Lecture 1

Therapeutic Nutrition

Overview of nutrition

Outlines

- Nutrition & nutrients
- Factors that influence the food intake
- The role of diet in healthy status

At the end of this unit, the student should be able to:

1. Define concepts.
2. Classified the nutrients and metabolism.
3. Identify the functions of nutrients.
4. Discuss the role of diet on health status.
5. Discuss the types of nutrients.
6. Compare between macronutrients and micronutrients.
7. Discuss the factors that affecting nutrition.
8. Identify the clinical signs of good nutritional status

Definition

- **Nutrition** is the process by which the body metabolizes and utilizes nutrients

- **Nutrients** are organic and inorganic substances found in foods that are required for body functioning. Adequate food intake consists of a balance of nutrients: water, carbohydrates, proteins, fats, vitamins, and minerals.
- Foods differ greatly in their **nutritional value** (the content of a specified amount of nutrients found in a food), and no one food provides all essential nutrients.

Classes of nutrient & metabolism

Essential nutrients

The body's most basic nutrient need is water. Following this, the next most important nutritional need is for nutrients that provide energy.

The energy-providing nutrients are:

1. Carbohydrates.
2. Fats.
3. proteins. These will be referred to as **macronutrients** (because they are needed in large amounts to provide energy) and,
4. Vitamins and minerals will be referred to as **micronutrients.** Vitamins and minerals are required in small amounts to metabolize the energy providing nutrients.

Factors Affecting Nutrition 1. Development

- People in rapid periods of growth (i.e., infancy and adolescence) have increased needs for nutrients.
- Elders, on the other hand, need fewer calories and dietary changes in view of the risk of coronary heart disease, osteoporosis, and hypertension.

2. Gender

- Nutrient requirements are different for men and women because of body composition and reproductive functions.
- The larger muscle mass of men translates into a greater need for calories and proteins.

Because of menstruation, women require more iron prior to menopause than men do. Pregnant and lactating women have increased caloric and fluid needs

3. Ethnicity and Culture

- Ethnicity often determines food preferences.
- Traditional foods (e.g., dates, meat, and rice for Arabs, rice for Asians, pasta for Italians, and curry for Indians) .
- Food preference probably differs as much among individuals of the same cultural background as it does general) between cultures.
- Not all Italians like pizza, for example, and many undoubtedly enjoy Mexican food.

4. Beliefs about Food

- Beliefs about effects of foods on health and well-being can affect food choices.
- Many people acquire their beliefs about food from television, magazines, and other media.
- For example, some people are reducing their intake of animal fats in response to evidence that excessive consumption of animal fats is a major risk factor in vascular disease, including heart attack and stroke .

5. Personal Preferences

- Individual likes and dislikes can be related to typical food and familiarity. Some adults are very adventuresome and eager to try new foods.
- Others prefer to eat the same foods repeatedly.

- Preferences in the tastes, smells, flavours (blends of taste and smell), temperatures, colors, shapes, and sizes of food influence a person's food choices.

  For example, some people may prefer sweet and sour tastes to bitter or salty tastes.

  Textures play a great role in food preferences.

- Some people prefer firm to soft, tender to tough, smooth to lumpy, or dry to moist.

6. Religious Practices

 Religious practice also affects diet. Islam prohibits eating carnivorous animals, pork, alcohol intake, and meat from animals not prepared in the Halal way (that is, properly slaughtered).

7.Lifestyle

- Certain lifestyles are linked to food-related behaviours.
- People who are always in a hurry probably buy convenience grocery items or eat restaurant meals (or junk food).
- People who spend many hours at home may take time to prepare more meals.
- Individual differences also influence lifestyle patterns (e.g., cooking skills, concern about health).
- Some people work at different times, such as evening or night shifts.
- They might need to adapt their eating habits to this and also make changes in their medication schedules if they are related to food intake.

8.Economics

- Not all persons have the financial resources for extensive food preparation and storage facilities.
- The quality and quantity of a person's food can be affected by their socioeconomic status.

  The nurse should not assume that all clients have their own resources to buy fruits, meat, or higher-fat and -protein foods.

9.Medications and Therapy

- The effects of drugs on nutrition vary considerably.
- They may alter appetite, disturb taste perception, or interfere with nutrient absorption or excretion.
- Nurses need to be aware of the nutritional effects of specific drugs when evaluating a client for nutritional problems.
- Therapies (e.g., chemotherapy and radiation) prescribed for certain diseases may also adversely affect eating patterns and nutrition.
- Oral ulcers, intestinal bleeding, or diarrhea resulting from the toxicity of antineoplastic agents used in chemotherapy can seriously diminish a person's nutritional status.

10. Health

- An individual's health status greatly affects eating habits and nutritional status.
- The lack of teeth, ill-fitting dentures, or a sore mouth makes chewing food difficult.

- Difficulty swallowing (dysphagia) due to a painfully inflamed throat or a narrowing of the esophagus can prevent a person from obtaining adequate nourishment.
- Disease processes and surgery of the gastrointestinal tract can affect digestion, absorption, metabolism, and excretion of essential nutrients.

  Gastrointestinal and other dis- eases also create nausea, vomiting, and diarrhea, all of which can adversely affect a person's appetite and nutritional status.

11. Advertising

- Advertising is thought to influence people's food choices and eating patterns to a certain extent.
- Of note is that such prod- ucts as coffee, frozen foods, and soft drinks are more heavily advertised than such products as bread, vegetables, and fruits.
- Convenience foods (frozen or packaged and easy to prepare) and take-out (fast) foods, snack foods, candy, soda, and sugared cereals are heavily advertised over fresh, healthy foods. In many countries of the Arab world,
- food advertisements must have Ministry of Health approval to be targeted to a certain audience.
- In the Arab world there has been an increase in advertising that targets elders in particular and encourages use of herbs and supplements, which require regulation according to the food and health system.
- Some of these products are nutritionally safe whereas others are not and can cause interactions with medications they might be taking or cause unexpected side effects.

12. Psychological Factors

- Although some people overeat when stressed, depressed, or lonely, others eat very little under the same conditions.
- Anorexia and weight loss can indicate severe stress or depression.

Unit II: Dietary references and diet-planning guides

Outline :

- The basis for recommended dietary allowances (RDA).
- The food table (Food Consumption pattern).

Learning objectives

At the end of this chapter, the student should be able to:

1. Discuss the Standards for a healthy diet.
2. Describe and draw the food guide pyramid.
3. Discuss the nutritional care process.

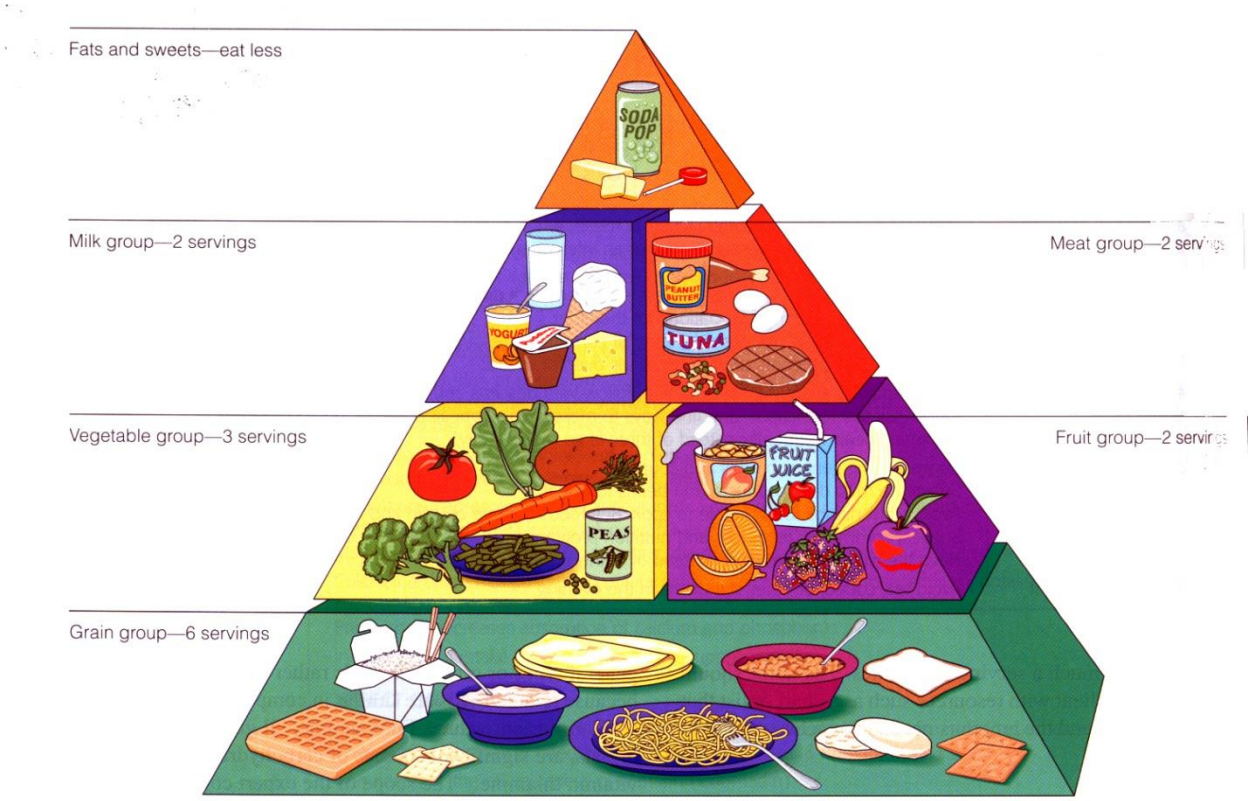
Standards for a healthy diet

- Various daily food guides have been developed to help healthy people meet the daily requirements of essential nutrients and to facilitate meal planning.
- Food group plans emphasize the general types or groups of foods rather than the specific foods, because related foods are similar in composition and often have similar nutrient values. For example, all grains, whether wheat or oats, are significant sources of carbohydrate, iron, and the B vitamin thiamine.
- "The scope of the expert consultation [of the World Health Organization (WHO) and Food and Agriculture Organization (FAO)], and the subsequent recommended nutrient requirements, included over 20 essential nutrients.

