

Malnutrition and obesity

Biomedical Engineering - URJC

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Introduction to Malnutrition

- Food and nutrition are fundamental human needs, critical for health and well-being.
- Nutrition is an essential component of healthcare, influencing clinical outcomes.
- Six essential nutrient groups: carbohydrates, proteins, lipids, minerals, vitamins, and water.

Factors Influencing Nutritional Requirements

Malnutrition

- Nutritional needs vary based on age, sex, and activity levels.
- Imbalance leads to **malnutrition**, encompassing undernutrition, micronutrient issues, and overnutrition.

Categories of Malnutrition (WHO Guidelines)

Categories of Malnutrition

- 1 **Undernutrition:** low weight-for-height, low height-for-age, and low weight-for-age.
- 2 **Micronutrient issues:** deficiencies/excess in vitamins and minerals.
- 3 **Overnutrition:** overweight, obesity, and diet-related health conditions.

Diagnosis of Malnutrition in Adults

Categories (just another classification)

- Starvation-related,
- acute disease/injury-related,
- chronic disease-related.

Nutrient Requirements and Dietary Evaluation

- Nutrition impacts health across life stages.
- **Macronutrients:** proteins, carbohydrates, and lipids are crucial for energy balance, body composition, and health.
- **Micronutrients:** vitamins, minerals, and antioxidants, are essential compounds needed in smaller amounts for biochemical processes.

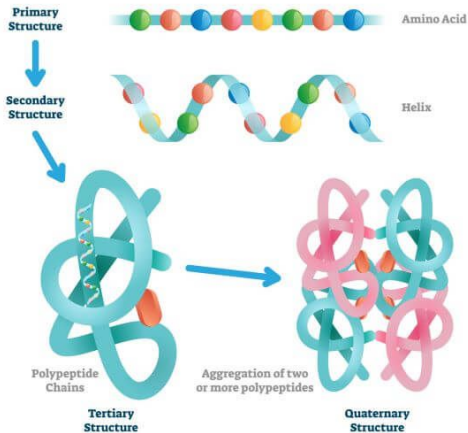
Proteins

Proteins

- Functions of dietary proteins: amino acids for structural purposes, enzyme synthesis, hormonal regulation.
- Proteins are less efficient as an energy source but essential for overall health.

Proteins

PROTEIN STRUCTURE



Proteins



Carbohydrates

Carbohydrates

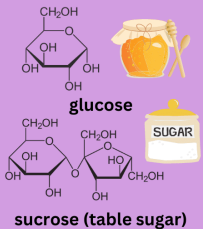
- Important energy source (4 kcal/g).
- Role in glucose regulation, gut health, and immune function.
- Fiber, a non-digestible carbohydrate, is crucial for satiety and overall health.

Carbohydrates

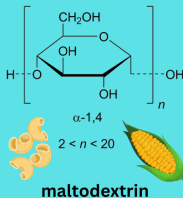
Examples of Carbohydrates

Carbohydrates are organic molecules containing carbon, hydrogen, and oxygen.

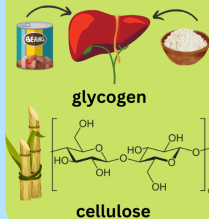
Sugars



Oligosaccharides



Polysaccharides



Carbohydrates



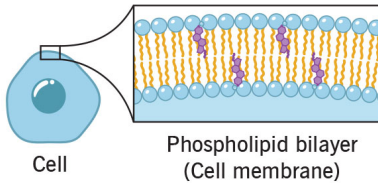
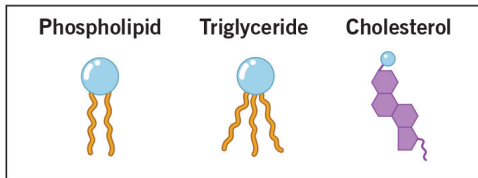
Lipids

