مرض السكر و انواعه

Outline

- **Definition**
- **Risk factors for diabetes mellitus**
- **Classification of diabetes**
- **Clinical manifestations**
- **Assessment and diagnostic findings**
- **Diabetes Management**
- **Complications of Diabetes**

Definition

Diabetes

is a condition in which the body either cannot produce insulin or cannot effectively use the insulin it produces.

Diabetes

is a group of metabolic diseases characterized by elevated levels of glucose in the blood (hyperglycemia)

Insulin

The pancreas secretes insulin in response to glucose levels in the blood

ADAM.

A hormone produced by the pancreas, controls the level of glucose in the blood by regulating the production and storage of glucose. In the diabetic state, the cells may stop responding to insulin or the pancreas may stop producing insulin entirely. This leads to hyperglycemia.

Pathophysiology

- Insulin (secreted by beta cells) moves glucose from blood into muscle, liver, and fat cells, inhibits breakdown of stored glucose, protein, and fat.
- Glucagon (secreted by alpha cells) is released when blood glucose levels decrease and stimulates the liver to release stored glucose.
- Insulin and glucagon together maintain a constant level of glucose.

Initially, liver produces glucose through breakdown of glycogen (glycogenolysis). After 8 to 12 hours without food, breakdown of noncarbohydrate substances, including amino acids (gluconeogenesis)

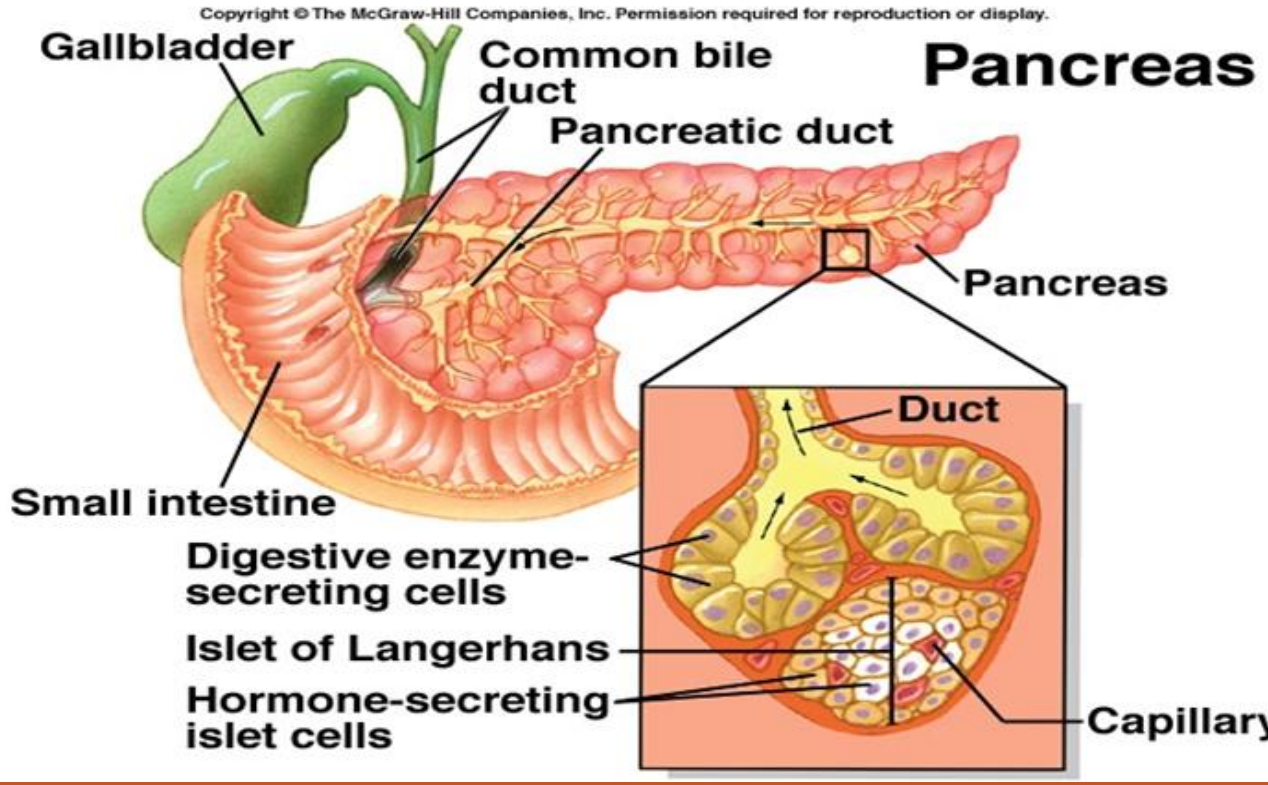
Risk Factors for Diabetes Mellitus

- Age ≥40 years
- First-degree relative with diabetes (Family history of diabetes)
- History of gestational diabetes mellitus
- Hypertension(≥140/90 mm Hg)
- Overweight
- Abdominal obesity