- These nutrients comprise the basis of all human nutrition: protein, energy, vitamin A and carotene, vitamin D, vitamin E, vitamin K, thiamine, riboflavin, niacin, vitamin B_6, pantothenic acid, biotin, vitamin B 12' folate, vitamin C, antioxidants, calcium, iron, zinc, selenium, magnesium, and iodine.
- For each nutrient, consideration was given to function, metabolism, dietary intake patterns, requirement levels, and toxicity.

The food guide pyramid

- The Food Guide Pyramid is a graphic aid that was developed by the U.S.
- Department of Agriculture (USDA) as a guide in making daily food choices. There are many food pyramids originated from the general food guide pyramid such as the pyramid for young children and the pyramid for elders.
- Using and following this guide does not guarantee that a person will consume the necessary levels of all essential nutrients.
- For example, someone who chooses cooked and low-fiber fruits and vegetables might have an inadequate intake of dietary fiber even though the recommended number of servings is eaten.
- However, the food guide is easy to follow, and people who eat a variety of foods from each group, in the suggested amounts, are likely to come close to recommended nutrient levels.
- The Food Guide Pyramid does not address fluid intake or provide guide lines about combination foods or about convenience foods



Recommended Dietary Intake

- The Committee on the Scientific Evaluation of Dietary Reference Intakes of the Institute of Medicine in United States publishes the Dietary Reference Intakes (DRIs) tables, which contain four sets of reference values: estimated average requirements (EARs), recommended dietary allowances (RDAs), adequate intakes (Als), and tolerable upper intake levels (ULs).
- Definitions of these terms are found following .
- The values for RDAs and AIs in the tables are modified for different age groups and according to gender.

Definitions for Dietary Reference Value tables

- **Dietary reference intakes (DRIs):** The standards for nutrient recommendations that include the following values .
- **Estimated average requirement (EAR):** The average daily nutrient intake value estimated to meet the requirement of half the healthy individuals in a particular life stage and gender group.
- **Recommended dietary allowance (RDA):** The average daily nutrient intake level sufficient to meet the nutrient requirement of nearly all (97 to 98%) healthy individuals in a particular life stage and gender group.
- **Adequate intake (AI):** Used when RDA cannot be determined. A recommended average daily nutrient intake level based on observed or experimentally determined approximations or estimates of nutrient intake for a group (or groups) of healthy people that are assumed to be adequate.
- **Tolerable upper intake level (UL):** The highest average daily nutrient intake level likely to pose no risk of adverse health effects to almost all individuals in a particular life stage and gender group. As intake increases above the UL, the potential risk of adverse health effects increases

Dietary Reference Intakes (DRIs): Recommended Intakes for Individuals, Macronutrients

Food and Nutrition Board, Institute of Medicine, National Academies

Life Stage Group	Total Water[a] (L/d)	Carbohydrate (g/d)	Total Fiber (g/d)	Fat (g/d)	Linoleic Acid (g/d)	α-Linolenic Acid (g/d)	Protein[b] (g/d)
Infants							
0–6 mo	0.7*	60*	ND	31*	4.4*	0.5*	9.1*
7–12 mo	0.8*	95*	ND	30*	4.6*	0.5*	**11.0**[c]
Children							
1–3 y	1.3*	**130**	19*	ND	7*	0.7*	**13**
4–8 y	1.7*	**130**	25*	ND	10*	0.9*	**19**
Males							
9–13 y	2.4*	**130**	31*	ND	12*	1.2*	**34**
14–18 y	3.3*	**130**	38*	ND	16*	1.6*	**52**
19–30 y	3.7*	**130**	38*	ND	17*	1.6*	**56**
31–50 y	3.7*	**130**	38*	ND	17*	1.6*	**56**
51–70 y	3.7*	**130**	30*	ND	14*	1.6*	**56**
> 70 y	3.7*	**130**	30*	ND	14*	1.6*	**56**
Females							
9–13 y	2.1*	**130**	26*	ND	10*	1.0*	**34**
14–18 y	2.3*	**130**	26*	ND	11*	1.1*	**46**
19–30 y	2.7*	**130**	25*	ND	12*	1.1*	**46**
31–50 y	2.7*	**130**	25*	ND	12*	1.1*	**46**
51–70 y	2.7*	**130**	21*	ND	11*	1.1*	**46**
> 70 y	2.7*	**130**	21*	ND	11*	1.1*	**46**
Pregnancy							
14–18 y	3.0*	**175**	28*	ND	13*	1.4*	**71**
19–30 y	3.0*	**175**	28*	ND	13*	1.4*	**71**
31–50 y	3.0*	**175**	28*	ND	13*	1.4*	**71**
Lactation							
14–18 y	3.8*	**210**	29*	ND	13*	1.3*	**71**
19–30 y	3.8*	**210**	29*	ND	13*	1.3*	**71**
31–50 y	3.8*	**210**	29*	ND	13*	1.3*	**71**

NOTE: This table presents Recommended Dietary Allowances (RDAs) in **bold** type and Adequate Intakes (AIs) in ordinary type followed by an asterisk (*). RDAs and AIs may both be used as goals for individual intake. RDAs are set to meet the needs of almost all (97 to 98 percent) individuals in a group. For healthy infants fed human milk, the AI is the mean intake. The AI for other life stage and gender groups is believed to cover the needs of all individuals in the group, but lack of data or uncertainty in the data prevent being able to specify with confidence the percentage of individuals covered by this intake.

[a] *Total* water includes all water contained in food, beverages, and drinking water.

[b] Based on 0.8 g/kg body weight for the reference body weight.

[c] Change from 13.5 in prepublication copy due to calculation error.

Table (2)

Dietary Reference Intakes (DRIs): Estimated Average Requirements for Groups

Food and Nutrition Board, Institute of Medicine, National Academies

Life Stage Group	CHO (g/d)	Protein (g/d)[a]	Vit A (µg/d)[b]	Vit C (mg/d)	Vit E (mg/d)[c]	Thiamin (mg/d)	Ribo-flavin (mg/d)	Niacin (mg/d)[d]	Vit B_6 (mg/d)	Folate (µg/d)[b]	Vit B_{12} (µg/d)	Copper (µg/d)	Iodine (µg/d)	Iron (mg/d)	Magnes-ium (mg/d)	Molyb-denum (µg/d)	Phos-phorus (mg/d)	Sele-nium (µg/d)	Zinc (mg/d)
Infants																			
7–12 mo		9*												6.9					2.5
Children																			
1–3 y	100	11	210	13	5	0.4	0.4	5	0.4	120	0.7	260	65	3.0	65	13	380	17	2.5
4–8 y	100	15	275	22	6	0.5	0.5	6	0.5	160	1.0	340	65	4.1	110	17	405	23	4.0
Males																			
9–13 y	100	27	445	39	9	0.7	0.8	9	0.8	250	1.5	540	73	5.9	200	26	1,055	35	7.0
14–18 y	100	44	630	63	12	1.0	1.1	12	1.1	330	2.0	685	95	7.7	340	33	1,055	45	8.5
19–30 y	100	46	625	75	12	1.0	1.1	12	1.1	320	2.0	700	95	6	330	34	580	45	9.4
31–50 y	100	46	625	75	12	1.0	1.1	12	1.1	320	2.0	700	95	6	350	34	580	45	9.4
51–70 y	100	46	625	75	12	1.0	1.1	12	1.4	320	2.0	700	95	6	350	34	580	45	9.4
> 70 y	100	46	625	75	12	1.0	1.1	12	1.4	320	2.0	700	95	6	350	34	580	45	9.4
Females																			
9–13 y	100	28	420	39	9	0.7	0.8	9	0.8	250	1.5	540	73	5.7	200	26	1,055	35	7.0
14–18 y	100	38	485	56	12	0.9	0.9	11	1.0	330	2.0	685	95	7.9	300	33	1,055	45	7.3
19–30 y	100	38	500	60	12	0.9	0.9	11	1.1	320	2.0	700	95	8.1	255	34	580	45	6.8
31–50 y	100	38	500	60	12	0.9	0.9	11	1.1	320	2.0	700	95	8.1	265	34	580	45	6.8
51–70 y	100	38	500	60	12	0.9	0.9	11	1.3	320	2.0	700	95	5	265	34	580	45	6.8
> 70 y	100	38	500	60	12	0.9	0.9	11	1.3	320	2.0	700	95	5	265	34	580	45	6.8
Pregnancy																			
14–18 y	135	50	530	66	12	1.2	1.2	14	1.6	520	2.2	785	160	23	335	40	1,055	49	10.5
19–30 y	135	50	550	70	12	1.2	1.2	14	1.6	520	2.2	800	160	22	290	40	580	49	9.5
31–50 y	135	50	550	70	12	1.2	1.2	14	1.6	520	2.2	800	160	22	300	40	580	49	9.5
Lactation																			
14–18 y	160	60	885	96	16	1.2	1.3	13	1.7	450	2.4	985	209	7	300	35	1,055	59	10.9
19–30 y	160	60	900	100	16	1.2	1.3	13	1.7	450	2.4	1,000	209	6.5	255	36	580	59	10.4
31–50 y	160	60	900	100	16	1.2	1.3	13	1.7	450	2.4	1,000	209	6.5	265	36	580	59	10.4

Assessment of Nutritional Status

The Nutrition Care Process

The nutrition care process is defined as a systematic problem solving method that dietetics professionals use to critically think and make decisions to address nutrition related problems and provide safe effective quality nutrition care . It is composed of the following four steps;

a. Assessment

b. Diagnosis

c . Intervention

d. Monitoring and evaluation

Nutrition assessment

The ABCD approach to nutrition assessment includes anthropometry , biochemical tests , clinical observation , and dietary evaluations .

