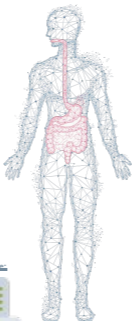




L5:

Nutritional requirements

GNT Block



Color Index:

- Main text
- Female slides
- Male slides
- Important
- Doctor's notes
- Extra notes

Editing file:





Objectives:



Understand the basic terms of nutritional requirements that are important for establishing intake of a nutrient in a population.



Interpret the food pyramid that recommends daily serving size from each food group for vegetarians and non-vegetarians.



Identify dietary guidelines and goals that are necessary for good health.



Discuss energy requirement in humans including basic energy expenditure and the factors that affect it.



Understand total parenteral nutrition (TPN) and its applications.

Lecture presented by :

Dr. Sumbul Fatma

Dr. Usman Ghani



What is nutrition?

Overview

- What is nutrition?
- Assessment of malnutrition
- Dietary reference intakes (DRIs)
- Estimated Average Requirement (EAR), Recommended Dietary Allowance (RDA) & Adequate Intake (AI)
- Acceptable Macronutrient Distribution Ranges (AMDR)
- The Food Pyramid: dietary guidelines and goals
- Energy requirement and expenditure in humans
- Total parenteral nutrition (TPN)

What is nutrition?

- Composition and quantity of food intake by living organisms (Quantity and quality of food)
- Biochemical utilization of food (Is it easily digestible food & How Much energy it's producing)
- Human nutrition is divided into three areas:
 - Undernutrition (nutrient deficiency) Will show symptoms
 - Overnutrition (excessive nutrient intake) E.g: obesity & toxicity
 - Optimal nutrition (balanced nutrient intake) taking the right amount that your body needs

Assessment of malnutrition

◆ Malnutrition in humans is measured by:

Dietary intake studies: identify people with deficient diets. E.g:
24-hour dietary recall but it is not accurate

Biochemical studies: identify subclinical nutritional deficiencies E.g:
no symptoms of a deficiency, a blood sample can reveal the deficiency (accurate)

Clinical symptoms: identify clinical nutritional deficiencies

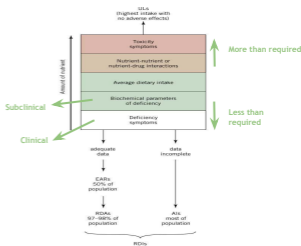
Dietary Reference Intakes (DRIs)

Definition

Quantitative estimates (not exact values) of nutrient intakes required to prevent deficiencies and maintain optimal health in populations

Recommended by:

Food and Nutrition Board of the National Research Council, USA



Dietary Reference Intakes Standards (four standards)

Estimated Average Requirement (EAR)

The amount of nutrient intake estimated to **meet the nutritional requirement of half of the healthy individuals 50%** in an age and gender group

Recommended Dietary Allowance (RDA)

(The most accurate)

The amount of nutrient intake that is sufficient to meet the nutritional requirement of nearly all healthy individuals 97-98% in a group

- RDA is two SD (Standard deviation) above EAR

- $RDA = EAR + 2 SD$

Dr: you have to know how to calculate the RDA (see example next slide)

Adequate Intake (AI)

(The least accurate)

It is used instead of EAR and RDA if:

- a **nutrient is considered essential but the experimental data are inadequate** for determining EAR and RDA

- (AI) covers the nutritional requirement of all individuals in a group with **approximation** due to insufficient data

Tolerable Upper Intake Level (UL)

The highest level of daily nutrient intake that has no adverse health effects or toxicity in almost all individuals

Dietary Reference Intakes (DRIs) cont..



Doctor's note:

EAR-> The Average of your population data

RDA-> Calculated from EAR

SD-> The Standard Deviation

Example:

The requirement of X nutrient for 4 individuals is:

40/50/60/70 μg

Calculate EAR?

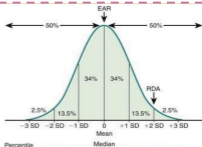
$(40+50+60+70) \div 4 = 55$

Calculate RDA?

$RDA = EAR + 2SD$,

-> $SD = \pm 15$ (The difference between the mean and the lowest or highest value) $(55-70)$

$= 55 + 2(15) = 85 \mu\text{g}$

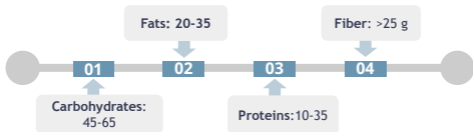


Dietary reference intakes. Normal requirement distribution of hypothetical nutrient showing percentile rank and placement of the estimated average requirement (EAR) and the recommended dietary allowance (RDA) on the distribution. SD, standard deviation.

Only for your understanding

Acceptable Macronutrient Distribution Ranges (AMDR)

- ◆ Range of adequate intake of a macronutrient associated with reduced risk of chronic diseases.
- ◆ AMDR for adults (% of total calories) :



Food pyramid

Food pyramid

United States Department of Agriculture Center for Nutrition Policy and Promotion

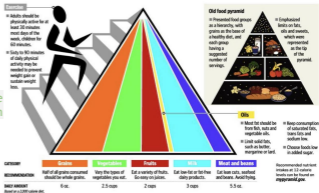
1- Public educational tool established in 1992

4- Fats, oils and sweets have small serving size

2- Recommends size of daily servings

3- Pyramid shape

Female doctor: You should know what the highest/lowest recommendations are, and the numbers in the (Exercise) part will be given in the question; other numbers are NOT IMPORTANT.



