YBN UNIVERSITY

Established by the Act of Government of Jharkhand Act 15, 2017
Gazette Notification No. 505, Dated 17th July 2017
As per Section 2(f) of UGC Act. 1956

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Food & Nutrition Science

UNIT 1 - INTRODUCTION TO FOOD AND NUTRITION

By

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Dear Students, I welcome you all for our lecture series on FOOD & NUTRITION . In today's lecture, let's make an attempt to know about '**Introduction to Food & Nutrition'.**

INTRODUCTION TO FOOD AND NUTRITION

Every day, several times a day, we make food choices that influence our body's health.These choices may benefit or harm our health and over a long period the results become important.

A proper diet is essential from the very early stages of life for proper growth, development and to remain active. Food consumption, which largely depends on production and distribution, determines the health and nutritional status of the population.

The following aspects will be studied under introduction to food and nutrition:

1. Basic terms used in the study of food and nutrition
2. Nutrients
3. Food groups
4. Dietary reference intakes
5. Relationship between food, nutrition and health
6. BMI and Nutritional status

1. BASIC TERMS USED IN STUDY OF FOOD AND NUTRITION:

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The following terms and concepts are widely used in the understanding nutrition-

Health: is defined by the World Health Organization as the "State of complete physical, social and mental well-being and not merely the absence of any disease and infirmity". The essential requirements of health include the following:

- Optimal growth and development
- Maintenance of structural integrity and functional capacity of the body
- Ability to withstand the process of ageing with minimal loss of ability
- Ability to fight diseases as shown by resisting infections,
- Preventing the onset of degenerative diseases
- Resisting the effect of environmental pollutants and toxins

Foods:Products derived from plants or animals that can be taken into the body to yield energy and nutrients for the maintenance of life and the growth and repair of tissues.

Nutrition:Nutrition is derived from thelatin word '*nutrire*' meaning feed, nourish and is a science of foods, nutrients and other substances they contain and their actions within the body as well as social, economic, cultural and psychological associations of food and eating.

Nutrients: Chemical substances obtained from food and used in the body to provide energy, structural materials, and regulating agents to support growth, maintenance, and repair of the body's tissues.

Nutrient requirements:Defined as the minimum amount of the absorbed nutrient necessary for normal physiological functioning of the body.

Nutritional status: The health status of an individual as affected by the intakeand level of nutrients and the ability of those levels to maintain normal metabolism.

Malnutrition: means an undesirable kind of nutrition leading to ill-health. It results from a lack,excess or imbalance of nutrients in the diet. It includes under nutrition and overnutrition.Undernutrition is a state of an insufficient supply of essential nutrients andovernutrition refers to an excessive intake of one or more nutrients.

Phytochemicals: Non nutrient compounds found in plant derived foods that have biological activity in the body. Foods with such phytochemicals providing benefits to health are called functional foods.

Balanced diet: A diet which contains different types of foods in quantities enough to meet the need for nutrients as well as a small provision to meet nutrients during a short duration of starvation.The daily diet must provide all essential nutrients in the required amountswhich vary with age, gender, physiological status and physical activity. A typical Indian balanced diet should provide 60-70% of energy from carbohydrates, 10-12% from protein and 20-25% of energy from fat. The features of a balanced diet are-

- Meets nutritional requirements
- Develops maximum cognitive ability
- Prevents degenerative diseases
- Improves longevity
- Improves immunity
- Helps in coping up stress

2. NUTRIENTS

Broadly the nutrients are classified based on the amount required as macronutrients and micronutrients. Carbohydrate, fat, and protein are called macronutrients because the body requires them in relatively large amounts (many grams daily). In contrast, vitamins and minerals are micronutrients, required only in small amounts (milligrams or micrograms daily).

