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**Diploma in Pharmacy 1<sup>st</sup> Year**  
**Social Pharmacy**  
**Chapter 3 : NUTRITION AND HEALTH**

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- ◆ Nutrition includes all the processes or activities by which the human body intakes and utilises all the required food for its growth, development, regulation, and repair.
- ◆ Nutrition is a branch of life sciences which deals with the process of receiving and utilising all the substances required for growth and development as well as keeping the body healthy.
- ◆ It includes all the steps starting from the intake and swallowing of food, digestion of food as it passes through the GIT.,

### **Macronutrients and Micronutrients**

- The supply of materials ( in the form of food) required for supporting life in cells and organisms is termed Nutrition (or nourishment).
- A healthy diet prevents or improves a number of common health problems.
- ◆ The following seven major classes of nutrients are essential:
  - I. Carbohydrates,*
  - II. Vitamins,*
  - III. Minerals,*
  - IV. Water.*
  - V. Proteins,*
  - VI. Fats,*
  - VII. Fibres,*

### **These nutrient classes are divided into:**

- 1) **Macronutrients:** These nutrients provide calories or energy to the body and are needed in large quantity for maintaining its functions and carrying out the daily life activities. They include carbohydrates, fats, fibres, proteins, and water.
- 2) **Micronutrients:** They are needed in smaller quantities and include minerals and vitamins. But, their deficiency may result in severe or life threatening conditions.

They perform many functions, like enabling the body for producing enzymes, hormones, and other substances required for normal growth and development.

## The three major functions of the essential nutrients:

Functions	Nutrients
Provide Energy	Carbohydrates, Proteins, Lipids (fats and oil )
Promote Growth and Development	Proteins, Lipids, Vitamins, Minerals, Water
Regulate Body Functions	Proteins, Lipids, Vitamins, Minerals, Water

## ➔ Carbohydrates

- ◆ Carbohydrates are the sources of energy, and contain carbon, hydrogen, and oxygen.
- ◆ They add large amount of calories (4kcal/gram) in the diets.
- ◆ The amount of calories an individual requires depends on the age, sex, size, health, and intensity of physical activity.

### Carbohydrates are divided into:

**Starch:** Foods like bread, potatoes, rice, cereals, and pasta contain starch. These foods provide energy and do not have a high content of calories.

**Sugar:** Sugar is not an essential part of diet, as it only provides calories and no other nutrients. Sugar in excess amount can lead to tooth decay and weight gain.

Excess calories from the body can be removed (without the loss of any nutrients) by merely reducing the amount of sugar intake, i.e., by having low-calorie drinks, sugar-free tea and coffee, and by avoiding cakes and sweets.

## ➔ Proteins

- Proteins are required for body growth, repair, and healing.
- Around 20 different proteins contain carbon, hydrogen, oxygen, nitrogen, and sometimes sulphur molecules.
- Meats and poultry, fish, eggs, nuts, beans, and lentils are the rich sources of proteins.
- Protein molecules are made up of amino acids.
- A healthy diet should contain 9 essential amino acids in sufficient amount  
*Histidine, Leucine, Methionine (And/Or Cysteine), Phenylalanine (And/Or Tyrosine), Threonine, Isoleucine, Lysine, Tryptophan, Valine.,*

## ➔ Fats

- Fats provide energy and contain fat-soluble vitamins.
- They insulate the body against cold.
- Essential fatty acids are required by human health.
- Human body can synthesise fat from carbohydrates.

### Types of Fats

- Saturated Fat,
- Monounsaturated Fat,
- Polyunsaturated Fat,
- Trans Fat etc

## ➔ Vitamins

- Vitamins are organic substances that maintain the normal structure and function of cells.
- Since they cannot be synthesised by the human body, they should be added in the human diet from external sources.
- Vitamins mostly are obtained from plants or animals.

### Vitamins are of the following two types:

- 1) **Fat-soluble Vitamins:** These include vitamin A, D, E, and K. They undergo intestinal absorption in the presence of bile salts and intact pancreatic function.
- 2) **Water-soluble Vitamins:** These include vitamin C and B complex group. They undergo rapid absorption from small intestines.

