

Core Course 5, Unit – 2 : FOOD AND NUTRITION

BALANCED DIET

By

Ms. Namratha Pai K

DOS in Food science and Nutrition, University of Mysore, Mysuru

Food, as we all know is a basic necessity and is vital to nourish the body. It is essential right from the womb until the tomb. Food may be defined as anything solid or liquid which when consumed meets the requirements of energy, body building, repair, regulation and protection due to the nutrients present in it. Intake of the right kinds and amounts of food can ensure good nutrition and health, which may be evident in our appearance, efficiency and emotional well-being. Different nutrients present in the food are carbohydrates, proteins, fats, vitamins and minerals. Nutrient requirements are the quantities of nutrients that healthy individuals must obtain from food to meet their physiological needs. The recommended dietary allowances (RDAs) are estimates of nutrients to be consumed daily to ensure the requirements of all individuals in a given population. The Indian Council of Medical Research (ICMR) provides RDA for Indians. Nutrition in simple words has been defined as food at work in the body. Nutritional science includes the study of nutrients and other substances in the food, their absorption, assimilation, biosynthesis, catabolism and excretion. Diet on the other hand, refers to whatever we eat and drink each day. It includes use of specific intake of nutrients at right amounts to meet the nutritional needs of normal individuals or modification with specific restriction of nutrients during a diseased state which is also called as therapeutic diets. A diet balanced in the required amounts of nutrients play a vital role in meeting the nutritional needs during special conditions such as pregnancy and lactation. It is also important for patients with a disease or to those who are recovering from an illness. When the diet is deficient in certain nutrients they reflect as acute deficiency disorders such as goitre, protein energy malnutrition, night blindness, anaemia etc or as chronic diseases such as cardiovascular diseases and cancer. Lifestyle and diet play a major role in preventing and managing diseases. The topic under this session has been divided into five major sub-divisions namely

1. Functions of food

2. Food groups
3. Dietary guidelines of ICMR to ensure a balanced diet
4. Balanced diet at different stages of life
5. Food pyramid and food plate

1. Functions of food:

Food has various functions in our lives. Functions of food may be classified according to their role in the body as physiological, social and psychological functions. Let us have a look into the physiological function of food.

1. a. Physiological functions of food

Physiological functions of food include foods that yield energy such as carbohydrates and fats, food that help in body building such as proteins and foods that provide protection such as vitamins and minerals. According to their role at the physiological level, foods are classified as the following:

Energy yielding foods

Body building foods

Protective and regulatory foods

Foods that help in maintenance of health

Energy yielding foods: Foods rich in carbohydrates and fats are called energy yielding foods. They provide energy to sustain the involuntary processes essential for continuance of life, to carry out various voluntary activities and to convert food ingested into usable nutrients in the body. The energy needed to carry out these work is obtained from oxidation of food. Cereals, roots, tubers, dry fruits, oils, butter and ghee are all good sources of energy. Carbohydrates and protein provide 4Kcal of energy per gram whereas fats and oils provide 9Kcal of energy per gram.

Body building foods: Foods rich in protein are called body building foods. These foods help to maintain life, to repair or replace worn out tissues and to promote growth. They also supply energy. Milk, meat, egg and fish are rich in proteins of high biological value. Pulses and nuts are good sources of protein but the proteins are of relatively lower biological value than animal protein.

Protective and Regulatory foods: Foods rich in protein, minerals and vitamins are known as protective and regulatory foods. They are essential for health and regulate activities such as maintenance of body temperature, muscle contraction, control of water balance, clotting of blood, removal of waste products from the body, maintaining heartbeat and to improve immunity. Milk, egg, liver, fruits and vegetables are sources of protective foods.

Foods that help in maintenance of health: Food is a source of phytochemicals and antioxidants which help in neutralizing deleterious free-radicals which damage the biological tissues thus, preventing a wide array of degenerative diseases. Food plays an important role in preventing chronic diseases like cancer, degenerative diseases and cardiovascular diseases; and in the management of diseases such as hypertension and diabetes. Such foods can be termed as functional foods. Few examples of foods that are rich in phytochemicals and antioxidants are green leafy vegetables, fruits, vegetables and spices.