Carbohydrates

Carbohydrates are either simple or complex, and are major sources of energy. They provide energy of 4 Kcal/g. The simple carbohydrates, glucose and fructose, are found in fruits, vegetables and honey, sucrose in sugar and lactose in milk, while the complex polysaccharides are starches in cereals, millets, pulses and root vegetables and glycogen in animal foods. The other complex carbohydrates which are resistant to digestion in the human digestive tract are cellulose in vegetables and whole grains, and gums and pectins in vegetables, fruits and cereals, which are called as the dietary fibre.

Protein

Proteins are complex molecules composed of different amino acids. Certain amino acids which are termed "essential" have to be obtained from proteins in the diet since they are not synthesized in the human body. Other nonessential amino acids can be synthesized in the body to build proteins. Proteins perform a wide range of functions and also provide energy (4 Kcal/g). Protein requirements vary with age, physiological status and stress and more protein is required during growth, pregnancy, lactation, infection and illness.

Animal foods like milk, meat, fish and eggs and plant foods such as pulses and legumes are rich sources of proteins. Animal proteins are of high quality as they provide all the essential amino acids in right proportions, while plant or vegetable proteins are not of the same quality because of their low content of some of the essential amino acids. However, a right combination of cereals, millets and pulses provides most of the amino acids.

Fat

Fats are a concentrated source of energy providing 9 Kcal/g, and are made up of fatty acids in different proportions. Dietary fats are derived from two sources viz. the invisible fat present in plant and animal foods; and the visible or added fats and oils (cooking oil). Fats serve as a vehicle for fat-soluble vitamins like vitamins A, D, E and K. It is necessary to have adequate and good quality fat in the diet for meeting the requirements of essential fatty acids.

Diets should include adequate amounts of fat particularly in the case of infants and children, to provide concentrated energy since their energy needs more compared to adults. Adults need to be cautioned to restrict intake of saturated fat (butter, ghee and hydrogenated fats) and cholesterol (red meat, eggs, organ meat). Excess of these substances could lead to obesity, diabetes, cardiovascular disease and cancer.

Vitamins and Minerals

Vitamins are chemical compounds required by the body in small amounts. They must be present in the diet as they cannot be synthesized in the body. Vitamins are essential for numerous body processes and for maintenance of the structure of skin, bone, nerves, eye, brain, blood and mucous membrane. They are either water soluble or fat-soluble. Vitamins A, D, E and K are fat-soluble, while vitamin C, and the B-complex vitamins such as thiamine (B1), riboflavin (B2), niacin (B3), pyridoxine (B6), folic acid (B9) and cyanocobalamin(B12) are watersoluble. Fat-soluble vitamins can be stored in the body while water-soluble vitamins are

not and get easily excreted in urine.

Minerals are inorganic elements found in body fluids and tissues. The important macro minerals are sodium, potassium, calcium, phosphorus, magnesium and sulphur, while zinc, copper, selenium, molybdenum, fluorine, cobalt, chromium and iodine are micro minerals. They are required for maintenance and integrity of skin, hair, nails, blood and soft tissues. They also govern nerve cell transmission, acid/base and fluid balance, enzyme and hormone activity as well as the blood- clotting processes.

Water–Water is a crucial element that provides the environment in which nearly all the body's activities are conducted. Several foods and large proportion of human body is made up of water. It participates in many metabolic reactions and supplies the medium for transporting vital materials to cells and carrying waste products away from them.

3. FOOD GROUPS

The balanced diet as defined earlier can be achieved through a proper blend of foods from the basic five food groups based on the nutrient content and biological group the plant belongs to.The five food groups are as follows-

Cereal grains and products- Include foods like rice, wheat, ragi, bajra, maize, jowar, barley, rice flakes, wheat flour oats etc. The main nutrients provided are Energy, protein, Invisible fat, Vitamin – B_1, Vitamin – B_2, Folic Acid, Iron and Fibre.

Pulses and Legumes- Include foods like bengal gram, black gram, green gram, red gram, lentil (whole as well as dhals) cowpea, peas, rajmah, soyabeans. The main nutrients provided are Energy, Protein, Invisible fat, Vitamin – B_1, Vitamin – B_2, Folic Acid, Calcium, Iron and Fibre.