Anthropometric data include the following :

Age , Gender , Height , Weight , Body frame , Body composition

Anthropometric measurements :Is a physical measurements of the human body used for health assessment , including height , weight , skin fold thickness , and circumference , head , hip , waist , wrist , mid arm muscle .

1. **Biochemical tests include the following:**

- Plasma proteins
- Liver enzymes(evaluate liver function)
- Blood urea nitrogen , serum electrolytes(evaluate renal function)
- Urinary urea nitrogen excretion
- Complete blood count (evaluate for anemia)
- Fasting glucose(evaluate for high or low blood glucose levels)
- Total lymphocyte count (evaluate immune functions)

2. Clinical observations include the following

- Clinical signs of nutrition status
- Physical examination

Clinical signs of nutrition status

- Clinical signs of nutrition status by observation of various areas of the patients , body may reveal signs of poor nutrition .
- example ,Weight and height according age , hair , skin (smooth , moist , good color) , lips (smooth , moist , good color) , eyes (bright , clear , shiny)

Physical examination

Such evaluation include inspection of skin for the presence of edema and skin turgor . evaluation of nail integrity and assessment of body organ sounds in the intestine and lungs .

Evaluation of the diet includes the following assessments:

1. **Usual intake** , current intake , restrictions , modification (use 24-hour recall and food dairies)
2. **Support system** (caregivers to help with nutrition care plan)
3. **Nutrition supplements**, vitamin or mineral supplements
4. Foods allergies intolerances
5. **Activity level** (average energy expended per day)

Unit III: Metabolism of Nutrients and Energy Balance

Outline :

- the body deals with energy in take above or below requirements.
- Food energy value (metabolism|).
- The body of measures related below and their strength and weakness.
- Body mass index (BMI).
- Body Circumference measurement**.**

Learning objectives

At the end of this chapter, the student should be able to:

1. Define concepts
2. Discuss the energy balance .
3. Describe the factors which Affect Basal Metabolic Rate.
4. Discuss the term of Body weight and body mass standards.
5. Outline the classification of overweight and obesity by BMI and arm circumference.
6. Identify examples of energy requirements for people according to their daily activities and nature of work.

Energy

- Metabolic rate refers to the rate of heat liberation during chemical reactions; it is expressed in units called calories.
- A calorie is the quantity of heat required to raise the temperature of 1 gram of water 1_C; it is used to express the quantity of energy released from different foods or expended by different functional processes of the body.

- Because a large quantity of energy is released during metabolism, the energy is expressed in terms of kilocalories (kcal), each of which is equivalent to 1000 calories.
- The basal metabolic rate(BMR) refers to the energy needed to maintain essential physiological functions, such as respiration, circulation, and muscle tone, when a person is at complete rest both physically and mentally.

Energy Balance

- Energy balance is the relationship between the energy derived from food and the energy used by the body.
- The body obtains energy in the form of calories from carbohydrates, protein, and fat.
- The body uses energy for voluntary activities such as walking and talking and for involuntary activities such as breathing and secreting enzymes.
- A person's energy balance is determined by comparing his or her energy intake with energy output.

Energy Intake

- The amount of energy that nutrients or foods supply to the body is their caloric value. A calorie (c, cal, kcal)is a unit of heat energy.
- A small calorie (c, cal)is the amount of heat required to raise the temperature of I gram of water 1°C. This unit of measure is used in chemistry and physics.

- A large calorie (Calorie. kilocalorie, kcal)is the amount of heat energy required to raise the temperature of 1 gram of water 15 to 16°C.
- The energy liberated from the metabolism of food has been determined to be:

  1 gram of carbohydrates = 4 Calories

  1 gram of protein = 4 Calories

  1 gram of Fat = 9 Calories

Energy Output

- **Metabolism** refers to all biochemical and physiologic processes by which the body grows and maintains itself.
- Metabolic rate is normally expressed in terms of the rate of heat liberated during these chemical reactions.
- The **basal metabolic rate (BMR)** is the rate at which the body metabolizes food to maintain the energy requirements of a person who is awake and at rest.
- The energy in food maintains the basal metabolic rate of the body and provides energy for activities such as running and walking.

Factors which Affect Basal Metabolic Rate (BMR)

1. Body surface area

- This is a reflection of height and weight.
- The greater the body surface area factor. the higher the BMR.

- Tall, thin people have higher BMRs If we compare a tall person with a short person of equal weight, then if they both follow a diet calorie controlled to maintain the weight of the taller person, the shorter person may gain up to 15 pounds in a year.

2. **Sex:** Males average a higher BMR because of a greater proportion of lean body mass

3. **Body temperature**: Fever, for example, increases BMR.

4. **Hormones**: Thyroid hormones have a stimulatory effect on the metabolism of the body and, therefore, BMR. Thus BMR is raised in hyperthyroidism and reduced in hypothyroidism.

5. **Age**: Metabolic rate declines with age. In infants and children BMR is higher and in adults it is less

6. **Diet**: Starvation or serious abrupt calorie reduction can dramatically reduce BMR (30%). Restrictive low-calorie weight loss diets may cause BMR to drop as much as 20%.

7. **Pregnancy/breast feeding**: these increase metabolic rate

8. **Environment**: In cold climates, the BMR is higher compared to warm climates.

9. **Rapid growth and/or development**: infancy, growth spurts, healing after illness or injury.

10. **Disease states**: BMR is higher in cardiac failure, leukemia, and hypertension. It is marginally lowered in Addison's disease.

11. **Weight**. Heavier the weight, the higher BMR. Example: The metabolic rate of obese women is 25 'percent higher than the metabolic rate of thin women.

12. **Exercise**: Physical exercise not only influences body weight by burning calories, it also helps raise our BMR by building extra-lean tissue. (Lean tissue is more metabolically demanding than fat tissue.) So, we bum more calories even when sleeping.

13. Amount of lean body mass: muscle, liver ,brain, kidney all metabolize at a high rate at rest, and have high energy needs when more active

Body weight and body mass standards

- Maintaining a healthy or ideal body weight requires a balance between the expenditure of energy and the intake of nutrients.
- Generally, when energy requirements of an individual equate with the daily caloric intake, the body weight remains stable.
- **Ideal body weight (lBW)** is the optimal weight recommended for optimal health; however, many health professionals consider the body mass index to be a more reliable indicator of a person's healthy weight.
- For people older than 18 years, the **body mass index (BMI)** is an indicator of changes in body fat stores and whether a person's weight is appropriate for height, and may provide a useful estimate of malnutrition.
- However, the results must be used with caution in people who have fluid retention (e.g., ascites or edema), athletes, or elders.
- **To calculate the BMI**.
    1. Measure the person's height in meters, e.g., 1.7 m

2. Measure the weight in kilograms, e.g., 72 kg
3. Calculate the BMI using the following formula

$$BMI = \frac{\text{Weight in kilograms}}{(\text{Height in meters})^2}$$

Or

$$\frac{72 \text{ kilograms}}{1.7(\text{meters})^2} = 24.9$$

Table (1) : Show Classification of Overweight and Obesity by BMI, Waist Circumference and Associated Disease Risks

			Disease Risk* Relative to Normal Weight and Waist Circumference	
	BMI (kg/m^2)	Obesity Class	Men 102 cm or less Women 88 cm or less	Men >102 cm Women >88 cm
Underweight	<18.5		—	—
Normal†	18.5–24.9		—	—
Overweight	25.0–29.9		Increased	High
Obesity	30.0– 34.9	I	High	Very high
	35.0–39.9	II	Very high	Very high
Extreme obesity	40.0+	III	Extremely high	Extremely high

*Disease risk for type 2 diabetes, hypertension, and cardiovascular disease.
†Increased waist circumference can also be a marker for increased risk even in persons of normal weight.
Source: From *Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults: The Evidence Report*, by the National Heart, Lung, and Blood Institute, 1998, p. xvii, Washington, DC: U.S. Department of Health & Human Services. Retrieved June 25, 2006 from http://www.nhlbi.nih.gov/guidelines/obesity/ob_gdlns.htm

Methods of Determining Caloric Needs

- The first step in designing a personal nutrition plan for ourselves is to calculate how many calories we burn in a day; our total daily energy expenditure (TDEE).
- TDEE is the total number of calories that our body expends in 24 hours, including all activities.

Specific Dynamic Action

- Ingestion of food is accompanied by an increased rate of heat production. The extra-heat production by the body, over and above the calculated caloric value, when a given food is metabolized by the body, is called as specific dynamic action.

Examples :-

The energy requirement of a man (age 20 years, BMR=42 Cal/ Sq. meter body surface/hr., body surface area=1.7 sq. m) engaged in light work-

The energy demand depends on three important factors:

a. Basal metabolic rate

b. Physical activity

c. Specific dynamic action

The food provides energy for:

- Basal metabolism (8 hours)

- Simple activities: standing, sitting, walking, dressing and writing (8hours).
- Professional work: i) light work, ii) moderate work, iii) heavy work iv)very heavy work (8 hours).
- Other 10% as SDA.

