

Nutrition

Food

Carbohydrates
energy and fiber source

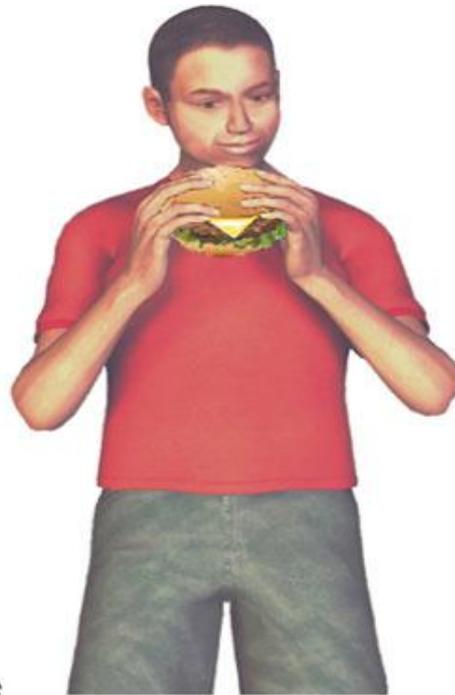
Protein
structural building blocks

Fat
energy storage; cell repair

Water
solvent and lubricant;
transport of nutrients;
temperature regulation

Vitamins
involved in chemical reactions

Minerals
involved in enzyme functions,
nerve impulses, and bone structure



- The foods we eat contain **nutrients**. Nutrients are substances required by the body to perform its basic functions. Nutrients must be obtained from diet, since the human body does not synthesize them.
- Nutrients are used to produce energy, detect and respond to environmental surroundings, perform the different daily life activities and different body functions.
- There are six classes of nutrients required for the body to function and maintain overall health. These are carbohydrates, lipids, proteins, water, vitamins, and minerals. Foods also contain non-nutrients that may be harmful (such as cholesterol, dyes, and preservatives) or beneficial (such as antioxidants).

Carbohydrates

- The major food sources of carbohydrates are grains, milk, fruits, and starchy vegetables like potatoes.
- Carbohydrates are broadly classified into two forms based on their chemical structure:
 - ✓ fast-releasing carbohydrates, often called simple sugars (e.g. sucrose), and
 - ✓ slow-releasing carbohydrates (Glycogen and starches are slow-releasing carbohydrates. Fiber is also a slow-releasing carbohydrate, but it cannot be broken down in the human body and passes through the digestive tract undigested unless the bacteria that inhabit the gut break it down).
- One gram of carbohydrates yields four kilocalories of energy for the cells in the body to perform work.

Lipids

- Lipids are found predominately in butter, oils, meats, dairy products, nuts, and seeds, and in many processed foods. Unlike carbohydrates, they are insoluble in water.
- The main job of lipids is to store energy. Lipids provide more energy per gram than carbohydrates (nine kilocalories per gram of lipids versus four kilocalories per gram of carbohydrates).

- In addition to energy storage, lipids serve as cell membranes, surround and protect organs, aid in temperature regulation, and regulate many other functions in the body.

Proteins

- Proteins are macromolecules composed of chains of subunits called amino acids.
- The food sources of proteins are meats, dairy products, seafood, and a variety of different plant-based foods, most notably soy.
- Proteins provide four kilocalories of energy per gram; however, providing energy is not protein's most important function. Proteins provide structure to bones, muscles and skin, and play a role in conducting most of the chemical reactions that take place in the body.

Water

- Is a nutrient we must have in large quantities.
- It is composed of two hydrogens and one oxygen per molecule of water. More than 60 percent of your total body weight is water.
- On average, an adult consumes just over two liters of water per day from food and drink.

Micronutrients

- Micronutrients are nutrients required by the body in lesser amounts but are still essential for carrying out bodily functions.
- Micronutrients include all the essential minerals and vitamins.

✓ Minerals

- They include trace minerals, such as molybdenum, selenium, zinc, iron, and iodine, are only required in a few milligrams or less and
- macro minerals, such as calcium, magnesium, potassium, sodium, and phosphorus, are required in hundreds of milligrams.
- Many minerals are critical for enzyme function, others are used to maintain fluid balance, build bone tissue, synthesize hormones, transmit nerve impulses, contract and relax muscles, and protect against harmful free radicals.

✓ **Vitamins**

- Vitamins are categorized as either water-soluble or fat-soluble.
- The water-soluble vitamins are vitamin C and all the B vitamins (thiamine, riboflavin, niacin, pantothenic acid, pyroxidine, biotin, folate and cobalamin).
- The fat-soluble vitamins are A, D, E, and K.
- Vitamins are required to perform many functions in the body such as making red blood cells, synthesizing bone tissue, and playing a role in normal vision, nervous system function, and immune system function.
- Vitamin deficiencies can cause severe health problems.

Malnutrition diseases (Nutrition disorders)

Malnutrition diseases, which are nutrition disorders, occur as a result of our body not getting enough of or excess of nutrients.

Carbohydrate malnutrition diseases and nutrition disorders:

- ✓ Deficient malnutrition: Carbohydrates are easy and fast sources for energy production in the human body.
- The shortage of carbohydrates in food causes nutrition problems like energy starvation, weakness and lethargy.
- ✓ Excess nutrition: Consumption of excess carbohydrates above the body requirement for a long period of time causes obesity, type 2 diabetes and cardiovascular diseases.

Protein nutrition disorders and malnutrition diseases:

Deficient malnutrition: Protein deficiency in children causes malnutrition diseases like kwashiorkor.

kwashiorkor is marked by pedal edema, pot belly and wasted body muscles.

Excess nutrition: Prolonged consumption of excess of protein especially in the absence of fats causes nutrition problem called rabbit starvation in which there is discomfort and hunger that can be satiated only by the intake of fat and carbohydrates.

Fat malnutrition and nutrition:

Deficient malnutrition: deficiency of fats in nutrition causes low sex hormone levels and malabsorption of fat-soluble vitamins.