Milk and meat products-Include foods such as milk, curd, skimmed milk, cheese, paneer & chicken, liver, fish, egg, meat. The main nutrients provided are Protein, Fat, Vitamin B_2, B_{12}, Calcium and phosphorus.

Fruits & Vegetables **–** Fruits include Mango, Guava, Tomato Ripe, Papaya, Orange, Sweet Lime, Water melon etc; Vegetables include greens such as Amaranth, Spinach, Drumstick leaves, Coriander leaves, Mustard leaves, fenugreek leaves and other vegetables such as Carrots, Brinjal, Ladies fingers, Capsicum, Beans, Onion, Drumstick, Cauliflower etc. The main nutrients provided are Vitamin C, Fibre, Invisible Fats, Carotenoids, Vitamin – B_2, Folic Acid, Calcium, Iron, Fibre and a variety of phytochemicals.

Fats and sugars- Butter, ghee, hydrogenated oils, cooking oils like groundnut, mustard, coconut, sunflower, palmoleinetc are foods under fats and sugar, jiggery under sugars. The major nutrients provided are energy and different types of fatty acids. Fats are a concentrated source of energy. Some amount of fat is needed in daily diet because they supply essential fatty acids. Besides this, some vitamins like A, D, E and K are fat soluble and important for our body.Sugar, jaggery and honey are sweetening agents and provide carbohydrates to the body.

The five food group system has the following uses by health care professionals:-

- Tool for nutritional assessment and screening: Evaluation of dietary history of an individual can disclose nutrient inadequacies from any of the five food groups. This can help in identifying the risk of an individual developing malnutrition
- Tool for nutritional counselling: The five food group system can be used in the education of an individual about proper nutrition.
- Food labelling: The food groups can be used as a component of the food labelling.

4. DIETARY REFERENCE INTAKES

The results of research studies in the field of nutrition are used by Scientists/Researchers to derive standards. These standards explain the amounts of individual nutrients required by healthy individuals of all age groups for supporting health. Such standards are collectively called as 'Dietary Reference Intakes' which is an umbrella term for the following individual values-

Estimated average requirements(EAR)

The estimated nutrient requirement that is adequate in 50% of the population studied and is used to develop the recommended dietary allowances.

Recommended dietary allowances (RDA)

RDA's are estimates of nutrients to be consumed daily to ensure the requirements of all individuals in a given population. RDA is adequate for 97-98% of the healthy population and is separate for physiological groups such as infants, pre-schoolers, children, adolescents, pregnant women, lactating mothers, and adult men and women, taking into account their physical activity.RDA also includes a margin of safety to cover variation between individuals, dietary traditions and practices.

Adequate intakes (AI)

For some nutrients, there is insufficient knowledge to determine an Estimated Average Requirement (which is needed to set an RDA). In these cases, an AI is used which reflects the average amount of a nutrient that a group of healthy people consume.

Tolerable upper intake levels (UL)

It is the maximum intake of a nutrient that is not associated with adverse side effects in most individuals of the healthy population.

Overall, these recommendations apply to healthy people and may not be appropriate for people with diseases who have altered nutrient needs. Care should be taken to consider country specific recommendations while deciding the nutrient requirements.

5. RELATIONSHIP BETWEEN FOOD, NUTRITION AND HEALTH

Diet has always played a vital role in supporting health. Good nutrition impacts greatly on people's general wellbeing. Food choices influence the health and well-being of individuals. Malnutrition occurs when there is imbalance in nutrients consumed and utilized. Poor nutrition can have an effect on energy levels, alertness, mobility, steadiness and healing. Nutrition imbalance can be either: *General*, i.e. due to excessive/deficient amounts of food of any or all types, leading to obesity, protein energy malnutrition net cor*Specific*, i.e. excess/deficiency of a single nutrient that may arise due to faulty food habits or an underlying disease e.g. Vitamin C deficiency, iron deficiency anemia etc. The health consequences depend on the nutrient and the severity of the imbalance.