## ➔ Minerals

- Minerals are required for various body functions.
- Calcium, magnesium, sodium, potassium, and phosphorus are required in larger amounts; while iron, iodine, fluoride, zinc, and selenium are required in comparatively small amounts.
- Some essential minerals are discussed below:
  - 1) Calcium,
  - 2) Magnesium
  - 3) Sodium
  - 4) Potassium. Etc

## ⇒ **Fibres**

- Fibres help in keeping bowels working regularly and the large intestine healthy.
- Breakfast cereals, wholemeal or granary bread, fruits and vegetables, wholegrain rice, pasta, potatoes (the skins especially), beans, pulses, and lentils are the sources of fibres.

### **Importance of Fibre in Diet**

- ⇒ It helps in intestinal peristalsis movement.
- ⇒ The weight and size of stool increases and softens because of dietary fibre.
- ⇒ High-fibre foods also reduce blood pressure and inflammation.
- ⇒ In diabetic patients, soluble fibre slows the absorption of sugar that helps in improving blood sugar levels.
- ⇒ Increase in dietary fibre intake (especially cereal fibre) reduces the risk of death that may occur due to cardiovascular disease and all cancers.

## ⇒ **Water**

- Water forms the major component of body mass.
- A human body can survive only a few days without water; deficiency of any other nutrients does not show such profound effects.
- Lack of water increases blood pressure, malfunctions heart, and also results in failure of kidneys.

### **Importance of Water in Diet**

- ❖ It helps in the transport of nutrients and waste products in and out of cells.
- ❖ It is required for all digestive, absorption, circulatory, and excretory functions.
- ❖ It is required for utilising the water-soluble vitamins.
- ❖ It is required for maintaining proper body temperature.
- ❖ It maintains the health, and integrity of every cell in the body.
- ❖ It keeps sufficient bloodstream liquid to flow blood vessels through.
- ❖ It transports nutrients and oxygen to cells.

# BALANCED DIET

- A balanced diet contains different food items in such quantities and proportions that the requirement for healthy person
- Health Benefits of a Balanced Diet.
- It increases energy, improves the body functioning, boosts the immune system, and prevents weight gain.
- It prevents the risk of developing certain diseases (diabetes, cancer and heart disease).
- It reduces symptoms, and allows an individual to better manage his/her illness.
- It makes an individual energetic, manages his/her weight, and helps to fight stress.

## Nutrition Deficiency Diseases

### ➔ Diseases Induced due to Deficiency of Proteins

The most prominent form of protein deficiency state is Protein Calorie Malnutrition (PCM), frequently affecting the infants and 1-3 years of children.

**PCM is characterised by:**

1. **Marasmus:** It is a chronic condition which results due to the deficiency of total energy intake. Thus. protein and energy reserves of the child get depleted
2. **Kwashiorkor:** It is a condition mainly affecting the individuals with adequate calorie intake but a relative protein deficiency, and who are catabolic with trauma, infection, or burns

### ➔ Diseases Induced due to Deficiency of Vitamins

Vitamin deficiencies in children. adolescent. pregnant and lactating women more commonly occur in developed countries. conditioned deficiencies can occur in either case.

**Vitamins are categorised into:**

- 1) Fat-soluble Vitamins: Vitamin A. D. E. and K.
- 2) Water-soluble Vitamins: Vitamin B complex and C.

Vitamins And Their Chemical name	Deficiency Diseases
Vit A      Retinol	Stunted growth, Night blindness, Dryness of eyes
Vit B <sub>1</sub> Thiamine	Loss of muscle tone, beri beri



Vit B2	Riboflavin	Cheilosis, Eye lesions
Vit B3	Niacin or Nicotinic Acid	Diarrhoea,
Vit B5	Pantothenic	Dermatitis, Adrenal
Vit B6	Pyridoxine	Seborrheic
Vit B7	Biotin	Bacterial and fungal infections.
Vit B9	Folic Acid	Anaemia, Diarrhoea
Vit B12	Cyanocobalamin	Pernicious anaemia,
Vit C	Ascorbic Acid	Bleeding gums,
Vit D	Calciferol	Rickets in Childrens,
Vit E	Tocopherol	Neurological disorder
Vit K	Phylloquinone	Slow blood clotting,

### → Diseases Induced due to Deficiency of Minerals

- Mineral deficiency is mainly caused when an individual does not receive sufficient essential minerals from food or supplements.
- Different types of diets result in mineral deficiency.
- A major cause is poor diet including junk food, and lacking fruits and vegetables.
- A very low calorie diet (especially in individuals undergoing weight-loss programs or with eating disorders) may also cause this deficiency.

