

CHAPTER I : NUTRITION, HEALTH & DISEASES

Nutrition

Def: The assimilation of food materials by living organisms that enable them to grow, maintain themselves & reproduce

↳ The science studies the relationship between food & living organism (Human), which is the process that the organism use food to survive, grow & generate energy, as well as responses to food intake, dietary changes & other pathological factors

Community nutrition encompasses individual & interpersonal-level intervention that create changes in knowledge, attitudes, behavior & health outcome among individuals, families or small-targeted group with community settings

Nutritional Education → Fundamental activity to improve the nutritional status & health of the people.

Intervention to change the habits & behaviors related to nutrition in the socio-economic development context.

Continuous process requiring the participation of the whole society.

Sharing of information, experience & knowledge is the essential activity.

Nutrition therapy: Treatment based on nutrition including checking a person's nutrition status & giving the right foods or nutrients to treat conditions such as those caused by diabetes, heart disease & cancer → involve simple changes in a person's diet, or intravenous or tube feeding Applied in combination with other medical treatments

Food: materials (raw, processed or formulated form) consumed orally by humans / animals for growth, health & satisfaction/pleasure composed mainly of water, lipids, proteins & carbohydrates with small proportion of minerals & organic compounds for energy

A balanced diet → Ensure body growth

Improve the immune system

Reduce infant mortality

Impact on working & lifestyle

Play an active role in disease prevention, treatment & health recovery

National Strategy on Nutrition

Context → Globalization

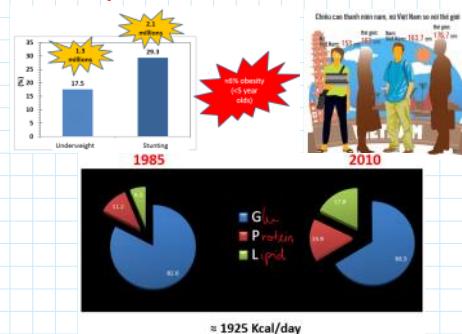
Urbanization

Climate change

Population growth

Reducing aid & support loans

Nutritional survey 2011-2020



National Nutrition Strategy 2011-2020 with the vision to 2030

By 2020, people's meals (diet) will be improved in quantity, more balance in quality, ensuring safety & hygiene, child malnutrition (Especially stunting) has been drastically ↓ contributing to improve the stature, physical strength of Vietnamese people, effectively controlling overweight & obesity → limiting chronic diseases related to nutrition

Micronutrient deficiency prevention program

- Prevention of vitamin A deficiency: children 6-36 months, mothers within 1 month after birth, children >5yo at risk
- Prevention of iron deficiency anemia: pregnant women & women of childbearing age, children 2-5 yo
- Prevention of disorders caused by iodine deficiency: nationwide



National Nutrition Strategy 2011-2020 with the vision to 2030

Implement proper nutrition to improve nutritional status suitable to each target group, locality, region, & ethnic group, contributing to reduce disease burden & improving stature, physical strength & intelligence of Vietnamese people.

Objective

- ① Continue to improve the quantity & quality of people's meals
- ② Improve the nutritional status of mothers & children
- ③ Improve micronutrient status
- ④ Step by step effectively control overweight & obesity & a number of nutrition-related chronic diseases in adults
- ⑤ Improve understanding & promote proper nutrition practices
- ⑥ Improve the capacity & operational efficiency of nutrition networks in communities & health facilities

Solution

- Social mobilization
- Perfecting policies & strengthening the legal corridor
- Health education & communication
- Financial resource
- Human resource development
- Technique
- International cooperation

Vision to 2030: Ensure the proper / balanced nutrition, suitable to the needs of Vietnamese people, to improve nutritional status for all people in all regions in the country, reduce the burden of diseases, & contribute to improve stature, physical strength & intelligence of Vietnamese people.

Solution

- ① Implementation of a diverse, reasonable & food-safe diet for all ages & all subjects according to life cycle
- ② Improve the nutritional status of mothers, children & adolescents
- Strengthen social mobilization & intersectoral collaboration
- Complete mechanisms & policies on nutrition

- ① Implementation of a diverse, reasonable & food-safe diet for all ages & all subjects according to life cycle
- ② Improve the nutritional status of mothers, children & adolescents
- ③ Improve micronutrient deficiencies in children, adolescents & women of reproductive age
- ④ Prevent chronic non-communicable diseases, related risk factors in children, adolescents & adults
- ⑤ Improve the nutritional response capacity in all emergencies & increasing resources for the implementation of the strategy.