Undernutrition is a state of nutrient deficiency due to insufficient food intake. It usually affects the balance of all the nutrients in the body. Poor diets, when combined with poor health can lead to serious health and nutritional problems such as decreased immunity, frequent infections, hormone changes, diminished fat free mass, decreased work efficiency, poor growth in children, increased expenses for medical care and overall decreased quality of life.

Over nutrition is the opposite of undernutrition and occurs due to frequent or habitual consumption of nutrients by eating too much food to the level that it becomes dangerous to health. Although most nutrients can be harmful in excess, the danger of over nutrition relates mostly to carbohydrates and fats. Obesity is an extreme form of over nutrition resulting from

an accumulation of excessive amounts of body fat. Obesity increases the risk of chronic diseases including type 2 diabetes, hypertension (high blood pressure), stroke, heart disease, cancer, joint problems, liver problems, difficulty in breathing and decreased mobility. The health consequences of these conditions range from premature death to disabilities.

Thus with proper food choices leading to a good nutrition can have the following benefits-

- Promotion of optimal growth and development of children
- Reduced risk of developing chronic diseases such as cardiovascular disease, cancer, diabetes, obesity, osteoporosis, iron deficiency, and dental caries (cavities).
- Obtaining a healthy and productive life.

6. BMI AND NUTRITIONAL STATUS

Body Mass Index (BMI) formerly called the Quete let index, is a measure for indicating nutritional status in adults. It is one of the measures used to assess an individual's nutritional status and helps to identify malnutrition. BMI is also recommended for use in children and adolescents. In children, BMI is calculated as for adults and then compared with z-scores or percentiles.

It is defined as a person's weight in kilograms divided by the square of the person's height in metres (kg/m2). For example, an adult who weighs 70 kg and whose height is 1.75 m will have a BMI of 22.9.

70 (kg)/1.752 (m2) = 22.9 kg/m2

The BMI ranges are based on the effect of excessive body fat causing disease and death. BMI was developed as an indicator of risk of developing diseases such as cardiovascular diseases, high blood pressure, osteoarthritis, some cancers and diabetes because as BMI increases the chance of developing above mentioned diseases also increases.

The World Health Organization has provided the following criteria for assessment of nutritional status based on BMI.

BMI (kg/m^2)	**Nutritional status**

Below 18.5	Underweight
18.5–24.9	Normal weight
25.0–29.9	Pre-obesity

BMI (kg/m^2)	**Nutritional status**
30.0–34.9	Obesity class I
35.0–39.9	Obesity class II
Above 40	Obesity class III

The BMI criteria is further modified for use in South Asian populations as South Asians have been found to be more at risk of the problems such as type 2 diabetes and heart disease arising due to being overweight, is provided below.

BMI(kg/m^2)	**Nutritional status**
<18.0	Underweight
18.0-22.9	Normal
23.0-24.9	Overweight
>25	Obesity

Nutrition is a basic human need and a prerequisite to a healthy life. Foods provide nutrients—substances that support the growth, maintenance, and repair of the body's tissues. A proper diet is essential from the very early stages of life for proper growth, development and to remain active. Individual food choices influence health both positively and negatively. A proper balance of foods selected over time can make an important contribution to health.

CONCLUSION

Foods provide nutrients that are necessary for growth, maintenance, and repair of the body's tissues. Food selection by people varies based on habit, preference, culture etc but not always based on the nutrition value of foods. Food choices can alter the health of an individual both negatively and positively. Nutritional science deals with the nutritional value of foods and study of the nutrient requirements across different age groups and stages of life. These help in

simplifying the process of learning proper food selection and providing recommendations to promote proper food habits and health. Thus the current chapter provides the basic terms and their meaning in nutrition, nutrients available in foods grouped into categories, terms under nutrient requirements and use of BMI as an indicator of nutritional status.