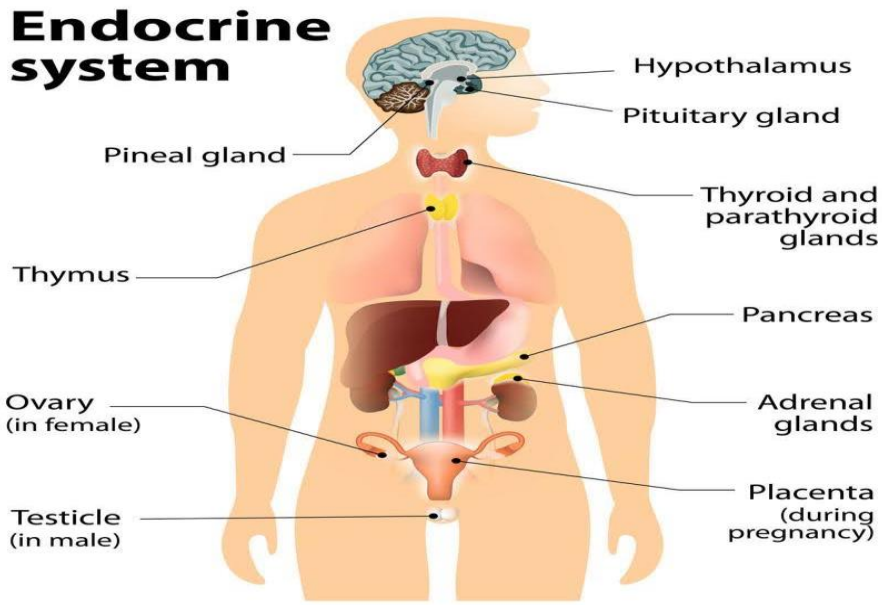
THE ENDOCRINE SYSTEM

The endocrine system controls and regulates metabolism; this includes energy production, growth, fluid and electrolyte balance, response to stress, and sexual reproduction.



Diabetes Mellitus

DM is a chronic disorder of metabolism characterized by a partial or complete deficiency of the hormone insulin.

The peak of age from 4 to 6 years and another at early puberty 10 to 14 years The incidence in boys is slightly higher than in girls (1:1 to 1.2:1).

DM had been classified according to the type of treatment needed.

1. Insulin-dependent diabetes mellitus (IDDM), or type I;
2. Non–insulin-dependent diabetes mellitus (NIDDM), or type II.

Type 1 diabetes is characterized by destruction of the pancreatic beta cells, which produce insulin; this usually leads to absolute insulin deficiency.

Type 1 diabetes has two forms.

1. Immune-mediated DM results from an autoimmune destruction of the beta cells
2. Idiopathic type 1 refers to rare forms of the disease that have no known cause.

Type 2 diabetes usually arises because of insulin resistance, in which the body fails to use insulin properly, combined with relative insulin deficiency.

It typically occurs in people over 45 years of age, who are overweight, sedentary, and have a family history of diabetes.

Type 1 DM

Etiology

- ✓ Type 1 DM is an autoimmune disease that arises when a person with a genetic predisposition is exposed to a precipitating event, such as a viral infection including mumps, and congenital rubella, (environmental factor).
- ✓ At least 60% of the genetic susceptibility to type 1 DM is conferred by human leukocyte antigen (HLA) on chromosome 6.
- ✓ Cow's milk (destroys pancreatic cells in genetically susceptible hosts) causing DM.
- ✓ Children born to fathers with type 1 DM are about three times more likely to develop type 1 DM (approximately 7% frequency) than children born to mothers with type 1 DM (approximately 2% frequency).

Ketoacidosis

When insulin is absent or there is altered insulin sensitivity, glucose is unavailable for cellular metabolism, and the body chooses alternate sources of energy, principally fat. Consequently, **fats break down into fatty acids**, and glycerol in the fat cells is converted **by the liver to ketone bodies (e.g., β-hydroxybutyric acid, acetoacetic acid, acetone).**

The respiratory system attempts to eliminate the excess carbon dioxide by increased depth and rate—**Kussmaul respirations**, or the hyperventilation characteristic of metabolic acidosis.

Long-Term Complications

1. Nephropathy.
2. Retinopathy.
3. Neuropathy.
4. Microvascular disease.

Clinical Manifestations of type 1 diabetes mellitus

1. Polyphagia.
2. Polyuria.
3. Polydipsia.
4. Weight loss.
5. Enuresis or nocturia.
6. Irritability.
7. Shortened attention span.
8. Lowered frustration tolerance.
9. Fatigue.