Dietary guidelines and goals

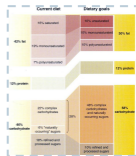
Consume a variety of foods from the basic food groups.

Control calorie intake to manage body weight.
Be physically active everyday.

Choose fats and CHOs (carbohydrates) wisely for good health.

Increase daily intake of fruits, vegetables, whole grains, and non-fat or low-fat milk and milk product.

Choose and prepare foods with little salt.



Female doctor: You don't have to memorize these numbers

Energy requirement in humans

1

The dietary energy intake required to maintain energy balance in a healthy individual

2

Energy balance is maintained by calorie intake and energy expenditure

3

Energy content of food is measured in calories or kilocalories (heat energy) E.g: Fat -> 9 kilocalorie/g
Proteins/carbs -> 4 kilocalories /g

Sex	Age	Weight (Kg)	Avg. Energy Needs (kcal)
Men	23-50	70	upto 2900
Women	23-50	55	upto 2200
Pregnant	-	-	+300
Lactating	-	-	+500

Female doctor: you don't have to memorize the numbers

Vegetarians



Vegetarians and nutrient intake

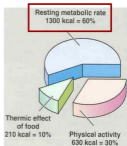
- Lower intake of iron, calcium and vitamin D
- Long-term vegans may develop megaloblastic Anemia due to vitamin B12 deficiency
- Most consume enough protein
- Lower in total dietary fat

Vegetarians and chronic disease

- Lower Body Mass Index (BMI)
- Lower death rate from ischemic heart disease
- Lower blood pressure
- Lower cancer rates compared to non-vegetarians

Basic energy expenditure depends on:

Resting metabolic rate (RMR)	<ul style="list-style-type: none">- Energy expense at rest- Required for normal body function- Depends on age, sex, growth, body surface area, fever, fasting, stress- Men: 1800 kcal / Women: 1300 kcal
Physical activity	<ul style="list-style-type: none">- Sedentary person: 30-50% above RMR- Active person: 100%+ above RMR
Thermic effect of food	<ul style="list-style-type: none">- Heat produced by the body due to food digestion and absorption- 5-10% of total energy expenditure



Important

Total parenteral nutrition (TPN)

- A type of exogenous nutrition in which terminally-ill patients are provided with all essential nutrients **intravenously** or through tube feeding
- TPN is particularly indicated in severe inflammatory bowel disease, coma, **cachexia**, **prolonged ileus** (terminal loss of intestinal peristalsis) and extensive burns
- Nutrients are pumped into a large central vein to allow rapid dilution of the solution (3L/24 hr)
- **Tube feeding** is only provided to patients whose GI tract is intact and supports this type of nutrition (Enteral nutrition)

- Standard composition of TPN feed (24 hr requirement)
 - Energy content: **2000 kcal**
 - Nitrogen: 12-14 g
 - Fat: 900 kcal
 - Glucose: 1000 kcal
 - Electrolytes, trace elements, vitamins: present
 - Volume: **3 liters**
- Individual nutritional requirements of patients may vary
- Continuous biochemical, hematological and immunological monitoring of patient on TPN is required

Quiz

MCQs

Q1 : Energy balance maintained by:

- A- Energy expenditure
- B- Fats
- C- lipid
- D- Carbohydrates

Q2: Human nutrition is divided into three areas, except ?

- A- Undernutrition
- B- Overnutrition
- C- Optimal Nutrition
- D- no nutrition

Q3: The DRIs standard that covers the nutritional requirement of all individuals in a group with approximation due to insufficient data is ?

- A- Adequate Intake (AI)
- B- Recommended Dietary Allowance (RDA)
- C- Tolerable Upper Intake Level(UL)
- D- Estimated Average Requirement(EAR)

Q4: AMDR for adult regarding the proteins is ?

- A- 20-35
- B- 25-35
- C- 20-25
- D- 10-35

Q5: TPN is particularly indicated in?

- A- Diarrhea
- B- Hemiplegia
- C- Mild burns
- D- Cachexia

Q6: Malnutrition is assessed by the following ways, except ?

- A- Clinical symptoms
- B- Biochemical studies
- C- Biochemical methods
- D- Dietary intake studies

Answers: 1:A, 2:D, 3:A, 4:D, 5:D, 6:C

SAQ

Q: Define the Dietary Reference Intakes ?

A: Quantitative estimates of nutrient intakes required to prevent deficiencies and maintain optimal health in populations

Q: Basic energy expenditure depends on ?

A: Resting metabolic rate (RMR), Physical activity & Thermic effect of food

Q: Human nutrition is divided into three areas:

- A: • Undernutrition (nutrient deficiency)
- Overnutrition (nutrient excessive intake)
- Optimal nutrition (balanced nutrient intake)

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Special Thanks to Aleen Alkulyah for the Design!

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