The daily energy requirement is variable which depends on age, sex, and body size.

- Sleep-basal level (8 hour) BMR x body surface area x 8 hr.

  = 42 x 1.7 x 8 = 571 Cal

- Simple activities (8 hr.) at basal level = 571 Cal

  For simple activities at 25 Calories / hr.

  over basal level 25 x 8 = 200 Cal

- For professional work (light work) at basal level = 571 Cal

- For professional work at 55 Calories/hr.

  over basal level 55 x 8 = 440 Cal

  Subtotal = 2353

Extra 10 % for SDA, = 235 Cal

Total = 2588 Cal/day

The energy requirement of dental student (age 18 years, BMR = 40 Cal/Sq.meter body surface/hr, body surface area = 1.7 sq.m) engaged in moderate work

- Sleep-basal level (8 hour) BMR x body surface area x 8 hr.

  = 40 x 1.7 x 8 = 544 Cal.

- Simple activities (8 hr.) at basal level = 544 Cal

  For simple activities at

25 Calories/hr. over basal
level 25 x 8 =200 Cal
For professional work
(light work)
at basal level = 544 Cal
For professional work at
75 Calories/hr. over basal
level 75 x 8 = 600 Cal
Sub total = 2432
Extra 10 % for SDA, = 243 Cal
Total =2675 Cal/Day

The energy requirement of men (age 25 years, BMR=40 Cal/Sq.meter body surface/hr,
body surface area=l.7 sq.m) engaged in heavy work

- Sleep- basal level (8 hour) BMR x body surface area x 8 hr.
  = 40 x 1.7 x 8 = 544 Cal.
- Simple activities (8 hr.)
  at basal level = 544 Cal
  For simple activities at
  25 Calories/hr. over
  basal level 25 x 8 =200 Cal
- For professional work
  (heavy work)
  at basal level =544 Cal
  For professional work at
  150 Calories/hr. over basal
  level 150 x 8 =1200 Cal
  Subtotal =3032 Cal
  Extra 10 % for SDA, =303 Cal
  Total =3335 Cal/Day

From the above calculations the reference ranges of Caloric requirements of various
types of work for an adult per day is as follows:
Light work 2100- 2600
Moderate work ...2500-3000
Heavy work 3000-3500
Very heavy work 3500-4000

Unit IV

Carbohydrates (Sugar , starch , and fiber) :

- **Function**
- **Requirement and Sources**
- **Various health of dietary fiber**

Learning objectives

At the end of this chapter, the student should be able to:

1. Define concepts.
2. Identify the functions of carbohydrates.
3. Compare between soluble and insoluble dietary fibers.
4. Disuses the daily requirements for carbohydrates and fibers.
5. Describe the dietary sources of carbohydrates and fibers.
6. Outline the main therapeutic effect of rich- fiber diet

Carbohydrates

- Carbohydrates are organic compounds composed of carbon ,hydrogen, and oxygen.
- They play a significant role in providing cells with energy and supporting the normal functioning of the body.
- Carbohydrates are classified according to the number of saccharides (sugar units), as follow:
    a. **Monosaccharides** (simple sugars) include glucose, galactose ,and fructose.

b. **Disaccharides** (double sugars) include sucrose, lactose, and maltose.
c. **Polysaccharides** (complex sugars) include glycogen, cellulose (fiber), and starch.

Classification of carbohydrates

1. **Simple carbohydrates** (sugars) and,
2. **Complex carbohydrates** (starches and fibres).As with all nutrients, carbohydrates must be ingested, digested and metabolized.

Types of Carbohydrates

a. **Sugars*:*** Sugars, the simplest of all carbohydrates, are water soluble and are produced naturally by both plants and animals. Sugars may be monosaccharaides (single molecules such as glucose-the most simple sugar-fructose, and galactose) or disaccharides (double molecules).

Most sugars are produced naturally by plants, especially fruits, sugar cane, and sugar beets. However, other sugars are from an animal source. For example, lactose, a combination of glucose and galactose, is found in animal milk.

Processed or refined sugars (e.g., table sugar, molasses, and corn syrup) have been extracted and concentrated from natural sources.

b. **Starches :**Starches (polysaccharides) are the insoluble, non-sweet forms of carbohydrate. They are composed of branched chains of dozens or hundreds of glucose molecules. Like sugars, nearly all starches exist naturally in plants, such as grains and potatoes. Other foods, such as cereals, breads, flour, and puddings, are processed from starches.

c. **Fibres:** Fibres, a complex carbohydrate derived from plants, supplies roughage, or bulk, to the diet. However, fibres cannot be digested by humans but satisfies the appetite and helps the digestive tract to function effectively and eliminate waste. Fiber is present in the outer layer of grains, bran, and in the skin, seeds, and pulp of many vegetables and fruits.

Natural sources of carbohydrates also supply vital nutrients, such as protein, vitamins, and minerals that are not found in processed foods.

Carbohydrate Metabolism.

Major enzymes include:

- Ptyalin (salivary amylase), pancreatic amylase, and the disaccharidases-maltase, sucrase, and lactase and are used in carbohydrate digestion.
- The desired end products of carbohydrate digestion are monosaccharaides, which are absorbed by the small intestine in a healthy person.
- After the body breaks carbohydrates down into glucose, some glucose continues to circulate in the blood to maintain blood levels and to provide a readily available source of energy.
- The remainder is either used as energy or stored, either as glycogen, a large polymer (compound molecule) of glucose, or as fat (glucose that cannot be stored as glycogen is converted to fat), by a process called glycogenesis in the liver and skeletal muscles.

- Insulin, a hormone secreted by the pancreas, enhances the transport of glucose into cells.

Function of Carbohydrates.

To some extent every body cell depends on glucose. The cells of the nervous system and the brain almost exclusively use glucose for energy.

- Fibers are different than starches in that they cannot be broken down by the digestive system, and therefore they provide little or no energy for the body.
- Fiber has been shown to protect against heart disease and diabetes by lowering cholesterol and glucose levels.
- Fiber has also been shown to help provide a feeling of fullness, and promote proper bowel function.
- Some examples of good sources of fiber are bran cereals, okra, butter beans ,kidney beans, navy beans, sweet potatoes .

Dietary fiber

- Dietary fiber is a complex mixture of dietary fiber is a complex mixture of plant materials that are resistant to breakdown (digestion) by the human digestive enzymes.
- There are two major kinds of dietary fiber:

1. **Insoluble** (cellulose, hemicelluloses, and lignin) found in whole-grain products such as whole-wheat bread.
   Insoluble fiber means it does not dissolve in water

Importance of insoluble fibers

a. promotes normal elimination by providing bulk for stool formation and thus hastening the passage of the stool through the colon**.**

b. helps to satisfy appetite by creating a full feeling**.**

c. It also cannot be used by intestinal-colon bacteria as a food source, so these beneficial bacteria generally do not grow and produce intestinal gas.

2. **Soluble** (gums, pectins) fibers found in fruits, vegetables, dry beans and peas, and some cereals such as oats.

Importance of Soluble fibers

a. Some studies indicate that soluble fibers may play a role in reducing the level of cholesterol in the blood.

b. It seems to bind up cholesterol allowing it to be eliminated with the stool (10-15%).

- Eating a variety of foods that contain dietary fiber is the best way to promote health.
- Breads, cereals, other grain products, fruits, vegetables, meat, poultry, fish and alternates are the sources.

Fiber as therapeutic diet

Problems/disease	Clinical features	Importance of fiber diet
Irritable bowel syndrome (IBS)	• altered bowel habits, • constipation, diarrhea, or both alternately. • bloating, abdominal pain, cramping, and spasm. • An attack of IBS can be triggered by emotional. Tension and anxiety, poor dietary habits, and certain medications.	• help to relieve the symptoms of irritable bowel syndrome by producing soft bulky stools. • helps to normalize the time it takes for the stool to pass through the colon •
Colon Polyps/Cancer		• Fibers produce a large bulky stool may act to dilute these carcinogens by moving them through the bowel more quickly.
Diverticulosis	• These pockets usually cause no problems. • of infection or inflammation of the sac lining the abdomen (peritonitis).	• A high-fiber diet may increase the bulk in the stool and thereby reduce the pressure within the colon. • A high-fiber diet reduce the formation of pocket.

Unit VI: Proteins

Outline :

- Function of protein
- Protein quality
- Requirements of protein
- Nitrogen balance and the suitable situation to be positive or negative .

Learning Objectives

At the end of this chapter, the student should be able to:

1. define concepts
2. discuss the roles of proteins in the body.
3. Compare between complete and incomplete proteins.
4. Mentions the sources for each type of proteins
5. Describe the effect of proteins on the body weight.
6. Discus the daily requirement for protein.

Proteins

- Proteins are organic compounds that contain carbon ,hydrogen, oxygen, and nitrogen atoms; some proteins also contain sulfur.
- After water, proteins are the most abundant intracellular substance.

- Proteins are essential for almost every bodily function, beginning with the genetic control of protein synthesis, cell function, and cell reproduction .
- The end products of protein digestion are amino acids.
- Every cell in the body contains some protein, and about three quarters of body solids are proteins.
- Amino acids are basic structural units of proteins and categorized as essential or nonessential.

a. Essential amino acids

- are those that cannot be manufactured in the body and must be supplied in the diet.
  - Nine essential amino acids-histidine, isoleucine, leucine, lysine, methionine, phenylalanine, tryptophan, threonine, and valine are necessary for tissue growth and maintenance.
  - A tenth, arginine, appears to have a role in the immune system.

b. Nonessential amino acids

- are those that the body can manufacture.
- Nonessential amino acids include alanine, aspartic acid, cysteine, glutamic acid, glycine, hydroxyproline, proline, serine, and tyrosine.

