Nutrition and Health

# Nutrition:

* Is the intake of food, considered in relation to the body’s dietary needs.
* Good nutrition is an adequate, well balanced diet combined with regular physical activity is a cornerstone of good health. Poor nutrition can lead to reduced immunity, increased susceptibility to disease, impaired physical and mental development, and reduced productivity.

Nutritional Epidemiology:

It is a relatively new field of medical research that studies the relationship between nutrition and health.

Community Nutrition:

Identification of nutritional needs of population groups and available resources.

# Types of Nutrients:

 There are two types of nutrients required to maintain health:

1. **Macronutrients:** these form the main source of energy for human bodies and are also the building blocks for tissues. Macronutrients are there for required in large amounts. Macronutrients consist of:
	1. Proteins
	2. Carbohydrates
	3. Lipids
2. **Micronutrients:** These take part in the metabolic reactions of the body and ensure normal functioning; yet they do not provide energy. Micronutrients are only needed in small amounts. The micronutrient group consists of:
	1. Vitamins.
	2. Minerals.



Figure 1.Source: http://dietdatabase.com/macronutrients-and-micronutrients/

# Nutritional requirements:

**Recommended Dietary Allowances (RDA):**

RDA, are guidelines put together by the Food and Nutrition Board of the National Academy of Sciences' Institute of Medicine. to describe the level of nutrients considered to be adequate to meet the nutritional needs of all healthy persons. A separate RDA value exists for each nutrient.

**Importance of RDA:**

* It is important to meet our daily recommended dietary allowances so that our body gets everything it needs to function in a proper way
* It is also important to assess the nutritional adequacy of diets for growth of infants, children and adolescents.
* to maintain health in adults of both sexes and during pregnancy and lactation.
* **Malnutrition:**
* It is a condition, in which the body lacks specific nutrients, has excess amounts or the nutrients are disproportioned.
* **Deficiency:**
* A body is called deficient when it lacks certain nutrients, which are needed.

# Micronutrients deficiency

## 1-Vitamin D:

Vitamin D also known as calciferol is a fat-soluble sterol vitamin with a hormone-like function. This vitamin is comprised of two main forms:

1. Vitamin D2 (ergocalciferol):

Obtained from plant sources such as mushrooms

1. Vitamin D3 (cholecalciferol):

Obtained from:

* Animal sources like fatty fish, liver, egg yolk and dairy products such as milk and yoghurt.
* Formed endogenously in the human skin following the exposure to ultraviolet rays from sunlight.
1. Dietary supplements of both forms of vitamin D

### Vitamin D deficiency:

 The RDA are established to prevent Vitamin D deficiency and its complications, which may occur due to inadequate dietary intake or restricted exposure to sunlight.

Vitamin D deficiency are associated with bone mineralization defects that comprise the classical vitamin D deficiency diseases; rickets in infants and children and osteomalacia in adults.

* Vitamin D deficiency could also cause osteoporosis, which is the reduction of bone mass while maintaining bone matrix composition normal, the loss of bone mass occurs more in post-menopausal women than in males.

## 2-Vitamin B

 **• Vitamin B1** (thiamine)

 **• Vitamin B2** (riboflavin)

 **• Vitamin B3** (niacin)

 **• Vitamin B5** (pantothenic acid)

 **• Vitamin B6** (pyridoxine)

 **• Vitamin B7** (biotin)

 **• Vitamin B9** (folic acid)

 **• Vitamin B12** (various cobalamins)

B-group vitamins are essential water-soluble elements in the human body. There are 8 different vitamins, which mainly share the function of energy production from carbohydrates, proteins, and fat. Also, B-group vitamins are all necessary for a healthy nervous system. Therefore, they can all cause fatigue and nerve damage when deficient.