1.b Social functions of food:

Food has always been the central part of our social existence. Humans are social beings and food has been a part of our community, culture and religion. Special foods are distributed as benediction in religious places. Cultural changes are observed in the preparation of food and pattern of diet in different regions of the country. Whether fasting or feasting, food has acquired religious importance. It is a token of expressing gratitude, love, friendship and happiness. Food is the central part of various occasions such as birth, naming ceremony, birthdays, festivals, marriages etc. It connects our social life and symbolizes social acceptance. Hence, food is an integral part of our social well-being.

1.c Psychological functions of food:

In addition to satisfying physiological and social needs, foods also satisfy certain emotional needs of human beings. These include a sense of security, love and acceptance. For example,

preparation of delicious foods for family members is a token of love and affection. Food influences greatly on our psychological well-being. Certain amino acids such as tryptophan, phenylalanine, tyrosine and methionine are precursors of neurotransmitters that influence our psychological well-being such as serotonin, dopamine, noradrenaline and γ -aminobutyric acid. Dietary deficiencies of amino acids, carbohydrates and essential fatty acids have been linked to psychological disorder such as depression.

2. Food Groups

Foods have been classified into different groups depending on their nutritive value and for the ease to plan a diet. They are grouped as basic four, basic five and basic seven food groups.

Significance of the food group system is:

- i. Planning wholesome balanced menus to achieve nutritional adequacy.
- ii. Assessing nutritional status - a brief diet history of an individual can disclose inadequacies of food and nutrients from any of the five groups.

Groups	Food	Nutrients
Basic Four	a) Cereals, millets and pulses	Carbohydrates, proteins, B-vitamins
	b) Vegetables and fruits	Vitamins, minerals and fiber
	c) Milk, milk products, and animal foods	Protein, calcium, B-vitamins, phosphorus
	d) Oils, fats, nuts and oilseeds	Fat and protein
Basic Five	a) Cereals, grains and products	Carbohydrates, protein, invisible fat, thiamine, riboflavin, folic acid and fiber
	b) Pulses and legumes	Carbohydrates, protein, invisible fat, thiamine, riboflavin, folic acid, iron, calcium, and fiber

	c) Milk and meat products	Protein, calcium, fat, riboflavin and phosphorus
	d) Fruits and vegetables	Carotenoids, Vitamin C, riboflavin, folic acid, iron, calcium and fiber
	e) Fats and sugars	Essential fatty acids, iron, vitamin A, D, E and K.
Basic Seven	a) Green and yellow vegetables	Carotenoids, ascorbic acid and iron.
	b) Oranges, grapes, tomatoes, raw cabbage	Ascorbic acid
	c) Potatoes, other vegetables and fruits	Vitamins, minerals, fiber
	d) Milk and milk products	Calcium, phosphorus, protein, vitamins,
	e) Meat, poultry, fish and eggs	Protein, phosphorus, iron, B-vitamins
	f) Bread, flour and cereals	Thiamine, niacin, riboflavin, carbohydrates, fiber
	g) Butter or fortified margarine	Vitamin A and fat

The most commonly used food group system is the five basic food groups as recommended by the ICMR. Foods that fall under each group have been discussed below.

I. Cereals, Grains and Products:

Cereals - Rice, Wheat, Barley, Oats, Rye.

Millets - Ragi, Bajra, Maize, Jowar, Little millet (Samai), Kodo millet (varagu).

Products - Flakes, Flour, Puffed products.

II. Pulses:

Pulses - Bengal gram, Black gram, Green gram, Red gram, lentils, Cow pea, Horse gram

Beans- Broad bean, Field bean, Haricot bean, Shell bean, Lima bean, Moth bean

Peas – Green peas

III. Milk and Meat Products:

Milk - Curd, Skimmed Milk, Cheese, Khoa, cream

Meat - Chicken, Liver, Fish, Egg, Beef, Mutton, Pork.

IV. Fruits and Vegetables:

Fruits - Mango, Guava, Tomato, Papaya, Orange, Sweet Watermelon.

Vegetables -

Green Leafy: Amaranth, Spinach, Drumstick leaves, Coriander leaves, Mustard leaves, fenugreek leaves, cabbage.

Roots and tubers: Beetroot, Carrot, Onion, Potato, Radish, Tapioca, Sweet potato, Yam.

Other Vegetables: Brinjal, Ladies fingers, Capsicum, Beans, Drumstick, Cauliflower, bottle gourd, snake gourd.