Plasma proteins

- Plasma proteins , mainly in the form of albumin and globulin , are organic compounds of large molecular size .

- They do not as freely across membranes as electrolytes , which are much smaller .
- Thus plasma protein molecules are retained in blood vessels , controlling water movement in the body and maintaining blood volume by influencing the shift of water in and out of capillaries in balance with the surrounding water .
- In this function plasma proteins re called colloids , which exert colloidal osmotic pressure (COP) to maintain integrity of the blood volume .

Protein Digestion

- Digestion of protein foods begins in the mouth, where the enzyme *pepsin* breaks protein down into smaller units.
- Most proteins are digested in the small intestine.
- The pancreas secretes the proteolytic enzymes trypsin, chymotrypsin, and carboxy peptidase; glands in' the intestinal wall secrete amino peptidase and dipeptidase.
- These enzymes break protein down into smaller molecules and eventually into amino acids.
- Amino acids are absorbed by active transport through the small intestine into the portal blood circulation.
- The liver uses some amino acids to synthesize specific proteins (e.g., liver cells and the plasma proteins albumin, globulin, and fibrinogen).

Storage

- Plasma proteins are a storage medium that can rapidly be converted back into amino acids.

- Other amino acids are transported to tissues and cells throughout the body where they are used to make protein for cell structures. In a sense, protein is stored as body tissue.
- The body cannot actually store excess amino acids for future use.

Protein Metabolism

Protein metabolism includes three activities: anabolism (building tissue), catabolism (breaking down tissue), and nitrogen balance.

- **ANABOLISM**. All body cells synthesize proteins from amino acids. The types of proteins formed depend on the characteristics of the cell and are controlled by its genes.
- **CATABOLISM**. Because a cell can accumulate only a limited amount of protein, excess amino acids are degraded for energy or converted to fat. Protein degradation occurs primarily in the liver.

The role of proteins in the body

1. Whenever our body is growing, repairing or replacing tissue, proteins are involved .
2. Proteins form the building blocks of bones, teeth, muscles, skin and blood.
3. In addition, proteins help to regulate fluid balance; act as enzymes, act as transporters and some hormones are proteins as well.
4. As antibodies, proteins also help with the body's defense against disease.
5. Proteins can also be used as a source of energy if needed

Complete and Incomplete Proteins

Complete Proteins contain an of the **essential amino acids** needed for growth.

Sources of Complete Proteins

a. animals like meat, fish, poultry.

b. cheese, eggs, yogurt and milk .

Incomplete Proteins are **missing one or more essential amino acids** needed for growth.

Sources of Incomplete Proteins

- Incomplete proteins are found in the plant form.
- Vegetables, seeds, nuts, grain and legumes.

Complementary proteins

- Two or more dietary proteins whose amino acid composition complement each other in such a way that the essential amino acids missing from one are supplied by the other.
- By combining two or more plant proteins we can consume all of the essential amino acids needed to support growth.
- We can receive all of the amino acids we need over the course of a day by choosing a variety of grains, legumes, seeds, nuts, and vegetables.

Recommended Daily Allowance for Protein

The RDA for adults is 0.8 grams of protein per kg/body weight/ day or go to table (1) in unit two

Biological Value of a Protein (BVP)

- It is a measurement of protein quality expressing the rate of efficiency with which protein is used for growth.
- A protein with high BV has all the essential amino acids in the right proportion. The BVP can be calculated by using a formula.

$$BVP = \frac{\text{N Intake - (Excretion in urine and feces)}}{\text{N Intake - N Excretion in feces}} \times 100$$

$$= \frac{\text{N Retained}}{\text{N absorbed}} \times 100$$

- Egg contains the highest quality food protein known.
- It is so nearly perfect, in fact that egg protein is often the standard by which all other proteins .are judged .
- Based on the essential amino acids It provides, egg human nutrition. on a scale with 100 representing top efficiency, these are the biological values of proteins m several foods

Whole egg	93.7

Milk	84.5
Fish	76.0
Beef	74.3
Soybeans	72.8
Rice, polished	64.0
Wheat, whole	64.0
Corn	60.0
Beans, dry	58.0

- Protein from animal sources (meat, fish dairy products, egg white) is considered high biological value protein or a "complete" protein because all nine essential amino acids are present in these proteins.
- An exception to this rule is collagen-derived gelatin which is lacking in tryptophan.

Nitrogen balance

- This is when a person's daily intake of nitrogen from proteins equals the daily excretion of nitrogen's.
- If a person .excretes more nitrogen than he consumes his .body will break down muscle tissue to get the nitrogen it needs(Negative nitrogen state) Muscle loss occurs.
- If a person consume more nitrogen than he excrete he will be in an anabolic muscle building - state (positive nitrogen state).

Unit IX: The Healthiest and Special Diets

Outline :

- Client's Diets
- Modification for diseases
- Vegetarian diets
- The system of diet therapy

Learning Objectives

At the end of this chapter, the student should be able to:

1. discuss the effects of disease on body systems.
2. Identify the types of therapeutic diet.
3. Specify the objectives of each types of therapeutic diet.
4. Describe the internal feeding and vegetarian nutrition .
5. Mention the diet therapy for the more common problems in body systems.

Client's Diets

- Alterations in the client's diet are often needed to:
    1. treat a disease process such as diabetes mellitus.
    2. prepare for a special examination or surgery.
    3. increase or decrease weight.
    4. restore nutritional deficits, or .
    5. allow an organ to rest and remote healing.

- Diets are modified inone or more of the following aspects: texture, kilocalories, specific nutrients, seasonings, or consistency.
- Hospitalized clients who do not have special needs eat the regular (standard or house) diet.
- a balanced diet that supplies the metabolic requirements of a sedentary person about 2,000 Kcal.
- A variation of the regular diet is the light diet, designed for postoperative and other clients who are not ready for the regular diet.
- Foods in the light diet are plainly cooked and fat is usually minimized, as are bran and foods containing a great deal of fiber.
- Diets that are modified inconsistency are often given to clients before and after surgery or to promote healing inclients with gastrointestinal distress.
- These diets include clear liquid, full liquid, soft, and diet as tolerated. Insome health institutions, gastrointestinal surgery clients are not permitted red-coloured-liquids or candy since , if vomited, the color may be confused with blood.

Types of Therapeutic Diet

A: Clear liquid diet

The major objectives of this diet are to:

1. relieve thirst.
2. prevent dehydration, and,
3. minimize stimulation of the gastrointestinal tract.

- This diet is limited to water, tea, coffee, or other carbonated beverages, strained and clear juices, and plain gelatine.
- Note that 'clear' does not necessarily mean 'colourless.'
- This diet provides the client with fluid and carbohydrate (in the form of sugar) but does not supply adequate protein, fat, vitamins, minerals, or calories.
- It is a short-term diet (24-36 hours) provided for clients after certain surgeries or in the acute stages of infection, particularly of the gastrointestinal tract.

B: Full liquid diet

- This diet contains only liquids or foods that turn to liquid at body temperature, such as milk drinks , sherbet , vegetable juices.
- Full liquid diets are often eaten by clients who have gastrointestinal disturbances or are otherwise unable to tolerate solid or semisolid foods.

C: Soft diet

- The soft diet is easily chewed and digested.
- It is often ordered for clients who have difficulty chewing and swallowing such as tender meat , cheese , potatoes , cooked vegetables , cooked or canned fruit , bananas , pasta , cooked cereals as rice , soft cake.

Diet as tolerated :

- Diet as tolerated is ordered when the client's appetite, ability to eat, and tolerance for certain foods may change.
- For example, on the first postoperative day a client may be given a clear liquid diet.
- If no nausea occurs, normal intestinal motility has returned as evidenced by active bowel sounds and client reports passing gas, and the client feels like eating, the diet may be advanced to a full liquid, or regular diet.

Modification for disease

- Many special diets may be prescribed to meet requirements for disease process or altered metabolism. For example, a client with diabetes mellitus may need a diet recommended by dietician in that health institution labelled as Diabetic diet.
- An obese client may need a calorie- restricted diet, a cardiac client may need sodium and cholesterol restrictions, and a client with allergies will need a hypoallergenic diet.
- Some clients must follow certain diets (e.g., low-salt diet) for a lifetime.
- The dietitian informs the client and support persons about the specific foods

allowed and not allowed and assists the client with meal planning.

- The nurse reinforces this instruction, assists the client to make changes, and evaluates the client's responses.

Enteral Nutrition

- An alternative feeding method to ensure adequate nutrition includes enteral (through the gastrointestinal system) methods.
- Enteral nutrition (EN), also referred to as total enteral nutrition (TEN), is provided when the client is unable to ingest foods or the upper gastrointestinal tract is impaired and the transport of food to the small intestine is interrupted.
- Enteral feedings are administered through nasogastric and small-bore feeding tubes, or through gastrostomy or jejunostomy tubes.

Vegetarian diets

- People may become vegetarians for economic, health, religious, ethical, or ecologic reasons.
- There are two basic vegetarian diets:
  1. those that use only plant foods (vegan) and those that include milk, eggs, or dairy products. Some people eat fish and poultry but not beef,
  2. others eat only fresh fruit, juices, and nuts; and still others eat plant foods and dairy products but not eggs.
- Vegetarian diets can be nutritionally sound if they include a wide variety of foods and if proper protein and vitamin and mineral supplementation are provided.