| Name  | Function | Deficiency  | Source |
| --- | --- | --- | --- |
| B1 Thiamine | * Energy production.
* Plays a role in nerve function.
 | 1. Dry Beriberi: affects the muscles and nerves and can cause neuritis.
2. Wet Beriberi: affects the cardiovascular system and can lead to heart failure.
3. Infantile Beriberi: occurs when the mother doesn’t take adequate thiamine levels.
 | Found in both foods of animal and vegetable origin. |
| B2Riboflavin | * Energy production.
* Essential for tissue growth and and RBC production.
* Important for normal vision.
 | Ariboflavinosis: Cracked lips, glossitis, angular stomatitis, dry scaly skin, and increased photosensitivity.  | Dairy products, breads, and breakfast cereals. |
| **B3**Niacin | * Energy production.
* Lowers LDL
* Repairing damaged DNA
* Vasodilation
* Aids in digestion by increasing HCL in the stomach
* Maintain nerve function
 | Pellagra: 4Ds (diarrhea, dermatitis, dementia, and death), aggression, confusion, weakness, and peripheral neuritis. | Meats and cereals. |
| **B5**Pantothenic Acid | * Energy production.
* Involved in synthesis of hormones and neurotransmitters.
 | Extremely rare, but can cause fatigue, loss of appetite, and paresthesia. | Found in almost all foods, especially fresh vegetables, meats, and whole grains. |
| **B6**Pyridoxine | * Energy production.
* Synthesis of neurotransmitters.
* Promotion of RBC production.
* Maintain nerve function.
 | Microcytic anemia, dermatitis, nerve damage, and depression. | Meat, fish, potatoes, bananas, and green leafy vegetables. |
| **B7**Biotin | * Energy production.
* Important for normal embryonic growth.
 | Rare, but can cause hair loss, dermatitis, and depression. | Yeast, eggs, fish, soybeans, cauliflower, mushrooms, and bananas. |
| **B9**Folic Acid | * Synthesize and repair DNA.
* Aids in RBC production.
* Development of fetal nervous system.
* Cell growth
 | Macrocytic anemia, birth defects in pregnant women, glossitis, diarrhea, and depression. | Liver and green leafy vegetables. |
| **B12**Cobalamins | * Energy production.
* Maintenance of the nervous system.
* Production of RBCs
 | Macrocytic anemia, pernicious anemia, peripheral neuropathy, depression, and lack of appetite.  | Mostly of animal origin: liver, milk, and eggs. |
|  |  |  |  |

## 3-Iodine deficiency:

Iodine deficiency is major public health problem and considered the world’s most prevalent/preventable cause of brain damage and mental retardation; it also increases the incidence of stillbirth, miscarriages and infant mortality.

Trace amounts of Iodine is primarily required for the synthesis of thyroid hormones T3 and T4 from the thyroid gland in the human body

Iodine is an important chemical element found commonly in oceans and seaweeds; it is widely yet unfairly distributed in the soils worldwide. Common geographic areas in the world where foods are grown in iodine-deficient soils are the Himalayas, Alps and Andes, which are all mountainous regions, and away from the seas, that’s why before introducing iodized salts in these regions, people who were eating only local foods (no seafood and iodinated foodstuffs) were at high risk for Iodine deficiency.

Unsatisfactory amounts of iodine consumption will ultimately cause inadequate production of thyroid hormones leading to IDD **(Iodine deficiency disorders):**

* One of the commonest problems in iodine deficiency is thyroid enlargement known as goiter (endemic goiter)
* Cretinism is a condition associated with goiter, mental retardation and facial disturbances.
* Majority of children who’re born to iodine-deficient mothers will have low IQ points where iodine deficiency alone can reduce 10-15 IQ points. This will subsequently impact on their performance in school and on their learning abilities.
* Iodine deficiency causes symptoms of hypothyroidism such as depression, weight gain and low basal temperature, mental sluggishness and fatigue.

**Prevention of IDD**

A great response against iodine deficiency was done in the 1980s from the World Health Organization. This was done through Universal Salt Iodization (USI) by fortifying the table salt with iodine, which is considered an extremely cheap method and globally effective, salt iodization continues to be the optimal primary focus for preventing iodine deficiency.

Also the administration of oral or intramuscular iodized oil before and during gestation is also a very effective method in preventing mental retardation and cretinism principally in high-risk geographical areas.

## 4-Vit A deficiency:

Vitamin A deficiency is considered the number one cause of blindness in children.