Classification of diabetes

1. Type 1 diabetes (10% of all diabetes): Insulin dependent

- Marked by absence of insulin production and secretion from autoimmune destruction of the beta cells of the islets of Langerhans in the pancreas.
- Often have antibodies to insulin



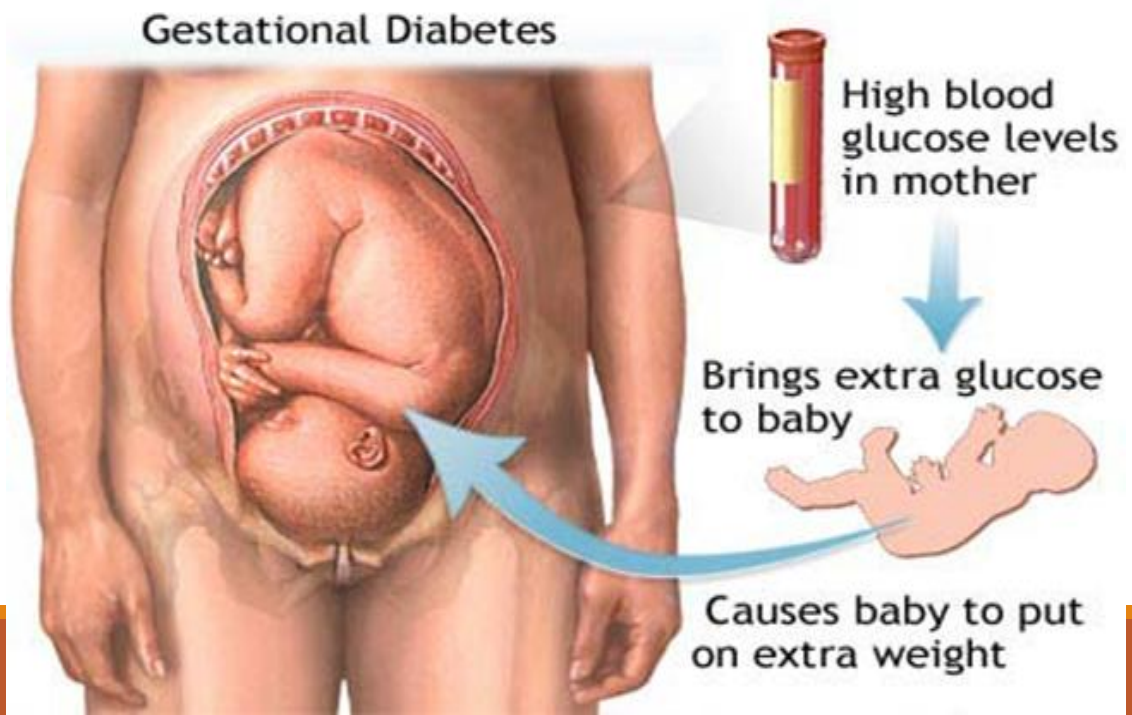
2. Type 2 diabetes (90% of diabetes) Non–insulin-dependent diabetes

- Causes include obesity, heredity, and environmental factors.
- Relative deficiency of insulin production and a decreased insulin action and increased insulin resistance.
- Oral antidiabetic agents may improve blood glucose if dietary modification and exercise are unsuccessful
- May need insulin on a short- or long-term basis

3. Gestational diabetes mellitus:

- Glucose intolerance with first onset occurring during pregnancy.

- Onset during pregnancy, usually in second or third trimester due to hormones secreted by the placenta, which inhibit the action of insulin.
- Treated with diet and, if needed, insulin



Clinical manifestations:

All types of diabetes include the “three P’s”:

- Polyuria (increased urination)
- Polydipsia(increased thirst)
- Polyphagia. (increased appetite)

results from catabolic state induced by insulin deficiency and the breakdown of proteins and fats.