V. Fats and Sugars:

Fats - Butter, Ghee, Hydrogenated fats, cooking oils like Groundnut, Mustard, Coconut.

Sugars: Sugar, Jaggery

3. Dietary guidelines of ICMR to ensure a balanced diet: The ICMR has provided guidelines for Indians to ensure balanced diet. The guidelines are as follows:

- a) Choosing variety in the daily diet is not only appealing but also provides nutrients and promotes good health because, a single food cannot provide all the nutrients.
- b) A diet consisting of foods from several food groups provides all the required nutrients in proper amounts.
- c) Cereals, millets and pulses are major sources of most nutrients.

- d) Milk which provides good quality proteins and calcium must be an essential item of the diet, particularly for infants, children and women.
- e) Oils and nuts are calorie-rich foods, and are useful for increasing the energy density and quality of food.
- f) Inclusion of eggs, flesh foods and fish enhances the quality of diet. However, vegetarians can derive almost all the nutrients from diets consisting of cereals, pulses, vegetables, fruits and milk-based diets.
- g) Vegetables and fruits provide protective substances such as vitamins/ minerals/phytonutrients.
- h) Diversified diets with a judicious choice from a variety food groups provide the necessary nutrients.

Table 2: Portions of food groups to be included by adults with sedentary activity for a balanced diet:

Food groups	Portion size(g)	Man (No. of portions)	Woman (No. of portions)
Cereals and millets	30	12	9
Pulses (Vegetarians)	30	2	2
Pulses (Non-vegetarians)	30	1	1
Milk and milk products	100	3	3
Vegetables	100	3	3
Fruits	100	1	1
Fats and oils	5	5	4
Sugars	5	5	4

4. Balanced diet at different stages of life:

4.a *Nutritional requirements during infancy:* During early infancy, much of the nutrient requirements are met by breast milk whereas after 6months 70% of the needs can be achieved by breast feeding and 30% by supplementary foods. The energy requirements for infants are higher than adults per unit body weight i.e., infants require 108Kcal/kg body weight whereas adults

require 40Kcal/kg body weight. The protein, calcium and phosphorus needs are also higher than adults per unit body weight since the demand for skeletal and muscle growth is higher in infants. The protein requirements are 2g/kg body weight. Diluted and strained vegetable and fruit juices, milk (120-180mL per day), sprouted and dried cereals gruels, sprouted and dried pulse porridge can be supplemented to during late infancy. Germinated cereal and pulses are rich in enzyme amylase which aids in digestion.

4.b Nutritional requirements for school children (1-12years): During schooling, the nutritional requirements for protein, iron and pyridoxine increases. There is an increase in total body size along with muscle mass and bone growth. Energy, protein, calcium and iron deficiencies are the most common nutrient deficiencies observed during schooling. Hence milk, egg, greens, pulses and cereals should be provided sufficiently in the diet. The protein requirement is 1.5-2g per kg body weight. Energy dense, body building and protective foods are important for children of 1-12years of age. Protective foods such as fruits help in fighting infections which is common among school going children.

4.c Nutritional requirements during adolescence (13-18years): Adolescence is the time period between childhood and adulthood. The major change in the physiology includes influence of hormones which result in physical, biochemical and emotional development. During this period the final accelerated growth spurt occurs with respect to height and weight and the maximum height is attained. These changes demand for nutrients such as energy, protein, minerals and vitamins. The energy requirements for adolescents range between 2000-2500Kcal, protein requirements are 1.5g per kg body weight and calcium of 600-800mg per day. Adolescent girls are at greater physiological stress than boys because of menstruation. Therefore for growth, maturation and bone development; body building, protective foods and foods rich in calcium and iron are essential during adolescence.

4.d Nutritional requirements for adults: The energy and protein requirements per unit body weight are lesser for adults than infants and children aged 1-12years. The protein requirement for an adult is 1g/kg body weight and requires around 60g of protein per day. The RDA for fat is 20-25g per day. The portion sizes of different food groups to be included in the diet to meet the nutritional requirements of adults per day are given in detail in table 2.