Fat deficiency coupled with high intake of proteins causes 'rabbit starvation' condition.

Excess nutrition: Fats when consumed in excess of requirement can result in cardiovascular problems and obesity.

Minerals nutrition disorders and malnutrition:

Many malnutrition diseases are caused by the deficiency of minerals.

Iodine:

Deficient malnutrition: Goiter, cretinism and hypothyroidism are the results of dietary Iodine deficiency.

Iron:

Deficient malnutrition: Iron deficiency in nutrition causes anemia with symptoms of decreased hemoglobin in blood.

Excess nutrition disorders: Iron in excess causes iron overload and iron intoxication damaging intestinal lining and liver.

Sodium:

Deficient malnutrition: Hyponatremia and electrolyte disturbance occurs in deficiency with fluid retention.

Excess nutrition: Hypernatremia and electrolyte disturbance occurs affecting oxygen transport.

Calcium:

Deficient malnutrition: Hypocalcaemia occurs with electrolyte disturbance.

Excess nutrition: Hypercalcaemia occurs in excess consumption.

Potassium:

Deficient malnutrition diseases: Hypokalemia with symptoms like elevated blood pressure is caused when there is malnutrition of this mineral.

Excess nutrition disorders: Hyperkalemia with symptoms like palpitation and muscle weakness is encountered in excess nutrition of potassium.

Magnesium:

Deficient malnutrition diseases: Muscle weakness and hyperexcitability are symptoms of its deficiency. In severe deficiency death may occur from heart failure.

Excess nutrition: Hypermagnesemia occurs in persons with renal impairment with symptoms like nausea, vomiting and weakness.

Zinc:

Deficiency malnutrition diseases: Hair loss, diarrhea, wasting of body tissues and skin lesions occur due to Zinc deficiency.

Excess nutrition disorders: Zinc in excess causes zinc toxicity which suppresses copper and iron absorption.

Copper:

Deficiency malnutrition diseases: Pancytopenia (decrease the number of white and red blood cells and platelets).

Excess nutrition: Copper toxicity shows symptoms like palsy and convulsions and in some cases result in death.

Vitamins malnutrition diseases and nutrition disorders:

There is much negative impact in health with the deficiency of vitamins in the nutrition.

Vitamin A:

Deficiency malnutrition: Deficiency of vitamin A causes low testosterone levels, night blindness and Xerophthalmia. In Xerophthalmia the eye fails to produce tears leading to dryness of cornea and conjunctiva.

Excess nutrition disorders: Hypervitaminosis A is the condition caused by excess of vitamin A. The malnutrition effects include angular cheilitis, hair loss, excessively dry skin, birth defects, nausea and vomiting, headache, blurred vision and reduced muscle coordination.

Vitamin B₁:

Deficiency malnutrition: The deficiency of vitamin B₁ in nutrition causes Beriberi leading to neurodegeneration, wasting and death.

Excess nutrition: Adverse effects are not recorded for higher doses.

Vitamin B₂:

Deficiency malnutrition: Deficiency of riboflavin (vitamin B₂) leads to sore throat, cracking of the lips and corners of the mouth, glossitis and seborrheic dermatitis.

Excess: No adverse effects are reported for excess consumption of riboflavin.

Vitamin B₃:

Deficiency malnutrition: Deficiency of niacin leads to Pellagra. The affected person suffers from hypersensitivity to light, diarrhea, dementia and dermatitis.

Excess nutrition disorders: excess of niacin can cause birth defects, cardiac arrhythmias and dyspepsia.

Vitamin B₆:

Deficiency malnutrition: Lack of vitamin B₆ causes seizures, nerve damage, anemia, skin problems and mouth sores.

Excess nutrition: Overdose causes neurological problems like numbness and poor coordination.

Vitamin B7:

Deficiency malnutrition: Hair loss, dermatitis, conjunctivitis, depression and hallucination are some of the symptoms of deficiency.

Excess: No adverse effects are reported for excess consumption.

Vitamin B9:

Deficiency malnutrition: Neural tube defects in developing embryos and impaired DNA synthesis and repair are some of the effects of deficiency.

Excess disorders: No adverse reactions are found for overdose.

Vitamin B12:

Deficiency diseases: Pernicious anemia occurs when there is nutrition deficiency of this vitamin. Symptoms like sore tongue, weakness, paraesthesias, diarrhea and memory changes are seen.

Excess disorders: No adverse effects have been reported in case of heavy doses of vitamin B12.

Vitamin C:

Deficiency: Scurvy is the result of deficiency of vitamin C. Symptoms include bleeding gums and mucous membranes and suppurating wounds.

Excess nutrition: Excess of vitamin C may lead to diarrhea and upset stomach.

Vitamin D:

Deficiency malnutrition diseases: Deficiency of vitamin D causes rickets in children and osteomalacia in adults.

Excess nutrition disorders: Excess of vitamin D leads to hypervitaminosis D with vomiting, dehydration and constipation.

Vitamin E:

Deficiency malnutrition: Vitamin E deficiency causes poor nerve conduction and neurological problems.

Excess nutrition disorders: Hypervitaminosis E is the result excess of vitamin E, leading to excessive bleeding.

Vitamin K:

Deficiency malnutrition: Vitamin K is required for blood coagulation and the deficiency leads to hemorrhage.

Excess disorders: There are no adverse effects of excess consumption of vitamin K.

Diseases and conditions causing malnutrition and nutrition disorders:

- AIDS.
- Alzheimer diseases (Senile Dementia).
- Chronic heart diseases.
- Celiac diseases.
- Chronic renal diseases.
- Chronic lung diseases.
- Chronic diarrhea.
- Pernicious anemia.
- Pancreatic insufficiency.
- Short bowel syndrome.
- Third degree burns.
- Tuberculosis.
- Renal failure diseases.
- Sepsis.
- Ulcerative colitis.
- Whooping Cough.
- Surgery.
- Trauma.
- Pregnancy.
- Dyspepsia.

What Are the Symptoms of Nutritional Deficiencies?