- Because the proteins found in plant foods are incomplete proteins, vegetarians must eat complementary protein foods to obtain all the essential amino acids.
- A plant protein can be complemented by combining it with a different plant protein.

The system of diet therapy

First prophylactic dietary regimes :

Statement	Diet
1. Phenyl ketone urea	Low phenyl alanine intake
2. Galactosemia	No milk
3. Hemolytic	Iron and folate intake
4. Hypertension	Low salt
5. Obesity	Low calorie intake

Second: Therapeutic dietary regimes:

Statement	Disease	Diet therapy
1. Urimea	Renal failure	Low protein intake
2. Protein in urine	Nephritic syndrome	High protein intake
3. Oedema	Heart , kidney , liver	Salt – restriction
4. High gastric juice	Peptic ulcer	Bland regime
5- Fat mal absorption	Pancreases disease	Low fat intake

Third : Therapeutic dietary regimes for systems:

Statement	Disease	Diet therapy
Dysphagia	Peptic	Semifluid
Dyspepsia	Gastro intestinal tract	Bland diet
Nausea	Gastro intestinal tract	Low fat
Constipation	Gastro intestinal tract	High fiber
Chronic diarrhoea	Gastro intestinal tract	Bland diet

Unit X: Nutrition During pregnancy and lactation

Outline :

- Healthy pregnancy
- Wight gain during pregnancy
- Nutritional demands of pregnancy
- General dietary problems
- Complications of pregnancy
- nutrition during pregnancy and lactation

Learning Objectives

At the end of this chapter the student should be able to:

1. Identify the characteristics of healthy pregnancy.
2. Describe the Wight changes during the different stages of pregnancy.
3. Principles of Nutritional therapy during Pregnancy.
4. Discuss the general dietary problems during pregnancy and lactation.
5. Describe the dietary requirement for pregnant and lactating women.

Healthy pregnancy

- A healthy pregnancy has often been defined by the birth weight of the newborn , because infant mortality , or death , is low for infants with birth weights of 3500 to 4500 gm.
- The two key factors that predict infant birth weight are:

1. maternal preconception weight and ,
2. weight gain during pregnancy .

- Nutrition and other lifestyle factors affect maternal weight and weight gain , many of these factors, particularly nutrition, are modifiable or may be controlled by the pregnant woman.

Weight gain in pregnancy

- The basal metabolic rate (BMR) rises during pregnancy by as much as 15% to 20% by term.
- This increase is caused by the increased oxygen needs of the fetus and the maternal support tissues .
- There are alterations in maternal metabolism of protein, carbohydrate and fat.
- **There are three components to maternal weight gain:-**

1. Maternal body composition changes including increased blood and extracellular fluid volume.
2. The maternal support tissues such as the increased size of the uterus and breasts
3. The products of conception, including the fetus and the placenta.

- Poor weight gain by the mother during pregnancy may then lead to growth retardation in the infant .
- Infant born small for gestational age (SGA) or low birth weight are more likely to require prolonged hospitalization after birth or be ill or die during the first year of life .

Low birth weight : weight less than (2500 gm) at birth

Nutritional demands of pregnancy

Pregnancy is associated with increased nutritional needs due to the physiologic changes of the woman and the metabolic demands of the embryo/fetus**.**

In fact, energy requirements increase by an estimated 300 kcal/day during pregnancy and 500 kcal/day during lactation**.**

Micronutrients need During Pregnancy

Micronutrient	**RDA**
Biotin	30 mcg/day (AI)
Folic Acid	600 mcg/day
Niacin	18 mg/day
Pantothenic Acid	6 mg/day (AI)
Riboflavin	1.4 mg/day
Thiamin	1.4 mg/day
Vitamin A	750 mcg (2,500 IU)/day
Vitamin B_6	1.9 mg/day

Vitamin B_{12}	2.6 mcg/day
Vitamin C	80 mg/day
Vitamin D	15 mcg (600 IU)/day
Vitamin E	15 mg (22.5 IU)/day
Vitamin K	75 mcg/day
Calcium	1,300 mg/day
Chromium	29 mcg/day
Copper	1 mg/day
Fluoride	3 mg/day
Iodine	220 mcg/day
Iron	27 mg/day
Magnesium	400 mg/day
Manganese	2 mg/day
Molybdenum	50 mcg/day
Phosphorus	1,250 mg/day
Potassium	4,700 mg/day

Selenium	60 mcg/day
Sodium	1,500 mg/day
Zinc	12 mg/day
Choline	450 mg/day

Vitamin A

- Adequate maternal status of vitamin A is critical for a healthy pregnancy.
- Forms of the vitamin, known as retinoids, are involved in the:
  1. regulation of gene expression.
  2. cellular proliferation and differentiation.
  3. growth and development.

  vision, and immunity.
- Vitamin A deficiency during pregnancy has been linked to:
  1. impaired immunity.
  2. increased susceptibility to infection, and,
  3. increased risk of maternal morbidity and mortality.

Principles of Nutritional therapy during Pregnancy.

1. Prevention of the weight extremes , underweight or obesity .

2. Correction of any dietary deficiencies and maintenance of optimal nutritional status during pregnancy .
3. Management of any related coexisting disease such as diabetes mellitus or hyperlipidemia

Energy needs

- The DRI standard recommends an additional amount of energy of approximately 340 kcal /day during the second trimester and,
- 450 kcal/day during the third trimester of pregnancy to supply needs during this time of rapid growth.

The calories must be sufficient two functions

1. Supply the increased energy and nutrient demands created by the increased metabolic workload, including some maternal fat storage and fetal fat storage to insure an optimal newborn size for survival.
2. Spare protein for tissue building.

Protein, fat and carbohydrate needs

- The total amount of protein recommended for a pregnant woman is 71 gm./day .
- an increase of 25 gm./day based on the woman non pregnant.
- More protein is necessary for demands posed by the following :-

    1. Rapid fetal growth
    2. Enlargement of the uterus , mammary glands, and placenta

3. Increase in maternal circulating blood volume and for increased plasma proteins to maintain colloidal osmotic pressure and circulation of tissue fluids.
4. Formation of amniotic fluid.
5. Storage reserves for labor, delivery and lactation

- Carbohydrate intake at least 175 g/ day during pregnancy is important for an adequate supply of glucose and non-protein energy .
- Whole grain breads and cereals and fresh fruits and vegetables should be consumed to meet maternal and fetal glucose needs, as well as provide fiber for satiety and bowel regulation .
- In general, total daily dietary k-calorie intake should comprise 15% protein ,30% fat and 55% carbohydrate.

Mineral needs

All the major and trace minerals play roles in maternal health . Four that have special functions in relation to pregnancy , calcium , iodine , iron and zinc.

Mineral	Daily requirement	importance
Calcium	1000 mg of calcium per day	• construction and maintenance of bone and teeth. • important factor in the blood-clotting mechanism. • used in normal muscle action

Iodine	increase by 70 mg/day during pregnancy	• Iodine is vital for thyroid hormone synthesis and prevention of goiter. • support changes in maternal thyroid economy. • increased maternal renal clearance
Iron	27 mg of iron per day	
Zinc		

Vitamin needs

Vitamin	Daily requirement	importance
Vitamin A	770 µg	• Vitamin A is an essential factor in cell differentiation , organ formation. • maintenance of strong epithelial tissue. • tooth formation and normal bone growth
Vitamin C	85 mg/day	• Vitamin C is essential to the formation of intercellular cement substance in developing connective tissues and vascular systems . • It also increases absorption of iron , which is needed for the increasing quantities of hemoglobin
Vitamin D	5µg cholecalciferol (200 IU/day)	vitamin D is used to promote the absorption and utilization for these minerals

General dietary problems

1. Nausea and vomiting

- Symptoms of nausea and vomiting are usually mild and short term , is called " morning sickness " of early pregnancy.
- At least 50% of all pregnant women , most of them in their first pregnancy , experience this condition , beginning during the fifth or sixth week of the pregnancy and usually ending about the fourteenth to sixteenth week .
- This problems occur because some physiologic factors and hormonal changes in pregnancy or on low blood sugar which can be relieved by carbohydrate foods, but which will return within 2 to 3 hours after a meal .

- **Hyperemesis**: Severe vomiting during pregnancy , this persistent condition causes severe alterations in fluids and electrolytes, weight loss , and nutritional deficits , sometimes requiring hospitalization and alternative feeding by enteral parenteral methods to sustain the pregnancy . about 3.5 : 1000 occur in pregnant women.

2. Constipation

- Placental hormones relax the gastrointestinal muscles , and the pressure of the enlarging uterus on the lower portion of the intestine may make elimination somewhat difficult .
- Increased fluid intake and the use of naturally laxative foods containing dietary fiber , such whole grains , fruits and vegetables fruits and juices.
- Laxatives should be avoided .
- Appropriate daily exercise is essential for overall health during pregnancy .

3. **Heartburn or Gastric pressure :-**

- These discomforts occur especially after meals and are usually caused by the pressure of the enlarging uterus crowding the stomach .
- Gastric reflux of some of the food mass, now a liquid chyme mixed with stomach acid , causing an irritation and a burning sensation .
- Small meals, avoiding eating large meals at any time , and not lying down after a meal .

Effects of iron supplements

- The effect of iron supplement may include gray or black stools and sometimes nausea , constipation , or diarrhea .
- The iron supplement should be taken 1 hour before a meal or 2 hours after with liquid such as water or orange juice but not with milk or tea .
- The absorption of iron is increased with vitamin C and decreased with milk , other dairy foods , eggs , whole grain bread and cereal , and tea.