10. Dry skin.
11. Blurred vision.
12. Poor wound healing.
13. Flushed skin.
14. Headache.
15. Frequent infections.
16. **Hyperglycemia.**
    a. Elevated blood glucose levels.
    b. Glucosuria Diabetic ketosis.
    c. Ketones and glucose in urine.
    d. Dehydration in some cases.
17. **Diabetic ketoacidosis.**
    a. Dehydration
    b. Electrolyte imbalance
    c. Acidosis
    d. Deep, rapid breathing (Kussmaul)

Diagnostic Evaluation

Children who have **glycosuria**, **polyuria**, and a history of **weight loss** or failure to gain despite a voracious appetite; Glycosuria, galactose, can produce a positive result

An 8-hour **fasting blood glucose level of 126 mg/dl or more, a random blood glucose value of 200 mg/dl or more accompanied** by classic signs of diabetes, or an oral glucose tolerance test (**OGTT) finding of 200 mg/**dl or more in the 2-hour sample is almost certain to indicate diabetes.

Therapeutic Management

The management of the child with type 1 DM consists of a multidisciplinary approach involving the **family**; the child (when appropriate); and **professionals**, including a pediatric endocrinologist, diabetes nurse educator, nutritionist, and exercise physiologist. Often psychologic support from a mental health professional is also needed.

Insulin Therapy

Insulin replacement is the cornerstone of management of type 1 DM.

Insulin dosage is tailored to each child based on home blood glucose monitoring.

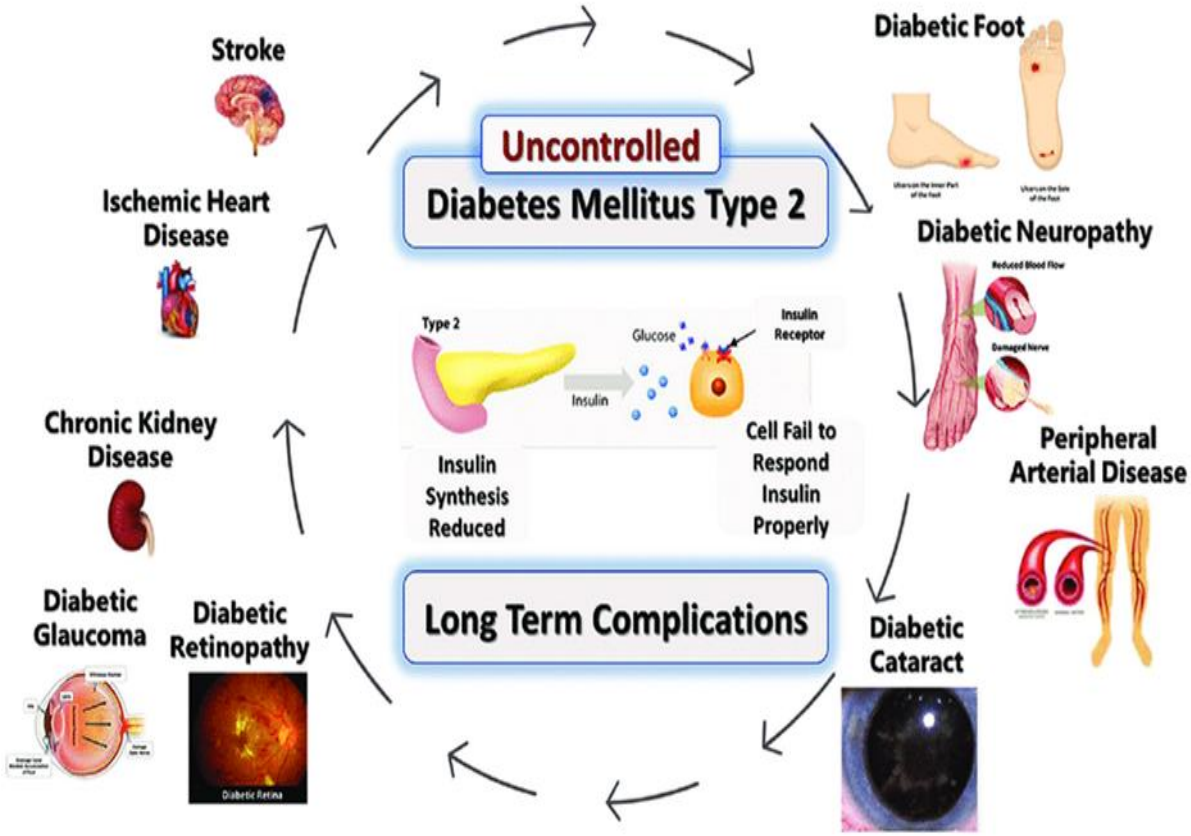
The goal of insulin therapy

Maintaining near-normal blood glucose values, while avoiding too frequent episodes of hypoglycemia.