- Strengthen social mobilization & intersectoral collaboration
- Complete mechanisms & policies on nutrition
- Health education & communication
- Promote & apply researches for nutrition
- Human resource development
- Technique
- International cooperation
- Promote & apply IT on nutrition nationwide.

Vision to 2045: All people achieve optimal nutritional status, control nutrition-related non-communicable diseases in order to contribute to improving health & quality of life

Nutrition & growth

→ Nutrition in fetus: having nutritional & metabolic damage will cause an impairment in developing organ systems that cannot be repaired later
→ low birth weight, low head circumference & body length, high mortality rate

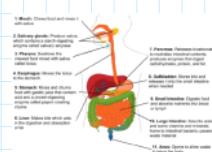
Nutrition & Immunology - Infection

- Immune role of some vitamins (A, C, B₁₂, ...)
- The role of some minerals (Fe, Zn, Cu, ...)
- Lack of nutrition reduces human resistance, increase the infection → deteriorate nutritional status
- Infection Disrupt → malnutrition Nutritional status Disrupt immune mechanisms
- Malnutrition type I: Lack nutrients necessary for specific metabolic functions. Body grows normally → nutrients in the tissues ↓ → pathological manifestations
- Malnutrition type II: Lack of protein-energy, many nutrients at the same time body stop growing, underweight, growth retardation, stunting
- Chronic diseases: Obesity - Hypertension - Cardiovascular - Diabetes - Gallstones - Cirrhosis - Cancer - Osteoporosis



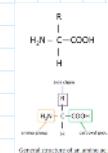
Marasmus (marcotreathy) Kwashiorkor (kwem)

CHAPTER II: NUTRIENTS



Protein

→ Made up of aas (>20 different aas in proteins)



- Sequence of aas joined by peptide bonds
- Determine the form/shape of higher protein structure

Primary structure: Sequence of amino acids

Secondary structure: Organization of segments of polypeptide chain

- 3D organization of the complete protein chain
- 2 types: fibrous proteins (collagen, muscle protein) & globular proteins (myoglobin, hemoglobin, enzymes, ...)

→ The association of protein chains



Essential amino acids for adults

Methionine
Valine
Threonine
Phenylalanine
Leucine
Isoleucine
Trypophan
Lysine

Role: structure & function of living organisms
Nutrient transportation
Water absorption & pH balance
Protection & detoxification
Energy balance (1g protein → 1kcal)

→ Protein deficiency
Slow-growing
Edema (disorder of water metabolism)
↓ Protective function
Pathological changes in the endocrine glands
Changes in the shape & structure of bones
Adverse effects on the state of central nervous system.

Quality of protein
aas composition
biological value
The body's assimilation ability

factors affecting protein absorption
Supply energy
Vitamins & minerals
Inhibitors
Processing technology
The balance of aas

mostly used in animal food
Protein efficiency ratio, PER: $PER = \frac{\text{Protein intake (g)}}{\text{Growth in body mass (g)}}$

Biological value, BV: $BV = \frac{(\text{N incorporated} \cdot 100)}{\text{N absorbed}}$

Net protein utilization, NPU: $NPU = BV \cdot D = \frac{N \text{ incorporated}}{N \text{ intake}}$

→ protein intake

Lipid

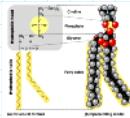
Esther of glycerol & fatty acids

Most popular in our bodies: C₆, C₁₂, C₁₈

Triacylglyceride, phospholipid, sterol, ...

Unsaturated, saturated

→ anti-oxidant activities (fish oil, ...)



Quality of lipid
Liposoluble vitamins
Essential unsaturated fatty acids
Assimilation & absorption abilities

Some acids cannot be synthesized by our bodies:

- Oleic acid: 18:1 (n-9); Omega-9
- Linoleic acid: 18:2 (n-6); Omega-6
- Linolenic acid: 18:3 (n-3); Omega-3
- Arachidonic acid: 20:4 (n-6); Omega-6

Nutrition tips: Lipid: ≥ 15% daily calorie intake (pregnant woman: ≥ 20%). Max: 30%

Body structure
Energy storage (30% fat → keto's cycle) → Palmitoleic acid ab. 4 (n-6), Omega-6

Nutrition tips:

- Lipid: > 15% dietary calorie intake (pregnant woman: > 20%). Max: 30%
- Cholesterol: < 300 mg/day
- Fat/oil: 60:10:40:30% (↑ of for elders)
- 10% polyunsaturated fat, 30% saturated fat ≈ 60% stearic acid

Carbohydrate

Role

- Main energy source (1g → 4 kcal)
- Structure
- Relationships with protein + lipid conversion
- Blood sugar (glucose) → glycemic index (↑ to ↑ blood glucose)
- Fibre

| Low GI (<55) | Medium GI (56-69) | High GI (70+) |
|--------------------|-------------------|---------------|
| Whole grain bread | White bread | White rice |
| Whole grain cereal | Cereals | Rice |
| Whole grain pasta | Pasta | Pasta |
| Whole grain bread | White bread | White rice |
| Whole grain cereal | Cereals | Rice |
| Whole grain pasta | Pasta | Pasta |
| Whole grain bread | White bread | White rice |
| Whole grain cereal | Cereals | Rice |
| Whole grain pasta | Pasta | Pasta |
| Whole grain bread | White bread | White rice |
| Whole grain cereal | Cereals | Rice |
| Whole grain pasta | Pasta | Pasta |

<https://glycometers.com/gi/search/>

Nutrition tips:

- > 60% of daily calorie intake
- Depends on energy consumption (physical activities)
- Need energy long time → slow → low GI food

Vitamin

Liposoluble vitamins

Vitamin A

- Growth & Development
- Cellular differentiation
- Reproduction
- Immunity

Recommended Dietary Allowances for Vitamin A
Male: 900 µg = 3000 IU (International Unit)
Female: 700 µg = 2300 IU

• Vitamin A is fat-soluble, we eat it and don't because it is a fat-soluble, other 1.87 ± 0.3 µg IU = 0.33 IU (retinol equivalent) for every 1 µg of Vitamin A in our diet.

• 12 IU = 1 µg of retinol, 1 µg of β-carotene = 1 IU

• 12 µg of β-carotene = 1 µg of retinol, 1 µg of β-carotene = 1 µg of retinol



Vitamin D (calciferol)

- Calcium homeostasis & bone formation
- Function regulation of some genes

- Minimum intake 100 IU/day
- RDAs: 300-400 IU = 7.5 - 20 µg
- Vitamin D toxicity: hypercalcemia causing calcification of muscle tissue (> 4000 IU/day). In pregnant women, it can cause changes in the placenta.

Vitamin E (tocopherol)

- Antioxidation
- Cell damage prevention
- Immunity



Vitamin K

- Blood coagulation
- Bone health



Hydrophilic vitamins

Vitamin B complex:



Vitamin C

- Collagen synthesis
- Nervous transmission
- Hormone activation
- Detoxification
- Antioxidation
- Anti-allergy
- Immunity



Minerals

Major minerals (> 100 mg/day): Ca, P, K, S, Na, Cl, Mg

Trace minerals: Fe, Zn, Cu, Mn, I, Se, F.

Water

Solvent - reactive - luminescent - body thermoregulation - mineral source

| Loại kinh | Loại kinh có tác dụng |
|---|------------------------------|
| Huyết áp, tim mạch, não hoặt, giảm cholesterol, chống đột quỵ | Hỗ trợ viêm khớp, xương khớp |
| Chống viêm mô lái | Chống nhiễm trùng |
| Giảm mồ hôi | Giảm mồ hôi |
| Tăng miễn dịch | Tăng miễn dịch |
| Tắc kinh gây đái ngang | Tắc kinh gây đái ngang |

CHAPTER III: BASIC PRINCIPLES TO BUILD A BALANCED DIET



character → energy → kcal → d²

Basic principles

- Identify subject characteristics (bio/physio / psycho)
- Satisfy energy requirement (building diet)
- Satisfy nutrients requirements
- balance diet

BMR (basal metabolic rate): energy expended by an individual at rest (normal condition)

Factors affecting BMR

- body structure
- Gender (woman: 10-12% < man)
- Age (young age ↑ BMR)
- Neurological system
- body temperature
- BMR ↓ when undernutrition
- BMR of pregnant woman ↑ 20%

Energy for physical activity

- Sedentary: 20% BMR
- Low: 20% BMR
- Moderate: 40% BMR
- Heavy: 50% BMR

Special energy needs

- Rapid growth stage (preschool, adolescents): ↑ 10% energy needs
- Pregnancy period: ↑ 20% energy needs
- Aging stage: ↓ energy needs