### Mineral deficiency is categorised into:

- ☞ Calcium Deficiency : Osteopenia
- ☞ Iron Deficiency : anaemia.
- ☞ Magnesium Deficiency : Fatigue, weakness, appetite loss, nausea, and vomiting are the early signs of magnesium deficiency.

## Effects of Junk Foods

- Junk foods are food items with very small or no nutritional value (e.g, cold drinks, burgers, oily food, bakery products, candies, etc.)
- They are rich in fat, salt, and calories.
- Nutritional intake of the body reduces with increased consumption of junk foods; and this eventually leads to deficiency of essential nutrients, thereby causing health-related problems.



## Types of Junk Foods

**1) Refined Food:** Refined wheat flour, pasta, bread, oils and white sugar are examples of refined food. Intake of sugar in large amount increases unwanted body fat because sugar gets converted into fat.

**2) Hydrogenated Fats and Oils:** Cookies, burgers, chips, fries cooked with trans and hydrogenated fats are unhealthy. Intake of large amount of fats results in strokes or heart disease because the fat starts depositing in the arteries. Omega-3 fatty acids are an alternative of such fats and oils.

**3) salt :** Potassium present in the salt helps in balancing of body water. Though, excessive amount of sodium causes high blood pressure. Normally, large amount of salt is present in packed and canned food items.

## Adverse Effects of Junk Food

- Respiratory Problems
- Affected Nervous System
- Dull and Lifeless Skin
- Weak Bones
- Heart Diseases
- Increased Blood Pressure
- Behavioural Issues
- Obesity
- Memory Loss
- Diabetes
- Kidney Diseases

## Nutritive and Calorific Values of Various Foods

Based on its nutritive value, food is classified as follows:

- Cereals and millets
- Pulses and legumes
- Fruits
- Animal Food
- Nuts and oil seeds
- Green leafy vegetables
- Milk and milk products

### ➤ **Cereals and Millets**

Cereals include wheat, rice, and maize: while millets include Jowar, Bajra, Ragi. etc. (i.e., the coarse grains). About 100gm of cereals yield 350kcal of energy.

### ➤ **Pulses and Legumes**

Green gram, Bengal gram, red gram, lentils, and black gram are consumed in majority of Indian states. Pulses contain 20-25% of protein (more than that obtained from cereals, meat, and eggs).

### ➤ **Vegetables**

Vegetables (especially green leafy vegetables, roots, and tubers) are a chief source of vitamins and minerals, and also contain sufficient quantity of water. Except for peas, all vegetables contain small amounts of protein and energy.

### ➤ **Nuts and Oil Seeds**

Groundnut (peanut), cashew nut, coconut, almonds, pistachio, mustard seeds, sesame seeds, cotton seeds, sunflower seeds, maize germ, etc. are the nuts from which cooking oils are extracted. Nuts and oilseeds are good sources of fat, and also contain small amounts of good quality protein. Nuts are good sources of vitamin B and minerals (calcium, phosphorus, and iron.) Vegetable oils are mostly rich in essential fatty acids.

### ➤ **Fruits**

Fruits are protective food, which are rich in vitamins and are a good source of minerals. They contain cellulose that helps in peristalsis. The energy content of fruits is normally less; however, bananas, mangoes, grapes, etc., are rich source of energy. Ripe fruits contain more carbohydrates. Daily intake of 85-100gm of fruits is recommended.

### ➤ **Animal Food**

Meat includes flesh of cattle, pigs, sheep, etc. Meat protein contains sufficient quantities of essential amino acids. Meat also includes 15-20% of protein, 10-20% of fat, and large quantities of minerals and vitamin B.

### ➤ **Fats and Oils**

Fats and oils are good sources of energy and fat-soluble vitamins. They are used in cooking. Vegetable fats (groundnut oil, mustard oil, etc.) are superior to animal fats (butter, ghee, etc.). Coconut oil is used in Southern India; groundnut, mustard and Northern soya bean oils are used in India. Fats are also obtained from cashew nut, almond, chestnut, etc.