- Fatigue and weakness
- Sudden vision changes

- Tingling or numbness in the hands or feet
- Dry skin
- Skin lesions or wounds that are slow to heal and recurrent infections.
- The onset of type 1 diabetes may also be associated with sudden weight loss or nausea, vomiting, or abdominal pains, if DKA has developed.

DIABETES

KNOW THE SYMPTOMS

Criteria for the Diagnosis of Diabetes Mellitus

1. Symptoms of diabetes “three Ps” plus “random” plasma glucose concentration equal to or greater than 200 mg/dL. **or**

2. Fasting plasma glucose greater than or equal to 126 mg/dL. **or**

3. Two-hours postload glucose equal to or greater than 200 mg/dL.

Diabetes Management

The main goal of diabetes treatment is to normalize insulin activity and blood glucose levels to reduce the development of vascular and neuropathic complications.

1. Nutrition
2. Exercise
3. Monitoring
4. Pharmacotherapy
5. Education

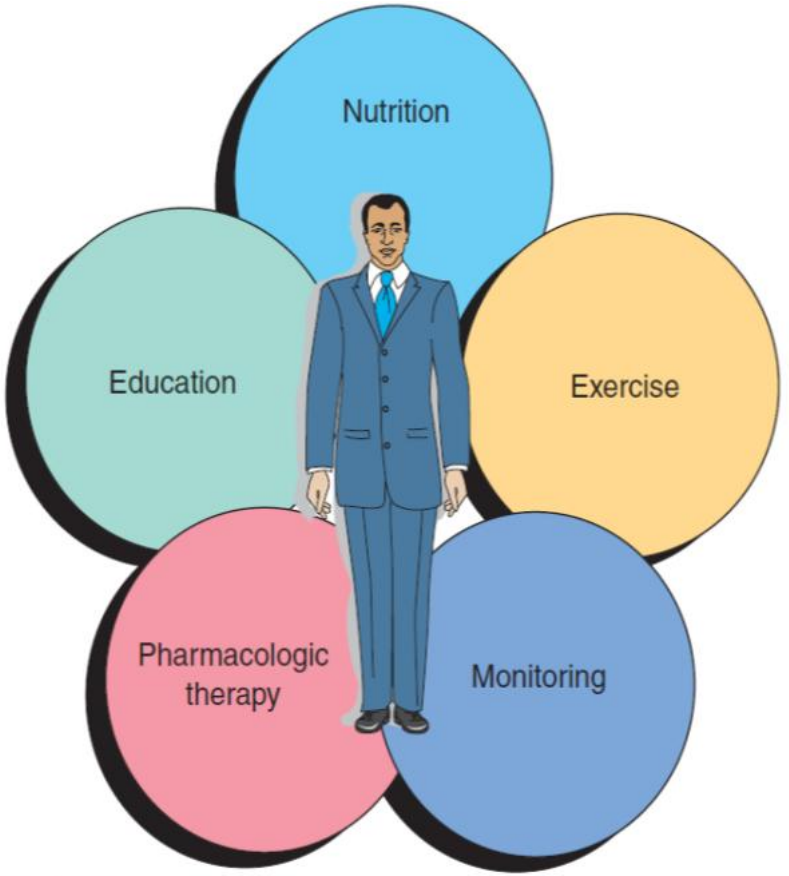


FIGURE 42-1. The five components of diabetes management.

Nutritional Management:

- Meet energy needs
- Achieve and maintain a reasonable weight.
- Prevent wide fluctuations of blood glucose levels
- Decrease serum lipids, if elevated

Diabetic diet:

50% to 60% of calories should be derived from **carbohydrates**, **20% to 30%** from **fat**, and the remaining **10% to 20%** from **protein**.

Carbohydrates: The majority of the selections for carbohydrates should come from whole grains.

- All carbohydrates should be eaten in moderation to avoid high postprandial blood glucose levels.

Fats: fat content of diabetic diet is less than 30% of total calories, limiting saturated fats to 10% of total calories, and limiting total intake of cholesterol to **less than 300 mg/day.**

Protein

- The meal plan may include use of some nonanimal sources of protein (eg, legumes, whole grains), to reduce saturated fat and cholesterol intake.
- Protein intake may be reduced in patients with early signs of renal disease.

Fiber

- A high-carbohydrate, high-fiber diet plays a role in lowering total cholesterol. Increased fiber in the diet may improve blood glucose levels and decrease the need for exogenous insulin.

