GOVERNMENT OF TAMIL NADU

HIGHER SECONDARY SECOND YEAR

NUTRITION AND DIETETICS

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Department of School Education

Untouchability is Inhuman and a Crime

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HOW TO USE THE BOOK?

Introduction	The subject to be discussed in the lesson is introduced
Text Book	This text book provides a tiny spark of information that ignites a mightly flame of knowledge in children.
Message Box	Gives information in short and crisp form and definitions also
Do You Know?	Provides additional information related to the subject in boxes to stir up the curiosity of students
Activity	For self-study and self evaluation
QR Code	Given to make content more interesting and dynamic in nature to enhance the thinking skills
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Summary	Describes the main points briefly in bullets for recapitulation
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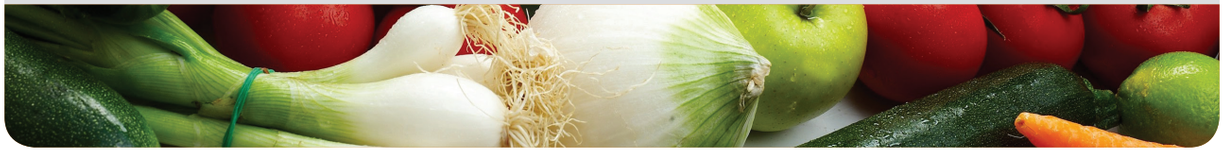

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Nutrition and Dietetics

Theory

RECOMMENDED DIETARY ALLOWANCES AND MEAL PLANNING

Unit 1

OBJECTIVES

At the end of this lesson, the student will be able to

- Know the various factors which influence our RDA and the difference between requirement and RDA
- Define the term balanced diet and understand the importance of consuming a balanced diet
- Discuss the use of food groups and RDA in planning balanced diets
- Understand the principles and aims of meal planning
- Identify the factors that need to be considered while planning meals
- Learn the steps involved in meal planning
- Understand the concept of food exchanges in meal planning
- Learn different ways of reducing the cost of a meal without affecting its quality

Nutrients are needed by humans in specific amounts to ensure good health and well being. These nutrient needs are met by eating the right kinds and amounts of food. While planning balanced diets, we need certain guidelines regarding the kinds and amounts of nutrients that we require for maintenance of good health.

Each day our body needs a supply of a number of nutrients to carry out its activities efficiently. Based on research the amounts and kinds of nutrients needed for good health have been determined.

1.1 RECOMMENDED DIETARY ALLOWANCES

Recommended Dietary Allowances (RDA) are estimates of intakes of nutrients which individuals in a population group need to consume to ensure that the physiological needs of all subjects in that population are met.

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The recommended dietary allowance (RDA) is the guideline stating the amount of nutrients to be actually consumed in order to meet the requirements of the body.

Evolution of Recommended Dietary Allowances (Indian Council of Medical Research- ICMR For Indian Population)

- Following the recommendations of the League of Nations in 1937, an attempt to recommend dietary allowances for energy, protein, iron,calcium, vitamin A, thiamine, ascorbic acid and vitamin D for Indians was made in 1944 by the Nutrition Advisory Committee of the Indian Research Fund Association, now called Indian Council of Medical Research (ICMR).

- Between 1950 and 1968, in the wake of recommendations for energy and protein requirements by the Food and Agricultural Organization (FAO) and based on the international data provided by the FAO/ WHO expert groups and those available in India, the recommendations for dietary requirements were revised.

- A few years later, a newer set of data were generated by various researches and surveys conducted by renowned institutions like Avinashilingam Institute for Home Science and Higher Education for Women – Deemed University, Coimbatore, National Institute of Nutrition, Hyderabad.

- ICMR and National Nutrition Monitoring Bureau (NNMB), created a necessity to revise RDAs further. In 1988 an expert committee constituted by ICMR modified the reference body weight for Indian adults and RDAs in respect of energy fat, vitamin D and vitamin A. Recommendations on the safe intake of fat in terms of both visible and invisible dietary fats were made. For the first time, recommendations for certain trace elements, electrolytes (sodium and potassium), magnesium and phosphorus, vitamin K and vitamin E and dietary fibre were considered.

A number of approaches such as

- Dietary intake of nutrients
- Growth
- Nutrient balance
- Minimal loss of nutrients and
- Nutrient turnover

were utilized in arriving at the RDAs.

Difference between Requirement and Recommended Dietary Allowances

The requirement for a particular nutrient is the minimum level that needs to be consumed to perform specific functions in the body and to prevent deficiency symptoms. It should also maintain satisfactory stores of the nutrients in the body.

Requirements are the quantities of nutrients that healthy individuals must obtain from food to meet their physiological needs. The recommended dietary allowances (RDA) are estimates of nutrients to be consumed daily to ensure the requirements of all individuals in a given population. The recommended level depends upon the bioavailability of nutrients from a given diet. The term bioavailability indicates what is absorbed and utilized by the body. In addition, RDA includes a margin of safety, to cover variation between individuals, dietary traditions and practices

Recommended Dietary Allowances = Requirement +Margin of safety

The margin of safety is added to take care of factors such as

1. Losses during cooking and processing

2. Short periods of deficient intake

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3. Nature of the diet

4. Individual variations in requirements

The requirement for vitamin C or ascorbic acid is actually 20 mg/day, but since the vitamin is easily destroyed during pre-preparation, cooking and storage, the recommended intake is twice the requirement and is 40 mg/day

1.1.1 Factors influencing RDA

The RDAs apply to healthy individuals and are set high enough to cover individual variation. Recommended dietary allowances of an individual depend on many factors like

1. **Age** - Adults require more total calories than a child, whereas a growing child requires more calories per kg of body weight than an adult.
2. **Sex** - Males with high Basal Metabolic Rate (BMR) require more calories than females.
3. **Physical activity**– The type of activity also determines the energy requirements. Based on the nature of work and level of activity different occupations are classified into three categories:
   - Sedentary
   - Moderate
   - Heavy

Sedentary (light work): A sedentary person is one who does most of the -work sitting at one place using only his hands and head. A few examples of individuals undertaking sedentary work include teachers, tailors, typists, clerks, office executives, housewives who have household help.

Moderate (neither too light nor too strenuous hard work): A person is said to be a moderately active individual if his/her work involves the use of both hands and feet continuously but not very strenuously. A few examples of people who would belong to this group would include postmen, housemaids, servants, fishermen, agricultural labourers, housewives who do most of the housework themselves manually.

Heavy (hard, strenuous work): A person is a heavy worker if he/she is involved in hard/ strenuous work using hands and feet very fast and continuously for a long period each day. Rickshaw pullers, stone cutters, mine workers, coolies belong to this group.

4. Physiological state : Nutrient requirements are increased in conditions of physiological stress such as pregnancy and lactation.

5. Disease and drugs : Drugs prescribed for treatment can alter the requirement of one or more nutrients.

1.1.2 Recommended dietary intakes for adults

Age : 18 - 29 years

Weight : 60 kg

Age : 18 - 29 years

Weight : 55 kg

Fig.1.1 Reference man and Woman

Recommended dietary intakes for adults are based on age, sex, body size and activity level. In the case of adults, there are substantial variations in RDA particularly for energy and protein depending on the age, body weight,and activity pattern. That is why RDAs have worked out on the basis of a **"Reference individual".** The **Reference man** is an **Indian man** in the age

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Table no 1.1. RECOMMENDED DIETARY ALLOWANCES FOR INDIAN 2010

Group	Particulars	Body wt kg	Net Energy Kcal	Protein g/d	Fat g/d	Calcium mg/d	Iron mg/d	Vitamin A		Thiamin mg/d	Riboflavin mg/d	Niacin mg/d	Pyridoxine mg/d	Ascorbic acid mg/d	Folic acid mg/d	Vit B12 mg/d
								Retinol µg/d	B-carotene µg/d							
Man	Sedentary work	60	2320	60	25	600	17	600	4800	1.2	1.4	16	2.0	40	200	1
	Moderate work		2730		30					1.4	1.6	18				
	Heavy work		3490		40					1.7	2.1	21				
Women	Sedentary work	55	1900	55	20	600	21	600	4800	1.0	1.1	12	2.0	40	200	1
	Moderate work		2230		25					1.1	1.3	14				
	Heavy work		2850		30					1.4	1.7	16				
	Pregnant Woman		+350	+23	30	1200	35	800	6400	+0.2	+0.3	+2	2.5	60	500	1.2
Lactation	0-6 months	55	+600	+19	30	1200	21	950	7600	+0.3	+0.4	+4	2.5	80	300	1.5
	6-12 months		+520	+13	30					+0.2	+0.3	+3	2.5			
Infants	0-6 months	5.4	92/kg	1.16 g/kg	-	500	46 µg/kg	350	2800	0.2	0.3	710 µg/kg	0.1	25	25	0.2
	6-12 months	8.4	80/kg	1.69 g/kg	19		5			0.3	0.4	650 µg/kg	0.4			
Children	1-3 years	12.9	1060	16.7	27	600	9	400	3200	0.5	0.6	8	0.9	40	80	0.2-1.0
	4-6 years	18.0	1350	20.1	25		13	400	3200	0.7	0.8	11			100	
	7-9 years	25.1	1690	29.5	30		16	600	4800	0.8	1.0	13	1.6		120	
Boys	10-12 years	34.3	2190	39.9	35	800	21	600	4800	1.1	1.3	15	1.6	40	140	0.2-1.0
Girls	10-12 years	35	2010	40.4	35		27			1.0	1.2	13	1.6			
Boys	13-15 years	47.6	2750	54.3	45	800	32	600	4800	1.4	1.6	16	2.0	40	150	0.2-1.0
Girls	13-15 years	46.6	2330	51.9	40		27			1.2	1.4	14				
Boys	16- 17 years	55.4	3020	61.5	50	800	28	600	4800	1.5	1.8	17	2.0	40	200	0.2-1.0
Girls	16- 17 years	52.1	2440	55.5	35		26			1.0	1.2	14				

Source: Dietary Guidelines for Indians - A Manual by Kamala Krishnaswamy, B. Sesikeran (Second Edition 2011), NIN, ICMR

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group of **18-29** years doing **moderate work** and weighing **60 kg**. Similarly, an **Indian woman 18-29** years old doing **moderate work** and weighing **55kg** is referred to as the Reference woman.

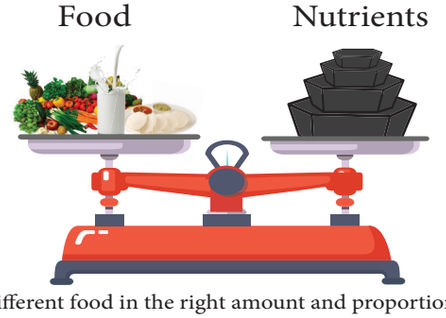
The RDA is based on scientific knowledge and prepared by the National Nutritional Advisory Committee (ICMR). The Committee revises the RDA every 10 years. The current RDA for Indians was set up in 2010. The recommended dietary allowances for Indians (2010) is given in table 1.1

1.2 BALANCED DIET

A **"Balanced Diet"** can be defined as **one which contains different types of foods in such quantities and proportions that the need for calories, minerals, vitamins, and other nutrients is adequately met and a small provision is made for extra nutrients to, withstand short durations of leanness.**

A balanced diet should provide around 50-60% of total calories from carbohydrates, 10-15% from proteins and 20-30% from both visible and invisible fat.

In addition, a balanced diet should provide bioactive phytochemicals such as dietary fibre, antioxidants and other nutraceuticals which have positive health benefits.



Different food in the right amount and proportion provide all essential nutrients and thus make a balanced diet

Fig. 1.2 Balanced diet

Balanced Diet enhances the quality of life as it:

- meets nutritional requirement
- prevents degenerative diseases
- improves longevity
- prolongs productive life
- improves immunity
- increases endurance level
- develops cognitive ability
- helps in coping up with stress

Points to be considered in planning a balanced diet

- Calorie allowances can be ± 50, while for all other nutrients minimum RDA must be met.
- Energy from cereals should not be more than 75 percent.
- Include two cereals in one meal e.g. rice and wheat.
- To improve protein quality the ratio of cereal protein to pulse protein should be 4:1.
- Two to three serving of pulses should be taken a day.
- Include at least one medium size fruit. The fruit can be given raw without much cooking.
- Five servings of fruits and vegetables should be included in a day
- The diet should include minimum 100ml milk per day.
- Foods rich in fibre should be included.
- One-third of the nutritional requirements, at least calorie and protein should be met by lunch and dinner.

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Fig no 1.3 Food Guide for planning a balanced diet

In order to plan balanced meals for people, the foods we use in our daily meals are classified into four basic food groups: on the basis of the major nutrients present. The food groups are chosen because of the specific nutrients contributed by each to the total diet. This practical tool devised to guide food selection to meet nutritional needs is termed **'Food Guide'.**

A food guide is a practical tool in meal planning and evaluation

It's a guide that helps us to make healthy food choices

It tells us all the food groups our bodies need and how many servings of each group we need

How to plan a meal with the help of the Food Guide?

- ❖ Include foods from each of the four broad food groups
- ❖ Choose the minimum number of servings from each group
- ❖ Make choices with in each group
- ❖ Include one food from the protein group in each meal
- ❖ Use seasonal foods

1.3 MEAL PLANNING

Any individual who carries the responsibility of providing meals has to take decisions regarding what to serve, how much to serve, how much to spend, where to shop, how much to buy, how to prepare food, how to serve meals and at what hour to serve the meal. All such decisions are a part of planning meals. Extending this concept further, one could define meal planning as a simple practical exercise which involves applying the knowledge of food, nutrient requirement, and individual preferences to plan adequate and acceptable meals. In other terms, **meal planning means planning for adequate nutrition.**

Meal planning means planning diets which will provide all nutrients in required amounts and proportions i.e. adequate nutrition.

As the family's well-being and health are depended on how well they are fed. It is a challenge to every meal-planner to meet it and when well done, it proves to be a satisfying and rewarding experience.

Meal planning thus is both an art and a science: **art** in the skillful blending of colors, texture, and flavor: and **science** in the wise choice of food for optimum nutrition and digestion.

1.3.1 Objectives of Meal planning

1. To satisfy the nutritional needs of the family members.

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2. To keep expenditure within the family food budget.

3. To take into account the food preference of individual members.

4. Using methods of cooking to retain maximum nutrients.

5. To economize on time, fuel and energy.

6. To serve attractive and appetizing meals.

Providing a meal that would be enjoyed and accepted by one and all in the family is rather difficult. Individual preferences, varied nutrient needs, varied food habits, are a few factors that would influence meal planning. The crucial aspect to be considered then is how best to plan adequate and satisfying meals, within the socio-cultural, economic, regional and psychological framework of the individual.

The various factors influencing meal planning are illustrated in figure 1.4

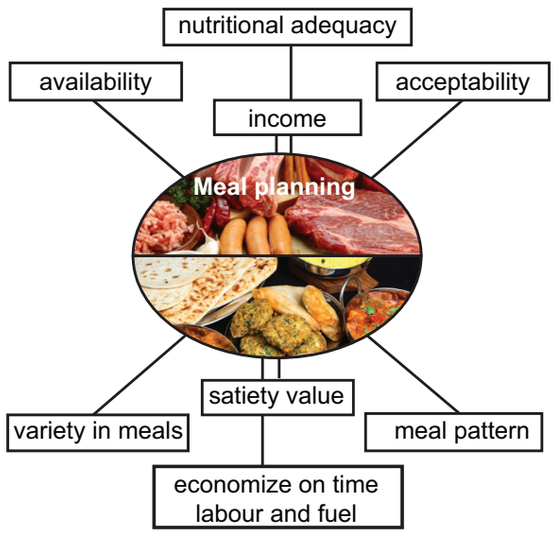

Fig. 1.4 Factors affecting Meal Planning

1.3.2 Factors affecting Meal Planning

1. Nutritional adequacy:

The nutritional requirement of the individual to be served is an important consideration in meal planning. This point is particularly important when we are planning meals for a family. In a family, there might be different individuals - a child, an adolescent, an adult, a pregnant woman or an elderly person. Each of these individuals has his/her own specific nutrient requirements. **The basic aim while planning meals should be to fulfill the nutrient needs of each individual**

How do we ensure this? This can be ensured by planning balanced meals according to the recommended dietary intakes for different individuals. No single food can meet all the nutritional requirements. Therefore, to achieve a balance of nutrients a combination of different foods need to be included in the diet. The diet can be planned by including foods from the four food groups. Although all nutrients are important, the requirement for certain nutrients is proportionately higher in certain age groups. e.g.- Iron in an adolescent girl and a pregnant woman. Therefore identifying rich sourcesof various nutrients within the same food group is required. e.g.- wholecereals and rice flakes are rich in iron among cereals, milk and fish have high calcium content among animal foods.