- pallor.
- fatigue.
- weakness.
- difficult breathing.
- hair loss.
- constipation.
- sleepiness.
- heart palpitations.
- fainting.
- depression.
- tingling and numbness of the joints.
- menstrual disorders (such as missed periods).
- poor concentration.

The symptoms of under nutrition include:

- fatigue.
- a lower body temperature.
- diarrhea.
- reduced appetite.
- irritability.
- weakness.
- slower breathing.
- numbness or tingling of the hands and feet.
- dry skin.
- hair loss.
- bruises.

Protein-Energy Malnutrition (PEM)

- Protein-energy malnutrition (PEM) is a problem affecting children and adults throughout the world.
- It is an important underlying cause of death and disability in developing countries.
- Protein deficiency affects the transport of many essential nutrients that are normally bound to protein carriers in the plasma, and thus correction of protein and thus correction of protein synthesis improves the apparent deficiency of specific nutrients.
- Clinical forms of malnutrition include:
 - ✓ Marasmus: – Severe wasting
 - ✓ Marasmic kwashiorkor – Severe wasting in the presence of edema
 - ✓ Kwashiorkor – Malnutrition with edema
- Causes of protein energy malnutrition include
 - ✓ Early weaning
 - ✓ Delayed introduction of complementary food
 - ✓ Low protein diet
 - ✓ Severe or frequent infections.

Marasmus

- ✓ Marasmus occurs due to decreased caloric intake over months to years
- ✓ Marasmus occurs more often in young children and babies. It leads to dehydration and weight loss.
- ✓ the risk for marasmus is increased among residents of a rural area where it's difficult to get food or an area that has a food shortage.
- ✓ Babies, including babies who aren't breast-fed, young children, or older adults also have an increased risk for marasmus.

The manifestations of marasmus include:



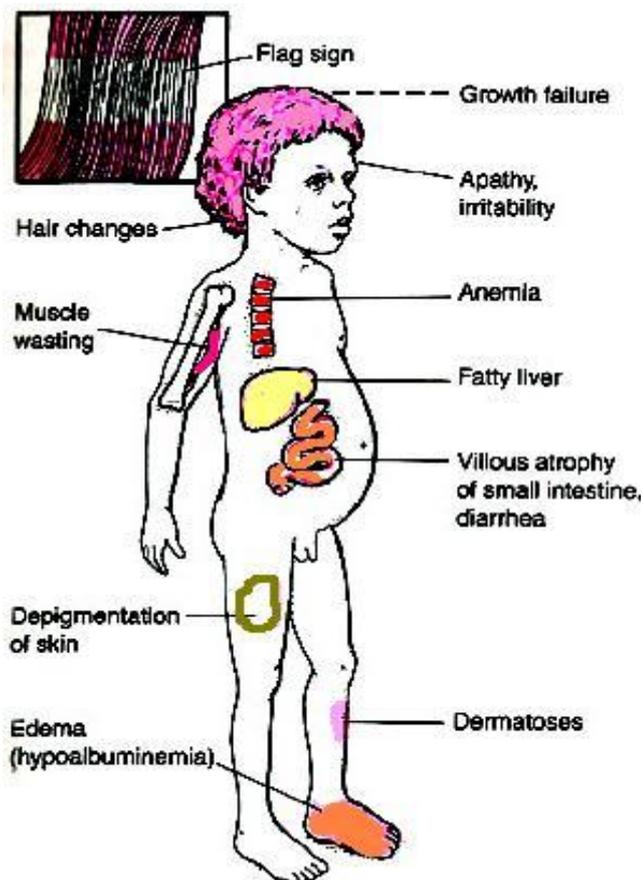
- Cachexia, severe illness, “little old man”, irritability, apathy.
- Underweight, growth retardation
- Hair sparse, brittle, easily pulled out

- Corneal opacity
- Poor skin turgor
- Nails fragile, thin and fissured
- Loss of subcutaneous tissue
- Muscle wasting
- Abdominal distension (muscular hypotonia)
- Rectal prolapse (loss of perianal fat)
- Vital signs: hypothermia, hypotension, bradycardia
- Anthropometry: wasting or stunting, weight for height or height for age is less than 65% of the mean average

Kwashiorkor:

- ✓ Kwashiorkor occurs in people who have a severe protein deficiency.
- ✓ Children who develop kwashiorkor are often older than children who develop marasmus.
- ✓ Having a diet that's mainly carbohydrates can lead to this condition.
- ✓ The risk for kwashiorkor is increased among the residents of a rural area where there's limited access to protein-rich foods.
- ✓ Children who have been weaned off of breast milk are also at an increased risk if they don't have access to protein-rich foods.

The manifestations of kwashiorkor include:



- Edema, or puffy or swollen appearance due to fluid retention.
- An inability to grow or gain weight.
- Flaking paint rash, pellagrous lesions, fissures,
- Mucosal thinness, ulcerations, mild anemia
- Lifeless, thin, pale, weak, or dry hair
- Fragile and thin nails
- Hepatomegaly (steatosis)
- Vital signs: hypothermia, hypotension
- Anthropometry: usually underweight; occasional fat appearance

Marasmus symptoms

Weight loss

Dehydration

Stomach shrinkage

Diarrhea

Kwashiorkor symptoms

An inability to grow or gain weight

Edema, or swelling of the hands and feet

Stomach bulging

Causes of marasmus and kwashiorkor:

The main cause of both of these conditions is a lack of access to food. Some conditions that may affect a person's access to food include:

- Famine.
- A caregiver's inability to get food due to lack of transportation or a physical inability.
- Poverty.
- Having an eating disorder.
- Lacking education about dietary needs.
- Taking a medication that interferes with the absorption of nutrients.
- Having a medical condition that increases the body's need for calories.

Iron deficiency anemia

Definition:

Iron deficiency anemia is a common type of anemia — a condition in which blood lacks adequate healthy red blood cells.