Role of the Nurse:

- Be knowledgeable about dietary Management.
- Communicate important information to the dietician
- Reinforce patient understanding.
- Support dietary and lifestyle changes.

Beat O Diabetic Food Chart

FRUITS AND VEGETABLES

Fresh Fruits & Green Leafy Vegetables

They are filled with the goodness of antioxidants, fibre, vitamins & minerals

Fruit Juice Drinks & Canned Vegetables

High in calories, trans-fats and sugar

DAIRY

Skimmed Milk & Low-Fat Yogurt

Important source of calcium, vitamin D & protein

Whole Milk & Ice Cream

High fat & sugar content is harmful for diabetics

PROTEINS

Lean Proteins & Seafood

Beans & seeds are rich in iron, vitamins while grilled fish & chicken comprises of beneficial proteins

Pork & Red Meat

Rich in saturated fats, high in iodine - avoid them completely

FATS

Nuts, Seeds & Avocados

Loaded with fibre, vitamins, antioxidants & rich in Omega fatty acids

Cookies, Cakes & Fast Food

Raises blood cholesterol levels & high in sugar

OTHERS

Sprouts & Oats

Sprouts are high in Vitamin C & Fibre, while Oats are low in GI score and regulate sugar levels

Fried Foods & Processed Grains

Contains saturated fats & high on carbohydrates

Exercise:

Benefits: Exercise lowers blood glucose levels by increasing the uptake of glucose by body muscles and by improving insulin utilization.

Precautions for Exercise in People with Diabetes

- Blood glucose should not exceed 250 mg/dL before exercise.
- Exercise with elevated blood glucose level increase secretion of glucagon. The liver then releases more glucose.
- Exercise in same time & same amount each day.

- Patients who require insulin should be taught to eat a **15-g carbohydrate snack (a fruit exchange) or a snack** of complex carbohydrates with a protein **before** engaging in moderate exercise.
- To avoid post exercise hypoglycemia after strenuous or prolonged exercise, the patient may need to **eat a snack** at the end of the exercise session - and at bedtime and **monitor** the blood glucose level more frequently.

Monitoring

Candidates for Self-Monitoring of Blood Glucose (SMBG)

- Intensive insulin therapy (2 to 4 injections/day or use of insulin pump)
- For diabetes management during pregnancy.
- Unstable diabetes (severe swings from very high to very low blood glucose)
- A tendency to develop severe ketosis or hypoglycemia
- Hypoglycemia without warning symptoms

Frequency of SMBG

- SMBG is recommended 2 to 4 times daily (before meals and at bedtime).

Patients not receiving insulin, assess blood glucose 2 or 3 times per week.

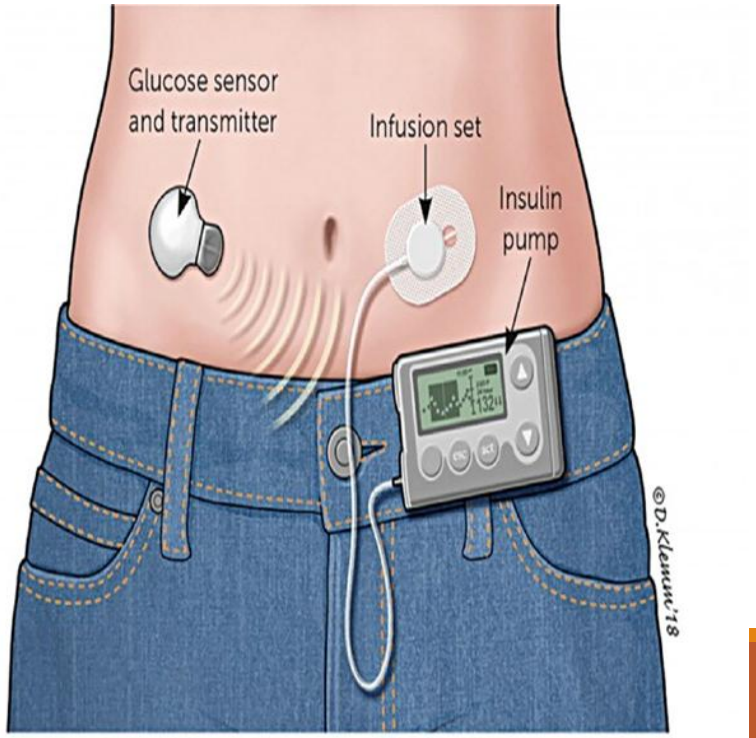
Advantages and Disadvantages of SMBG Systems