2. Food cost and economy

The expenditure on food is an important part of a family's budget and it is influenced by

- ❖ Family size
- ❖ The number of children
- ❖ Age group
- ❖ Activity and
- ❖ Special needs of pregnancy, lactation and disease condition.

The proportionate expenditure on food depends upon the income levels i.e. it increases with a decrease in total income. Moreover, in case of low-income level, a higher proportion is spent on buying staples rather than protective foods like milk, vegetables,and fruits. Therefore the aim should be to achieve

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maximum nutritional benefit at minimum cost. For example, pulses can be used as a source of protein instead of animal foods or less expensive cuts of meat can be used. For achieving economy in meal planning, the following considerations are important.

1. Knowledge of prevailing prices of food items.
2. Knowledge of proportion of edible portion of different food stuffs as they vary widely. It may be high as 100 percent in foods likemilk or low as 35-40 percent in leafy vegetables. This helps to decide the quantity of food to be purchased.

a. Likes and dislikes

The meal planned should not only meet RDA but also individual preference, particularly vegetarian or non- vegetarian preferences. The likes and dislikes of all the family members should be kept in mind.If a person does not like greens, it can be tried in a different form or substituted by some other equally nourishing food. Food habits, religion, traditions,and customs of the individual should be considered in planning the menu.

Meal planning helps to ensure nutritious meals according to personal likes / dislikes

3. Buying foods from fair price shops and retail outlets.
4. Bulk purchase of non-perishables.
5. Using seasonal foods as they are not only economical but also nutritious.
6. Minimizing nutrient losses during preparation and cooking.
7. Making proper use of left over foods and the commonly discarded foods e.g. green leaves of vegetables like radish leaves.

3. Acceptability of meals

Acceptability of meals is as important as meeting nutritional needs or planning within the budget. To make meals acceptable the following considerations are important.

b. Variety

The meal should have variety in colour, texture, taste andflavor for better acceptability. Variety can be achieved by

- selecting foods from each food group
- including a variety of vegetables to add colour
- avoid repeating the same food in different meals as well in the same meal in a different form.
- use different methods of cooking such as baking, boiling, frying to bring variety in texture.
- use alternative garnishes and accompaniments.

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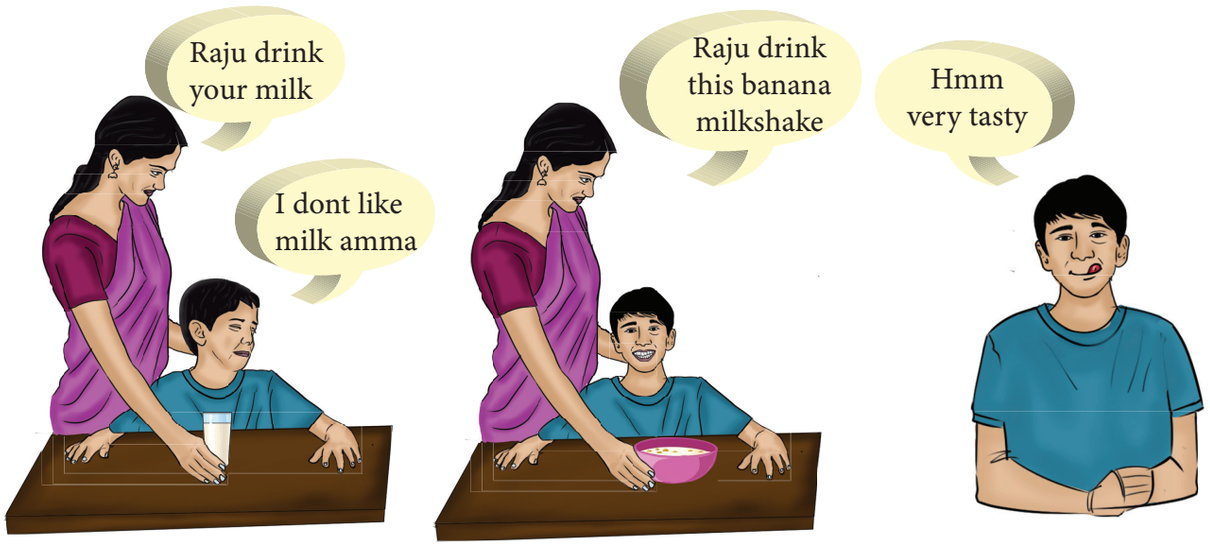

The form in which food is served influences food acceptance

c. Food habits and religious beliefs

Religious and socio-cultural beliefs influence the choice of food. Certain foods are prohibited by certain religions. Also, the socio-cultural factors either promote or prohibit the intake of particular foods indifferent families and communities.

d. Food availability and seasonal variation

As far as possible, seasonal and locally available foods should be used. Vegetables and fruits in season are not only cheap but have the highest nutrient content and best flavour.

e. Food Fads

Wrong notions and beliefs regarding consumption of food are prevalent in different communities many of which are baseless and may deprive an important nutrient source. For example, fad-like milk and fish should not be included in the same meal. These food fads need to be discouraged.

f. Portion sizes

While planning and preparing a meal, it must be ensured that the quantity prepared be easily consumed by the person of the given age, sex and activity. At the same time, the quantity must meet nutritional needs. These quantities are referred to as "one serving portion" or "portion sizes".

1.4 Steps in meal planning

The following steps may be adopted in planning meals.

1. Recommended Dietary Allowances

To plan a balanced diet the first step is to know the recommended dietary allowances for different age groups.

2. Food list

The next step is to prepare a food list ie., a list of quantities of various food groups to be included in the diet so that it is balanced and can meet the RDA. This can be done by

- Selecting foods from all the five food groups.
- Deciding the quantities of the selected foods as multiples of portion sizes.

The number of portion of various food groups to be included in planning a balanced diet for adults is given in Table- 1.2

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Table 1.2 Portion size for menu plan

Food groups	Portion (g)	Energy (Kcal)	Protein (g)	Carbohydrate (g)	Fat (g)
Cereals and Millets	30	100	3.0	20	0.8
Pulses	30	100	6.0	15	0.7
Egg	50	85	7.0	-	7.0
Meat, chicken or fish	50	100	9	-	7.0
Milk (ml) and milk products	100	70	3.0	5	3.0
Roots and Tubers	100	80	1.3	19	-
Green leafy vegetables	100	46	3.6	-	0.4
Other vegetables	100	28	1.7	-	0.2
Fruits	100	40	-	10	-
Sugar	5	20	-	5	-
Fats and oils	5	45	-	-	5

Source: Dietary Guidelines for Indians - A Manual by Kamala Krishnaswamy, B. Sesikeran (Second Edition 2011), NIN, ICMR

To calculate the day's requirement of above-mentioned food groups for an individual, multiply gram per portion with the number of portions

For example, the quantity of cereals and pulses to be included for an adult man doing sedentary work is 375g (30 x 12.5) and 75g (30 x 2.5) respectively.

Table 1.3 Balanced diet for adults- sedentary/moderate/heavy activity (number of portions)

	Portion (g)	Type of work					
		Sedentary		Moderate		Heavy	
		Man	Woman	Man	Woman	Man	Woman
Cereals and millets	30	12.5	9	15	11	20	16
Pulses	30	2.5	2	3	2.5	4	3
Milk	100 ml	3	3	3	3	3	3
Roots and tubers	100	2	2	2	2	2	2
Green leafy vegetables	100	1	1	1	1	1	1
Other vegetables	100	2	2	2	2	2	2
Fruits	100	1	1	1	1	1	1
Sugar	5	4	4	6	6	11	9
Fats and oils	5	5	4	6	5	8	6
For vegetarians substitute one pulse portion with one portion of egg/meat/chicken/ fish							

Source: Dietary Guidelines for Indians - A Manual by Kamala Krishnaswamy, B. Sesikeran (Second Edition 2011), NIN, ICMR

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Table 1.4 Balanced diet for infants, children, and adolescents (number of portions)

Food grops	g/portion	Infants 6-12 months	1-3	4-6	7-9	Years					
						10-12		13-15		16-18	
						Girls	Boys	Girls	Boys	Girls	Boys
Cereals & millers	30	0.5	2	4	6	8	10	11	14	11	15
Pulses	30	0.25	1	1.0	2	2	2	2	2.5	2.5	3
Milk (ml) & milk products	100	4*	5	5	5	5	5	5	5	5	5
Roots & tubers	100	0.5	0.5	1	1	1	1	1	1.5	2	2
Green leafy vegetables	100	0.25	0.5	0.5	1	1	1	1	1	1	1
Others vegetables	100	0.25	0.5	1	1	2	2	2	2	2	2
Fruits	100	1	1	1	1	1	1	1	1	1	1
Sugar	5	2	3	4	4	6	6	5	4	5	6
Fat/ oil (visible)	5	4	5	5	6	7	7	8	9	7	10

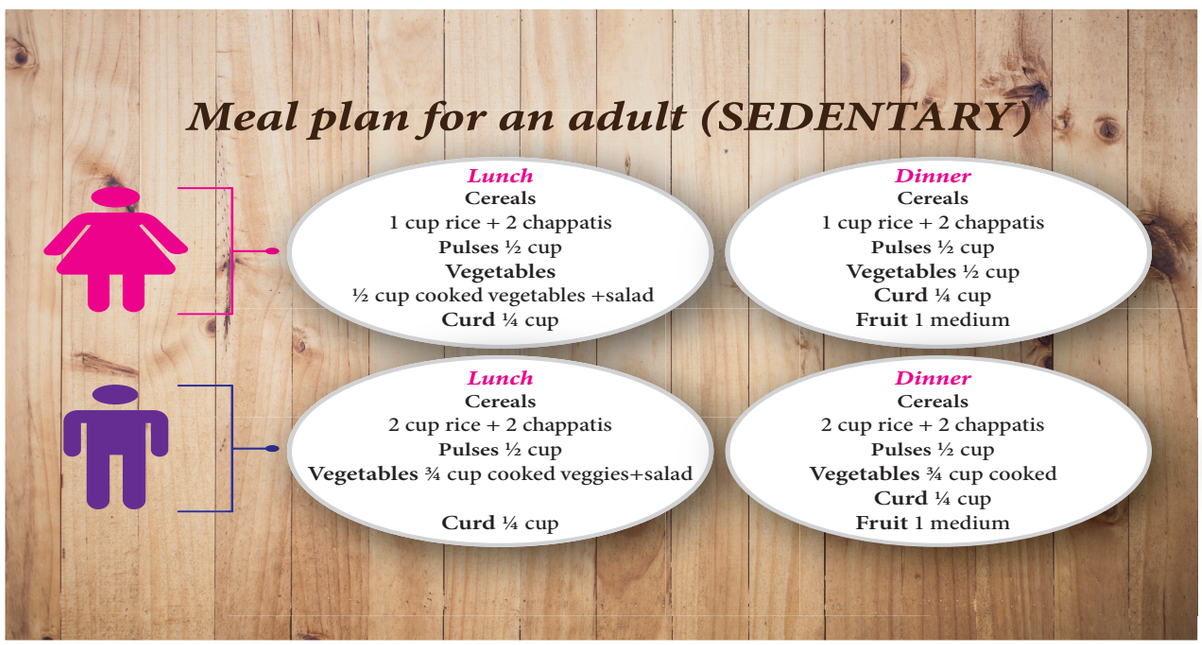
*Quantity indicates top milk. For breastfed infants, 200 ml top milk is required.

One portion of the pulse may be exchanged with one portion (50g) of egg/meat/chicken/fish

Source: Dietary Guidelines for Indians - A Manual by Kamala Krishnaswamy, B. Sesikeran (Second Edition 2011), NIN, ICMR

3.Making the menu

The foods that are listed in step II are converted into the actual recipes and distributed in different meals like breakfast, lunch, evening tea and dinner.



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1 day menu for an adult (sedentary work)

- Energy – 2875 kcal
- Protein – 60 gm (60kg wt.)

Meal	Food	Quantity
Early Morning	Milk or tea with sugar	1 cup
Breakfast	Bread with egg or paratha with curd, coffee	1 egg, 2 bread, 2 paratha, 1
Mid-day	Fruit chat or fruit juice or Tea with biscuits	1 cup, 4-6
Lunch	Vegetables, Chapati, Rice, Curd, Salad	1 cup, 2, 1 plate, 1 cup mixed
Evening Tea	Tea with snacks	1 cup
Night Dinner	Dal/ rajama, Vegetables, Chapati	1 cup 1 cup , 3
Bed time	Kheer/fruit	1 cup/fruit

1.5 Food Exchange

Each food group has similar food items that have been placed together in one food group. Therefore, if we substitute one food for the other in the same group, we will be able to get almost the same nutrients. For example, 'X' takes one glass of milk and roti in breakfast, 'Y' eats poha (rice flakes)and one Katori of curd whereas 'Z' eats one fresh cheese (paneer) sandwich. Looking at their food selection, all of them take milk or its product along with cereals and get approximately the same nutrients. So we can say that substitution of one food item with the other within a group in such a way that the nutrients provided by them are approximately the same is called **'Food Exchange'.**

Substitution of one food item with the other in such a way that the nutrients provided by them are the same is called "Food exchange".

If you are modifying the same meal for different family members, then how will you decide on how much of one item is equivalent to another one? If you are not sure about how to go about exchanging one food item with another in the correct proportion, then you may not be able to fulfill everyone's requirements correctly. For example, if you are exchanging milk with egg then you should know how much of milk is equivalent to one egg or if one does not want to eat an egg, in that case, how much of pulses should be given instead?

Food exchanges help you to modify the diet for an individual according to needs, likes, dislikes and food habits and help you to make the diet more flexible and interesting. The following illustration gives you a fair idea about the exchanges that can be done among various foods so that the nutrients derived by these foods remain the same.

Protein Rich Foods

Milk Egg Meat Pulses Curd Paneer Butter Milk

1 glass of milk = 1 egg = 1 medium size katori meat = 1 big katori pulses = 1 big katori curd = 1/4 cup of paneer = 3 cups of butter milk

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Cereals

1 Chapati = 1 bread slice = 1 potato = 1/2 cup rice = 1/2 cup dhal = 4 salted biscuits = 1/2 cup noodles = 1 idly = 1 plain dosa = 1/2 cup Upma/poha

Fat

1 tsp of butter = 1 tsp of oil = 2tsp mayonnaise = 4-5 pieces of nuts = 10-12 pieces of peanuts = 5 tsp cream.

Activity : 1

Your brother does not like milk but your sister is very fond of it. How will you solve this problem?

Activity : 2

Select nutritious snacks from the following food items. (i) Aval Uppuma (ii) FrenchFries (iii) Kozhukkatai (iv) Vegetable cutlets (v) Pizza (vi) Puffs (vii) Peanut balls

1.6 Low-Cost Balanced Dietts

The income of the family or more specifically, the amount of money available for food per person influence the kind and amount of food to be included in each meal. To understand this better consider the three income groups - low, middle and high.