Lipids

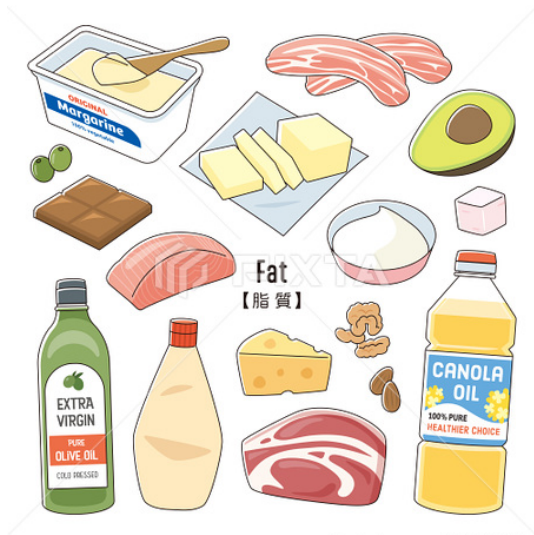
- Most energy-dense macronutrient (9 kcal/g).
- Essential for hormone production, cellular structure, energy storage, and absorption of fat-soluble vitamins.

Lipids

Lipids



Lipids



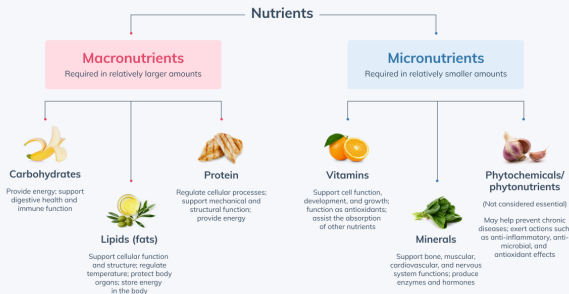
Micronutrients

Micronutrients

- Vital for health, classified into vitamins, minerals, and antioxidants.
- Deficiencies/excess can lead to adverse health effects.

Micronutrients

What are macronutrients and micronutrients?



Micronutrients

macronutrients



carbohydrates, lipids & proteins

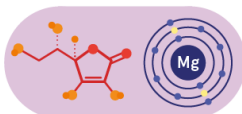


main source
of energy for
the body



needed
in grams
per day

micronutrients



vitamins & minerals



essential
to maintain
health



needed mostly
in mg or µg
per day

Micronutrients

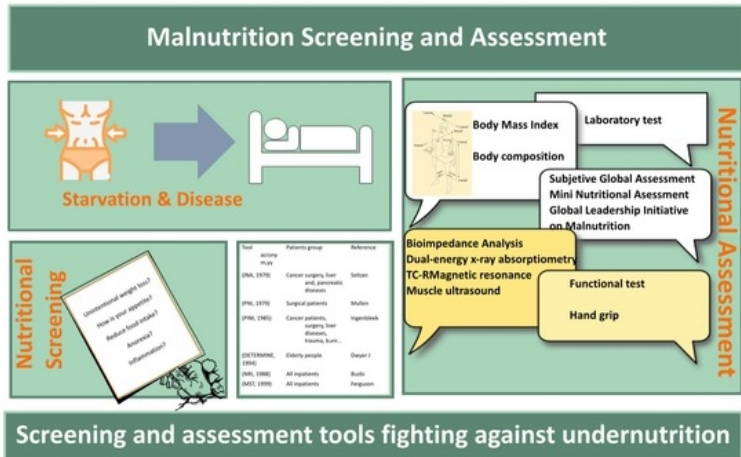
MACRONUTRIENTS AND MICRONUTRIENTS



Nutritional Assessment Overview

- No single test for nutritional status evaluation.
- Weight changes, skin-related symptoms, and dietary preferences are considered.
- Early assessment aids in timely intervention and improves outcomes.