4.e Nutritional requirements during pregnancy: Nutritional requirements during pregnancy are of utmost importance to the mother and growing fetus. Good nutritional status before and during conception will ensure lesser complications. 500µg/day of folic acid supplementation has proven to be beneficial before planning pregnancy and during pregnancy to prevent neural tube defects. Pregnant women need an additional 300Kcal of energy, 15g of protein, 10g of fat, 600mg of calcium and 8-10mg of iron than normal adult women. The body demands requirement of all the nutrients in right amounts during pregnancy. Therefore diet comprising of energy dense, body building, and protective foods especially egg, fish, fruits, vegetables, nuts and green leafy vegetables are essential during pregnancy. As discussed in table 2 regarding the portion size and numbers of different food groups for normal adult, pregnant women require an additional 2 portions of fats and oils, 2 portions of milk, 1 portion of fruits and half portion of green leafy vegetables.

4.f Nutritional requirements during lactation: The nutritional requirements of lactating mothers should meet the needs for post pregnancy tissue repair, daily nutritional needs, nutritional needs of the infant and for production of milk. Nutritional needs are greater during lactation than during pregnancy. The body demands requirement of all the nutrients in right amounts during lactation. Fluid intake of 2-3 liters per day is essential to prevent dehydration during lactation. An additional 550Kcal of energy, 25g of protein, 25g of fat and 600mg of calcium is required for lactating mothers than normal adult women. An additional 1 portion of cereals, 2 portions of pulses, 2 portions of fat/oil, 2 portions of milk, 1 portion of fruits and half portion of green leafy vegetables are required during lactation. Between 6-12 months of lactation, diet intake should be gradually brought back to normal.

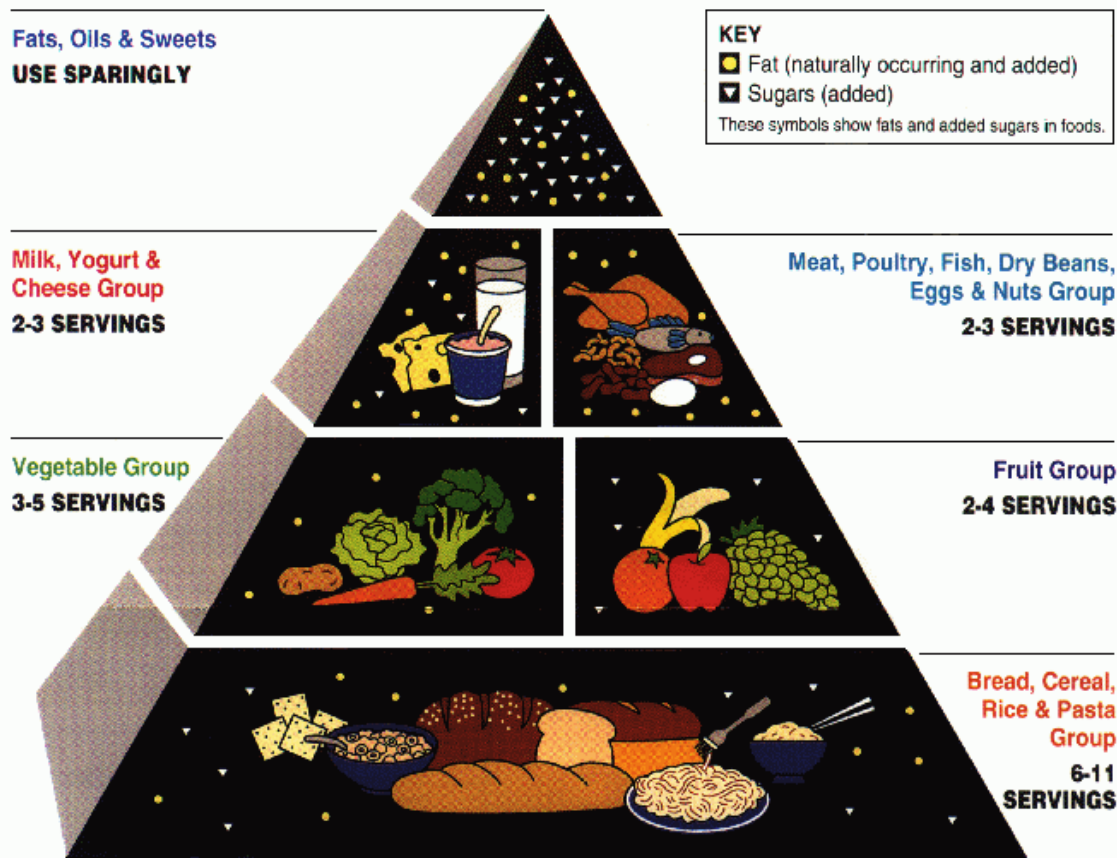
4.g Nutritional requirements during old age: the energy requirement during old age is lesser than adults due to decreased activity. The requirement of protective foods is essential during old age to prevent damage from free radicals and oxidative stress related degenerative diseases. 10-12% of total calories should be from protein and 50% from carbohydrates. The requirement for calcium is higher and is 1000mg/day for postmenopausal women. Saturated fats should be limited in the diet. 20g of fiber everyday is essential to prevent bowel discomfort however rough bran, fiber and mature vegetables are not recommended. Fiber from tender vegetables and fruits