People with limited income or those belonging to the lower income group may not be able to include much of milk, meat,and fruits in their daily diet as these are expensive foods. So the crucial decision is what food items to select that would enable them to plan nutritious meals at low cost. Well, there are many ways in which one can ensure nutritious meals without increasing the cost. To begin with, one could use:

- more of the cheaper foods like cereals. It would further lower cost if high price cereals such as rice or wheat are partially replaced by millets i.e. ragi, jowar, bajra and partially by roots and tubers i.e. potato, colocasia, tapioca
- jaggery instead of sugar
- seasonal and locally available fruits and vegetables only
- food combinations (cereal and pulse) and processes like germination, fermentation improve the nutritive value (as they add extra nutrients without extra cost)
- cheaper variety of pulses and cheap nuts such as groundnuts
- vegetable oils to increase energy and essential fatty acid intake
- inexpensive yellow fruits like papaya or mango and greens to increase vitamin A and C intake
- green leafy vegetables to improve the intake of vitamin A, iron and calcium
- at least 150 ml of milk to improve the intake of riboflavin, calcium besides improving the protein quality of the diet.

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People belonging to the "middle income group" can surely have more variety by including more of cereals (rice\wheat), pulses, milk, fruits,and vegetables. They can have reasonable amounts of fats\oils and sugar in their diets. However, use of nuts\oilseeds and other miscellaneous foods like jam, jellies etc would be limited. As income rises one gets the freedom to choose from a wide variety of foods –or out of season, locally available or purchased from outside. Consumption of milk and milk products, meat, vegetables, fruits, fats,and oils tends to increase. But care needs to be taken that foods like fats, oils, sugars, are not taken in amounts more than needed by the body.

1.6.1 Dietary Guidelines to reduce the cost of a meal

1. The inclusion of millets like ragi, jowar, and bajra can reduce the cost of a meal.
2. Combination of cereals and pulses improve the quality of cereal as well as pulse protein.
3. Pulses like horse gram can be included to reduce the cost of a meal.
4. Fermenting, malting and sprouting can be done at home which enhances the nutritive value without increasing the processing cost.
5. Greens, particularly from trees like drumstick or agathi, are cheaper. Locally available or kitchen garden produce can be used.
6. Leaves of cauliflower, carrots, knolkhol and beet root which are highly nutritious can become part of a meal. Curry leaves can be used in consumable form like chutneys, chutney powder or in ground form in curry leaves pulao.
7. Inexpensive and nutritious fruits like papaya and guava can be included in the diet.
8. Inclusion of dry fish (like nethili) may supply a good amount of nutrients without increasing the cost.
9. Jaggery can be used instead of sugar.
10. Toned milk with low fat is less expensive but gives all other nutrients except fat.
11. Steamed foods are less expensive than fried foods. Low-cost diets have less amount of fats, oils,and sugars.
12. Natural foods are less expensive compared to processed and preserved foods.
13. Foods that are distributed through the public distribution system (Ration shops) can be used.
14. Recipes made at home are cheaper than bought. Homemade food can be carried to the workplace instead of buying from the canteen.
15. The inclusion of locally available ingredients and seasonal foods reduce the cost of a meal

Activity : 3

Mr. A. is an accountant in a government office in Chennai. His office timings are 9.00 a.m. to 5.30 p.m. His meal pattern is as follows. He has bed-tea early morning. Before leaving for his office he eats a heavy breakfast. He carries a packed lunch to office (which he eats around 1.30 p.m.). Before lunch, around mid-morning, he usually takes tea along with his friends. Around 4- 4.30 p.m. he has another cup of tea supplemented with a snack. He returns home around 7.30p.m.and has dinner right away. Then late at night, before going to bed he drinks a glass of milk.

Now answer the following questions

a) What is the meal frequency adopted by Mr. A?

.....

b) List the various meals Mr. A has had in a day.

.....

c) Can you suggest a menu for dinner for Mr. A?

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POINTS TO REMEMBER

MEAL PLANNING

1. Plan meals according to the age, sex, income, activity pattern, work schedule of the individual.
2. Do plan meals in advance
3. Ensure that meals planned help to meet the recommended dietary intakes for each member of the family.
4. Include at least one food item from each of the three food groups in each meal.
5. Include seasonal and locally available foods in the meals.
6. Economize on the resource- time, labour and fuel.
7. Include in the meals those foods/dishes which are liked by family members.
8. Prepare the dishes in the way people know or are familiar with
9. Introduce variety by including foods of different colour, texture and flavor in each meal.
10. Avoid repetition of foods and method of preparing foods
11. Ensure that meals prepared relieve hunger and give a feeling of satisfaction and fullness.

Activity : 4

Look into the given menus and tell which is better one ? Why?

Menu-I	Menu-II
Chapathi Rice Potato masala Dhal Curd Salad	Chapathi Rice Rajmah Lady's finger masala Carrot raita Salad (cabbage, cucumber, beetroot) Papad

Make a list of different food items included in the meals consumed in your family yesterday. Categorize these food items into the four food groups. Analyze and discuss whether your family ate balanced meals or not.

Meal	Food items	Food groups	Remarks
Early Morning			
Breakfast			
Mid morning			
Lunch			
Evening			
Dinner			
Post Dinner			

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Activity : 5

Give the capacity of the following

1. One tea cup – gms
2. One teaspoon – gms
3. One tablespoon – gms
4. ¼ cup – tsp
5. 2 table spoon – tsp

SUMMARY

- Each day our body needs a supply of a number of nutrients to carry out its activities efficiently. Nutrients are needed by humans in specific amounts to ensure good health and well being.
- Recommended Dietary Allowances (RDA) are estimates of intakes of nutrients which individuals in a population group need to consume to ensure that the physiological needs of all subjects in that population are met
- Recommended dietary allowances of an individual depend on many factors like Age, Sex, Physical activity, and Physiological state
- In order to meet the recommended dietary allowances, it is important to eat a balanced diet
- A "Balanced Diet" can be defined as one which contains different types of foods in such quantities and proportions that the need for calories, minerals, vitamins, and other nutrients is adequately met and a small provision is made for extra nutrients to, withstand short durations of leanness.
- A balanced diet should provide around 60-70% of total calories from carbohydrates, 10-12% from protein and 20-25% of total calories from fat.
- Meal planning helps in planning a balanced diet. Meal planning is a simple practical exercise which involves applying the knowledge of food, nutrient requirement, and individual preferences to plan adequate and acceptable meals.
- Meal planning helps to meet the nutritional requirements of the family, fulfills family needs, saves time and energy, provides variety, gives satiety and considers the individual likes and dislikes
- Food exchanges help us to modify the diet of an individual according to their needs, likes, dislikes and food habits and help us to make the diet more flexible and interesting
- The income of the family or more specifically, the amount of money available for food per person influence the kind and amount of food to be included in each meal. There are many ways in which one can ensure nutritious meals without increasing the cost.

A-Z GLOSSARY

Terms	Meanings
Activity level:	Level of activity of a person-sedentary (light), moderate or heavy. Activity level is chiefly related to the occupation of an individual.
Pregnancy:	The state of carrying a developing embryo or fetus within the female body. Pregnancy lasts for about nine months
Lactation:	Period when the mother breastfeeds her infant.

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Meal Pattern:	Number of meals consumed in a day and the timing and nature of different meals.
Mid-afternoon meal:	Referring to a meal consumed between lunch and tea usually consisting of items like fruits, soups, beverages, snacks.
Mid-morning meal:	Referring to a meal consumed between breakfast and lunch usually consisting of a beverage and a snack. Soups and fruit-based items are also served.
Physiological stress:	Stress on the body due to normal physiological events unlike the stress caused by disease. Periods of physiological stress are generally rapid growth phases (e.g. infancy, adolescence, pregnancy,and lactation).
Food fads:	A fad diet is a diet that promises weight loss or other health advantages, such as longer life, and usually relies on pseudoscience rather than science to make many of its claims.

Evaluation

I. Fill in the Blanks

1. A balanced diet should provide _____ percent of calories from carbohydrate.

   a) 50-60 b) 20-30 c) 40-50

2. _____ Servings of fruits and vegetables should be included in a day.

   a) Seven b) two c) five

3. _____ can be used instead of sugar to reduce the cost of a meal.

   a) sweeteners b) jaggery c) molasses

4. Inclusion of millets like _____ and _____ also helps to reduce the cost of a meal.

   a) Ragi and bajra b) wheat and rice

   c) brown rice and red rice

5. Meal planning is both a _____ and an Art.

   a) Science b) Philosophy c) Chemistry

6. During periods of physiological stress nutrient needs are_____.

   a) Increased b) decreased c) no change

7. Nutritive value of pulses can be improved by _____.

   a) Roasting b) boiling
   c) sprouting

8. Use _____ vegetables and fruits, which are rich in nutrients and are available at a reasonable cost.

   a) imported b) seasonal c) organic

9. One-third of the day's calorie and protein requirements should be met by _____.

   a) tea b) breakfast c) lunch

10. 100 ml of milk provides _____ k.cal of energy.

    a) 70 b) 30 c) 40

11. 30g of pulses provide an average of _____g protein.

    a) 6 b) 15 c) 20

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II. Answer the following (2 marks)

1. Define a Balanced diet.
2. Define RDA.
3. Define Reference man.
4. Define Reference Woman.
5. Define Food exchange list.
6. What is Meal Planning?
7. List sedentary activities.

III. Answer the following (3 marks)

1. Explain the objectives of planning a meal.
2. List the importance of a balanced diet.
3. List the importance of planning a menu.
4. Discuss the factors determining RDA.
5. How can you ensure nutritional adequacy in meals?
6. How can you achieve variety in meals?
7. List the ways by which you can maximize nutrients in a meal plan.
8. Why is it important to consider the likes and dislikes of individual family members during meal planning?
9. Classify occupations based on activity.
10. What are the qualities of a well-planned meal?
11. Differentiate between seasonal foods and out of season foods.
12. List at least two points you will keep in mind in order to prepare an attractive and appealing meal.
13. List the different types of work. Which kind of work requires maximum energy?
14. What are the requirements of a Balanced Diet?

IV. Answer the following (5 marks)

1. What are the factors to be considered in planning a menu?

2. What are food exchange lists? How are they used in planning diets?

3. Discuss in detail the steps involved in planning a menu.

4. Describe the different ways by which you can reduce the cost of a meal?

5. What are the points to be considered in planning a diet?

6. What are recommended dietary allowances? How were they arrived at?

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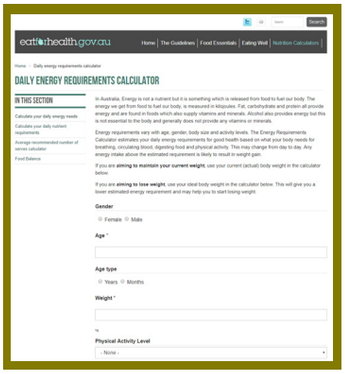
ICT CORNER

RECOMMENDED DIETARY ALLOWANCE AND MEAL PLANNING

Eager to know the proper meal?

Let's check that here..



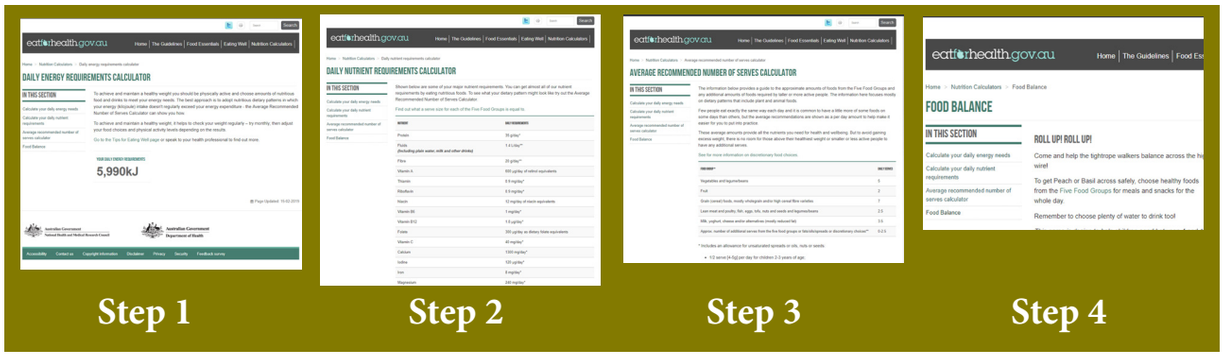
Steps:

Step 1: Use the **URL** or scan the **QR Code** to launch the **"Daily energy requirements calculator"** activity page.

Step 2: Click on **"Calculate your energy needs'** on the left of the window, feed in the details to know the energy need.

Step 3: Click on the **"Calculate your daily nutrient requirements"** and **"Average recommended number of serves"** to know them respectively.

Step 4: You shall know the **"Balance Diet"** by playing the game suggested.



DOWNLOADING

To go inside the app directly you can either use **QR code** or the **given link**

https://www.eatforhealth.gov.au/node/add/calculator-energy

*Pictures are indicative only

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NUTRITION IN PREGNANCY, LACTATION AND INFANCY

Unit 2

OBJECTIVES

This chapter briefly discuss about:-

- Physiological changes during pregnancy
- Nutritional requirments of pregnant and lactating women, consequences of malnutrition during pregnancy and lactation.
- Nutritional needs of infants, advantages of breast milk, artificial feeding, weaning and problems of weaning.

Pregnancy and lactation are the most stressful periods in the life of a woman. Adequate nutrition before and during pregnancy has greater potential for a long term health impact than it does at any other time. Studies in human and animals indicate that nutrition during pregnancy influences not only the normal development of the foetus and immediate help of the new-born infants, but there are now also compelling data that nutrition during pregnancy influences the subsequent morbidity and mortality of the off - spring when they are grown adults. Current recommendation for the nutrition during pregnancy stress the importance of a proper pattern of weight gain and an adequate intake of calories, proteins, vitamins and minerals to allow for optimal foetal development and the preservation of maternal health.

2.1 Nutrition in pregnancy

A woman who has been well nourished before conception begins her pregnancy with reserves of several nutrients so that the needs of the growing foetus can be made without affecting her health.

2.1 a. Physiological changes during pregnancy

- Total plasma volume in a non - pregnant women averages 2600 ml. By 34 weeks it is about 50% greater than it was at conception.
- Increased blood volume produces a high glomerular filtration rate. It appears that the renal tubules are unable to adjust completely and a percentage of nutrients that would have been reabsorbed in the non - pregnant women are excreted in the urine.

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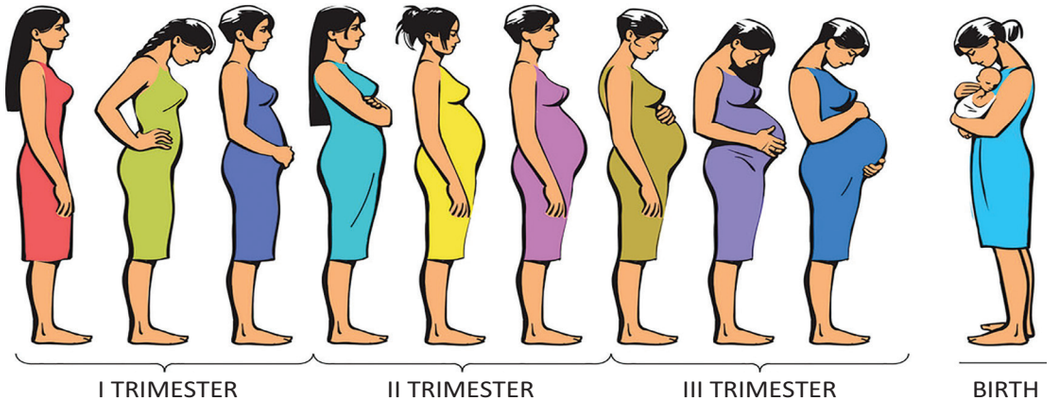

Fig 2.1 Stages of pregnancy

- There is a decreased ability to taste saltiness. This may in fact, be a physiologic mechanism for increasing salt intake.
- The ability to excrete water is lowered and oedema in the legs and ankle is common and normal.
- Gastrointestinal motility diminishes, to allow for increased absorption of nutrients. This often results in constipation.
- A relaxed lower oesophageal sphincter can cause regurgitation and heart burns.
- Increased progesterone level relaxes the uterine muscle to allow expansion with foetal growth.
- High oestrogen levels during pregnancy promote a gynaecoid type of fat distribution.