- Meters are less expensive,less dependent on technique, results are accurate.
- **Some common sources of error:**

- Improper application of blood (eg, drop too small)
- Damage to the reagent strips caused by heat, humidity or outdated strips
- **Improper meter cleaning and maintenance.**

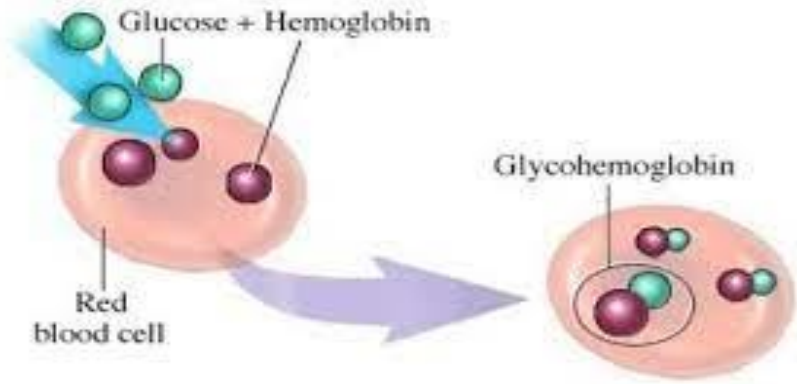
Continuous Glucose Monitoring System (CGMS)

A sensor attached to an infusion set, (similar to an insulin pump infusion set), is inserted subcutaneously in the abdomen and connected to the device worn on a belt. After 72 hours, the data are downloaded, and glucose readings are analyzed.



Glycated Hemoglobin ($HgbA_{1C}$, or A1C)

- Glycated hemoglobin is a blood test that reflects average blood glucose levels over a period of approximately 2 to 3 months.
- The greater the amount of blood glucose above normal, the more glucose binds to hemoglobin and the higher glycated hemoglobin level becomes. This complex lasts for the life of RBCs (120 days). Normal values 4% to 6%.



Pharmacological therapy

Insulin Therapy and Insulin Preparations

- In type 1 diabetes, exogenous insulin must be administered. In type 2 diabetes, insulin may be necessary if meal planning and oral agents are ineffective.
- In the past, all insulins were obtained from cow and pig pancreases. "Human insulins" are now widely available (by DNA technology).

Types

- Animal insulin
- Human insulin

Table 41-3 • Categories of Insulin

TIME COURSE	AGENT	ONSET	PEAK	DURATION	INDICATIONS
Rapid-acting	Lispro (Humalog)	10–15 min	1 h	3 h	Used for rapid reduction of glucose level, to treat postprandial hyperglycemia, and/or to prevent nocturnal hypoglycemia
	Aspart (Novolog)	10–15 min	40–50 min	4–6 h	
Short-acting	Regular (Humalog R, Novolin R, Iletin II Regular)	½–1 h	2–3 h	4–6 h	Usually administered 20–30 minutes before a meal; may be taken alone or in combination with longer-acting insulin
Intermediate-acting	NPH (neutral protamine Hagedorn)	2–4 h	6–12 h	16–20 h	Usually taken after food
	(Humulin N, Iletin II Lente, Iletin II NPH, Novolin L [Lente], Novolin N [NPH])	3–4 h	6–12 h	16–20 h	
Long-acting	Ultralente ("UL")	6–8 h	12–16 h	20–30 h	Used primarily to control fasting glucose level
Very long-acting	Glargine (Lantus)	1 h	Continuous (no peak)	24 h	Used for basal dose

Methods of insulin delivery:

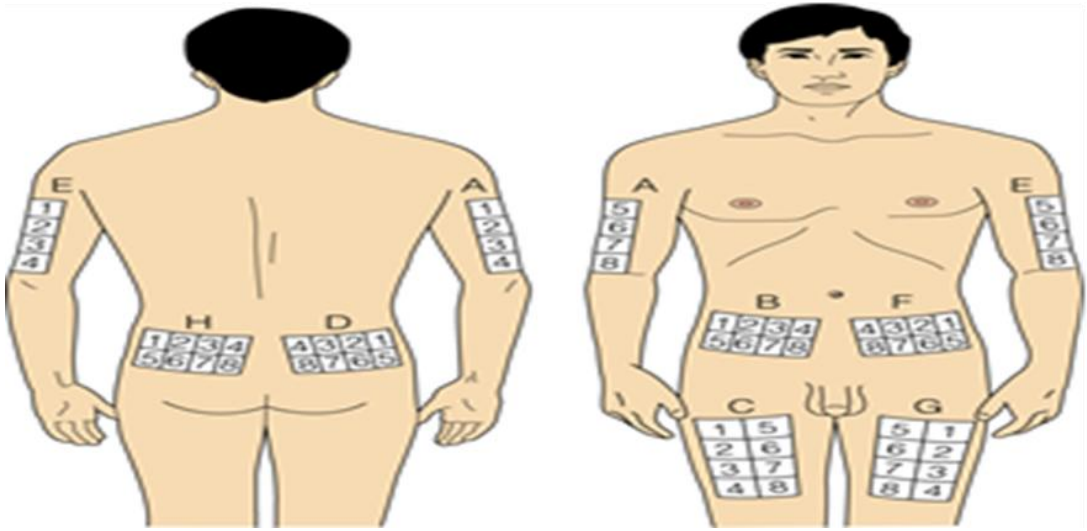
- Insulin Pens.
- Insulin Pumps.

1. **Insulin Pens**

Insulin pens use small (150- to 300-unit) prefilled insulin cartridges that are loaded into a pen like holder.

Injection sites

Abdominal areas is the most preferred because of rapid absorption.



2. **Insulin Pumps**

Continuous subcutaneous insulin infusion: involves the use of small, externally worn devices that closely mimic the functioning of the normal pancreas.


NovoLog®
FlexPen® Prefilled Syringe

Oral Anti-Diabetic Agents

- If glycaemic control is not achieved (HbA1c > 6.5% with lifestyle modification) within 1 –3 months, oral anti-diabetic agent should be initiated.

- In the presence of marked hyperglycaemia in newly diagnosed symptomatic type 2 diabetes (HbA1c > 8%, oral anti-diabetic agents can be considered at the outset together with lifestyle modification.

- Combining insulin and some oral anti-diabetic agents as metformin,& sulphonylureas, has been shown to be effective in people with type 2 diabetes.
- Insulin dose can be increased until target Fasting blood glucose (FPG) is achieved.

Education:

- Foot care
- Eye care
- General hygiene (eg, skin care, oral hygiene)
- Risk factor management (eg, control of blood pressure and, blood lipid levels, and normalizing blood glucose levels).

Complications of Diabetes:

Acute Complications of Diabetes:

- Hypoglycemia
- Diabetic ketoacidosis (DKA)

Complications of diabetes mellitus

Hypoglycemia:

(Abnormally low blood glucose level) occurs when the blood glucose falls to less than 50 to 60 mg/dL.

Caused by;

- Too much insulin or oral hypoglycemic agents.
- Too little food, or excessive physical activity.
- It often occurs before meals, especially if meals are delayed or snacks are omitted.

Signs & Symptoms:

Impaired function of the CNS may include:

- Sweating, pallor, coldness,
- Numbness of the lips and tongue.
- Headache, lightheadedness,
- Double vision and drowsiness.
- Slurred speech,
- Confusion, memory lapses,
- Inability to concentrate,
- Impaired coordination,
- Emotional changes, irrational combative behavior

Symptoms of hypoglycemia

feeling dizzy/shaking

profuse sweating

pins and needles around mouth

headache

excessive hunger

Treatment:

- Immediate treatment must be given, 15 g of a fast-acting concentrated source of carbohydrate given orally: about 6 hard candies or 2 to 3 teaspoons of sugar or honey
- It is not necessary to add sugar to juice.
- If symptoms persist for longer than 10 to 15 min, treatment is repeated even if blood glucose testing is not possible.
- Once symptoms resolve, a snack containing protein and starch (e.g., cheese and crackers) is recommended.

Emergency Measures

- For unconscious patients, injection of glucagon 1 mg can be administered either subcutaneously or intramuscularly.
- If nausea occurs, patient should be turned to the side to prevent aspiration.
- In hospitals and emergency departments, 25 to 50 mL of 50% dextrose in water (D50W) may be administered IV.

Diabetic Ketoacidosis:

Caused by an absence or markedly inadequate amount of insulin.