# Fortification of foods

- ❖ Fortified foods are those in which nutrients that do not naturally occur in the food are added.
- ❖ These foods are intended for improving nutrition and enhancing the health.
- ❖ For example, milk is fortified with vitamin D, calcium may be added to fruit juices, etc,
- ❖ Fortification is the process of adding nutrients or non-nutrient bioactive components to edible products (e.g., food, food constituents, or supplements).

## Types of Fortification

- Biofortification (breeding crops to increase their nutritional value, which includes plant breeding as well as genetic engineering),
- Microbial biofortification and synthetic biology (addition of probiotic bacteria),
- Commercial and industrial fortification (flour, rice, oils).
- Home fortification (e.g., vitamin D drops).

## Benefits of Food Fortification

- ✂ It is an excellent method for improving the health of large population, since the nutrients can be added to staple foods being consumed widely.
- ✂ It is a safe method of improving nutrition among people. Adding micronutrients to food does not put any health risk to the people.
- ✂ It is possible to add one or more micronutrients without adding considerably to the total cost of the
- ✂ food product at the point of manufacture.

## INTRODUCTION TO FOOD SAFETY

- Food safety involves the procedures followed at the time of preparation, handling and storage of the food to prevent food-borne illness and injury.)
- Any health hazards can be encountered by the food products during their transportation through supply chain.
- Proper and safe handling of food is essential to prevent food-borne diseases.
- Food poisoning can be avoided by

- Preparing and serving food safely.
- Preventing the transmission of bacteria through cross-contamination.
- Presenting the food in a hygienic way

## **Tips for Safe Food Handling**

- Those working in to a kitchen should have clean hands prevent the spread of microorganisms.
- Food workers should frequently wash their hands.
- Hands should be dried with a paper towel.
- Gloves should be used to protect damaged skin or protect hands from the risk of developing skin conditions.
- Food workers should maintain personal receiving, storing, cooking hygiene while processing, packing, transporting or distributing the food.

## **ADULTERATION OF FOODS**

- Food adulteration is the practice of adulterating food or contaminating food materials by adding adulterants, which are poor quality substances added to food items for economic and technical benefits.
- These adulterants can be available in all food products consumed daily, including dairy products, cereals, pulses, grains, meat, vegetables, fruits, oils, beverages, etc.
- The process of contaminating food or adding adulterants to them is a Common practice in developing countries.
- For example, milk can be diluted by adding water to ease its quantity and starch powder is added to increase its solid content.

### **Food products are adulterated due to the following reasons:**

- It is done as a part of the business strategy.
- It is done to increase the quantity of food production and sales.
- It is done due to make maximum profit from food items by fewer investments.
- It is done due to increased food demand for a rapidly growing population.
- It is done due to lack of knowledge on proper food consumption.

# Prevention of Adulteration

- The National Health Service and Food Research Institute states that several food products have been adulterated to increase the quantity and make more profit.
- World Health Day is celebrated globally every year on 7<sup>th</sup> of April. As per reports, WHO aims to make everyone aware of the adulterations of food products, and motivate them to have a healthy balanced diet.

## Adulteration can be prevented as follows:

- All the grains, pulses and other food products should be cleaned and stored.
- Fruits and vegetables should be thoroughly washed in running water before use.
- Before buying food products, like milk, oil, and other pouches, the seal should be checked for validity.

## ARTIFICIAL RIPENING OF FRUITS

- ❖ Ripening is a natural physiological Process because of Which the fruit becomes sweeter, more palatable, edible. nutritious, softer, and attractive.
- ❖ Ripening is also related to colour change because of the pigments already present or produced during ripening.

## Effects of Artificial Ripening

- It causes Symptoms like headache, dizziness, high sleepness, memory loss etc
- Pregnant women particularly need to be very carefully and should not consume such fruits and vegetables.

## PESTICIDES

The Food and Agriculture Organisation (FAO) defined pesticide as any substance or mixture of substances intended for preventing, destroying or controlling any pest, including vectors of human or animal disease, unwanted species of plants or animals, causing harm or interfering with the production, processing, storage, transport, or marketing of food, agricultural commodities, wood and Wood products, or animal feed stuffs, or substances that may be administered to animals for the control of insects, arachnids, or other pests in or on their bodies.