2.1 b. Role of Placenta

The placenta is the principal site of production for several hormones responsible for regulation of foetal growth and development of maternal support tissues. It is also involved for exchange of nutrients, oxygen and waste products.

2.1.1 Weight gain during pregnancy

A healthy women gains an average weight about 11-13 kg during pregnancy. About 900 to 1800g is an average gain during the first trimester. Thereafter 450 gram/ week during the remaining of the pregnancy is usual.

The overweight women (20 % or more above the ideal weight for height and age) entering pregnancy have increased risk of complications like hypertension, diabetics, etc. Even in this group it is not advisable to restrict weight gain by limiting calories from food intake. Hence obese women should receive atleast 30 kcal/ kg body weight and are advised to reduce weight by exercise rather than diet restriction. While low weight gain in pregnancy is associated with a higher incidence of pre - maturity and low birth weight babies.

"Sharp sudden increase in weight after the 12th week of pregnancy which may indicate excessive, abnormal water retention, should be watched. Weight reduction should never be undertaken during pregnancy. Excessive weight gain places an extra strain on the organs and increase the incidence of toxaemia."

DO YOU KNOW?

The uterus enlarges up to 500 times its normal size? It can go from a couple of ounces to 1-2 pounds in weight. Once after delivery it gradually goes back to its original size.

Tables 2.1 and 2.2 give the components of weight gain during pregnancy and recommended weight gain based on body mass index.

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Table 2.1 components of weight gain during pregnancy.

Gestation (weeks)	12	13-27	28-40
Foetus	5	1500	3000
Placenta and amniotic fluid	50	1000	1500
Maternal tissues and blood	600	6000	7000
Total weight gain	655	8,500	11,500

Source – Hytten, F. and Leitch, I. Physiology of Human Pregnancy, Blackwell Scientific Publishers, Oxford, London and Edinburgh, 1971.

Table 2.2 recommended weight gain for pregnant women based on body mass index.

Weight category based on BMI	Total weight gain (kg)
Under weight (BMI < 19.8)	12.5 – 18
Normal weight (19.8 – 26)	11.5 – 16
Over Weight (26 – 29)	7 – 11.5
Obese (>29)	6.0

Source – B.Srilakshmi.,Dietetics., New Age International Publishers.

Your heart grows! Yes, your heart organ actually enlarges while you are pregnant. It works harder and beats at a more rapid pace due to the increased volume of blood in your body. Your blood volume alone increases by 40 – 50% during pregnancy.

Due to undernourishment of the mother the baby is at an increased risk of being premature with low birth weight and development irregularities. Intrauterine nutrition is highly important for the growth of the central nervous system and kidneys of the foetus, which mature during the latter part of the pregnancy. Therefore nutrition deficits before birth can never be wholly reversed after birth.

Schematic diagram, figure 2.2 shows the relationship between maternal and foetal malnutrition.

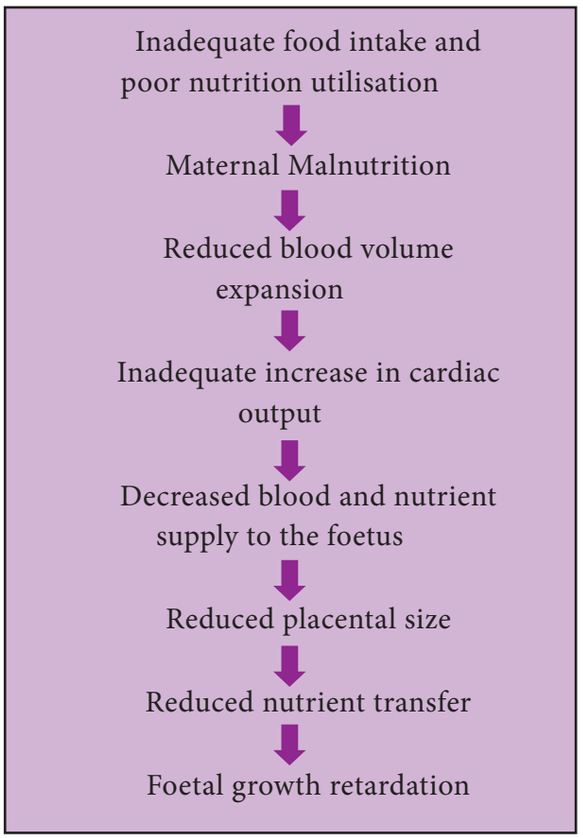

Fig 2.2 Relationship between maternal and foetal malnutrition.

2.1.2 Effects of under nutrition on the mother

a) Maternal body size

Early marriage tradition in many poor societies and pregnancy during adolescence before the genetic potential of growth is achieved, imposes additional burden which results in the poor growth of the foetus and birth of growth retarded child.

b) Multiple nutrient deficiencies.

Multiple nutrient deficiencies is due to poor diet are markedly aggravated during

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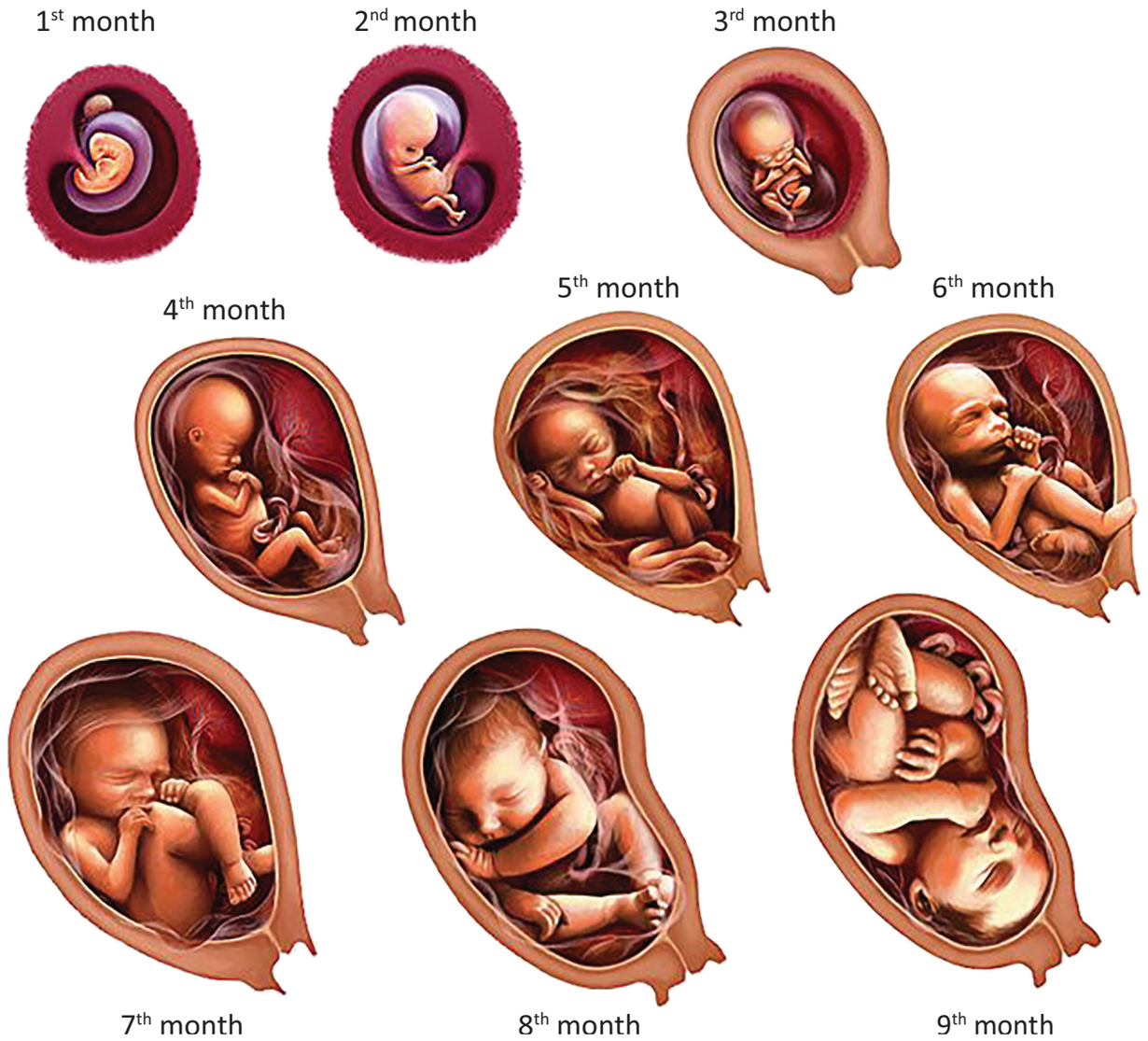

Fig 2.3 Stages of foetal growth

pregnancy. The incidence of anaemia, signs and symptoms of B complex vitamin deficiency such as angular stomatitis, glossitis, tingling and numbness, burning feet are common among low socio economic group. Serum levels of many nutrients such as serum iron, folic acid, vitamin B12, riboflavin, vitamin A and bone density are significantly lower in women from low income group as compared to the well to do women.

c) Maternal mortality

Anaemia, heavy bleeding and toxaemia seems to contribute to nearly 30 - 40 % of maternal death, indicating that maternal malnutrition is a major determinant of high maternal mortality.

d) Placental function

There is an impairment in placental function due to maternal malnutrition. Earlier opinion that placenta could function normally at the expenses of maternal resources is now been a question.

Activity : 1

Conduct a survey among pregnant women and find out weight gain during trimesters.

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2.1.3 Effects of maternal malnutrition on the foetus

a) Congenital malformations in the foetus

Foetal wastage is high in low- income population, one can assume that dietary deficiencies do contribute to higher incidence of congenital malformations. The incidence is much higher if mothers have suffered from viral infection such as rubella, influenza etc.

b) Birth weight

The birth weight of infant is influenced by many factors such as maternal age, parity, height, altitude, ethnic origin and socioeconomic status. Since mother's belonging to low income groups are lighter and shorter, it may be argued that the low birth weight observed in this population is an effect of maternal size, which in turn is an outcome of poor nutritional status of the mother.

c) Infant mortality

The major components of infant mortality i.e. perinatal (28 weeks of gestation to 7 days postnatal) and early neonatal (7 days - 1 month after birth) mortality, are directly related to the health and nutritional status of the mother during pregnancy. Due to high incidence of low birth weight and prematurity in poor - communities perinatal and neonatal death rates are also higher and contribute to almost 60 % of infant deaths.

d) Development of brain and mental function

The peak period of human brain growth is in the last few weeks of intrauterine and first 6 months of extra uterine life. After this, the brain growth slows down, nutritional insults during these phase can be expected to affect brain development and lead to poor mental function.

e) Delayed consequences of foetal growth retardation

In recent years, it is increasingly recognised that effects of foetal malnutrition continues into the adult age, if the infant survives. It is observed that the incidence of chronic metabolic disease like diabetes, hypertension, cardiovascular insufficiencies and cerebrovascular stroke are more common in these infant when grown into adulthood than the normal birth weight adults.

2.1.4 Nutrition requirement during pregnancy

a) Calories

Energy requirement during pregnancy is increased for maintaining the growth of the foetus, placenta and maternal tissues and for the increased basal metabolic rate (BMR). The additional energy cost of pregnancy for a 55 kg woman has been estimated to be around 80,000 kilocalories. The energy needs are evenly distributed throughout the pregnancy. Energy requirements are also influenced by the pre pregnancy body weight, physical activity and age. WHO recommends an additional 150 Kcal/day in the 1st trimester and 350 Kcal/day in the last 2 trimesters.

b) Protein

The additional protein requirement during pregnancy is mainly due to accretion of protein by the foetus, the enlargement of uterus, mammary glands, placenta, formation of amniotic fluid and storage reserves for labour, delivery and lactation which is around 1000g for the entire pregnancy. For this additional daily requirement, allowance of a good quality protein like 10g milk or egg protein per day has been suggested. The protein required for a pregnant woman is 82.2g/ day. Women who are chronically undernourished and underweight, those with infection and infestation and adolescent pregnant women, may require extra protein in the form of milk or other animal proteins and calories for repletion of tissue proteins to enable them to with stand the stress of pregnancy and lactation.

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Table 2.3 ICMR recommended dietary allowances of an expectant mother 2010

Nutrient	Normal adult women	Pregnant women
Energy Kcals		
Sedentary work	1900	+350
Moderate work	2230	+350
Heavy work	2850	+350
Protein gm	55	82.2
Fats gm	30	30
Calcium mg	600	1200
Iron mg	21	35
Vitamin A		
Retinol µg or	600	800
Carotene µg	4800	6400
Thiamine mg		
Sedentary work	1.0	
Moderate work	1.1	+0.2
Heavy work	1.4	
Riboflavin mg		
Sedentary work	1.1	
Moderate work	1.3	+0.3
Heavy work	1.7	
Niacin equivalent mg		
Sedentary work	12	
Moderate work	14	+2
Heavy work	16	
Pyridoxine mg	2.0	2.5
Ascorbic acid mg	40	60
Dietary folate µg	200	500
Vitamin B12 µg	1.0	1.2
Magnesium mg	310	310
Zinc	10	12

c) Minerals

i) Calcium

Calcium requirement suggested by ICMR for an adult woman is 600mg / day. Requirement increases during pregnancy to 1200 mg/ day. Increased intake of calcium by mother is highly essential, not only for the classification of foetal bones and teeth but also for protection of calcium resources of mother to meet the high demands during lactation. Dairy products are a primary source of calcium. Green leafy vegetables like agathi and gingelly seeds also contribute to calcium.

ii) Iron

Normal iron requirement for an adult woman is 21 mg/ day, ICMR requirements during pregnancy is 35 mg / day. Additional iron requirement during pregnancy is computed from iron needs for foetal growth (250 mg), expansion of maternal tissue including the red cell mass during pregnancy, (400mg) the iron content of placenta and the blood loss during parturition (250mg). There is, however, saving (150 mg) due to cessation of menstruation (amenorrhea). The iron absorption is better when taken with Vitamin C rich fruits i.e. fruits like 'amla' (Indian gooseberry), guava and other citrus fruits. Liver, dried beans, dried fruits, green leafy vegetables, eggs, enrich serials and iron fortified salt provide additional sources of iron.

d) Vitamins

i) Vitamin A

Normal Requirements of ß - carotene for an adult woman is 4800 µg and during pregnancy it is increased to 6400 µg. Same level is suggested during pregnancy. Liver, egg yolk, butter, dark green and yellow vegetables and fruits are good sources of vitamin A.

ii) Vitamin D

Vitamin D is a highly essential as it enhances the maternal calcium absorption. Its active form calcidiol and calcitriol cross the placenta with ease and play an important role in calcium metabolism of the foetus. Maternal deficiency of vitamin D results in neonatal hypocalcaemia and hypoplasia.

iii) Thiamine, Riboflavin, Niacin, Pyridoxine

Since the requirements of B complex vitamins like thiamine, riboflavin, niacin

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are related to calories, the additional amount recommended during pregnancy and lactation are based on additional calories. Thus, the additional amounts (mg) recommended during pregnancy is 0.2 mg thiamine, 0.2 mg riboflavin, and 2 mg niacin equivalents. The additional amount of pyridoxine recommended is 2.5 mg during pregnancy as well as lactation.

iv) Folate

During pregnancy there is considerable increase in the demand for folates, which are required for DNA synthesis in the rapidly growing tissue. The greatest significance of folic acid and its potential influence on pregnancy outcome is its role in preventing neural tube defects, such as **spina bifida**. Folic acid deficiency can lead to anencephaly. Recommended daily intake for adults is 100µg and for pregnant women 400µg. To reach this level, the consumption of green vegetables should be increased and additional folate supplements should be given even in pre pregnancy stage and throughout pregnancy.

v) Vitamin B 12

The recommended intake of vitamin B12 for adults is 2µg per day. During pregnancy, additional amount is required for haemopoiesis and liver storage for the foetus and subsequent secretion in milk. During the later half of pregnancy, the requirement of vitamin B12 increases to 3.0µg per day to provide for foetal storage of 50 - 100µg.