Symptoms:

Iron deficiency anemia symptoms may include:

- Extreme fatigue.
- Pale skin.
- Weakness.
- Shortness of breath.
- Chest pain.
- Frequent infections.
- Headache.
- Dizziness or lightheadedness.
- Cold hands and feet.
- Inflammation or soreness of tongue.
- Brittle nails.
- Fast heartbeat.
- Poor appetite, especially in infants and children with iron deficiency anemia.
- An uncomfortable tingling or crawling feeling in your legs (restless legs syndrome)

Causes of iron deficiency anemia include:

- **Blood loss.**
- **A lack of iron in the diet.** Examples of iron-rich foods include meat, eggs, leafy green vegetables and iron-fortified foods.
- **An inability to absorb iron.**
- **Pregnancy.**

Risk factors of iron deficiency anemia include:

These groups of people may have an increased risk of iron deficiency anemia:

- Women.
- Infants and children.
- Vegetarians.
- Frequent blood donors.

Complications of iron deficiency anemia include:

- Heart problems.
- Problems during pregnancy.
- Growth problems.

Tests and diagnosis of iron deficiency anemia include:

- Red blood cell size and color.
- Hematocrit.
- Hemoglobin.
- Ferritin.

Treatments and drugs of iron deficiency anemia include:

Iron supplements:

- Take iron tablets on an empty stomach.
- Don't take iron with antacids.
- Take iron tablets with vitamin C.

Treating underlying causes of iron deficiency:

- Medications, such as oral contraceptives to lighten heavy menstrual flow.
- Antibiotics and other medications to treat peptic ulcers.
- Surgery to remove a bleeding polyp, a tumor or a fibroid.

Prevention of iron deficiency anemia include:

- ✓ Choose iron-rich foods. Foods rich in iron include:
 - Red meat.
 - Poultry.
 - Seafood.
 - Beans.

- Dark green leafy vegetables, such as spinach.
- Dried fruit, such as raisins and apricots.
- Iron-fortified cereals, breads and pastas.
- Peas.

- Choose foods containing vitamin C to enhance iron absorption: Vitamin C is also found in:
 - Broccoli.
 - Grapefruit.
 - Kiwi.
 - Leafy greens.
 - Melons.
 - Oranges.
 - Peppers.
 - Strawberries.
 - Tangerines.
 - Tomatoes.

Obesity

Definition: Obesity is a complex disorder involving an excessive amount of body fat. It increases the risk of diseases and health problems, such as heart disease, diabetes and high blood pressure.

- Dietary changes, increased physical activity and behavior changes can help you lose weight. Prescription medications and weight-loss surgery are additional options for treating obesity.

Symptoms:

- Obesity is diagnosed when the body mass index (BMI) is 30 or higher.
- The body mass index is calculated by dividing weight in kilograms (kg) by the square of height in meters (m²).

Weight status	BMI
Underweight	Below 18.5
Normal	18.5-24.9
Overweight	25.0-29.9
Obese (Class I)	30.0-34.9
Obese (Class II)	35.0-39.9
Extreme obesity (Class III)	40.0 and higher

Causes of obesity:

Although there are genetic, behavioral and hormonal influences on body weight, obesity occurs when you take in more calories than you burn.

In general, the principal causes of obesity are:

- Inactivity.
- Unhealthy diet and eating habits.

Risk factors of obesity:

- Genetics.
- Family lifestyle.
- Inactivity.
- Unhealthy diet.
- Medical problems.
- Certain medications.
- Social and economic issues.
- Age.
- Pregnancy.
- Quitting smoking.
- Lack of sleep.

Complications of obesity:

Obese persons are more likely to develop a number of potentially serious health problems, including:

- High triglycerides and low high-density lipoprotein (HDL) cholesterol.
- Type 2 diabetes.
- High blood pressure.
- Metabolic syndrome — a combination of high blood sugar, high blood pressure, high triglycerides and low HDL cholesterol.
- Heart disease.
- Stroke.
- Cancer, including cancer of the uterus, cervix, endometrium, ovaries, breast, colon, rectum, esophagus, liver, gallbladder, pancreas, kidney and prostate.
- Breathing disorders, including sleep apnea, a potentially serious sleep disorder in which breathing repeatedly stops and starts.
- Gallbladder disease.
- Gynecological problems, such as infertility and irregular periods.
- Erectile dysfunction and sexual health issues.

- Nonalcoholic fatty liver disease, a condition in which fat builds up in the liver and can cause inflammation or scarring.
- Osteoarthritis.

Treatments and drugs:

- ✓ The goal of obesity treatment is to reach and stay at a healthy weight.
- ✓ a team of health professionals may be needed including a dietitian, behavior counselor or an obesity specialist to help in understanding and adopting changes in eating and activity habits.
- ✓ All weight-loss programs require changes in eating habits and increased physical activity.
- ✓ The treatment methods depend on level of obesity, overall health and the willingness to participate in weight-loss plan.

Other treatment tools include:

- Dietary changes.
- Exercise and activity.
- Behavior change.
- Prescription weight-loss medications.
- Weight-loss surgery.

Prevention:

- ✓ Whether the individual is at risk of becoming obese, currently overweight or at a healthy weight, certain steps are required to prevent unhealthy weight gain and related health problems.
 - ✓ Not surprisingly, the steps to prevent weight gain are the same as the steps to lose weight: daily exercise, a healthy diet, and a long-term commitment to watch what the individual eat and drink.
-
- Exercise regularly.
 - Follow a healthy eating plan.
 - Know and avoid the food traps that cause the individual to eat.
 - Monitoring weight regularly.

Diabetes mellitus

Definition:

- ✓ Diabetes mellitus refers to a group of diseases that affect how the body uses blood sugar (glucose).
- ✓ Glucose is vital to health because it's an important source of energy for the cells that make up muscles and tissues. It's also brain's main source of fuel.
- ✓ Having diabetes, no matter what type, means having too much glucose in blood which leads to serious health problems.

Types:

- 1) Type 1 diabetes.
- 2) Type 2 diabetes.
- 3) Gestational diabetes.