Nutrition during lactation

Nutritional needs

The physiologic needs of lactation are different from those of pregnancy , and they demand adequate nutritional support.

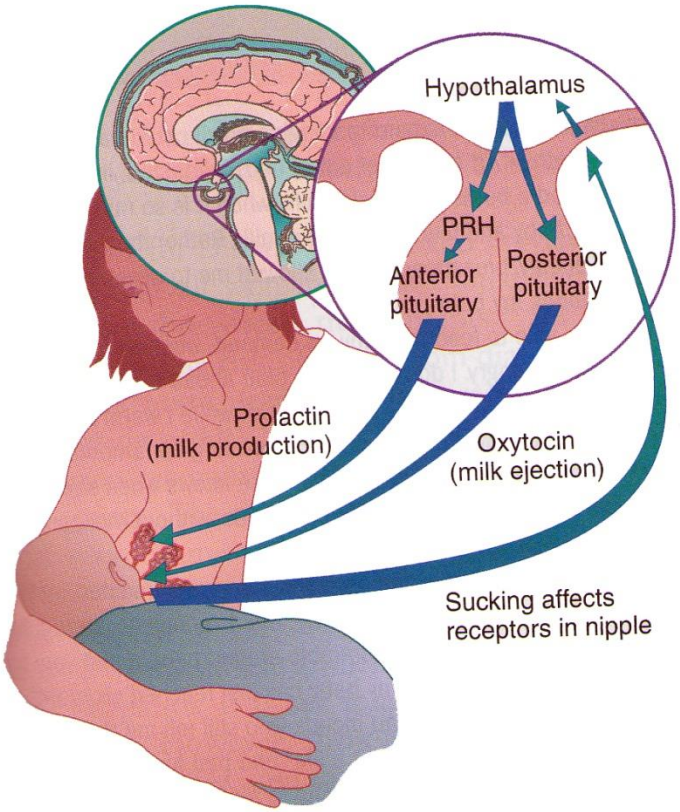
Energy

- The recommended caloric increase is 330 kcal/day (plus 170kcal /day from maternal stores) in the first 6 months and 400 kcal /day in the second 6 months of breastfeeding .
- This makes a daily total of about 2700 to 2800 kcal , this additional energy need for the overall total lactation process is based on the following four factors :

1. **Milk content** :as average daily milk production for lactating women is 780 ml .

   The energy content of human milk averages 0.67 to 0.74 kcal/g .Thus 780 ml of milk has a value of about 525 kcal .

2. **Milk production**
   - The metabolic work involved in producing this amountof milk is about 80% efficient and requires from 400 to 450 kcal .
   - During pregnancy the breast is developed for this purpose , stimulated by hormones from the placenta .
   - After birth the mother's production of the hormone prolactin continues this milk production process .
   - The suckling infant stimulates the brain's release of the hormone oxytocin from the pituitary gland to initiate the letdown reflex for the release of the milk from storage cells to travel down to the nipple .



Maternal breastfeeding reflexes.

3. **Maternal adipose tissue storage**
   - A component of the energy need for lactation (170 kcal/day in the first 6 months , is drawn from maternal adipose tissue stores deposited during pregnancy in normal preparation for lactation to follow in the maternal cycle .
   - additional energy input may be needed in the lactating woman's daily diet
4. **Exercise** : In some women , the weight gain during pregnancy , some overweight women who are breastfeeding have a weight loss program ,

this weight loss of around 0.5 kg/week from 4 to 14 weeks did not affect infant growth during lactation .

Protein

The recommendation for protein needs during lactation is 71g/day during both the first 6 months and second 6 months.

Minerals

The DRI standard for calcium during lactation is 1000 mg/day.

Vitamins

The DRI standard for vitamin C during lactation is 120 mg/day .

Maternal Micronutrients During Lactation

Micronutrient	Age	Recommended daily allowance (RDA)
Biotin	14-50 years	35 mcg/day (AI)
Folic Acid	14-50 years	500 mcg/day[a]
Niacin	14-50 years	17 mg/day[b]
Pantothenic Acid	14-50 years	7 mg/day (AI)
Riboflavin	14-50 years	1.6 mg/day

Thiamin	14-50 years	1.4 mg/day
Vitamin A	14-18 years	1,200 mcg (4,000 IU)/day[c]
Vitamin B_6	14-50 years	2.0 mg/day
Vitamin B_{12}	14-50 years	2.8 mcg/day
Vitamin C	14-18 years	115 mg/day
Vitamin D	14-50 years	15 mcg (600 IU)/day
Vitamin E	14-50 years	19 mg (28.5 IU)/day[d]
Vitamin K	14-18 years	75 mcg/day (AI)
Calcium	14-18 years	1,300 mg/day
Chromium	14-18 years	44 mcg/day (AI)
Copper	14-50 years	1.3 mg/day
Fluoride	14-50 years	3 mg/day (AI)
Iodine	14-50 years	290 mcg/day
Iron	14-18 years	10 mg/day
Magnesium	14-18 years	360 mg/day
Manganese	14-50 years	2.6 mg/day (AI)

Molybdenum	14-50 years	50 mcg/day
Phosphorus	14-18 years	1,250 mg/day
Potassium	14-50 years	5,100 mg/day (AI)
Selenium	14-50 years	70 mcg/day
Sodium	14-50 years	1,500 mg/day (AI)
Zinc	14-18 years	13 mg/day
Choline	14-50 years	550 mg/day (AI)

Unit XI: Infant Nutrition

Outline :

- Breast feeding
- Bottle feeding
- Weaning time

Learning Objectives

At the end of this chapter, the student should be able to:

1. Describe the energy and nutritional requirements for infant.
2. Identify the principles and advantages of breast feeding.
3. Discuss the indications of bottle feeding.
4. Identify the steps of formula preparation of bottle feeding.

Infancy

- The development of individual begins at birth and continues throughout life .
- Food is intimately related at each stage of development because physical growth and personal psychosocial development go hand in hand .

Breast feeding

- Human milk is the ideal first food for infants and is the primary recommendation of pediatricians and nutritionists .

- Nutrients in human milk are uniquely adapted to meet the growth needs of infants and are in forms more easily digested , absorbed ,and used.
- Breastfeeding supports early immunity for the baby , helps the mothers uterus quickly return to normal size .
- The ideal food for the first 4 to 6 months of life for the infants is breast milk , which has the correct balance of all the essential nutrients as well as immunologic factors that protect the infant from acute and chronic diseases
- The breast should be offered at least 10 to 12 times per 24 hours in the first several weeks , the infant should stay on the breast , between 10 to 15 minutes per breast , is a good recommendation .
- During pregnancy the breasts prepare for lactation and , toward term , produce colostrum .

Colostrum

- A thin , yellow fluid first secreted by the mammary gland a few days after childbirth, preceding the mature breast milk .
- It contains up to 20% protein , including a large amount of lactalbumin, more minerals ,and less lactose and fat than mature milk ,as well as immunoglobulins that represent the antibodies found in maternal blood .
- Mature breast milk comes in within the first 3 to 5 days after delivery .
- As the infant grows , breast adapts in composition to match the needs of the developing child .
- The fat content of breast milk changes from beginning to the end of the single feeding .

Energy and nutrient needs during infancy :

Energy

- The WHO suggests that infants receive 108 kcal/kg /day for the first 6 months of the life and ,
- 98 kcal/kg/day from 6 months until the first birthday .
- Human milk is high in cholesterol and essential fatty acids which important for proper brain and nervous system development .

Protein

- Protein requirement is highest during the 4 months of life when the growth is the most rapid .
- It is suggested infants receive 2.2 g/kg/day from birth to 6 months of age and 1.6 g/kg/day for the second half of the first year .
- Increasing a normal infants protein intake above the recommended amount should be avoided because the infant kidney is immature and unable to handle the large renal solute loads of an adult .

Advantages of breastfeeding

1. Fewer infections: because the mother transfers certain antibodies or immune properties in human milk .
2. Fewer allergies : cow's milk contains a number of potentially allergy-causing proteins that human milk does not have .
3. Ease of digestion : because human milk forms a softer curd in the GI tract that is easier for the infant to digest.
4. Improved cognitive development in childhood .

5. Decreases in the risk of childhood obesity and heart disease .

Benefits of breastfeeding for mother

1. Promotes faster shrinking of the uterus .
2. Reduces postpartum bleeding .
3. Decreases risk of breast and ovarian cancer .
4. Strengthens bond with the infant .
5. Enhances self-esteem in the maternal role .
6. Eliminates the need for preparing and mixing formula .
7. Saves money not spent on formula .

Bottle feeding

- If a mother chooses not to breast feed , or some condition in either the mother or baby prevents it , bottle feeding of an appropriate formula is an acceptable alternative .
- Sterile procedures in formula preparation , the amount of formula consumed , and weaning from the bottle are some aspects that must be addressed to ensure the health of the child .

Choosing a formula : Most mothers who bottle feed their infants use a standard commercial formula . In some cases of milk allergy or intolerance , a soy – based formula is used .

Preparing the formula:

1. Whether preparing a single bottle for each feeding or a day's batch , scrub , rinse ,and sterilize all equipment .

2. With any commercial formula , the manufactures instructions for mixing concentrated or powdered formula with water should be precisely and consistently followed .

Feeding the formula

- Babies usually drink formula either cold or warm ; they simply want it to be consistent .
- Tilting the bottle to keep the nipple full of milk can prevent air swallowing , and,
- the baby's head should be slightly elevated during feeding to facilitate the passage of milk into the stomach .