2.1.5 Dietary guidelines

Usually a diet containing 3 cups of milk or its equivalent, 2 servings of meat, fish, poultry, eggs, or a source of complete protein, a dark green yellow vegetables and generous serving of citrus fruits will provide a foundation for a nutritionally adequate diet. Between the 6th to 14th week of pregnancy 75% women suffer from nausea which inturn affect the appetite. The conception of small and frequent meals at regular intervals are helpful to many women. This pattern is also very helpful in the later part of pregnancy

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when discomfort is experienced after last meal due to overcrowding by foetus in the abdominal cavity. Plenty of water, at least 4 to 6 glasses in addition to what is contained in the form of milk and other beverages should be taken daily throughout pregnancy. It is recommended that, pregnant women limit their intake to two cups of caffeine containing beverages per day like tea, coffee and chocolate.

More fibre should be included in the diet to prevent constipation which is a common problem during pregnancy. 5 - 6 servings of fruits and vegetables should be included in the daily diet. Inclusion of green leafy vegetables ensures minerals like calcium and iron. Raw fruits and vegetables are to be included in the diet to meet vitamin C and fibre requirement. Fatty rich foods, fried foods, excessive seasoning, strongly flavoured vegetables may be restricted in the case of nausea and gastric distress.

2.1.6 Dietary problems

a) Nausea and vomiting

Nausea in pregnancy may be due to nervous disturbances, placental protein intoxication or due to derangement in carbohydrate metabolism. Morning sickness of early pregnancy can be improved by small and frequent meals. Liquids may be best taken between meals instead of with food. If the condition develops to hyperemesis gravidarum, a severe prolonged persistent vomiting, peripheral parenteral nutrition and careful oral

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feeding is essential. Fruits and vegetables can be given, fat rich foods, fried foods, exercise seasoning, coffee in large amounts and stronger flavoured vegetables may be restricted or eliminated if the nausea persists.

b) Heart burn

Increase progesterone production, cost decreased tone and mobility of the smooth muscles of gastrointestinal tract. This leads to regurgitation. Heartburn is a common complaint during the later part of pregnancy. This is usually, can be relieved by small and frequent meals limiting the amount of food consumed at one time and drinking fluids between meals. Sitting upright after meals at least for 3 hours before lying down may also help.

c) Constipation

The pressure of the enlarging uterus on the lower portion of the intestine, in addition to the hormonal muscle relaxant effect of placental hormones on the gastrointestinal tract may result in constipation. Increased the fluid intake and use of natural laxative foods such as whole grains, dried fruits and other fruits, vegetables that are rich in fibre, juices usually induce regularity.

d) Oedema

Mild, physiologic oedema is usually present in the extremities in the third trimester. Swelling of lower extremities may be caused by the pressure of the enlarging uterus on the veins returning fluid from the legs. The normal oedema requires no sodium restriction or other dietary changes.

e) Pica

Consumption of non - food items like laundry starch, ice cubes or clay is called pica. It occurs more often during pregnancy than at any other time. A deficiency for essential nutrient, such as calcium or iron, results in the eating of non - food substances that contain these nutrients

Activity : 2

Suggest some fibre rich diets to avoid constipation during pregnancy.

2.1.7 Practices incompatible with pregnancy

Besides malnutrition, a variety of lifestyle factors can have adverse effects on pregnancy and some may teratogenic. People who are planning to have a children can make the choice to practice healthy behaviours.

a) Alcohol

Alcohol consumption during pregnancy can cause irreversible mental and physical retardation of the foetus. Foetal alcohol syndrome (FAS) of the leading causes of mental retardation is the only one that is totally preventable.

b) Medicinal drugs

Drugs other than alcohol can also cause complication during pregnancy, problems in labour, and serious birth defects. For this reason pregnant women should not take any medicines without consulting their physician.

c) Illicit drugs

The recommendation to avoid a drugs during pregnancy also includes illicit drugs, of course. Unfortunately, use of illicit drugs such as cocaine and marijuna, is common among some pregnant women. Drug of abuse, such as cocaine, easily cross the placenta and impact foetal development further more they are responsible for preterm birth, low birth weight infant, perinatal death, and sudden infant death. If these new-born's survive their crisis and behaviour at birth are abnormal, and their cognitive development later in life is impaired.

d) Smoking and chewing tobacco

Smoking cigarettes and chewing tobacco at any time exert harmful effects, and pregnancy dramatically magnifies the hazards of these

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practices. Smoking restrict the blood supply to the growing foetus and soulmates oxygen and nutrient delivery and waste removal. Smokers tend to eat less nutritious food during their pregnancy than do non-smokers which in turn impairs foetal nutrition. A positive relationship exist between sudden infant death syndrome (SIDS) and both cigarette smoking during pregnancy and postnatal exposure to passive smoke. Smoking during pregnancy may even harm the intellectual and behavioural development of the child later in life. Infants of mother who chew tobacco also have lower weight and higher rates of foetal death than infants born to women who do not use tobacco.

e) Environmental contaminants

Infants and young children of pregnant women exposed to environmental containment such as lead and mercury show signs of impaired cognitive development.

In order to prepare body for birth, it produces a hormone called relaxin which softens your ligaments. This softening helps your baby pass through your pelvis during labour.

f) Vitamin mineral megadoses

The pregnant women who is trying to eat well may mistakenly assume that more is better when it comes to vitamin - mineral supplements. This is simply not true, many vitamin are toxic when taken in excess, and the minerals are even more so, some at levels not far above recommendations.

g) Caffeine

Caffeine crosses the placenta, and the developing foetus has a limited ability to metabolize it. For this reason, pregnant women may wonder whether they should give up coffee, tea, and colas because of their caffeine contents. Research studies have not proved that caffeine (even in high doses) causes birth defects in human infants (as it does in animal), but limited evidence suggests that moderate - to - heavy use may lower infant birth weight.

h) Weight loss dieting

Weight loss dieting, even for short periods, is hazardous during pregnancy. Low - carbohydrate diets or fats that causes ketosis deprive the foetal brain of needed glucose and may impair its development. Such diets are also likely to lack other nutrients vital to foetal growth. Regardless of prepregnancy weight, pregnant women should never intentionally lose weight.

i) Sugar substitutes

Artificial sweeteners have been extensively investigated and found to be safe for use during pregnancy. (Women with phenylketonuria should not use aspartame). It would be prudent for pregnant women to use sweeteners in moderation and within an nutritious and well balanced diet.

Activity : 3

Prepare a low cost iron rich diet for a pregnant women

2.2 Nutrition in lactation

Nutritional link between the mother and child continues even after birth. Born baby depends for some period solely on breast milk for their existence. During the first two or three days after birth, a small amount of Colostrum is secreted. The amount of milk produced corresponds either to the productive capacity of the mother or the nutritional requirements of the infant. Many factors influence milk production, nutritional status being one of them. Nutritional requirements

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of the mother during lactation mainly depends on the volume of milk produced, duration of lactation, and the composition of breastmilk to meet the requirements of the growing infant.

2.2.1 Role of hormones in milk production

Sucking by infant initiates hormonal changes that leads to milk production and let down reflex, which releases milk as shown in figure 2.4

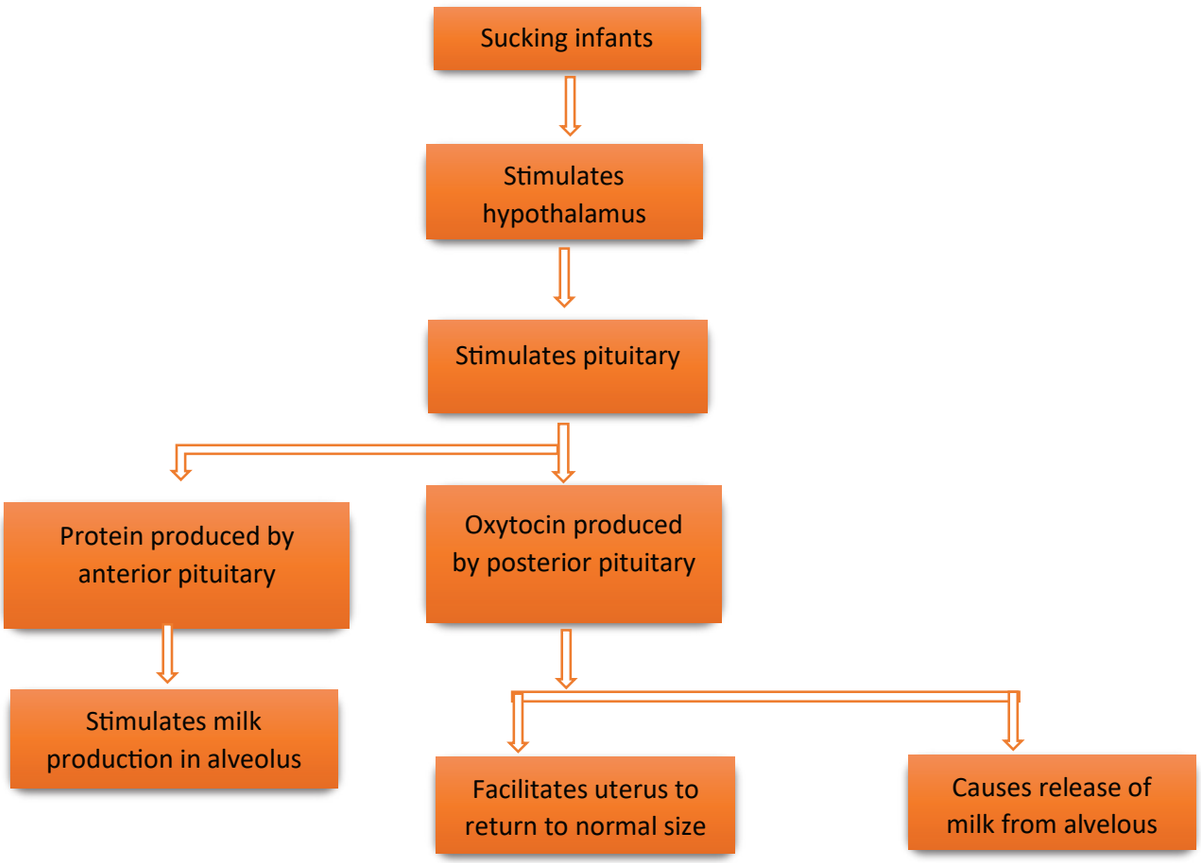

Fig 2.4 process of stimulation of milk production

This process of lactation is controlled by various hormones. The source of the hormones and their function is summarised in table 2.4

Table 2.4 Hormonal control of lactation

HORMONE	SOURCE	ACTIVITY
Oestrogen	Ovary and placenta	Stimulates breast development during pregnancy
Progesterone	Ovary and placenta	Stimulates breast development during pregnancy
Prolactin	Anterior pituitary gland	Simulates milk production
Oxytocin	Posterior pituitary gland	"Let down" reflex: Smooth muscles surrounding the alveoli of the nipples contract to allow the release of milk.

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2.2.2 Nutrient requirement during lactation

a) Energy

The additional energy needed for lactation is drawn from maternal adipose tissue stores lay down during pregnancy. Depending on the adequacy of the stores, additional energy input may be needed in the lactating women's daily diet. This is the reason nutrition expert committee (2010) prescribed additional calories 600 and 520 respectively for 0 - 6 months and 7 to 12 months.

b) Protein

During lactation, protein requirement has been computed on the basis of secretion of protein in milk. An additional daily intake of 22.9 g for the first 6 months and 15.2 g during 7-12 months of lactation is prescribed. If energy or protein is lacking, there will be a reduction in milk volume rather than in milk quality.

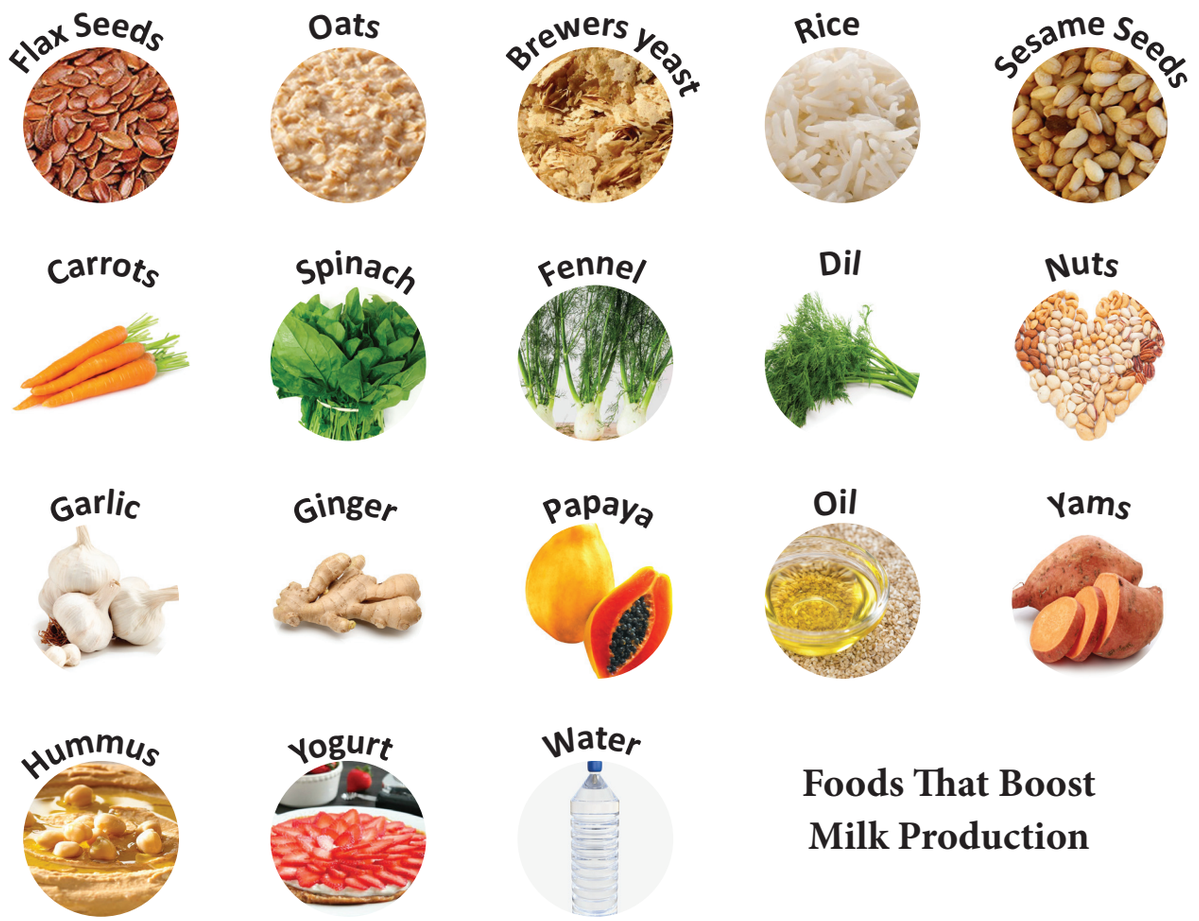
c) Minerals

i) Calcium

The increased amount of calcium that is required during gestation for mineralization of the foetal skeleton is now diverted into the mother's milk production. Both during pregnancy and lactation 1200 mg has been prescribed by ICMR. The retention of dietary calcium in lactating women is about 30 %, hence an extra amount of 600 mg is prescribed. About one litre of milk or milk products should be given to lactating mother to meet 1200 mg of calcium.

ii) Iron

The iron requirement during lactation is 25 mg per day. The baby is born with the relatively large reserve of iron since milk is not a good source of iron. A good allowance of iron in the mother's diet during lactation does not convey additional iron to the Infant. Iron requirement during lactation is the sum



Foods That Boost Milk Production

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of the requirement of the mother and that required to make up the iron lost in breast milk. Since there is an amenorrhea during lactation the basal requirement will be same as in adult women 14µg/kg.

d) Vitamins

i) Vitamin A

The quantity of retinol present in 680 ml of human milk is 50µg, so the ICMR recommends an additional allowance of 350µg of retinol. This can be achieved by including liver, fish liver oil, egg yolk, milk and green leafy vegetables in the diet.

ii) Thiamine, Riboflavin, Niacin

Thiamine content of mother's milk depends on mother's diet. Dietary allowances for thiamine for lactating mothers is 0.5 mg/1000 kcal and their daily requirement is computed on the basis of their energy allowance. The additional allowance recommended by ICMR (2010) on the basis of additional calorie allowances 0.3 mg for 0 to 6 months lactation and 0.2 mg for 7-12 months.