## **Types of Pesticides**

### **Based on the Types of Pests they Kill**

- Insecticides – insects
- Herbicides - plants
- Rodenticides - rodents (rats and mice)
- Bactericides – bacteria
- Fungicides - fungi
- LarviCides - larvae

### **Uses of Pesticides**

- The major advantage of pesticides is that they can save farmers by protecting the crops from insects and other pests.

### **Some other primary benefits of pesticides are:**

- They control pests and plant disease vectors.
- They control human/livestock disease vectors and nuisance organisms.
- They control organisms that may harm other human activities and structures.

### **Effects of Pesticides**

- ➔ The toxic chemicals present in pesticides are purposely released in the environment. Each pesticide is intended to kill a certain pest, still a large number of pesticides do not reach their target, and eventually enter the air, water, sediments, and even food.

## **GENETICALLY MODIFIED FOODS**

- ➔ Genetically Modified (GM) foods are derived from Organisms whose genetic material (DNA) has been modified by using modern biotechnology, gene technology, recombinant DNA technology, and genetic engineering.
- ➔ Most existing genetically modified crops have been developed for improving yield as they prevent the crops from plant diseases or increase the tolerance of herbicides.



- Because of improved yields and reliability, GM foods play a vital role in the reduction of food prices.

## Genetically Modified (GM) Foods

- Foods manufactured via Genetically Modified Organisms (GMOs) are termed as GM foods.)
- Positive Impacts of GM Crops.
- They are faster and low priced.
- They achieve the desired change in very few generations.
- They improve the agricultural yield with less labour and cost input.
- They provide benefits to the soil of "no-till" farming practice
- They decrease the usage of pesticides and herbicides.

## Negative Impacts of GM Crops

- Environment
- Health

## DIETARY OR FOOD SUPPLEMENTS

- The Dietary Supplement Health and Education Act of 1994 defined dietary supplements as **products intended to supplement the diet to enhance health.**
- These supplements include vitamins, minerals, amino acids, enzymes, herbs, and other botanicals.
- Dietary supplements are marketed as tablets, capsules, soft gels, gel caps, powders, and liquids.

## Types

- ☞ **Natural:** These supplements are extracted from plants, animal tissues, or inorganic materials, like seawater and rocks.
- ☞ **Semi-synthetic:** These supplements are extracted from natural sources and then changed chemically,
- ☞ **Synthetic:** These supplements are produced by artificial methods.



## Benefits

- To reduce the risk of evolving a chronic age-related disease (cancer, heart disease, osteoporosis, or type 2 diabetes).
- To improve the immune system.
- To cure or reduce the symptoms of a non-deficiency disease, like clinical depression or arthritis.
- To facilitate the intake during periods of increase in conditions of pregnancy, illness, or old age.)
- To facilitate athletic performance

## NUTRACEUTICALS

- In 1989, Stephen Defelice discovered the term nutraceuticals from nutrition and pharmaceutical.
- He defined nutraceutical as a substance that is considered as a food or its part, which provides nutritional value and other health benefits, including disease prevention or health promotion.
- Thus, nutraceuticals are foods or food ingredients that provide medical or health benefits.

## Classification

Depending upon various characteristics, nutraceuticals are classified into the following major classes:

- 1) Nutraceuticals according to their food source.
- 2) Nutraceuticals according to their mechanism of action.
- 3) Nutraceuticals according to their chemical nature.
- 4) Nutraceuticals according to their higher contents in specific foods items.

### Nutraceuticals According to Food Source

Sources	Examples of Nutraceuticals
Plants	Ascorbic acid, quercetin, capsaicinoids, lycopene, B-carotene, catechins, curcumin, ellegic acid, anthocyanates, cellulose, c-tocopherol, and pectin.

Animals	Conjugated Lenoleic Acid (CLA), EPA, DHA, choline, lecithene, ubiquinone, and sphingolipids.
Microbes	Yeast, Lactobacilus acidophilus, and Streptococcus salvaricus.

## Benefits

- ✓ Nutraceuticals increase the health value of humand diet.
- ✓ They help people to live longer.
- ✓ They help people to avoid specific medical conditions.
- ✓ They have a psychological benefit by doing something for oneself.

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# THANK YOU

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