Three main clinical features of DKA

- Hyperglycemia
- Dehydration and electrolyte loss
- Acidosis

Long Term Complications of Diabetes

Macrovascular Complications

- Diabetic macrovascular complications result from changes in medium to large blood vessels. Blood vessel walls thicken, sclerose, and become occluded by plaque that adheres to the vessel walls. Blood flow is blocked.

Three main types of macrovascular complications:

- Coronary artery disease.
- Cerebrovascular disease.
- Peripheral vascular disease.

Microvascular complications

- Increased blood glucose levels react through a series of biochemical responses to thicken the basement membrane.
  - **Retinopathy** is the leading cause of blindness among people between 20 and 74 years of age.
  - **Nephropathy** or renal disease secondary to diabetic microvascular changes in the kidney.
  - **Neuropathies** a group of diseases that affect all types of nerves, including peripheral (sensorimotor), autonomic, and spinal nerves.
  - **Foot & leg problems**

Foot and Leg Problems

Between 50% and 75% of lower extremity amputations are performed on people with diabetes. More than 50% of these amputations are thought to be preventable, provided patients are taught foot care measures and practice them on a daily basis.

Pathophysiology:

Diabetic foot ulcer begins with a soft tissue injury of the foot formation of a fissure between the toes or in an area of dry skin, injury or fissure may go unnoticed until a serious infection has developed. ⇨ Drainage, swelling, redness of the leg (from cellulitis), or gangrene may be the first sign of foot problems that the patient notices.

Treatment of foot ulcers:

Treatment involves bed rest, antibiotics, and débridement. In addition, controlling glucose levels is important for promoting wound healing.

- In peripheral vascular disease, foot ulcers may not heal because of the decreased ability of oxygen, nutrients, and antibiotics to reach the injured tissue. Amputation may be necessary to prevent the spread of infection.
- Foot assessment and foot care instructions are most important.

Patient Education: Foot Care

1. Work with health care team to keep blood glucose level within a normal range.

2. Protect feet from hot and cold
3. **Inspect feet every day.**
   - Look at bare feet every day for cuts, blisters, redness, ulcerations and swelling.
   - Use a mirror to check the bottoms of feet.

- **Wash feet every day.**
  - Wash feet in warm, not hot, water.
  - Dry feet well. Be sure to dry between the toes.
  - Do not soak feet.
  - Do not check water temperature with feet; use elbow.
- **Keep the skin soft and smooth.**
  - Rub a thin coat of skin lotion over the feet, but not between toes.

- **Trim toenails** straight each week or when needed.
- **Wear shoes and socks at all times.**
  - Never walk barefoot.
  - Never wear open-toed shoes
  - Wear comfortable shoes that fit well and protect feet.
  - Feel inside shoes before putting them on each time.
- **Keeps blood flowing to feet.**
  - Put feet up when sitting.
  - Do not cross legs for long periods of time.
  - Avoid smoking and elevated blood lipids that lead to peripheral vascular disease.

Foot care for patients with diabetic neuropathy

When nerves to the feet are damaged, regular foot care is important.

Clean feet daily and use moisturizing lotions.

Perform daily foot self-examination. Use a mirror if you cannot directly see the bottom of your feet.

Check shoes for tears and sharp edges.

Daily foot self-examination should include careful inspection for redness, cuts, swelling, and blisters.

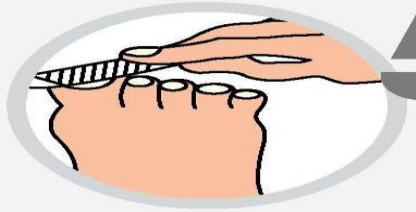
Taking care of your feet in diabetes

1. Wash your feet daily with lukewarm water and soap.

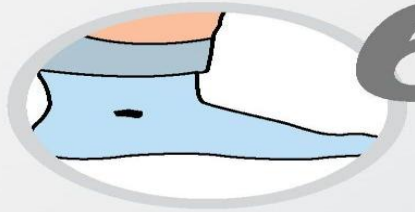
2. Dry your feet well especially between the toes.

3. Apply moisturising lotion, but do not apply between the toes.

4. Check your feet for blisters, cuts, redness, etc. If present, consult your doctor.



5. Trim your nails straight across and file the edge with a nail file.



6. Change socks daily; avoid dirty and tight socks.

7. Never walk barefoot either indoors or outdoors.

8. Examine your shoes daily for cracks, stones, nails which may irritate feet.