Symptoms:

- ✓ Some of the signs and symptoms of type 1 and type 2 diabetes are:
 - Increased thirst.
 - Frequent urination.
 - Extreme hunger.
 - Unexplained weight loss.

- Presence of ketones in the urine (ketones are a byproduct of the breakdown of muscle and fat that happens when there's not enough available insulin).
 - Fatigue.
 - Irritability.
 - Blurred vision.
 - Slow-healing sores.
 - Frequent infections, such as gums or skin infections and vaginal infections.
- ✓ Although type 1 diabetes can develop at any age, it typically appears during childhood or adolescence.
- ✓ Type 2 diabetes, the more common type, can develop at any age, though it's more common in people older than 40.

Causes:

- To understand diabetes, first it is necessary to understand how glucose is normally processed in the body.

How insulin works:

Insulin is a hormone that comes from a gland situated behind and below the stomach (pancreas).

- The pancreas secretes insulin into the bloodstream.
- The insulin circulates, enabling sugar to enter your cells.
- Insulin lowers the amount of sugar in your bloodstream.

- As blood glucose level drops, so does the secretion of insulin from pancreas.

The role of glucose:

Glucose — a sugar — is a source of energy for the cells that make up muscles and other tissues.

- Glucose comes from two major sources: food and liver.
- Sugar is absorbed into the bloodstream, where it enters cells with the help of insulin.
- The liver stores and makes glucose.
- When glucose levels are low, such as when one haven't eaten in a while, the liver breaks down stored glycogen into glucose to keep blood glucose level within a normal range.

Causes of type 1 diabetes:

- The exact cause of type 1 diabetes is unknown.
- What is known is that the immune system — which normally fights harmful bacteria or viruses — attacks and destroys insulin-producing cells in the pancreas.
- This leaves the body with little or no insulin. Instead of being transported into the cells, glucose builds up in your bloodstream.

- Type 1 is thought to be caused by a combination of genetic susceptibility and environmental factors, though exactly what many of those factors are is still unclear.

Causes of prediabetes and type 2 diabetes:

- In prediabetes — which can lead to type 2 diabetes — and in type 2 diabetes, the cells become resistant to the action of insulin, and the pancreas is unable to make enough insulin to overcome this resistance. Instead of moving into the cells where it's needed for energy, glucose builds up in the bloodstream.
- Exactly why this happens is uncertain, although it's believed that genetic and environmental factors play a role in the development of type 2 diabetes.
- Being overweight is strongly linked to the development of type 2 diabetes, but not everyone with type 2 is overweight.

Causes of gestational diabetes:

- During pregnancy, the placenta produces hormones to sustain pregnancy. These hormones make the cells more resistant to insulin.
- Normally, the pancreas responds by producing enough extra insulin to overcome this resistance. But sometimes the pancreas can't keep up. When this happens, too little

glucose gets into the cells and too much stays in the blood, resulting in gestational diabetes.

Risk factors:

Risk factors for type 1 diabetes:

- Family history.
- Environmental factors.
- The presence of damaging immune system cells (autoantibodies).
- Dietary factors.
- Geography.

Risk factors for prediabetes and type 2 diabetes:

- Weight.
- Inactivity.
- Family history.
- Race.
- Age.
- Gestational diabetes.
- Polycystic ovary syndrome.
- High blood pressure.
- Abnormal cholesterol and triglyceride levels.

Risk factors for gestational diabetes:

- Age.
- Family or personal history.

- Weight.
- Race.

Complications:

- Cardiovascular disease.
- Nerve damage (neuropathy).
- Kidney damage (nephropathy).
- Eye damage (retinopathy).
- Foot damage.
- Skin conditions.
- Hearing impairment.
- Alzheimer's disease.

Complications of gestational diabetes:

Complications in the baby:

- Excess growth.
- Low blood sugar.
- Type 2 diabetes later in life.
- Death.

Complications in the mother:

- Preeclampsia.
- Subsequent gestational diabetes.

Tests and diagnosis:

The American Diabetes Association (ADA) recommends that the following people be screened for diabetes:

- Anyone with a body mass index higher than 25, regardless of age.
- Anyone older than age 45.

Tests for type 1 and type 2 diabetes and prediabetes:

- Random blood sugar test.
- Fasting blood sugar test.
- Oral glucose tolerance test.

Treatment for type 1 and type 2 diabetes:

- Healthy eating.
- Physical activity.
- Monitoring blood sugar.
- Insulin.
- Oral or other medications.
- Transplantation.

Signs of trouble in any type of diabetes:

- High blood sugar (hyperglycemia).
- Increased ketones in your urine (diabetic ketoacidosis).
- Hyperglycemic hyperosmolar nonketotic syndrome.
- Low blood sugar (hypoglycemia).

Prevention:

- Eat healthy foods.
- Get more physical activity.
- Lose excess pounds.

Rickets

- Rickets is the softening and weakening of bones in children, usually because of an extreme and prolonged vitamin D deficiency.
- Vitamin D promotes the absorption of calcium and phosphorus from the gastrointestinal tract. A deficiency of vitamin D makes it difficult to maintain proper calcium and phosphorus levels in bones, which can cause rickets.
- Adding vitamin D or calcium to the diet generally corrects the bone problems associated with rickets.
- When rickets are due to another underlying medical problem, the child may need additional medications or other treatment.
- Some skeletal deformities caused by rickets may require corrective surgery.