Cleaning bottles and nipples

- Rinse bottles and nipples after each feeding with special bottle and nipple brushes , forcing water through nipple holes to prevent milk from crusting in them .

Weaning time

Weaning : to accustom a young child gradually to food other than the mother's milk or a bottle - fed substitute formula as the child's natural need to suckle wanes .

- By 6 to 8 months of age , as increasing amounts of other foods are introduced , weaning from bottle feeding takes place .
- Good food habits begin early in life and continue as the child grows .

- By 8 or 9 months of age , infants should be able to eat table foods like cooked , chopped , and simply seasoned foods without needing special infant foods .
- Whole cow's milk may be introduced at the end of the first year if the infant is consuming one third of his or her kcal as a balanced mixture of solid food ,including cereals , vegetables , fruits , and other foods , to supply adequate sources of vitamin C and iron .
- Foods with a high risk for choking and aspiration ,such as nuts , grapes , carrots , popcorn , cherries , peanut butter , and round candy , are best delayed for careful use only with the older child and not given to an infant .
- Throughout the first year of life , the requirements for physical growth and psychosocial development are met by human milk or formula , a variety of solid food additions ,and a loving , trusting relationship between parents and child .
- Solid food during the first year of life

Age	Food
4-5 months	iron – fortified infant cereal
5-6 months	strained fruits and vegetables strained fruits and vegetables
6-8 months	mashed or chopped fruits and vegetables juice from a cup
9-12 months	cheese , meats, egg yolk

Lec.9

Obesity :

Definition

- Obesity is defined as an excess accumulation of body fat ,this excess accumulation is the result of a positive energy balance where caloric intake exceeds caloric expenditure .
- It is the most common nutritional disorder in industrialized countries and is becoming increasingly prevalent in developing countries due to changing lifestyles.

Epidemiology

WHO further projects that by 2015, approximately 2.3 billion adults will be overweight and more than 700 million will be obese.

Etiology

1. Multifactorial disorders
2. Genetics:
3. Energy imbalance
4. Diet

- obesity is associated with increased food consumption .
- Intake of excess dietary fat has been implicated as a major cause of obesity

5. **Exercises**

- For a decades A strong link exists between physical inactivity and weight gain

6. **Diseases**

a. Hypothyroidism, Cushing's syndrome, pancreatic insulinoma, growth hormone deficiency, and hypothalamic insufficiency

b. A variety of psychosocial factors contribute to the development of obesity and to difficulty losing weight

7. **Drugs**

a. antipsychotics (phenothiazines, butyrophenones).

b. antidepressants and antiepileptic, (tricyclic antidepressants, lithium, valproate, carbamazepine); and,

c. insulin and some oral hypoglycemic.

d. the large doses of steroids sometimes used to treat autoimmune diseases can cause true obesity

Health effects of obesity

1. Obesity is associated with an increased prevalence of coronary artery disease, hypertension, diabetes mellitus, and other diseases.

2. **Diabetes (Type 2)**

   a. As many as 90% of individuals with type 2 diabetes are reported to be overweight or obese.

   b. Obesity has been found to be the largest environmental influence on the prevalence of diabetes in a population.

   c. Obesity complicates the management of type 2 diabetes by increasing insulin resistance and glucose intolerance, which makes drug treatment for type 2 diabetes less effective.

   d. A weight loss of as little as 5% can reduce high blood sugar.

3. **Hypertension**

   a. Over 75% of hypertension cases are reported to be directly attributed to obesity.

   b. Weight or BMI in association with age is the strongest indicator of blood pressure in humans.

   c. The association between obesity and high blood pressure has been observed in virtually all societies, ages, ethnic groups, and in both genders.

   d. The risk of developing hypertension is five to six times greater in obese adult Americans, age 20 to 45, compared to non-obese individuals of the same age.

4. **Cardiovascular Disease (CVD)**

   a. Obesity increases CVD risk due to its effect on blood lipid levels.

b. Weight loss improves blood lipid levels by lowering triglycerides and LDL ("bad") cholesterol and increasing HDL ("good") cholesterol.

c. Weight loss of 5% to 10% can reduce total blood cholesterol.

d. The effects of obesity on cardiovascular health can begin in childhood, which increases the risk of developing CVD as an adult.

e. Overweight and obesity increase the risk of illness and death associated with coronary heart disease.

f. Obesity is a major risk factor for heart attack, and is now recognized as such by the American Heart Association.

Treating of overweight and obesity

1. **Diet** : low energy (calorie) , diets , low fat diets ,low carbohydrates diets, and high-protein diets .
2. **Exercise** : increased movement is a way to increase energy expenditure that will burn fat deposits .
3. **Behavioral therapy** : increased physical activity , and eating a lower – fat diet .
4. Medication
5. Surgery

Lect.10

Malnutrition

Definition

- Poor nutrition due to an insufficient, poorly balanced diet, faulty digestion or poor utilization of foods. (This can result in the inability to absorb foods.)
- Malnutrition is not only insufficient intake of nutrients. It can occur when an individual is getting excessive nutrients as well as

Causes malnutrition:

•Human beings need a wide variety of nutrients to supply essential energy.

•Causes of malnutrition is occurs with deficiency of protein, both protein and carbohydrate, vitamins and minerals

Protein-energy Malnutrition (PEM) or Protein-calorie malnutrition(PCM)

Protein-calorie malnutrition (PCM) is present when sufficient energy and/ or protein is not available to meet metabolic demands, leading to impairment in normal Physiologic processes.

- **Kwashiorkor** is a condition which develops when there is protein deficiency.
- **Marasmus** occurs with deficiency of both protein and carbohydrates.

Causes of kwashiorkor

1. Inadequate dietary intake.
2. Poor quality dietary protein.
3. Increased metabolic demands.
4. Increased nutrient losses.

Symptoms

1. The increase in stature and retarded tissue development.
2. Poorly developed muscle and lack tone.
3. Severe edema.
4. Swollen legs and face.
5. Anorexia and diarrhea are common. Poor sanitation is cause of diarrhea.
6. Whimpering, but does not cry or scream.
7. The child is not interested in or curious about his surrounding, but remains seated whenever he is put down.

Pathologic and Biochemical Changes

1. Fatty infiltration of the liver.
2. Decreased serum levels of triglycerides, phospholipids, and cholesterol
3. Reduced amylase, lipase and trypsin.
4. Serum proteins and albumin fractions are markedly reduced.
5. Low Hb levels, especially if parasite infestation is also present.
6. Vitamin A levels are usually reduced. This could be a serious complication leading to and death in some children.

Marasmus

- It is a protein-caloric malnutrition caused by a diet deficient in both protein and carbohydrates.
- Severe growth failure and emaciation are the most striking characteristics of the marasmic infant. Marasmus differs from kwashiorkor in several important aspects.

Differences between marasmus and kwashiorkor

Marasmus	Kwashiorkor
1. The onset is earlier, usually in the first year of life	1. Onset is later , after the breast-feeding is stopped
2. Growth failure is more pronounced.	2. Not very pronounced
3. There is no edema	3. Edema is present
4. Blood protein concentration is reduced less markedly	4. Blood protein concentration is reduced very much
5. Skin changes are seen less frequently	5. Red boils and patches are classic symptoms
6. Liver is not infiltrated with fat	6. Fatty liver is seen
7. Recovery is much longer	7. Recovery period is short

Beriberi

- Beriberi is a thiamine (vitamin B1) deficiency which is common in South East Asia where many diets consist solely of white rice.
- Beriberi affects the proper functioning of the nervous system as well as the circulatory system and heart.

- Pregnancy, breast feeding mothers and those who are ill with fever may have a heightened dependency on thiamine and may develop a deficiency.
- Thiamine is best acquired through foods such as beef and whole grain (unrefined) breads and grains.

Pellagra

- Pellagra ”rough skin” is a niacin (or Tryptophan) deficiency which often results in the diarrhea and dermatitis.
- The large scale consumption of corn has resulted in many cases of pellagra because corn is poorly absorbed in the body.
- The best sources of Niacin are broccoli, eggs, dates, beef, salmon, seeds and peanuts.

Scurvy

- Scurvy is a disease which is occurs of vitamin C deficiency.
- Scurvy may occur in:
  a. those who consume large amounts of junk foods.
  b. smokers (as smoking depletes Vitamin C) and,
  c. those who don’t have proper access to sources of vitamin C.

Rickets

- Vitamin D deficiencies may result in “Rickets” which is a lack of proper calcium characterized by poorly developed and deformed bones.
- Vitamin D can be best found in cow’s milk but is very low in breast milk. Thus, women in developing countries are contributing to this disease if their babies sole source of nourishment is breast milk.

Anemia

The most common cause of anemia is a lack of food with plenty of iron .

Children who may get anemia :-

1. Born early
2. Born to anemic mother
3. Fed too long on milk only
4. Infected with parasites such as hookworm and whipworm
5. Not eating a mixed diet which contains iron-rich foods

Preventing anemia in young children

1. Pregnant women should eat kinds of food, especially those with plenty of iron , such as dark green leafy vegetables , beans , whole grain enriched cereals .

2. Babies born early need small doses of extra iron in the first 3 months of life , after 4-6 months , babies should have a mixed diet which contains good food sources of iron .
3. Babies should not drink tea, because it slows down the body's use of iron.
4. Children should live in clean surroundings , to prevent their getting hookworm infections .

Treating a child with anemia

1. Give plenty of iron-rich foods .
2. Give an iron tonic after a meal .