Republic of Iraq
Ministry of Higher Education
University of Al-Maarif University College
College of Nursing

Nutrition

Stage -3-

Lecture.1

Introduction of Nutrition

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Human nutrition: describes the processes where by the human body obtain and use necessary substances from foods (nutrients) to maintain structural and functional integrity

Clinical nutrition: focuses on the nutritional management of individual patients or groups of patients with established disease.

Nutrients: chemical substances obtained from food and used in the body to

- Provide energy, growth
- Regulating body processes
- Build repair tissue.
- Nutrients may also reduce the risks of some diseases

Essential nutrients: nutrients a person must obtain from food because the body cannot make them for itself in sufficient quantity to meet physiological needs; also called indispensable nutrient

Classification of nutrients

The major nutrients have traditionally been classified according to the amounts in which they are required, their chemical nature and their functions in the body. A principal distinction is between macronutrients and micronutrients.

- **Macronutrients** are required in large amounts by the body, usually measured in tens of grams.
- **Micronutrients** are substances required in very small amounts by the body, generally measured in milligrams or micrograms

A. Macronutrients

- The macronutrients found in the diet are carbohydrates, fats and proteins.
- Carbohydrates and fats are the major providers of energy, although protein can also provide energy.
- They all have a structural role, the most important in this respect being proteins.
- All contain carbon, hydrogen and oxygen; in addition, proteins contain nitrogen and some contain sulphur.

1. Carbohydrates

These are saccharides, combined in various degrees of complexity to form them simple sugars, and larger units such as oligosaccharides and polysaccharides. Their main function is to act as a source of energy, in the form of glucose. Some resist digestion (termed nonglycemic), and comprise the non-starch polysaccharides (NSP), which are part of 'dietary fibre' and have a role in bowelfunction.

2. Fats

Fats comprise a diverse group of lipid-soluble substances, the majority being triglycerides or triacylglycerols (TAGs). Derived products such as phospholipids and sterols (most notably cholesterol) are included in this group.

TAGs are broken down to yield energy, and form the major energy reserve in the body, in adipose tissue. Specific fatty acids found in TAGs are important in cell membrane structure and function, and must be supplied in the diet. These are termed essential fatty acids.

3. Proteins

Proteins consist of chains of individual amino acids, combined to form a large variety of proteins. On digestion, individual amino acids are used for the synthesis of other amino

acids and proteins required by the body, involving considerable recycling of the component

There are eight 'essential amino acids' (more in children), which must be supplied by the diet. In addition, some may become 'conditionally' essential in particular situations of physiological stress. Only when there is no further need for amino acids are they broken down and used as a source of energy, and the nitrogen part excreted as urea.

B. Micronutrients

1. Minerals

These are inorganic substances needed in small amounts, generally as part of the structure of other molecules (e.g. iron as part of haemoglobin), or as essential cofactors for the activity of enzymes (e.g. selenium in glutathione peroxidase).

Uptake of some minerals from the diet must be carefully regulated as there is limited excretion, and potential toxicity may result if large amounts accumulate in storage organs. In addition, some minerals compete with each other for absorption, so excessive intakes of one may hinder uptake of another (e.g. zinc and iron, or iron and calcium).

2. Vitamins

These share the common feature of being organic substances, required by the body in small amounts for its normal functioning. The vitamins are sub-classified, into water-soluble (vitamin C and B vitamins) and fat-soluble (vitamins A, D, E and K) groups. It is now recognised that vitamin D is synthesised in the skin by the action of ultraviolet light on a precursor, and could strictly be termed a hormone rather than a vitamin. Further, niacin can be made in the body from the amino acid tryptophan, so a separate supply may not be needed if protein intakes are adequate. However, in both of these cases, there are situations where synthesis is insufficient, and so a dietary need remains.

Water

Water provides the basic medium in which all the body's reactions occur. An inadequate level of fluid intake will quickly compromise the metabolic functions of the body and disturb the homeostatic mechanisms that operate.

Nutritional requirements

A certain amount of every nutrient is used by the body every day. This amount must therefore be replaced, either from the diet or from body stores. A **requirement** is defined as the amount of a specific nutrient required by an individual to prevent clinical signs of deficiency.