Additional allowance of riboflavin corresponding to the increased energy allowance would be 0.3 mg. RDA for riboflavin during lactation is computed on the basis of 0.6 mg 1000 kcal. If the diet meets the requirement of protein and calcium the requirement of riboflavin would be definitely met. Milk is not only a good source of calcium but also a good source of riboflavin.

The nicotinic acid content of the breast milk of Indian women ranges between 100 and 150µg per 100ml. The amount lost in milk is between 0.9 and 1.2 mg per day. The dietary allowances for niacin is 6.6 mg niacin equivalents per 1000 kcals.

iii) Folic acid

The folic acid content of breast milk secreted by Indian women is 1.6µg per 100ml.

Table 2.5 ICMR recommended dietary allowances of a lactating mother-2010

Nutrient	Normal women	Lactating women	
		0-6 months	7-12 months
Energy Kcals			
Sedentary work	1900		
Moderate work	2230	+600	+520
Heavy work	2850		
Protein gm	55	77.9	70.2
Fats gm	30	30	30
Calcium mg	600	1200	1200
Iron mg	21	25	25
Vitamin A			
Retinol µg	600	950	950
Carotene µg	4800	7600	7600
Thiamine mg			
Sedentary work	1.0		
Moderate work	1.1	+0.3	+0.2
Heavy work	1.4		
Riboflavin mg			
Sedentary work	1.1		
Moderate work	1.3	+0.4	+0.3
Heavy work	1.7		
Niacin equivalent (g)			
Sedentary work	12		
Moderate work	14	+4	+3
Heavy work	16		
Pyridoxine mg	2.0	2.5	2.5
Ascorbic acid mg	40	80	80
Dietary folate µg	200	300	300
Vitamin B12 µg	1.0	1.5	1.5
Magnesium	310	310	310
Zinc	10	12	12

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At the higher level, the amount of folate lost by the mother would be about 25µg a day. An additional allowance of 100µg of folate should be provided during lactation.

e) Fluid

An increase intake of fluid is necessary for adequate milk production, since milk is a fluid tissue. Water and beverages such as juices, soups, buttermilk and milk, all add to the fluid necessary to produce milk. A lactating mother should take 2-3 litres of fluid per day.

Human milk boost a baby's immune system big time helping baby fight viral, bacterial, and parasitic infections including respiratory tract infections, ear infections, bacterial meningitis, pneumonia, urinary tract infections, infant diarrhoea, common cold and flu.

2.2.3 Dietary guidelines

- "**Galactogogue"** or lactogogue act by increasing the prolactin secretion which in turn increases milk production. They also work psychologically and have a marginal effect on milk production. Sucking is the best lactogogue. The diet can include lactogogues, which stimulate the production of milk. Garlic, milk, almonds, and garden cress seeds are considered to increase the milk production in certain regions of India.
- Weight gain beyond that desirable for body size, should be avoided. When the baby is weaned, the mother must reduce her food intake in order that obesity may be avoided.
- It is better to control constipation by inclusion in the diet of raw and cooked fruits and vegetables, whole grains and an adequate amount of water than by use of laxatives.
- No food need be withheld from the mother unless it causes distress to the infant. Occasionally, tomatoes, onions, members of cabbage family, chocolate, spices and condiments may cause gastric distress or loose stools in the infant.

Activity : 4

Suggest a few recipes that promotes milk production.

2.2.4 Practice incompatible with lactation

Some substance impair milk production or enter breast milk and interfere with infant development. Some medical condition prohibit breastfeeding. This section describes these circumstances.

a) Alcohol

Alcohol easily enters breast milk, and its concentration peaks within an hour of ingestion. Infants drink less breast milk when their mother have consumed even small amount of alcohol.

b) Medical drugs

Many drugs are compatible with breastfeeding, but some medicines are contraindicated, either because they suppress lactation or because they are secreted into breast milk and can harm the infant.

c) Illicit drug

Illicit drugs of course are harmful to the physical and emotional health of both the mother and the nursing infant. Breast milk can deliver such high dose of illicit drugs as to cause irritability, tremors, hallucination and even death in infants.

d) Smoking

Cigarette smoking reduces milk volume, smokers may produce too little milk to meet their infant's energy needs. Consequently infants of breast feeding mothers who smoke gain less weight whereas infant's of those who do not smoke.

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e) Caffeine

Caffeine taken during lactation may make a breastfed infant irritable and wakeful. During pregnancy caffeine consumption should be moderate say 1-2 cups of coffee a day. Larger doses of coffee may interfere with the availability of iron from the milk and impair the infant iron status.

2.3 Growth and development during infancy

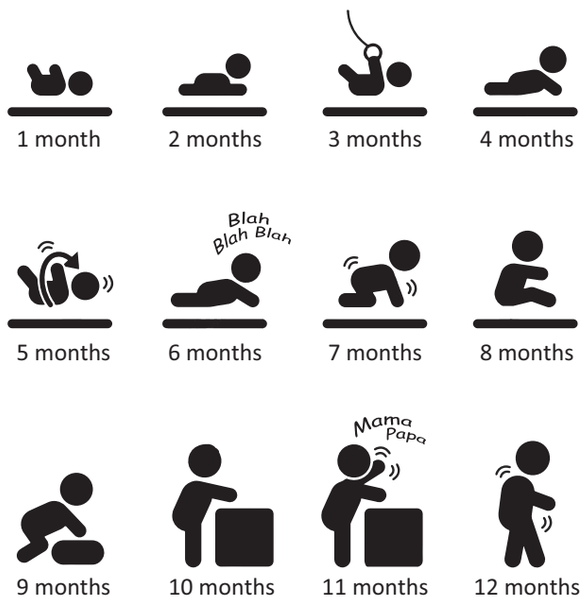

Fig 2.5 Stages of growth of an infant

Next to foetal period, the infants 1st year is the time of most rapid growth. According to WHO figures the average weight of most healthy new-born babies is around 3.2 kg. Healthy child doubles birth weight by six months. His weight becomes 3 times by the time the child is one year old. The normal birth length of 50 to 55 cm increases by another 23 to 25 cm during the first year. With increase in length the body proportions also change. At birth the child has 75% water 12 to 15 % fat. By the end of the one year the water content decreases to 60% and fat increases to 24 %. Muscles would be comparatively well developed at the end of the year. Infant have rapid heart rate, 120 - 140 per minute. But the haemoglobin level of well-nourished infant is 17 - 20 g per 100 ml. This provides a reserve for expansion of the blood circulation and adequate oxygen carrying capacity to the growing tissue during the first 4 - 6 months.

The full term infant is able to digest protein, emulsified fats and simple carbohydrates such as lactose. Salivary secretion and gastric acidity are low in infants under 3 months. Kidney reach their full functional capacity by the end of 1st year. During the first few months the glomerular filtration rate is somewhat lower and therefore the excretion of high concentration of solutes is more difficult. The increase in the number of brain cells is most rapid during foetal life and in the first five to six months after birth.

2.3.1 Nutritional requirements

a) Energy

Study reveal that basal and total energy requirement for infants are higher than adults per unit body weight. Infants require 92 Kcal / kg body weight. For one month old infant, 50 % energy intake is used for basal energy, 25 % for activity and 25 % for growth. Extremely active children may require up to 40% energy for activity. 70% of calories can be met by milk alone and rest of the calories have to be supplied by supplementary foods after six months.

b) Protein

Protein intake of a healthy infants is about 1.16 g/ kg body weight. The recommendations for infants are based on the total protein content and amino acid pattern of the average daily intake of human milk. Human milk provides all the amino acids more than the required amount needed for proper growth. Histidine, which is a non-essential amino acid for adults, is necessary for growth and maintenance of an infant. Human milk protein is 100% utilised. If calories and protein requirements are not met, infant suffer from protein energy malnutrition.

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This is a range of clinical disorder resulting in severe cases to marasmus or kwashiorkor.

c) Fats and essential fatty acids

Fat intake should be 35 % E depending on the physical activity of the child from age 6 months to 2 years. Linoleic acid is the most important essential fatty acid for an infant. DHA levels in red blood cells and neural tissues help in improving visual acuity and cognitive performance of infants. Both cow's milk and mother's milk satisfy the requirements of EFA. EFA requirement of young children is 3% E which can be satisfied by 19g per day visible fat.

d) Minerals - Calcium and phosphorus

Rapid growth requires 500 mg of calcium and 750 mg of phosphorus with a ratio 1:15. Adequate prenatal nutrition supply a store of bone minerals to prevent rickets provide postnatal care furnishers a liberal supply of calcium and phosphorus. Large percentage of calcium from breast milk is retained by the infant. When sufficient calcium is not supplied to the infant, there motor development is delayed. Ca: P ratio of 1.2: 1 as in cow's milk is lower compared to 2: 1 in human milk.

i) Iron

RDA of iron for an infant is 46µg/kg bodyweight starting from 3 months. At birth, body contains 80mg/ kg. This is about 3 times that of an adult. During the first four months, blood volume doubles and concentration of iron in haemoglobin falls to about half, that present at birth.

ii) Zinc

High levels are present in colostrum and it promotes normal growth. Zinc is necessary for normal brain development.

e) Vitamins

i) Vitamin A

The RDA for retinol is 350µg. Daily intake of Vitamin A by Indian infants through breast milk is about 140µg during the first 6 months of life. After six months egg yolk is supplemented in the infant's diet.

ii) Vitamin D

It is essential for utilisation and retention of calcium and phosphorus. A good supply of vitamin D during pregnancy benefits the mother and it helps satisfactory development of the infant. The vitamin D requirement of child is 400 I.U. if there is minimal exposure to sunlight.

Table 2.6 ICMR recommended dietary allowances for infants 2010

Nutrient	Months	
	0-6	6-12
Energy Kcals	92	80
Protein gm	1.16	1.69
Fats gm	-	19
Calcium mg	500	500
Iron mg	46 µg /kg	05
Vitamin A		
Retinol µg or	350	350
Carotene µg	2800	2800
Thiamine mg	0.2	0.3
Riboflavin mg	0.3	0.4
Niacin equivalent µg /kg	710	650
Pyridoxine mg	0.1	0.4
Ascorbic acid mg	25	25
Dietary folate µg	25	25
Vitamin B12 µg	0.2	0.2
Magnesium mg	30	45
Zinc mg	-	-

Activity : 5

Collect birth weight and height of 5 infants.

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2.3.2 Breast feeding

The Infant should be put to breast within half an hour after normal delivery and within 4 hours after caesarean sections. Prelacteal foods like honey, distilled water, glucose should not be given.

a) Colostrum

During the first two or three days after delivery, thick and yellowish fluid is secreted from the mammary gland. This differs from the regular milk and is called **"colostrum".** It is secreted in small quantity of about 10- 40 ml which is rich in protein. Colostrum is the first immunization to the infant. It contains an interferon like substance which possesses strong antiviral activity. Colostrum contains B12 binding protein which renders B12 unavailable for the growth of E. coli and other bacteria. It also contains antibodies against viral diseases such as smallpox, polio, measles and influenza. Enzymes like lysozyme, peroxidase and xanthine oxidize that promote cell malnutrition are found to be more in colostrum. Colostrum contains large quantities of protective substances and enhances the development and maturation of the baby's gastrointestinal track. Colostrum helps a baby pass his or her first stool.

Breastfeeding can actually reduce baby's risk of disease later in life including type 1 and 2 diabetes, Hodgkin's disease, leukaemia, obesity, high blood pressure, high cholesterol levels, ulcerative colitis, asthma, eczema and also lowers risk for sudden infant death syndrome (SIDS)

Table 2.7 Composition of Colostrum

Nutrient	Amount
Energy kcal	58
Fat g	2.9
Calcium mg	31
Phosphorous mg	14
Iron mg	0.09
Protein g	2.7
Lactose g	5.3
Carotene I.U	186
Vitamin A I.U	296

b) Transition milk

During the next two weeks, the milk increases in quantity and changes in appearance and composition. This is called **"transition milk".** The immunoglobin and protein content decreases while the fat and sugar content increases. Exclusive breastfeeding of colostrum and transition milk minimises infections related to neonatal deaths. The composition of milk changes even during the length of a single feed to exactly suit the need of a particular baby.

2.3.3 Advantages of breast feeding

Breastfeeding is not only beneficial to the infant but also to the mother. The advantages of breastfeeding can be considered under nutritional, immunological, psychological, economical and physiological and other factors.

Body is constantly making the perfect milk for baby. Milk changes its nutritional profile as baby grows (milk made for a 3 month old is different than for a 9 month old) milk can even change day to day. For example water content may increase during times of hot weather and baby sickness to provide extra hydration.

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a) Nutritional benefits

The composition of human milk is best suited to the infants and provide nutrients in easily digestible and bioavailable form.

i. Carbohydrate

Human milk is the sweetest milk due to the high amount of lactose. Lactose which is present in higher levels in human milk facilitates the absorption of magnesium and calcium and favours amino acid absorption and nitrogen retention.

ii. Protein

Human milk contains 1.1 g percent protein. Human milk has 20% casein and 80 % whey proteins which constitutes lactalbumin and lactoferrin. Lactalbumin has an amino acid pattern that mainly approaches that of body protein and provides more essential amino acids than casein. Breast milk contains amino acids specific for brain development. Human milk offers a high tryptophan to neutral amino acids ratio which controls brain serotonin synthesis. Human milk also contains binding proteins of thyroxine, corticosterol, vitamin D, folate and B12.

iii. Lipids

Lipids Present in human milk are unsaturated fat, essential fatty acids, prostaglandin precursors, fat soluble vitamins, steroids, phospholipids and cholesterol. Lipids involved in the development of brain are mostly long chain polyunsaturated fatty acids. These are abundant in the breast milk. Human milk contains cholesterol and is essential for synthesis of myelin of the nervous system. Presence of chlorine, acetylcholine, phospholipid precursors and carnitine ensure optimum metabolism and brain development.

iv. Minerals

Unlike vitamins, mineral content of human milk is minimally influenced by mother's stores and immediate intake of calcium, magnesium, phosphorus, iron, copper, zinc, sodium and potassium. Minerals in the breast milk are largely protein bound and balance to enhance bioavailability. Calcium content in human milk is 28 mg and calcium phosphorus ratio of 2:1 in human milk is favourable. Breast milk ensures better oxygen saturation and increases the bioavailability of trace elements like copper, cobalt, selenium, iron and zinc.

v. Vitamins

Breast milk contains more vitamin A, C and E than cow's milk. Breast milk contains water soluble vitamin D along with fat soluble fraction which protects against rickets. riboflavin, pyridoxine and B12 content of human milk are also related to the dietary intake of mother. Heat liable vitamins like thiamine and ascorbic acid are completely available in human milk. Breast fed infants receive about 25 -30µg of folate daily, most of which is available for absorption.

b) Hormones and growth factor benefits

Breast milk is so rich source of hormones like thyroid stimulating hormone (TSH), thyroxin, parathyroid hormone, corticosteroids, calcitonin, erythropoietin, oxytocin, growth hormone releasing factor, insulin and prolactin. It contains growth regulating factors, growth promoting factors and growth modulators.

c) Immunological benefits

These factors are present in colostrum as well as in matured milk.

i. Macrophages

Human milk contains macrophages. They contribute immunity in two ways: (a) They engulf and digest bacteria. (b) These cells synthesize complement, a protein involved in establishing immunity to infectious organism.