 It could happen universally either as a consequence of poor nutrition or secondary to malabsorption conditions

vitamin A deficiency (VAD) will cause the following:

* Xerophthalmia, where the eyes fail at lacrimation causing dryness, thickness and wrinkling of the superficial conjunctival layer and cornea.
* Xerophthalmia is usually preceded by night blindness (nyctalopia), however if not reversed quickly it may lead to irreversible corneal ulceration, destruction and total blindness that only an extensive surgery can regain the sight.
* A sign of VAD is Bitot spots, which is build up of keratin debris inside the superficial layer of the conjunctiva.
* Keratomalacia is also an eye condition that is known by softening and ulceration the cornea, this could end up causing the perforation of cornea leading to irreversible blindness.
* Decrease immunity especially in children, therefore increasing the risk of infections like diarrheal infection, pneumonia and measles. Also increasing the risk of mortality.
* VAD could also give dry skin, dry hair and broken fingernails.

**Prevention of VAD:**

* Consumption of Vitamin A enriched foods like liver, beef, chicken, fortified milk, carrots, leafy and green vegetables, eggs and mango.
* Supplementation is needed for clinical (symptomatic) VAD to reduce the risk of morbidity and all-cause mortality.
* In some high vitamin A deficiency prevalence countries, vitamin A capsule supplements are given to children less than 5 years old with measles and polio immunization
* Because the basis for lifelong health starts in childhood, Vitamin A supplements are important in gestation and during lactation because adequate breast-feeding provide a sufficient amount of vitamin to the infant through breast-milk.

**5-Iron Deficiency Anemia:**

Iron deficiency anemia is the most common cause of anemia worldwide.

**Iron Deficiency Causes:**

The most common nutritional deficiency worldwide is Iron deficiency. Iron deficiency may be due to several etiologies: reduced iron intake, reduced iron absorption, increased demand, and blood loss.

* Reduced iron intake is usually seen in poor countries where food sources are more vegetables and less meat.
* Negative influencers for iron absorption are phytates found in cereals and wheat, tannates found in tea, phosphates, carbonates, and oxalates. On the other hand, positive influencers are vitamin c, citrates, amino acids, and sugars.
* Increased demand for iron is seen in rapidly growing infants and children, and pregnant ladies.
* The most important etiology of iron loss is blood loss. Worldwide, hookworm and schistosomiasis are the most common causes of gut blood loss.

**Iron Deficiency Prevention**

Eating iron-rich foods from animal products like red meat, chicken, and seafood can prevent iron deficiency.

Vitamin C-rich foods like broccoli, grapefruit, oranges, and leafy greens can help the body better absorb dietary iron.

Additionally, tea should be avoided if there is risk of iron deficiency.

iron supplements are mandatory in pregnant ladies especially during the second and third trimesters. Moreover, iron deficiency prevention in infants can be achieved by completely avoiding cow's milk, starting iron supplementation at four to six months of age in breastfed infants, and using iron-fortified formula when not breastfeeding.

**6. Protein-Energy Malnutrition**

Protein-energy malnutrition (PEM) is currently the most widespread and serious health problem among children in the world. In 2000, the WHO estimated that 33% of children numbered in developing countries are malnourished.

**Protein Deficiency Causes**

Protein deficiency is caused by reduced protein intake from diet, most commonly due to poverty, starvation, anorexia, or chemotherapy that results in loss of appetite. Another cause is the increase in demand seen in growing children and repeated pregnancies, or in patients with major multiple surgeries or chronic illnesses.

Protein deficiency leads to several medical conditions, most importantly Protein-energy malnutrition (PEM), Marasmus and Kwashiorkor.

 **Protein Deficiency Prevention**

The best way to prevent this condition is through adequate consumption of protein rich foods. Food rich in proteins include eggs, meats, peanuts, milk, chicken, seafood, soy products, and fish.

**Over- nutrition:**

Over-nutrition is a form of malnutrition. It is defined as the pathologic state that develops when nutritional intake exceeds the body needs, which leads to caloric excess over an extended period of time. Example of Over-Nutrition: is obesity