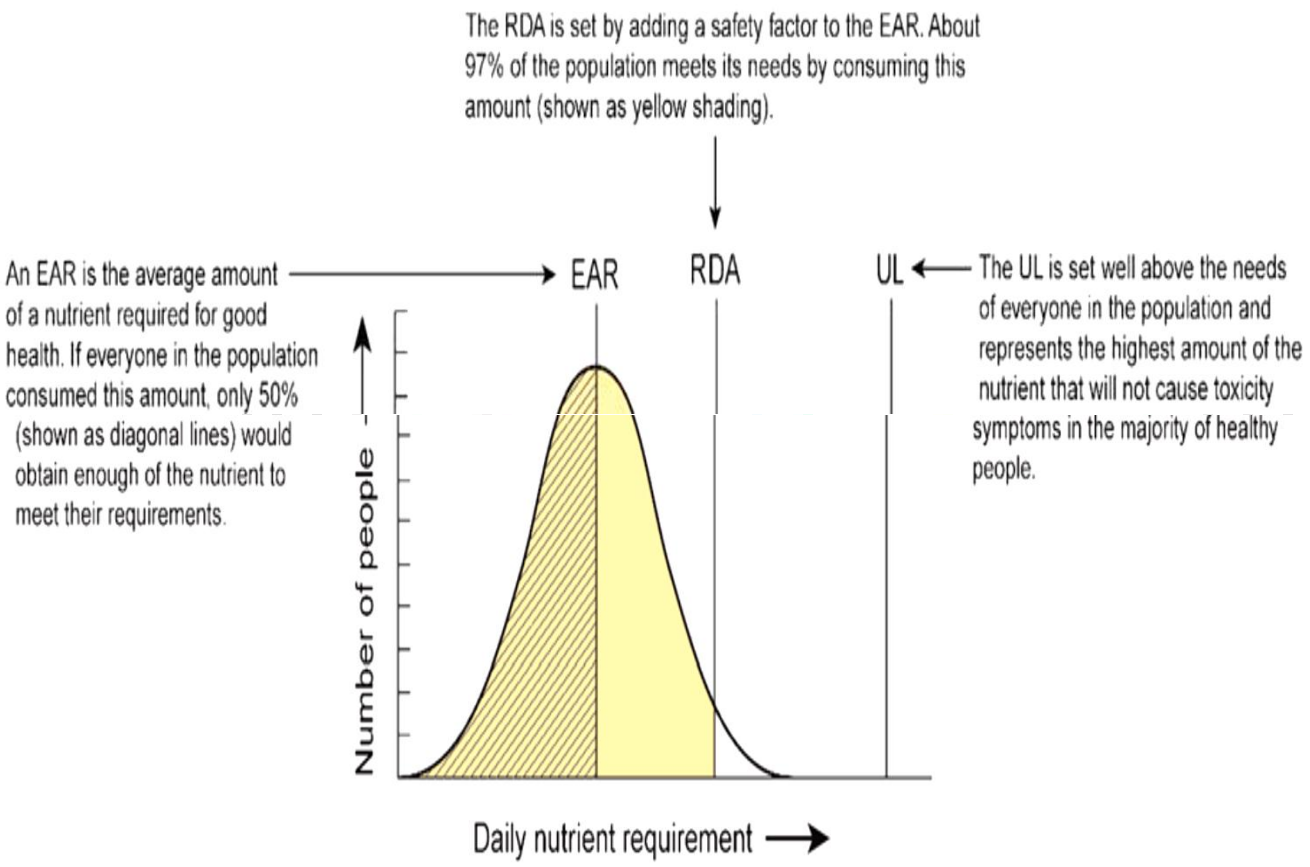
Dietary Reference Intakes (DRIs) A set of four types of nutrient intake reference standards used to assess and plan dietary intake; these include the Estimated Average Requirements (EARs), Recommended Dietary Allowances (RDAs), Adequate Intake levels (AIs), and the Tolerable Upper Intake Levels (ULs).

Estimated Average Requirement (EAR) The amount of a nutrient that meets the physiological requirements of half the healthy population in a specified life stage and gender group.

Recommended Dietary Allowance (RDA) The average intake of a nutrient thought to meet the nutrient requirements of nearly all (97%) healthy people in a specified life stage and gender group.

Adequate Intake (AI) level Nutrient intake of healthy populations that appears to support adequate nutritional status; established when RDAs cannot be determined.

Tolerable Upper Intake Level (UL) The highest level of chronic intake of a nutrient thought to be not detrimental to health.



Energy from foods

The amount of energy a food provides depends on how much carbohydrate, fat, and protein it contains. When completely broken down in the body, a gram of carbohydrate yields about 4 kcalories of energy; a gram of protein also yields 4 kcalories; and a gram of fat yields 9 kcalories. Because fat provides more energy per gram, it has a greater energy density than either carbohydrate or protein.

Calories: units by which energy is measured. Food energy is measured in kilocalories (1000 calories equal 1 kilocalorie), abbreviated kcalories or kcal. One kcalorie is the amount of heat necessary to raise the temperature of 1 kilogram of water by 1°C. The scientific use of the term kcalorie is the same as the popular use of the term calorie. However, the international unit for measuring food energy is the joule, a measure of work energy. One joule is the energy used when a mass of 1 kilogram is moved through 1 meter by using a force of 1 newton. To convert kcalories to kilojoules, multiply by 4.2; to convert kilojoules to kcalories, multiply by 0.24.

To calculate the energy available from a food, multiply the number of grams of carbohydrate, protein, and fat by 4, 4, and 9, respectively. Then add the results together. For example, 1 slice of bread with 1 tablespoon of peanut butter on it contains 16 grams carbohydrate, 7 grams protein, and 9 grams fat:

- 16 g carbohydrate × 4 kcal/g = 64kcal
- 7 g protein × 4 kcal/g = 28 kcal
- 9 g fat × 9 kcal/g = 81kcal
- Total = 173 kcal

Energy in the body: The body uses the energy-yielding nutrients to fuel all its activities. When the body uses carbohydrate, fat, or protein for energy, the bonds between the nutrient's atoms break. As the bonds break, they release energy. Some of this energy is released as heat, but some is used to send electrical impulses through the brain and nerves, to synthesize body compounds, and to move muscles.

If the body does not use these nutrients to fuel its current activities, it converts them into storage compounds (such as body fat) to be used between meals and overnight when fresh energy supplies run low. If more energy is consumed than expended, the result is an increase in energy stores and weight gain. Similarly, if less energy is consumed than expended, the result is a decrease in energy stores and weight loss.