Experimental equation: Men: 1 kcal/kg/h
Women: 0.9 kcal/kg/h

Total energy expenditure:
$$\begin{aligned} \text{TEE} &= \text{BMR} + \text{TEF} + \text{PA} + \text{others} \\ &= \text{BMR} + 0.1\text{BMR} + 0.5\text{BMR} \rightarrow 1.6 \text{ BMR} \\ &= 1.6 \times \text{BMR} \end{aligned}$$

Experimental equation: Men: 1 kcal/kg/h
Women: 0.9 kcal/kg/h

Total energy expenditure:

$$\begin{aligned} \text{TEE} &= \text{BMR} + \text{TEF} + \text{PA} + \text{others} \\ &= \text{BMR} + 0.1\text{BMR} + 0.3\text{BMR} + 0 \\ &= 1.4 \text{ BMR} \end{aligned}$$

→ Note: 1.4 BMR
Female: 0.9 BMR

Ex: Calculate the total energy expenditure for a female student weighed 50 kg?

$$\text{BMR} = 0.9 \cdot 50 \cdot 24 = 1080 \text{ kcal}$$

$$\text{TEE} = \text{BMR} + \text{TEF} + \text{PA} + \text{others} = \text{BMR} + 0.1\text{BMR} + 0.3\text{BMR} + 0 = 1.4\text{BMR} = 1512 \text{ kcal}$$

Energy storage & regulation

↳ Lipid: Storage in the form of fatty tissues, especially in the subcutaneous & abdominal cavity. A healthy person can fast for 2 weeks (without long-term pathological damage).

The body uses about 100g of stored fat/day

↳ Glucose: Storage in the form of glycogen in the liver & muscles

↳ Protein: The body has 10% protein reserves, mainly in the cytoplasm of cells & liver, can be used up in 4-6 days (before destroying the body structure)

Protein requirement

| nhóm tuổi | Tỷ lệ % năng lượng hàng ngày cho protein | | Nhóm chất dinh dưỡng (Protein) (kcal/g) | Tỷ lệ % năng lượng hàng ngày cho protein |
|------------|--|------|---|--|
| | Nam | Nữ | | |
| 0-6 tháng | 1.50 | 1.1 | 1.00 | 11 |
| 7-10 tháng | 1.20 | 2.22 | 1.8 | 2.22 |
| 1-3 tuổi | 1.00 | 1.20 | 1.00 | 1.00 |
| 4-11 tuổi | 1.00 | 1.20 | 1.00 | 1.00 |
| 12-18 tuổi | 1.00 | 1.20 | 1.00 | 1.00 |
| 19-24 tuổi | 1.00 | 1.20 | 1.00 | 1.00 |
| 25-30 tuổi | 1.00 | 1.20 | 1.00 | 1.00 |
| 31-40 tuổi | 1.00 | 1.20 | 1.00 | 1.00 |
| 41-50 tuổi | 1.00 | 1.20 | 1.00 | 1.00 |
| 51-60 tuổi | 1.00 | 1.20 | 1.00 | 1.00 |
| 61-70 tuổi | 1.00 | 1.20 | 1.00 | 1.00 |
| 71-80 tuổi | 1.00 | 1.20 | 1.00 | 1.00 |
| 81-90 tuổi | 1.00 | 1.20 | 1.00 | 1.00 |

Quy định all 2015 SGD: 10% sugar + 10% fat & protein

Role: cell renew - excrete nitrogen - pregnancy - factors affecting: stress, insomnia, infections, high ambient temp → ↑ protein requirements

For workers: ↑ protein demand.

WHO: 0.75g/kg/day (lacto-milk protein)

Vietnam: >0.75g/kg/day (depend on NPU)

Balanced diet

- Energy: P/L/G = 12-15/20-48-65
- Protein: A/V = 50/50
- Lipid: V = 30%
- Carbohydrate: <10% sugar
- Vegetables: 300g/day
- 1g alcohol → 7kcal (Male: <5% TEE, Female: <2.5% TEE)

$$\begin{array}{c} A=V=50\% \\ \downarrow \quad \uparrow \\ 15/20/65 \end{array} \quad V = 30\% \quad \text{<10% sugar}$$

$$\text{Ex: } 9.50 \text{ kg?} \rightarrow \text{TEE: } 1800 \text{ kcal/day} \pm 5\%$$