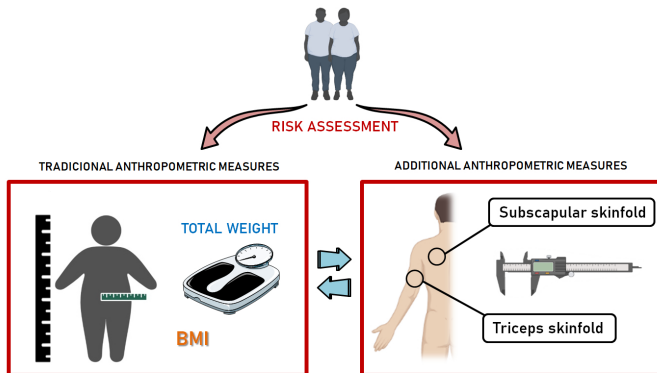
Nutritional Assessment Overview



Physical Examination and Anthropometric Measurements

- Assessing signs of malnutrition: general condition, vital signs, height, weight, skin, hair, oral cavity.
- **Anthropometric measurements** (BMI, skinfold thickness, circumference) help evaluate nutritional status.

Nutritional Assessment Overview



Benefits of using additional anthropometric measures:

- Added information about the real cardiovascular risk profile.
- Identification of patients at higher risk of myocardial infarction, stroke, hypertension, dyslipidemia, diabetes and mortality.
- Better prediction of recurrent adverse events in patients with ischemic heart disease.

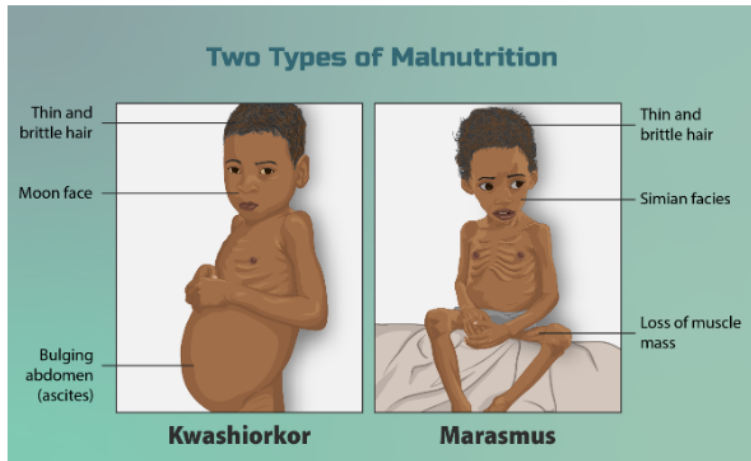
Laboratory Tests

- Routine clinical tests: electrolytes, BUN, creatinine, glucose, lipid profile, liver enzymes, CBC.
- Visceral proteins (albumin, prealbumin, transferrin) and micronutrient levels indicate nutritional status.

Malnutrition Types - Marasmus and Kwashiorkor

- **Protein-energy malnutrition:** inadequate protein and calorie intake.
- **Kwashiorkor:** severe *protein* deficiency, edema.
- **Marasmus:** severe *calories-related* insufficiency, wasting syndrome.

Malnutrition Types - Marasmus and Kwashiorkor



Obesity

Obesity

- Excessive accumulation of fat, associated with health risks.
- BMI used for classification: underweight, normal, overweight, obesity.
- Multifactorial etiology including genetics, lifestyle, and dietary factors.

Obesity



Obesity - Etiology and Pathophysiology

Obesity

- Imbalance between energy intake and expenditure causes excessive weight gain.
- Genetic, cultural, and societal factors contribute.
- Associated with cardiovascular disease, hypertension, dyslipidemia, insulin resistance, and various complications.

Obesity



Obesity - Treatment and Management

Obesity

- Multidisciplinary approach recommended.
- Individualized treatment, addressing underlying causes and comorbid conditions.
- Includes dietary modification, behavior interventions, medications, and surgical options.

Dietary Modification for Obesity

Obesity

- Individualized plans with close weight monitoring.
- Low-calorie diets recommended, either carbohydrate or fat restricted.
- Emphasize patient adherence to the prescribed diet.