VITAMINS AND DEFICIENCY DISEASES
INTRODUCTION

➢ Vitamins are organic compounds required in the diet in small quantities to perform biological functions.

➢ We obtain them from:
  foods we eat or via vitamin supplements.
According to solubility vitamins are of:
- Fat-soluble
- Water-soluble

Thirteen vitamins are known of which:
- Four are fat-soluble: Vitamins A, D, E, K
- Nine are water-soluble.
Distinction between fat-soluble and water-soluble vitamins.

- Fat soluble vitamins are readily stored in the body.
- Not readily excreted in urine.
- Excess consumption can lead to their accumulation and toxic effects.
VITAMIN SUPPLEMENTS

✓ Synthetic or natural substances which can be purchased as pills, capsules, powders or liquids.

✓ Best when accompanied by a well balanced diet.

✓ Do not replace a healthy diet.

✓ Do not provide calories or energy.
RECOMMENDED DIETARY ALLOWANCES (RDA)

- These are suggested levels of essential nutrients considered adequate to meet nutritional needs of healthy individuals.

- Requirements are influenced by physical characteristics, dietary habits, sex, pregnancy, lactation and age.
A multivitamin should contain fat-soluble vitamins A, D, E; water-soluble vitamins B₁, B₂, B₆, B₁₂, niacin, biotin, folic acid, pantothenic acid and vitamin C.

Contains minerals: zinc, magnesium, copper, and calcium.
VITAMINS

Fat-soluble

- Vitamin A
- Vitamin D
- Vitamin E
- Vitamin K

Non B-Complex

- Vitamin C

B-Complex

- Thiamine (B1)
- Riboflavin (B2)
- Niacin (B3)
- Pantothenic acid (B5)
- Pyridoxine (B6)
- Biotin (B7)
- Folic acid (B9)
- Vitamin B12

Water-soluble
FAT-SOLUBLE VITAMINS
VITAMIN- A

- It is the name given to a group of related compounds:
  - Retinol (vitamin A alcohol)
  - Retinal (vitamin A aldehyde)
  - Retinoic acid (vitamin A acid)

- Its provitamin carotenes are found in plants.
SOURCES:

- Fish oil, liver, egg yolk, milk, cheese, butter.

- Vegetable sources contains provitamin A carotenes.

- Yellow and dark vegetables and fruits are sources of carotenes.
  - Carrots
  - Mango
  - Papaya
  - Spinach.
FUNCTIONS OF VITAMIN A

- Maintenance of normal vision.
- Maintenance of normal cartilaginous and bone growth.
- Increased immunity against infections in children.
- Anti-proliferative effect.
VITAMIN- A DEFICIENCY

- May be due to:
  - inadequate dietary intake
  - impaired intestinal absorption
  - Chronic alcoholism.

- Impaired vision – Night blindness.
- Extremely dry skin, hair or nails.
- Epithelial metaplasia and keratinization.
- Xerophthalmia (dry eye).
VITAMIN D

SUNSHINE VITAMIN.

- CALCITRIOL.

- Exists in two activated sterol forms:
  Vitamin D₂ - CALCIFEROL  
  Vitamin D₃ - CHOLECALIFEROL.
Sources:

- Sunlight.
- Milk.
- Fish.
- Orange juice.
- Fortified cereals.
FUNCTIONS OF VITAMIN D

- Maintenance of adequate plasma levels of calcium and phosphorous.
- Metabolic functions.
- Bone mineralization.
- Neuromuscular transmission.
VITAMIN-D DEFICIENCY

- May be due to:
  - Limited exposure to sunlight
  - Diet deficiency.
  - Renal disorders.
  - Rickets.
  - Osteomalacia (in adults).
  - Hypocalcaemia due to neuromuscular dysfunction.
CAUSES

- Increased risk of:
  - Cancers
  - Autoimmune diseases
  - Hypertension

WHO IS AT RISK?

- Covered and protected skin
- Elderly
- Breast – fed infants
VITAMIN E

✓ Vitamin E describes a family of eight antioxidants:
  four tocopherols
  four tocotrienols.

✓ It is an antioxidant in cells.
SOURCES

- Vegetables:
  - spinach
  - carrot
- Egg
- Bread
- Almonds
- Peanuts.
- vegetable oils
FUNCTIONS OF VITAMIN-E

- Antioxidant.
- Inhibits platelets aggregation.
- Enhances vasodilation.
- Scavenger of free radicals.
VITAMIN -E DEFICIENCY

- Increased risk of cardiovascular diseases.
- Hemolytic anaemia in children.
- Neurological symptoms (impaired coordination and muscle relaxation).
- RISK FACTOR: fat malabsorption syndrome.
THERAPEUTIC USES

- DIABETES MELLITUS.

- CANCER PREVENTION.

- PREVENTION OF CARDIOVASCULAR DISEASES.
VITAMIN K

- K derived from the German word KOAGULATION

- Two naturally occurring forms:
  - Plants synthesize phylloquinone – Vitamin K₁
  - Bacteria synthesize menaquinone-3 – Vitamin K₂
Sources

✓ Vegetable oils
✓ Almonds
✓ Peanuts
✓ Spinach
✓ Body can produce its own (from bacteria in intestine).
FUNCTIONS OF VITAMIN-K

✓ Helps in clotting.