Symptoms and causes:

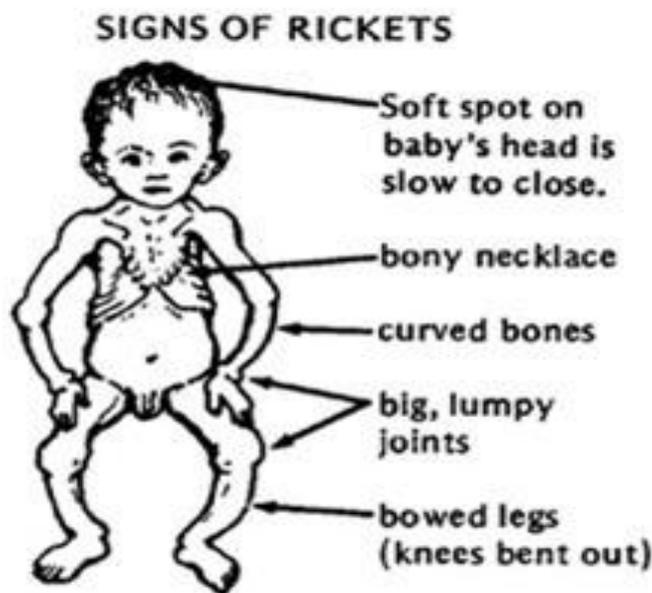
Symptoms:

Signs and symptoms of rickets can include:

- Delayed growth
- Pain in the spine, pelvis and legs
- Muscle weakness

Because rickets softens the growth plates at the ends of a child's bones, it can cause skeletal deformities such as:

- Bowed legs or knock knees
- Thickened wrists and ankles
- Breastbone projection



Causes

- The body needs vitamin D to absorb calcium and phosphorus from food.
- Rickets can occur if the child's body doesn't get enough vitamin D or if his or her body has problems using vitamin D properly.
- Occasionally, not getting enough calcium or lack of calcium and vitamin D can cause rickets.

Lack of vitamin D

Children who don't get enough vitamin D from these two sources can develop a deficiency:

- **Sunlight.** The skin produces vitamin D when it's exposed to sunlight. But children in developed countries tend to spend less time outdoors. They're also more likely to use sunscreen, which blocks the rays that trigger the skin's production of vitamin D.
- **Food.** Fish oils, fatty fish and egg yolks contain vitamin D. Vitamin D also has been added to some foods, such as milk, cereal and some fruit juices.

Problems with absorption

Some children are born with or develop medical conditions that affect the way their bodies absorb vitamin D. Some examples include:

- Celiac disease
- Inflammatory bowel disease
- Cystic fibrosis
- Kidney problems

Risk factors:

Factors that can increase a child's risk of rickets include:

- Dark skin.
- Mother's vitamin D deficiency during pregnancy.
- Premature birth.
- Medications.
- Exclusive breast-feeding.

Complications:

Left untreated, rickets can lead to:

- Failure to grow
- Abnormally curved spine
- Skeletal deformities
- Dental defects
- Seizures

Diagnosis:

During the exam, the doctor will gently press on your child's bones, checking for abnormalities. He or she will pay particular attention to your child's:

- **Skull.** Babies who have rickets often have softer skull bones and might have a delay in the closure of the soft spots (fontanels).
- **Legs.** While even healthy toddlers are a little bowlegged, an exaggerated bowing of the legs is common with rickets.

- **Chest.** Some children with rickets develop abnormalities in their rib cages, which can flatten and cause their breastbones to protrude.
- **Wrists and ankles.** Children who have rickets often have wrists and ankles that are larger or thicker than normal.

X-rays of the affected bones can reveal bone deformities. Blood and urine tests can confirm a diagnosis of rickets and also monitor the progress of treatment.

Treatment:

Most cases of rickets can be treated with vitamin D and calcium supplements. Follow doctor's directions as to dosage. Too much vitamin D can be harmful.

Prevention:

- ✓ Exposure to sunlight provides the best source of vitamin D. During most seasons, 10 to 15 minutes of exposure to the sun near midday is enough.
- ✓ To prevent rickets, make sure the child eats foods that contain vitamin D naturally — fatty fish, fish oil and egg yolks — or that have been fortified with vitamin D, such as:
 - Infant formula, cereal, bread
 - Milk, but not foods made from milk, such as yogurt and cheese
 - Orange juice

Planning a healthy balanced diet

What is the difference between an adequate diet and a balanced diet?

- An 'adequate diet' includes sufficient energy for the person's needs. The energy in the diet can be in any form, e.g. as carbohydrate, protein, fat, etc.
- A 'balanced diet' not only includes sufficient energy for the person's needs but all the person's dietary requirements in the correct proportions.

A balanced diet includes all six classes of nutrients (carbohydrates, fats, protein, vitamins, minerals and water) and calories in amounts that preserve and promote good health. It is the diet that contains the proper proportions of carbohydrates, fats, proteins, vitamins, minerals, and water necessary to maintain good health

The average person needs to eat about 2,000 calories every day to maintain their weight. However, a person's specific daily calorie intake can vary depending on their age, gender, and physical activity level. Men generally need more calories than women, and people who exercise need more calories than people who don't.

World health organization recommendations for a healthy diet for adults

- The daily protein requirements should account for 10-15% of the daily energy intake
- Less than 30% of total energy intake from fats.
Unsaturated fats (e.g. found in fish, avocado, nuts, sunflower, canola and olive oils) are preferable to saturated fats (e.g. found in fatty meat, butter, palm and coconut oil, cream, cheese, ghee and lard). Industrial trans fats (found in processed food, fast food, snack food, fried food, frozen pizza, pies, cookies, margarines and spreads) are not part of a healthy diet.
- Carbohydrates rich in natural fibers constitute the remaining 60%
- Less than 5 g of salt (equivalent to approximately 1 teaspoon) per day and use iodized salt.
- Excessive consumption of refined carbohydrates should be avoided
- Junk food should be avoided
- The requirements of micronutrients should be met

Therapeutic diets

- ✓ A therapeutic diet is a meal plan that controls the intake of certain foods or nutrients. It is part of the treatment of a medical condition and are normally prescribed by a physician and planned by a dietician.
- ✓ A therapeutic diet is usually a modification of a regular diet. It is modified or tailored to fit the nutrition needs of a particular person.
- ✓ Therapeutic diets are modified for:
 - (1) nutrients,
 - (2) texture, and/or
 - (3) food allergies or food intolerances.