Insulin is **administered as two or more injections per day** or as continuous subcutaneous infusion using a portable insulin pump.

Nutrition Essentially

The nutritional needs of children with diabetes are no different from those of healthy children. They need sufficient calories to balance daily expenditure for energy and to satisfy the requirement for growth and development.



Hypoglycemia

Occasional episodes of hypoglycemia are an integral part of insulin therapy, and an objective of diabetes management is to achieve the best possible glycemic control, while minimizing the frequency and severity of hypoglycemia.

The signs and symptoms of hypoglycemia are caused by both increased **adrenergic activity** and impaired **brain function**.

The increased adrenergic nervous (nervousness, pallor, tremulousness, palpitations, sweating, and hunger. Weakness, dizziness, headache, drowsiness, irritability, loss of coordination, seizures, and coma are more severe responses and reflect CNS glucose deprivation.

Nursing Management of DM

1. Nutritional modification.
2. Regular exercise.
3. Regular glucose monitoring.
4. Drug therapy.
5. Client education.

Juvenile Hypothyroidism



The thyroid gland secretes two types of hormones: **thyroid hormone** (TH) and **calcitonin**.

Thyroid hormone is made up of the hormones thyroxine (T4) and triiodothyronine (T3). The anterior pituitary hormone by TSH controls the secretion of TH.

Thyroid stimulating hormone (TSH) is regulated by the hypothalamic hormone thyrotropin-releasing factor (TRF) as a negative feedback response.

Hypothyroidism or hyperthyroidism may result from a defect in the thyroid or from a disturbance in the secretion of TSH or TRF.

Hypothyroidism is one of the most common endocrine problems of childhood.

It may be either **congenital** or **acquired**.

1- Beyond infancy, a number of defects may **cause primary hypothyroidism**. For example, a congenital hypoplastic thyroid gland may provide sufficient amounts of TH during the first year or two but be inadequate when rapid body growth increases demands on the gland.
2- A partial or complete **thyroidectomy for cancer or thyrotoxicosis** can leave insufficient thyroid tissue to furnish hormones for body requirements.
3- **Radiotherapy** for Hodgkin disease or other malignancies may lead to hypothyroidism.
4- **Infectious processes** may cause hypothyroidism. It can also occur when **dietary iodine is deficient.**

If left untreated, congenital hypothyroidism causes **mental retardation**. Improvements in newborn screening have led to earlier detection and prevention of cognitive dysfunction.

Thyromegaly (enlarged thyroid gland) and growth deceleration are seen in children with hypothyroidism.

Clinical manifestations

1. Dry skin
2. Puffiness around the eyes.
3. Sparse hair.
4. Constipation
5. Lethargy.
6. Sleepiness.
7. Mental decline.
8. Growth failure.
9. Delayed puberty.
10. Excessive weight gain can also be seen.

Therapy is TH replacement, the same as for hypothyroidism in the infant.

Adolescents may demonstrate problems with memory, attention, and visuospatial processing.

Nursing Care Management

Growth deceleration in a child whose growth has previously been normal should alert the observer to the possibility of hypothyroidism.

Treatment is **daily oral TH replacement.**

The importance of daily compliance and the need for periodic monitoring of serum thyroid levels should be stressed to patients and their families.

GOITER



A goiter is an enlargement or hypertrophy of the thyroid gland. It may occur with deficient (hypothyroid), excessive (hyperthyroid), or normal (euthyroid) TH secretion. It can be congenital or acquired.

Congenital disease usually occurs as a result of maternal administration of antithyroid drugs or iodides during pregnancy.

Acquired disease can result from increased secretion of pituitary TSH in response to decreased circulating levels of TH or from infiltrative neoplastic or inflammatory processes.

In areas where dietary iodine (essential for TH production) is deficient, goiter can be endemic.

Enlargement of the thyroid gland may be mild and noticeable only when there is an increased demand for TH (e.g., during periods of rapid growth).

Where iodine deficiency is severe, a large percentage of the population display goiters.

Enlargement of the thyroid at birth can be sufficient to cause severe respiratory distress.

TH replacement is necessary to treat the hypothyroidism and reverse the TSH effect on the gland.

Nursing Care Management

1. Large goiters are identified by their obvious appearance. Smaller nodules may be evident only on palpation.
2. Benign enlargement of the thyroid gland may occur during adolescence and should not be confused with pathologic states.
3. Nodules are rarely caused by a cancerous tumor but always require evaluation.
4. Include questions regarding exposure to radiation in the assessment.
5. Immediate surgery to remove part of the gland may be lifesaving in infants born with a goiter.
6. When thyroid replacement is necessary, parents have the same needs regarding its administration as discussed for the parents of children who have hypothyroidism.