$$\therefore \text{Protein} = 1.15 \cdot 50 = 57.5 \text{ g/day}$$

$$\text{Lipid} = 50\%$$

$$\text{Carbs} = X$$

$$\therefore \text{P/L/C: } 15/20/65 = 0.225 \text{ kcal/500 kcal} / 0.225 \text{ kcal} / 0.225 \text{ kcal}$$

$$\rightarrow m_{\text{P/L/C}} = 56.5 \text{ g/135 g} / 245 \text{ g}$$

$$\text{Protein: A/V: } 50/50 \rightarrow \text{avg A} = 25 \text{ g/day}$$

$$\text{Lipid: } 30\% V = 105 \text{ g/day}$$

$$\text{Carbs: } 10\% \text{ sugar} = 40.5 \text{ g sugar}$$

CHAPTER IV: BUILDING A DIET FOR SEVERAL SUBJECTS

Intellectual

Characteristics

Low energy consumption
lack of physical activity → over weight
Nervous stress → neuropathy, blood pressure, heart disease



Nutrients & balanced diet

- Limit lipid (40%), especially animal lipids
- Limit carbs (60-65%), especially refined carbs (sugar)
- Balance A/V protein (↑ feed containing methionine, cysteine, tryptophan & tyrosine)
- Adequate supply of vitamins (especially anti-oxidants)

Lipids: <20% - saturated fatty acids <10% - cholesterol <300mg/day
Urg & fruit: >300g/day
Salt <5g/day - sugar: <10% energy
Alcohol with moderation
Physical activity

Obese people

$$\text{BMI (Body Mass Index)} = \frac{W(\text{kg})}{H^2(\text{m})}$$

BMI Classification

| Classification | WHO | Asia-Pacific | Health Risk |
|-----------------|------------|--------------|-------------|
| Underweight | Under 18.5 | Under 18.5 | Low |
| Normal | 18.5-24.9 | 18.5-22.9 | Average |
| Overweight | 25.0-29.9 | 23-24.9 | Increased |
| Obese Class I | 30-34.9 | 25-29.9 | Moderate |
| Obese Class II | 35-39.9 | >30 | Severe |
| (continued >40) | | | |

Characteristics

Impatient (want to lose weight fast)

Slow, uncooperative, lack of confidence

Causes

Genetic

Histopathology, excessive hyperplasia of fat cells

Improper nutrition



Pregnant woman

Characteristics

- ↑ nutrition needs & energy needs
- Strong changes in physiological
- ↑ metabolism
- ↑ body weight
- ↑ energy for physical work
- Fetal development & physiological activities

Energy need



Energy needs

↑ 85,000 kcal / 3 months → ↑ 300 kcal/day
Ensure energy need → ensure weight increase

Nutrition needs

Protein: ↑ 10g/day (first 3 months) - ↑ 15g/day (last 6 months)
Lipid & carbs: ~not increase much
Calcii: first month: 100mg/day, next month: 350mg/day, last 6 months: 1000mg/day
Iron: 40mg/day

Macronutrients requirement

- Vitamin: A, B, C

- Minerals: Ca, P, I

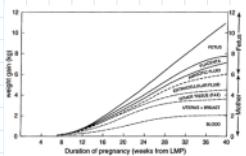
- Water



Nutrition needs

Protein: ↑ 10g/day (first 3 months) - ↑ 15g/day (last 6 months)
Lipid & carbs: ~not increase much
Calcii: first month: 100mg/day, next month: 350mg/day, last 6 months: 1000mg/day
Iron: 50mg/day
Zinc: ↑ 6mg/day (18mg/day)
Liposoluble vitamin: ↑ double vit D (10ug/day) - others have no special changes
Hydrosoluble vitamin: ↑ 0.2mg/day for vit B complex - ↑ 10mg/day with vit C - ↑ 400mg with folate.

Diet
Choose nutritious foods
NOT too restrictive
Fixed stimulants
Reduce spicy foods
Break down meals, chewing food
Care & encouragement
Moderate labor



Lactating woman

Characteristics
↑ energy & nutrition needs
postpartum stress

Energy needs:
↑ 500 kcal/day compared to woman not lactating
Take 200 kcal/day from lipid storage

Nutrition needs:
Generally, nutrition requirements is similar to pregnant women at last months
Protein: ↑ 15g/day
vit B: ↑ 0.5mg/day
vit C: ↑ 50mg/day
Folate: ↑ 100ug/day
Iron: 20mg/day
Calcii: 1000mg/day

Diet
Choose nutritious foods
NOT too restrictive
Fixed stimulants
Reduce spicy foods
Relax
Care & encouragement