Common therapeutic diets include:

1. Nutrient modifications

- No concentrated sweets diet
- Diabetic diets
- No added salt diet
- Low sodium diet
- Low fat diet and/or low cholesterol diet
- High fiber diet
- Renal diet

2. Texture modification

- Mechanical soft diet
- Puree diet

3. Food allergy or food intolerance modification

4. Tube feedings

- Liquid tube feedings in place of meals
- Liquid tube feedings in addition to meals

Brief descriptions of common therapeutic diets:

Clear liquid diet

- Includes minimum residue fluids that can be seen through. Examples are juices without pulp, broth, and Jell-O.
- Is often used as the first step to restarting oral feeding after surgery or an abdominal procedure.
- It can also be used for fluid and electrolyte replacement in people with severe diarrhea.
- It should not be used for an extended period as it does not provide enough calories and nutrients.

Full liquid diet

- Includes fluids that are creamy.
- Some examples of food allowed are ice cream, pudding, thinned hot cereal, custard, strained cream soups, and juices with pulp.
- Used as the second step to restarting oral feeding once clear liquids are tolerated.
- Used for people who cannot tolerate a mechanical soft diet.
- Should not be used for extended periods

No Concentrated Sweets (NCS) diet

- Is considered a liberalized diet for diabetics when their weight and blood sugar levels are under control.
- It includes regular foods without the addition of sugar.

Diabetic or calorie-controlled diet

- These diets control calories, carbohydrates, protein, and fat intake in balanced amounts to meet nutritional needs, control blood sugar levels, and control weight.

No Added Salt (NAS) diet

- Is a regular diet with no salt.

Low Sodium (LS) diet

- May also be called a 2 gram Sodium Diet.
- Limits salt and salty foods such as sausage, cured meats, canned soups, salty seasonings, pickled foods, salted crackers, etc.
- Is used for people who may be “holding water” (edema) or who have high blood pressure, heart disease, liver disease, or first stages of kidney disease.

Low fat/low cholesterol diet

- Is used to reduce fat levels and/or treat medical conditions that interfere with how the body uses fat such as diseases of the liver, gallbladder, or pancreas.
- Is low in total fat and saturated fats.

High fiber diet

- Is prescribed in the prevention or treatment of a number of gastrointestinal, cardiovascular, and metabolic diseases.
- Increased fiber should come from a variety of sources including fruits, legumes, vegetables, whole breads, and cereals.

Renal diet

- Is for renal/kidney people.
- The diet plan is individualized depending on if the person is on dialysis.
- The diet restricts sodium, potassium, fluid, and protein specified levels.

Mechanically altered or soft diet

- Is used when there are problems with chewing and swallowing.
- Changes the consistency of the regular diet to a softer texture.
- Includes chopped or ground meats as well as chopped or ground raw fruits and vegetables.
- Is for people with poor dental conditions, missing teeth, no teeth

Pureed diet

- Changes the regular diet by pureeing it to a smooth liquid consistency.
- Indicated for those with wired jaws extremely poor dentition in which chewing is inadequate.
- Often thinned down so it can pass through a straw.
- Is for people with chewing or swallowing difficulties.
- Foods should be pureed separately.
- Avoid nuts, seeds, raw vegetables, and raw fruits.
- Is nutritionally adequate when offering all food groups.

Food allergy modification

- Food allergies are due to an abnormal immune response to an otherwise harmless food.
- Foods implicated with allergies are strictly eliminated from the diet.
- Appropriate substitutions are made to ensure the meal is adequate.
- The most common food allergens are milk, egg, soy, wheat, peanuts, tree nuts, fish, and shellfish.
- A gluten free diet would include the elimination of wheat, rye, and barley. Replaced with potato, corn, and rice products.

Food intolerance modification

- The most common food intolerance is intolerance to lactose (milk sugar) because of a decreased amount of an enzyme in the body.
- Other common types of food intolerance include adverse reactions to certain products added to food to enhance taste, color, or protect against bacterial growth.
- Common symptoms involving food intolerances are vomiting, diarrhea, abdominal pain, and headaches.

Diabetic diet

- ✓ Diabetes is a metabolic disorder caused by low or no secretion of insulin hormone. By the deficiency of insulin glucose is not converted into glycogen leading to increase level of glucose in blood.

Nutritional Requirement

1. Calories: It depends upon the activity and occupation of the individual.

2- Carbohydrates: should provide 45-65% of daily calories. Best choices are vegetables, some fruits, beans and whole grains

2. Protein: Patient of diabetes require more of protein than normal (12-20% of daily calories) like egg, milk, fish, poultry, variety of pulses etc.

3. Fats: 75% of fats should be unsaturated fats (vegetable oils).

4. Vitamins: can be met by consuming foods like papaya, carrots for vitamin A. B- groups can be met with toned milk and whole grain cereals. Vitamin C is essential for diabetic patient and can be obtained by eating fruit and fruit juices.

5. Minerals: Calcium can be provided by consuming milk and milk products.

6. Water. it regulates the body functions. Beverages like soups, juices can be regularly included to keep fit.

Food allowed

Mixed grain, Whole legumes, cauliflower etc.

Foods avoided

Potato, banana, sweet beverages, dates etc.

Hypertension

- ✓ If there is any obstruction in the flow of the blood, then the heart has to pump the blood with more force causing high blood pressure. This is known as Hypertension.

Nutritional Requirement

1. Energy and Calories: Obese people are more prone to hypertension. weight should be controlled. Carbohydrates should be the main source of calories.

2. Protein: It is advisable to cut down some amount of protein foods. For example, the foods which have more of sodium content.

3. Fats: It is desirable to cut down fatty foods. High fat diets are known to increase the incidence of atherosclerosis.

4. Minerals: The amount of sodium should be restricted

Foods Allowed

Unsaturated Fatty acids, Foods which do not contain sodium.

Foods avoided

Spicy and salty foods, Saturated fatty acids and cholesterol rich foods like egg, meat, raw mangoes, water melon, tea , coffee etc.

Renal diet

- ✓ The purpose of the diet is to reduce the production of wastes that must be excreted by the kidney, to avoid fluid and electrolytes imbalance, slow the progression of renal disease, and to delay the need for dialysis, if not already on dialysis.

