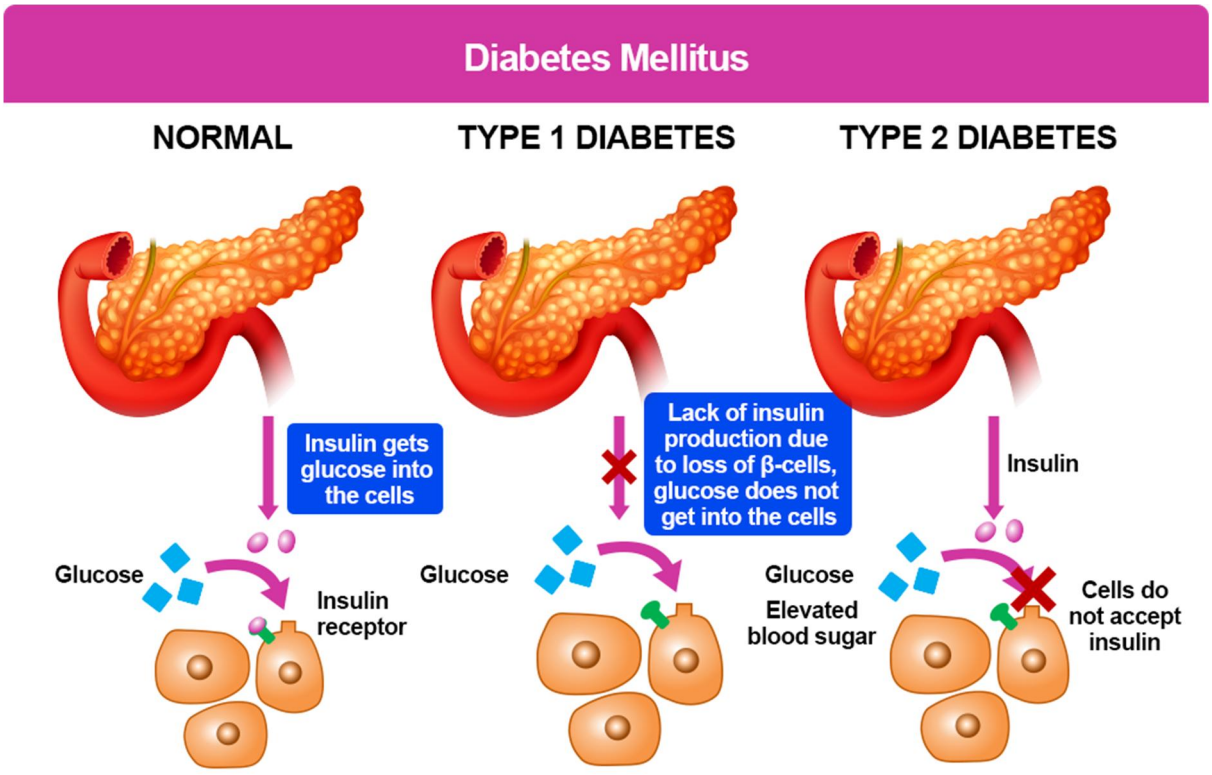
2.6.1 Types of Diabetes Mellitus:

- **Type 1 diabetes** is a chronic autoimmune disease where the body's immune system mistakenly attacks and destroys the insulin-producing cells in the pancreas. This leads to an absolute deficiency of insulin, a hormone crucial for regulating blood sugar levels. Without sufficient insulin, glucose (sugar) cannot be effectively transported from the blood into cells for energy, causing high blood sugar and leading to various health complications.
- **Type 2 diabetes** is a chronic condition where the body either doesn't produce enough insulin or can't properly use the insulin it produces, leading to high blood sugar levels. Insulin is a hormone that helps glucose (sugar) from food get into cells for energy. When cells become resistant to insulin or the pancreas doesn't make enough, glucose builds up in the blood, potentially causing damage to various organs over time.

2.6.2. Causes of Diabetes Mellitus:

Diabetes mellitus occurs when the body cannot produce enough insulin or cannot effectively use the insulin it produces. Major causes include:

- ❒ **Type 1 Diabetes**
  - ❖ Autoimmune destruction of pancreatic β-cells (no insulin production)
  - ❖ Genetic susceptibility
  - ❖ Possible viral triggers
- ❒ **Type 2 Diabetes**
  - ❖ Insulin resistance (cells do not respond to insulin)
  - ❖ Gradual decline in insulin production
  - ❖ Risk factors: obesity, sedentary lifestyle, unhealthy diet, family history, age >40



- ❒ **Gestational Diabetes**
  - ❖ Hormonal changes during pregnancy causing insulin resistance
- ❒ **Other causes**

- ❖ Pancreatic diseases (pancreatitis, surgery)
- ❖ Certain medications (steroids, antipsychotics)
- ❖ Endocrine disorders (Cushing's syndrome)

2.6.2 Symptoms of diabetes mellitus:

- ❖ Common signs and symptoms include:
- ❖ Increased thirst (**polydipsia**)
- ❖ Frequent urination (**polyuria**)
- ❖ Excessive hunger (**polyphagia**)
- ❖ Unexplained weight loss (more in Type 1)
- ❖ Fatigue
- ❖ Blurred vision
- ❖ Slow-healing wounds or frequent infections
- ❖ Tingling or numbness in hands/feet (neuropathy)

2.6.3. Diagnosis of diabetes mellitus:

Diagnostic tests and criteria (as per WHO/ADA):

Test	Diabetes Diagnostic Level
Fasting Plasma Glucose (FPG)	≥126 mg/dL (7.0 mmol/L)
2-hour Plasma Glucose (OGTT)	≥200 mg/dL (11.1 mmol/L)
HbA1c	≥6.5%
Random Plasma Glucose	≥200 mg/dL with symptoms

2.6.4 Treatment of diabetes mellitus:

- ❒ **Type 1 Diabetes**
  - ❖ Lifelong insulin therapy (basal-bolus or pump)
  - ❖ Healthy diet, regular exercise
  - ❖ Blood glucose monitoring
- ❒ **Type 2 Diabetes**
  - ❖ Lifestyle modification (diet, physical activity, weight loss)

- ❖ Oral medications (Metformin, Sulfonylureas, DPP-4 inhibitors, SGLT2 inhibitors, GLP-1 agonists)
- ❖ Insulin if oral therapy is inadequate

❒ **Gestational Diabetes**

- ❖ Dietary control, exercise
- ❖ Insulin if blood glucose targets are not met

❒ **Supportive measures**:

- ❖ Blood pressure and cholesterol control
- ❖ Foot care
- ❖ Education and self-management

2.6.5. Prevention of diabetes Mellitus:

For Type 1 Diabetes: No proven prevention, but research is ongoing.

For Type 2 Diabetes:

1. Maintain healthy body weight
2. Eat a balanced diet (low sugar, high fiber, whole grains, vegetables)
3. Regular exercise (at least 150 min/week moderate activity)
4. Avoid smoking and excessive alcohol
5. Regular screening if at high risk

For Gestational Diabetes:

1. Healthy weight before pregnancy
2. Balanced diet and physical activity during pregnancy
3. Early screening in high-risk women

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