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ii. Lymphocytes

Lymphocytes are the white blood cells responsible for mediating most aspects of the immune system, with its ability to attack a wide range of infectious microorganisms. Human milk contains T and B lymphocytes.

iii. Immunoglobulins

Immunoglobulin are the difference in proteins that include all types of antibodies. Immunoglobulin are resistant to the acidity for the stomach.

iv. Lactoferrin and Vitamin B12 binding protein

Lactoferrin is an iron containing protein found both in colostrum and mature milk. It's in which the growth of staphylococcus organism and E coli by tying iron that is needed for growth. Similarly vitamin B12 binding protein present in breast milk makes vitamin B12 unavailable to pathogens that require B12 to survive in the infant's gastrointestinal track.

v. Lactobacillus bifidus factor

It is a nitrogen containing carbohydrate in human milk. It encourages the growth of microorganism, lactobacillus bifidus and produces acetic acid or lactic acid from lactose and depresses the growth of pathogenic or disease producing organism like Escherichia coli.

vi. Enzymes

Breast milk supplies enzymes like amylase, lipoprotein, lipase, bile salt, stimulated lipases, oxidases, lacto peroxidase, and leucocyte myeloperioxidase. These enzymes increase digestibility and also act as defence against microbes. Enzymes like lysozyme, peroxidase and xanthine oxidase promote cell maturation.

d) Psychological benefits

An infant derives a sense of security and belonging in the mother and child relationship from the comfort of being held than from feeding process.

Table 2.8 Calorie percentage from protein, fat and carbohydrate in human and cow's milk.

Nutrient	Breast milk	Cow's milk
Total energy (per 100 ml)	65	65
Protein	07	19
Fat	47	55
Carbohydrate	31	26

Source: Gopalan C., B.V Ramasastri and S.C Balasubramanian (2011), Nutritive value of Indian foods, NIN, ICMR, Hyderabad, India.

2.3.4 Breast feeding during illness

- Breast Feeding is to be done during illness because -
- Breast milk is the most easily digestible food for the sick baby
- Breast feeding is the best pacifier to the sick baby
- Breast milk satisfies the nutritional and fluid demands
- Breast milk offers anti-infective and immunological factors.

WORLD ALLIANCE FOR BREAST FEEDING ACTION (WABA) insists exclusive breast feeding for 6 months.

Artificial feeding

Though no milk can be real substitute for mother's milk, sometimes it is necessary to give artificial feeding. Circumstances under which artificial feeding is essential are

- The mother is suffering from serious illness, fever or infection,
- Another pregnancy intervenes during lactation

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- The child is too weak to nurse or cannot because of harelip for cleft palate
- Breast milk has completely stopped or insufficient for the child
- Mother is not available to feed the child
- The mother is on anticoagulants, steroids and radioactive drugs,
- Death of the mother.

2.3.5 Weaning

Weaning begins from the moment supplementary food started and continue still the child is taken off the breast completely. The ideal time to start semi solid food is when a baby is ready to sit up, swallow and eat taste other foods, the baby's stomach is ready to digest food and the baby has good appetite and accepts food readily and there is no more activity in the child.

2.3.6 Types of supplementary foods

a) Liquid supplements

i. Milk

At about the sixth month of life the frequency of breastfeeding is reduced to three or four times per day and animal milk is substituted. Since the proportion of nutrients in animal milk differs from the human milk, the cow's milk is diluted with boiled and cooled water in the proportion of 2: 1 for the first feeds. The amount of water is gradually reduced so that in the course of a few weeks the baby receives undiluted animal milk. Two feeds, with 225 ml of milk per feed is an ideal replacement. Sugar can be added for taste and it to increase calories.

ii. Juice of fresh fruits

Oranges, tomatoes, sweet lime, grapes, serve to supplement the protective nutrients not present in sufficient amounts in breast milk as well as in animal milk. It is advantages to start feeding small quantities of fresh fruit juice even in the 3rd or 4th month of life.

iii. Soup from green leafy vegetables

In case fresh fruits are not available, green leafy vegetables may be used as an alternative. Strained soup can be given in the beginning with unstrained soup later on

b) Solid supplements

Mashed food is started around the 7th or 8th month of life. Around this time, the infant is already receiving animal milk, fruit juice or vegetable soup and fish liver oil.

i. Cereal and starchy gruels

To meet the increasing demands of calories and protein, well-cooked mashed cereal like rice, rice flour, rice flakes and ragi flour mixed with milk and sugar can be given. Addition of a small amount of vegetable oil to the porridge makes it less glutinous increasing the energy density.

ii. Vegetables

Cooked, Mashed vegetables like potato, green leafy vegetables and carrots can be introduced to get vitamins and minerals and colours in the diet

iii. Fruits

All fruits, with the exception of banana which is mashed, must be stewed and sieved for one year old baby. Thereafter, it is given simply stewed, with the addition of little sugar and lime juice for favour.

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iv. Non vegetarian foods

A small amount of hard boiled yolk of egg is given to start with and if the infant tolerates, the amount maybe gradually increased to a complete yolk of an egg. Yolk is a good source of vitamin A, iron and protein. Soft custard is also a suitable way in which to introduce egg yolk.

v. Pulses

Well cook pulses along with cereals in the form of kichidi / pongal can be given or can be made into porridge. Pulse and meat preparation can be given alternate days.

2.3.7 Points to be considered while introducing weaning foods

- Introduce only one food at a time
- Allow the infant to become familiar with the foods before trying to give another
- Give a very small amounts of any new food at the beginning, for example, one teaspoon full or less.
- At first strained fruits, vegetables and cereals are given.
- Variety in choice of food is important
- If, after several trials, the baby has an acute dislike for a particular food, omit that item for a week or two and then try again.
- Food should be given between breast feeds.
- Give freshly prepared food
- By one year, the infant can be given family diet, modified, in small quantities but at frequent intervals in addition to milk. The best indication of adequacy of the diet is the growth pattern of the child.

2.3.8 Low cost supplementary foods

Indian mothers wean infant into the traditional adult diet because of their ignorance of low cost weaning foods and also because of in capacity to buy expensive commercial foods.

Table 2.9 Low cost supplementary foods

Name of the product	Composition
Indian multipurpose food (C F T R I)	Low fat groundnut flour and Bengal gram flour (75:25) fortified with vitamins A and D, B1 B2 and calcium carbonate. Contains 40 percent protein.
Malt food (C F T R I)	Cereal malt, low fat groundnut flour and roasted Bengal gram flour (40:40:20) fortified with vitamins and calcium salts. Contains 40 percent protein.
Supplementary food (NIN)	Roasted wheat flour, green gram flour, groundnut, sugar or jiggery.(30:20:8:20). Contains 12.5 percent protein.
Win food (Gandhigram Rural Institute)	Pearl millet, green gram dal, groundnut flour and jaggery. (50:15:25:25). Contains 20 percent proteins.
Amutham	Rice flour, ragi flour, Bengal gram flour, sesame flour, groundnut flour and jaggery. (15:15:15:10:10:25). Contains 14 percent proteins.
Poshak	Cereal (wheat, maize, rice or jowar) pulse (chana dhal or green gram dhal) and oil seed (groundnut) and jaggery. (4:2:1:2).
Kerala Indegenous Food. (KIF)	Tapioca, Bulgar wheat and groundnut. (25:50:25).

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2.3.9 Foods to omit

Concentrated sweets, including baby food "desserts", have no place in an infant's diet. They convey no nutrients to support growth, and the extra food energy can promote obesity. Canned vegetables are also inappropriate for infants, as they often contain too much sodium. Honey and corn syrup should never be fed to infants because of the botulism. Infants and even young children cannot safely chew and swallow popcorn, whole grapes, whole beans, hard candies and nuts; they can easily choke on these foods, a risk not worth taking.

SOME INTRESTING FACTS ABOUT INFANTS

- When baby is born their hearing isn't 100% up to par. There is still of fluid which tends to impair somewhat they are able to recognise is this sound of mother's voice. They respond to this sound above all others.
- They may cry a lot but the fact of matter is new born babies don't shed tears! Although the tear ducts and glands are working, they produce just enough to lubricate and protect the babies Eyes. Look for those teardrops to start flowing between 1 and 3 months.
- Since adults are so much taller and wider than a baby you are naturally assume they have more bones right?
- Wrong! Baby is born but 270 bones and by the time he reaches adulthood the number drops to 206! Reason for the loss of bones is due to the fusion of spine and skull as baby grows.
- New-born babies are very near sighted and their vision only allows them to see people and objects that are clear rest when they are within 8 to 12 inches away.

Government Schemes for pregnant and lactating women*

Tamil Nadu government in a move to provide optimal nutrition for pregnant and lactating women, the Tamil Nadu government is all set to increase the benefits given under Dr Muthulakshmi Reddy Maternity Benefit Scheme by ₹5,000. The cash assistance being provided to pregnant mothers under Dr Muthulakshmi Reddy Maternity Benefit Scheme is being further enhanced to ₹18,000 from ₹12,000, said state health department officials. The new guidelines are under process to allot ₹18,000 along with revised nutrition programmes under the scheme. The financial aid of ₹12,000 was being given in three instalments (₹4000) for pregnant women aged 19 years or more on conditional release and restricted for first two deliveries only. However, the conditional release is being updated coupled with new nutrition plans and is likely to be implemented in April, said public health director Dr K Kolandaisamy. Every pregnant woman below poverty line who avails all required antenatal services during pregnancy in concerned primary health centre can benefit from the scheme. Mothers who deliver in government institutions and complete immunization for the child up to third dose of vaccinations under universal immunization programme are given the cash assistance. Other conditions are being upgraded and will be implemented shortly, state health department officials. The registration of pregnant women is mandatory with the 'Pregnant and Infant Cohort Monitoring and Evaluation (PICME)' portal that generates a 12-digit 'Reproductive and Child Health' (RCH) ID number and the entries to avail the benefit can be done only for the mothers having PICME number with her during delivery. A total of 25,698 pregnant women received cash assistance of `21.76 crore under Dr Muthulakshmi Reddy Maternity Benefit Scheme in the last two years in the districts of Tamil Nadu government.

***Refers to (NOT FOR EXAMINATION).**

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SUMMARY

- A whole new life begins at conception. Organ system develop rapidly, and nutrition plays many supportive roles. Maternal nutrition before and during pregnancy affects both the mother's health and the infant's growth.
- All pregnant women must gain weight. Maternal weight gain during pregnancy correlates closely with infant birth weight, which is a strong predictor of the health and subsequent development of the infant.
- Nausea, constipation, heartburn, and food sensitivities are common nutrition related concerns during pregnancy. A few simple strategies can help alleviate the discomforts.
- Lactation is an automatic physiological process that virtually all mothers are capable of doing. Most lactating women can obtain all the nutrients they need from a well-balanced diet.
- Breast milk excels as a source of nutrients for the young infants. Its unique nutrient composition and protective factors promote optimal health development throughout the first year of life.

A-Z GLOSSARY

Amenorrhea	It is the temporary or permanent absence of menstrual periods.
Anencephaly	It is the absence of a major portion of the brain, skull, and scalp that occurs during embryonic development.
Cerebrovascular stroke	A stroke occurs when the blood supply to part of your brain is interrupted or reduced depriving brain tissue of oxygen and nutrients. Within minutes, brain cells begin to die.
Caesarean delivery	A surgically assisted birth involving removal of the foetus by an incision into the uterus, usually by way of the abdominal wall.
Down syndrome	A genetic abnormality that causes mental retardation, short stature, and flattened facial features.
Foetal alcohol syndrome (FAS)	The cluster of symptoms seen in an infant or child whose mother consumed excess alcohol during pregnancy, including retarded growth, impaired development of the central nervous system and facial malformations.
Hypocalcaemia	A condition in which the blood has too little calcium.
Hypoplasia	Underdevelopment or incomplete development of a tissue or an organ.
Low birth weight (LBW)	A birth weight of 2500gms or less, indicates probable poor health in the new-born and mother during pregnancy.

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Spina bifida	One of the most common types of neural tube defects characterised by the incomplete closure of the spinal cord and its bony encasement.
Toxaemia	An abnormal condition of pregnancy characterised by hypertension and oedema and protein in the urine.

Evaluation

I. Choose the correct answer

1. The total plasma volume in a non-pregnant women averages _____ ml.
   (a) 2500 (b) 2600
   (c) 2800 (d) 3000
2. A healthy women gains an average weight about _____kg during pregnancy.
   (a) 11-13 (b) 14-15
   (c) 1-12 (d) 11-15
3. Consumption of non-food items like laundry starch, ice cubes are clay is called _____.
   (a) oedema (b) heart burn
   (c) pica (d) nausea
4. _____, dieting is hazardous during pregnancy.
   (a) exercise (b) weight loss
   (c) over eating (d) yoga
5. _____ stimulates milk production.
   (a) oxytocin (b) prolactin
   (c) progesterone (d) oestrogen.

II. Short answers

1. What is the role of placenta during pregnancy?
2. Suggest some ways to overcome nausea and vomiting during pregnancy?
3. What is meant by pica?
4. Write the minerals requirement for lactating mother?
5. Write short notes on Colostrum?

III. Brief answers

1. Write briefly about the weight gain during pregnancy?
2. Write about the effects of undernutrition on the mother during pregnancy?

3. Smoking and chewing tobacco exerts harmful effects during pregnancy. Give reasons.
4. Explain Hormonal control of lactation.
5. Write the practice incompatible with lactation?
6. Write briefly about colostrum?
7. Write about the immunological benefits of breast milk?

IV. Detailed answers

1. Write in detail about the physiological changes during pregnancy?
2. Explain the need of weight gain during pregnancy?
3. Write the effects of malnutrition on the foetus?
4. Suggest a diet for pregnant mother to avoid constipation?
5. Write the nutritional requirement during lactation?
6. Explain the process of stimulation of milk production?
7. Write the types of supplementary foods?

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NUTRITION DURING PRE SCHOOL, SCHOOL AGE AND ADOLESCENCE

Unit 3

OBJECTIVES

At the end of this lesson, the student will be able to

- Understand the growth and development associated with the different phases of life like the preschool, school age and adolescence.
- Understand the different nutritional factors that may affect the growth and development during preschool, school age and adolescence.
- Understand the nutritional requirements and nutrition related problems during preschool, school age and adolescence.

Parents look forward to being proud of strong, healthy, competent and happy sons and daughters. To grow and to function well in this adult world, children need a solid background of sound eating habits. Desirable food behaviors for a lifetime have their beginnings in childhood and adolescence. Nutrient needs change steadily throughout life into old age, depending on the rate of growth, gender, activities and many other factors.

3.1 Preschool Age

Early childhood is a stage in human development which includes toddlerhood (1-2 years) and preschool age(3-5 years). An infant grows rapidly, doubling its birth weight by 5 months and triples it by 1 year of age. During the second year, the child increases not only in height by 7-8 cm but also gains 4 times of its birth weight. After the age of one year a child's growth rate slows but the body continues to change dramatically. At age one, infants have just learned to stand and toddle; by two years they can take long strides with solid confidence and are learning to run, jump and climb.