are advisable therefore number of portion of cereals and millets is reduced by 3 for elderly men and 2 portions for elderly women and an extra portion of fruits is added.

5. Food pyramid and food plate:

A diet is optimum or balanced when it consists of foods from several food groups, provides all the required nutrients in proper amounts and provides phytochemicals, antioxidants and nutraceuticals to promote health. A balanced diet should provide 50-60% of the calories from complex carbohydrates, 10-15% from protein and 20-30% from visible and invisible fat. A balanced diet helps in meeting the nutrient requirements, improves immunity and cognition, prevents diseases, reduces stress and helps in improving the overall quality of life.

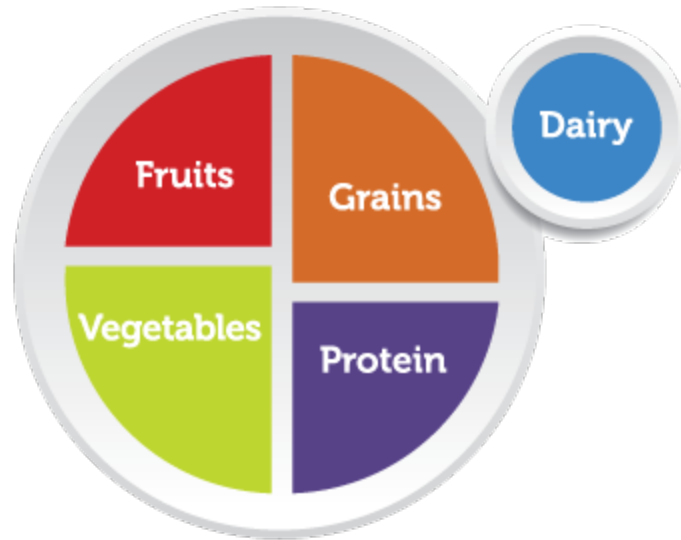
The food guide pyramid was introduced in 1992 by United States Department of Agriculture (USDA) as a general plan of what to eat each day. The food guide pyramid is a valuable tool for planning a health promoting diet. By incorporating the principle of balance, variety and moderation, an individual can still eat their favorite foods while following the food guide pyramid. A balanced diet should provide 50-60% of the calories from complex carbohydrates which is the major part of the diet thus making it the base of the food pyramid. Therefore 6-11 servings of cereals are recommended. Protective foods are essential in providing vitamins, minerals and fiber. Therefore 3-5 servings of vegetables and 2-4 servings of fruits form the next level of food pyramid. 2-3 servings of pulses, milk and milk products, egg, meat and fish form the next level of food pyramid to meet 10-15% of protein of the total calories. The tip of the food pyramid has sugars, fats and oils which are to be used sparingly since they are energy dense foods.



Source: Food guide pyramid, USDA

My plate:

My Plate is the current and latest nutrition guide published by the USDA, a food circle (i.e. a pie chart) depicting a place setting with a plate and glass divided into five food groups. It replaced the USDA's My Pyramid guide on June 2, 2011, ending 19 years of USDA food pyramid diagrams. My Plate is divided into sections of approximately 30% cereals, 40% vegetables, 10% fruits and 20% protein, accompanied by a smaller circle representing dairy, such as a glass of milk or a yogurt cup.



Conclusion: Food is the basic necessity of life. Different food groups provide different nutrients. Right foods in optimum amounts are essential in meeting the nutritional requirements of individuals depending on their physiological state. Dietary requirements vary at different stages of life. The food pyramid and food plate provides information on variety of foods that can be included at right proportions to meet the daily requirements.