Diet principles

- ✓ the nutritional management of individuals with renal disease focuses on the intake of protein, sodium, potassium, phosphorus and fluids.
- ✓ The level of restriction of these nutrients depends upon the clinical and biochemical status of the individual.

Guidelines for the Simplified Renal Diet follow:

1. Limit milk and milk products to ½ cup/day.
2. Limit foods high in potassium to one serving per day. Such foods include cantaloupe and potatoes, prunes, oranges, orange juice, dried beans and peas, nuts and peanut butter, chocolate, bananas, apricots, and tomatoes.
3. Eliminate salt substitutes and light salt.
4. If phosphorus restriction is required, limit bran cereal, whole wheat bread, nuts, and dried beans to one serving per day.
5. For protein requirements, a moderate protein diet (0.8-1 g protein per Kg of ideal body weight) is recommended. Low protein diets are used in some conditions when the patient refuses dialysis or cannot have it for some reasons.

Enteral nutrition

- ✓ Enteral nutrition support refers to the introduction of a nutritionally complete liquid formula directly into the stomach or small intestine via a narrow, often specifically designed, tube.

When is enteral nutrition used?

- ✓ Enteral (Tube) nutrition should be considered when an individual is not safe for oral intake when normal swallowing has been inhibited or interfered or when oral intake is not adequate to meet their nutritional requirements

Indications of enteral nutrition

1. Difficulty with sucking and/or swallowing with demonstrated risk of aspiration.
2. Anomalies: Cleft palate, Esophageal atresia, Tracheoesophageal fistula, other GI tract anomalies.
3. Neurologic disorders.
4. Head and neck surgery.
5. Mandibular fractures.
6. Severe comatose or unconscious states.
7. Trauma or paralysis of oral pharyngeal cavity.

8. When nutrient needs cannot be met orally: Anorexia, weight loss, growth failure, inadequate nutrient intake, hypermetabolic states, chronic non-specific diarrhea, short gut syndrome.

9. Other GI problems.

- ✓ The adequacy of a tube feeding is dependent on the product used and the quantity provided. Standard and modified (e.g. concentrated, diluted, fortified, etc.) formulas must be analyzed by a Registered Dietitian to assure the adequacy of caloric, carbohydrate, protein, vitamin, mineral and fluid content.
- ✓ When providing enteral nutrition support to a patient it is important to assess their nutrition status. A formal assessment based on anthropometry, biochemistry, clinical and diet history should be carried out by the dietitian. The nutrition assessment is used to determine priorities of nutritional management, estimate the patient's nutritional requirements, and provide a baseline measure for monitoring the effectiveness of intervention. Based on this assessment, a treatment goal can be set, and a nutrition care plan developed.

Contraindications to enteral nutrition

- In some clinical conditions, such as gut failure, intestinal obstruction, or an inability to gain enteral access, it may be necessary to bypass the gut and deliver nutrients directly into the bloodstream (parenteral nutrition).
- Careful consideration should be given to patient and family wishes concerning the appropriateness of initiating or continuing enteral feeding.

Routes of enteral feeding

Enteral feeding tubes may enter the body at a number of different sites. The choice of enteral feeding route depends on several factors, such as

- the intended duration of nutrition support,
- the patient's condition, and
- any limitations to access (such as trauma or obstructions).

Enteral nutrition tube different sites

- nasal tube (may be nasogastric, nasoduodenal or nasojejunal)
- oral tube (usually orogastric)
- trans-oesophageal feeding (“TOF”) or oesophagostomy tube
- percutaneous enteric tubes (gastrostomy or jejunostomy)

Parenteral nutrition support

- ✓ Parenteral nutrition refers to the infusion of an intravenous nutrition formula into the bloodstream.
- ✓ Total Parenteral Nutrition, or TPN, means that the infusion is providing a patient's complete nutritional requirements.

When is parenteral nutrition used?

- ✓ Parenteral nutrition should be considered only when it is not possible to meet an individual's nutritional requirements by the enteral or oral route.
- ✓ In such cases it may be necessary to bypass the gut and deliver nutrients directly into the bloodstream.

Indications for parenteral nutrition

- ✓ Gut failure, intestinal obstruction, or a complete inability to gain enteral access, are examples of situations in which parenteral nutrition is necessary.
- ✓ Sometimes parenteral nutrition may also be needed to supplement an inadequate oral or enteral intake, where this falls far short of requirements. This may occur where there is malabsorption (such as in short bowel syndrome or inflammatory bowel diseases) or where nutritional needs are high (such as in burns).
- ✓ The main indication for parenteral nutrition is when the gut is not functional or accessible.

- ✓ Examples of inadequate gut function might include:
 - bowel obstruction or suspected gut ischemia
 - some types/locations of gastrointestinal fistula
 - short bowel syndrome
 - persistent severe diarrhea or significant malabsorption
 - persistent signs of significant gut dysmotility (a distended and/or painful abdomen, persistent large gastric aspirates, no bowel output)

- ✓ The gut is not accessible when oral intake is not possible, or an enteral feeding tube cannot be inserted, due to:
 - facial injuries/surgery or malformation
 - upper gastrointestinal tract obstruction or malformation
 - risk of upper gastrointestinal tract bleeding (eg presence of oesophageal varices).

Contraindications to parenteral nutrition

- ✓ Parenteral nutrition should not be used if the patient's nutritional needs could be met via enteral or oral nutrition.
- ✓ Enteral and oral nutrition are more compatible with the body's normal processes, helping to maintain the functioning, structural integrity and immune benefits of the gut.
- ✓ Parenteral nutrition is not usually indicated in normally-nourished patients if full nutritional needs could be met

orally or enterally within the next five days (as gut function is expected to improve), or if the likely duration of the parenteral nutrition is less than five days.

Routes of parenteral nutrition

- ✓ Parenteral nutrition can be delivered either centrally, into the superior vena cava, or
- ✓ peripherally, that is into other veins, subject to additional limitations.