✓ Assist in bone mineralization.
VITAMIN K DEFICIENCY

✓ It is common in adults.
✓ Biliary obstruction.
✓ Due to antibiotic therapy.
✓ Due to malabsorption syndrome.
✓ Hemmorhage.
✓ Deficiency may appear in infants or in people.
✓ Who take anticoagulants such as Warfarin.
WATER-SOLUBLE VITAMINS
VITAMIN C

- Exist as L- ascorbic acid.

- Smokers and lactating mother needs higher range.
SOURCES

- Fruits
- Vegetables
- Tomato juice
- Sweet potato
- Citrus fruit
- Orange juice.
FUNCTIONS OF VITAMIN C

- Collagen synthesis.
- Body to fight against infections.
- Keep gum’s healthy.
- Aids in the prevention of heart disease and cancer.
VITAMIN C DEFICIENCY

✓ Leads to scurvy.
✓ Weight loss.
✓ Slow healing of wound and fractured bone.
✓ Fatigue and joint pain.
✓ Skin rash.
✓ Anaemia.
THERAPEUTIC USES

- Cardiovascular diseases.
- Cataracts.
- Diabetes mellitus.
- Cancer prevention.
- Common cold.
- Lead toxicity.
VITAMIN B

- Group of seven water-soluble vitamins:
  - Thiamine
  - Riboflavin
  - Niacin
  - Pyridoxine
  - Cobalamin
  - Biotin
  - Pantothenic acid
  - Folic acid
✓ Biotin and pantothenic acid deficiencies are rare.

✓ As it is found in numerous foods.

✓ Biotin deficiency may occur with prolonged antibiotic therapy.
VITAMIN B1-THIAMINE

SOURCES

✓ Yeasts
✓ Cereals
✓ liver
FUNCTIONS OF THIAMINE

- ATP production.
- Stabilizing the appetite.
- Proper nerve function.
VITAMIN -B1 DEFICIENCY

- BERI-BERI.
- WERNICKE –KORSAKOFF SYNDROME.

RISK OF THIAMIN DEFICIENCY

- Excessive loss: hemodialysis and diuretics.
- Low intake and alcoholism.
THERAPEUTIC USE

✓ CONGESTIVE HEART FAILURE.

✓ CANCER PREVENTION.

✓ ALZHEIMER’S DISEASE.
VITAMIN B2-RIBOFLAVIN

➢ Also called YELLOW RESPIRATORY ENZYME.

➢ Cytochrome oxidase enzyme.

➢ Rapidly absorbed from the bowel and stored in tissues.
SOURCES

- Eggs.
- Meat.
- Leafy green vegetables.
- Milk
FUNCTIONS OF RIBOFLAVIN

- Energy production.
- Cell respiration.
- Maintenance of good vision, skin, nails.
- Carbohydrate, fat and protein metabolism.
RIBOFLAVIN DEFICIENCY

✓ Itching and burning eyes.

✓ Oily skin.

✓ Dermatitis.

✓ Digestive disturbances.

✓ Cracks and sores in mouth and lips.
VITAMIN B3-NIACIN

- Includes biologically active derivative: NICOTINAMIDE

- Essential for the formation of two oxidative coenzymes (dehydrogenases).

  NAD (Nicotinamide adenine dinucleotide)

  NADP.
SOURCES

- Liver
- Kidney
- Meat
- Green vegetables
- Grain cereals.
FUNCTIONS OF NIACIN

- Energy production.
- Improves circulation.
- Maintenance of skin and tongue.
- Maintenance of nervous system.
VITAMIN B3 DEFICIENCY

✓ Pellagra – rare in Western societies.
✓ Nervousness.
✓ Irritability
✓ Fatigue.
✓ Headache.
✓ Insomnia.
✓ Mental depression.
VITAMIN B5-PANTOTHENIC ACID

FUNCTIONS

➢ Produces energy.

SOURCES

Fruits, meats, poultry, legumes.
VITAMIN B6-PYRIDOXINE

Related to two naturally occurring substance:
pyridoxine, pyridoxal, pyridoxamine.

**SOURCES**

- Meat
- Eggs
- Green vegetables
FUNCTIONS OF VITAMIN B6

- Production of red blood cells.
- Nervous system function.
- Immunity.
- Reducing muscle spasm, cramps and numbness.
- Maintaining proper balance of sodium and phosphorous.
DEFICIENCY OF VITAMIN B6

- Nervousness, Insomnia
- Skin lesions
- Loss of muscle control, muscle weakness.
- Arm and leg cramps.
VITAMIN B7-BIOTIN

SOURCES

- Meat
- Egg yolk
- Soya beans
FUNCTIONS OF VITAMIN B7

- Produce energy.
- Helps produce body chemicals (insulin).
- In gene expression.
VITAMIN-B7 DEFICIENCY

✓ Nausea.

✓ Anorexia.

✓ Mental and neurological symptoms:
  Hallucination
  Depression
VITAMIN B9 - FOLIC ACID

SOURCES
- Yeasts
- Leafy vegetables

FUNCTION
Synthesis of nucleic acids
FOLIC ACID DEFICIENCY

- Neural tube defects.
- Anaemia.

THERAPEUTIC USE:

Chronic hemolytic anaemia.
VITAMIN B12-COBALAMIN

FUNCTIONS

- Proper nerve function.
- Production of red blood cells.
- DNA reproduction.
- Prevention of anaemia.
- Metabolizing fats and proteins.
VITAMIN- B12 DEFICIENCY

✓ Anemia nerve damage hypersensitive skin.