Preschoolers are curious about everything that they see and hear. This is a great time for caregivers, both parents and teachers, to mold the children's minds and encourage them to use their creativity and imagination

3.1.1 Nutritional requirements of Preschool children

During this stage, children need vital nutrients for their brain to grow properly and the foundation for a healthy lifestyle should be laid during the preschool age.

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The RDA for a preschool child (1-6 years) is given in Table 3.1

Table 3.1 ICMR recommended dietary allowances for pre-school children

Nutrient	Years	
	1-3	4-6
Weight (Kg)	12.9	18.0
Energy (kcal)	1060	1350
Protein (g)	16.7	20.1
Fat (g)	27	25
Calcium (mg)	600	600
Iron (mg)	9	13
Vitamin A (µg)	400	400
Beta carotene (µg)	3200	3200
Thiamine (mg)	0.5	0.7
Riboflavin (mg)	0.6	0.8
Nicotinic acid (mg)	8	11
Pyridoxine (mg)	0.9	0.9
Ascorbic acid (mg)	40	40
Folic acid (µg)	150	150
Vitamin B12(µg)	0.2 to 1	0.2 to 1

Source: Dietary Guidelines for Indians - A Manual by Kamala Krishnaswamy, B. Sesikeran (Second Edition 2011), NIN, ICMR

Energy

The energy requirements of toddlers and children vary greatly based on differences in growth rate and level of physical activity. Insufficient food intake during this stage will not only result in under nutrition in terms of inadequate weight gain but will also hinder growth.

Protein

Protein is the primary component in many body tissues. Proteins build, maintain and restore tissues in the body such as muscles and organs. As a child grows and develops, protein is a crucial nutrient needed to provide optimal growth. Protein intake should be 1.5 to 2 g/kg body weight.

Fat

Until the age of three years, dietary fat plays a role in brain development. Fat comprises approximately 60% of the central and peripheral nervous system that essentially control, regulate and integrate every body system; thus it is essential that growing toddlers obtain adequate fat from their diet. A diet consisting of 30% of total calories from fat will help the child to meet their daily calorie and nutrient requirements for growth.

Vitamins

Vitamin A is essential to support rapid growth and to help combat infections. Inadequate intakes of vitamin A may lead to vitamin A deficiency which can cause visual impairment in the form of night blindness and may increase the risk of illness and death from childhood infections, including measles and those causing diarrhea. Milk,eggs, carrots and green leafy vegetables should be included in the diet of the child. Vitamin C is important for the child's general health and immune system. It can also help their body absorb iron. Good sources of vitamin C include oranges, kiwi fruit, strawberries and tomatoes.

Minerals

Calcium is the principle mineral required by the body for the process of bone mineralization. Toddlers and young children have an increased need for calcium to promote the rapid bone growth and skeletal development that takes place during these early years of life. Around 600 mg of calcium per day is required during this age. Milk is the best source of calcium. Hence the diet of a preschool child should include 1-2 glasses of milk per day.

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During periods of rapid growth the body's need for iron increases. Children 6- 24 months old are at the greatest risk of irreversible long-term consequences of iron deficiency like impaired physical and mental development. To meet this increased demand for iron, iron rich foods like rice flakes, dates, egg yolk and greens should be included in the diet.

3.1.2 Diet for the preschool child

The nutritional requirements of the child cannot be satisfied apart from an understanding of behavioral changes that occur. Toddlers begin to show independence and to assert themselves. They are alert to the attitudes of others and readily learn that they can use food as a weapon to gain attention. They mimic siblings and parents. They have short attention span and are easily distracted from eating. Their response to food is often inconsistent

Dietary guidelines for a preschool child

- The diet of the preschoolers should be adequate in quantity and quality of different nutrients. In addition to the amount of milk recommended, the preschool child should have two small servings of protein-rich foods like eggs and other non-vegetarian foods like pulses, paneer or cheese.
- When the child is about 18 months old finger foods such as carrots can be given.
- Proper elimination is usually maintained by a daily diet of fruits, vegetables and whole grain products.
- The diet should include a wide variety of foods. The child who is taught to eat everything on his plate is much more likely to enjoy optimal health than the one who picks and chooses
- Their food intake will improve if the food is interesting and attractive. e.g. chapathis, puris can be made into shapes or can be served in attractive plates. Flavour or colour of the milk can be changed to encourage the child to drink milk.
- Foods should be slightly seasoned so that they taste better and the child takes it well.
- Food preferences of the child should be taken into consideration.
- Child should never be forced to eat more than he can take.
- The person feeding the child should not show any dislike of the food in front of the child.
- The child should never be hurried while taking the food. The atmosphere should be pleasant and lacking distraction
- Regularity of meal times is essential
- Unripe bananas and fruits should not be given as they are difficult to chew and may choke the child.

3.1.3 Common feeding problems in children

Avoidant/Restrictive Food Intake Disorder is a common eating disorder experienced by young children. Children with this disorder experience a disturbance in their eating which can include a lack of interest in food or a sensory aversion to certain foods

- Eating only certain types of foods
- Refusing vegetables
- Refusing to chew
- Taking a long time to eat and keeping food in the mouth (rumination)
- The toddler/child wants to choose his own food.
- **Pica** is a type of condition where a child might eat non-food or non-nutritional substances persistently. These substances often include dirt, soap, chalk, sand, ice, and hair.

These aversions and restrictions can lead to weight loss and nutritional deficiency among young children.

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Picky eaters are very selective about what they eat. They have a fear of new foods called "food neophobia", which is generally defined as the reluctance to eat, or even taste new foods. Children with neophobia often reject many 'new' foods.

3.1.4 Tips for feeding Picky or Fussy eaters

Get them involved
Children are more likely to try foods when they feel a sense of ownership. Include them in meal planning, grocery shopping and food preparation
Be Creative
Serve vegetables as finger foods with dips Use cookie cutters to cut fruits and vegetables into fun shapes Serve traditional meals out of order (for example, breakfast can be served for dinner)
Enhance Favorite Recipes
Blend, slice or shred vegetables into soups, pancakes, muffins or dosai Serve fruit with yoghurt or ice cream
Be a Role Model and Share
Be a role model to children by eating healthy foods yourself. Children may need multiple exposures to new food before they accept it, so do continue offering foods that a child initially rejects
Respect and relax
Children tend to eat sporadically. They have small stomachs and so tend to fill up fast and become hungry again soon after eating. Focus on the child's overall weekly intake of food and nutrients rather than on daily consumption

3.1.5 Nutrition related problems in pre-school children

Malnutrition is harmful in children as it retards their physical growth and may cause mental disabilities. Deficiency of calorie and proteins may trigger a wide range of pathological conditions in the children. Protein Energy Malnutrition (PEM) is the most common nutritional disorder among children. About 1-2 percent of preschool children suffer from protein energy malnutrition like Kwashiorkor and Marasmus. This is the reason why parents should insist that children drink milk; eat pulses and other sources of proteins.

PEM can affect all age groups but it is more frequent among infants and young children whose rapid growth increases nutritional requirement

Marasmus

- The term marasmus is derived from the Greek work marasmus, which means **withering or wasting**
- Marasmus is a form of severe protein-energy malnutrition characterized by energy deficiency and emaciation.
- Marasmus usually develops between the ages of six months and one year in children who have been weaned from breast milk or who suffer from weakening conditions like chronic diarrhoea.
- marasmus is characterized by stunted growth and wasting of muscle and tissue
- A typical case of marasmus can be described as **bonny cage** having nothing but "skin and bones"

Causes of Marasmus

- Seen most commonly in the first year of life due to lack of breast feeding and the use of dilute animal milk.
- Poverty or famine and diarrhoea are the usual precipitating factors

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- Ignorance and poor maternal nutrition are also contributory factors
- Inadequate food intake
- Vitamin deficiencies
- Chronic starvation

Symptoms of Marasmus

- severe growth retardation
- extreme emaciation
- old man's or monkey's face
- loose hanging skin folds over arms and buttocks
- sunken eyes
- wrinkled skin
- temperature is subnormal
- loss or wasting of muscles,
- ribs become prominent, projected ribs
- digestion becomes weak
- body growth and development slows down.

Fig 3.1 Symptoms of Marasmus

It can be cured by ensuring mother's milk for infants, by delaying another pregnancy in quick succession and by having a diet rich in protein, carbohydrates, fats, vitamins and minerals.

Kwashiorkar

Kwashiorkor refers to an **inadequate protein intake with reasonable calorie (energy) intake.** This leads to decreased synthesis of visceral proteins. Kwashiorkor usually occurs at the age of about 12 months when breastfeeding is discontinued, but it can develop at any time during a child's formative years.

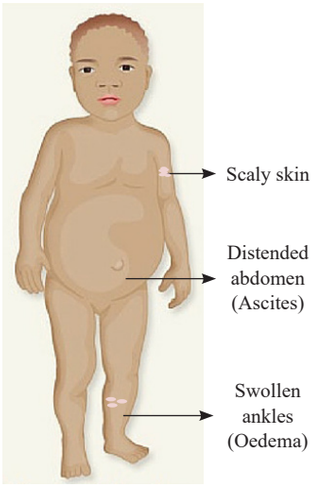

Fig 3.2 Symptoms of kwashiorkor

Causes

Kwashiorkor is most common in areas where there is:

- famine
- limited food supply
- delayed complementary feeding
- protein deficient diet
- infections

Symptoms

The three essential manifestation or signs of kwashiorkor are edema, growth failure and mental changes; in addition there may be changes in hair and skin.

The symptoms of this disease are

- enlargement of liver due to fatty infiltration,
- oedema due to water accumulation
- darkening of the skin with scaly appearance,
- hair becomes reddish-brown,
- legs become thin, and
- retardation of physical as well as mental growth

Eating a protein-rich diet that consists of milk, meat, groundnut, soyabean, jaggery can help in the treatment of kwashiorkor.

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Vitamin A deficiency in Children

Vitamin A deficiency (VAD) is a serious health problem among children in many developing or low-income countries. In fact, 250 million children across the world suffer from VAD. It could even result in death when left untreated.

There are many animal sources (liver, whole milk, cheese, eggs, and oily fish) and plant sources (colorful fruits and vegetables as well as greens) of vitamin A. When we don't eat enough of these foods, VAD sets in, leading to various diseases. VAD can also be triggered by inefficient storage, transport, and absorption of vitamin A.

Vitamin A deficiency leads to xerophthalmia which covers a wide range of eye problems like

a) Night blindness is an early symptom of Vitamin A deficiency. When vitamin A is deficient, the formation of rhodopsin is impaired giving rise to night blindness. Children with night blindness are unable to see in poor light condition /darkness.

b) Bitot's spot- Bitot's spots are whitish deposits on the thin lining of the lower eyelid. They are usually spotted in children aged 3–6 years.

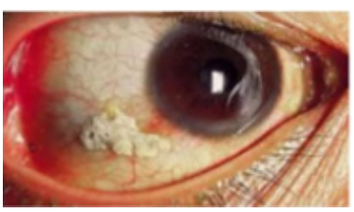

Fig 3.3 Bitot's spot

Without sufficient vitamin A, the conjunctiva becomes dull and dries (conjunctival xerosis). This leads to the buildup of keratin protein in the eye, manifesting as dry, triangular lesions with a foamy appearance called Bitot's spots.

If the symptoms of Bitot's spots are not addressed by treating vitamin A deficiency it can affect the cornea of the eye. Cornea is the clear front portion of the eye that allows light to enter and which is partially responsible for our eyes' ability to focus. Corneal xerosis is a drying up of the eyes. With corneal xerosis, the tear glands in the eye malfunction and no longer produce tears and mucus to keep the eye surface moist.

Wrinkling and dark colouring of the conjunctiva on one side, cornea dry and dull (Xerosis)

Fig 3.4 Corneal Xerosis

The cornea then becomes dry and hazy and takes on a parched appearance. It is also more prone to infections at this stage.

Prevention of Vitamin A deficiency

Eat foods which are rich in Vitamin A. Milk, egg, fish oil etc. are rich in vitamin A. Leafy vegetables like various types of greens, vegetables like carrot and fruits like papaya and mango are good sources of vitamin A. Liver, cod liver oil, butter and ghee also provide vitamin A

Based on research conducted by National Institute of Nutrition, Hyderabad, one spoon of Vitamin A syrup to children of 1-5 years age group once in 6 months also prevents vitamin A deficiency to certain extent.

When the children are given Vitamin A syrup once in six months up to five years of age, Vitamin A gets retained in the liver and is available in sufficient quantities till the next

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dose is administered. This is presently followed throughout our country to protect children from permanent blindness caused due to vitamin A deficiency.

Pregnant women should take nutritious food that contains vitamin A. This helps the child in the womb to get vitamin A from its mother.

Recipes rich in vitamin A suitable for children

Boiled egg, egg custard, coriander and mint chutney with bread / chapathi, carrot halwa, carrot salad, carrot kheer, carrot juice, papaya, orange juice, tomato juice, mango juice, palak dal, palak paneer.

3.2 Nutrition for School Children (6-12 years)

The school- age period has been called the latent time of growth. School-age children grow significantly, but at slower rate, and are physically very active in general. As a result, their nutritional needs are high and critical.

Maintaining a balanced diet and regular exercise is important for school-aged children (6-12 years). These children are required to eat a variety of foods from each food group to ensure optimal intake of all vitamins and minerals. At the same time, they may face new challenges regarding food choices and habits. Decisions about what to eat are partly determined by the influences from friends at school and the media, especially television.

3.2.1 Nutritional requirements of School children

Poor nutrition not only compromises the quality of life of school-aged children but also their potential to benefit from education. Adequate nutrition of school aged children will also ensure that they grow to their full potential, and provide the stepping stones to a healthy life.

The RDA of school children aged 7-12 years suggested by ICMR is given in Table 3.2

Table 3.2 ICMR recommended dietary allowances for school children

Nutrient	Years		
	7-9	10-12	
		Boys	Girls
Weight (Kg)	25.1	34.3	35.0
Energy (kcal)	1690	2190	2010
Protein (g)	29.5	39.9	40.4
Fat (g)	30	35	35
Calcium (mg)	600	800	800
Iron (mg)	16	21	27
Vitamin A (µg)	600	600	600
Beta carotene (µg)	4800	4800	4800
Thiamine (mg)	0.8	1.1	1.0
Riboflavin (mg)	1.0	1.3	1.2
Nicotinic acid (mg)	13	15	13
Pyridoxine (mg)	1.6	1.6	1.6
Ascorbic acid (mg)	40	40	40
Folic acid (µg)	120	140	140
Vitamin B12(µg)	0.2-1.0	0.2-1.0	0.2-1.0

Source: Dietary Guidelines for Indians - A Manual by Kamala Krishnaswamy, B. Sesikeran (Second Edition 2011) , NIN, ICMR

Nutritional requirements of boys and girls are more or less the same till the first 9 years. After that, there is a variation in some nutrients.

The essential nutrients for optimal health during school age are:

Energy

Energy needs vary with the child's growth rate, body size and physical activity. The mean increase in body weight is 2.5-2.7 kg/ year. During periods of rapid growth, appetite increases and children tend to eat constantly. The brain needs energy to function properly and hence a constant supply of glucose is critical. Cognitively demanding tasks, such as schoolwork, require regular supplies of glucose to the brain in order to enhance

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cognitive functioning and improves memory and mood. Carbohydrates and fats provide energy for growth and physical activity.

Protein

Protein builds, maintains and repairs body tissue. It is especially important for growth. It's important that parents encourage children to eat two to three servings of protein daily. Good sources of protein for children include meat, fish, poultry, milk and other dairy products.

Essential fatty acids

Deficiency of essential fatty acids may have a negative impact on school performance

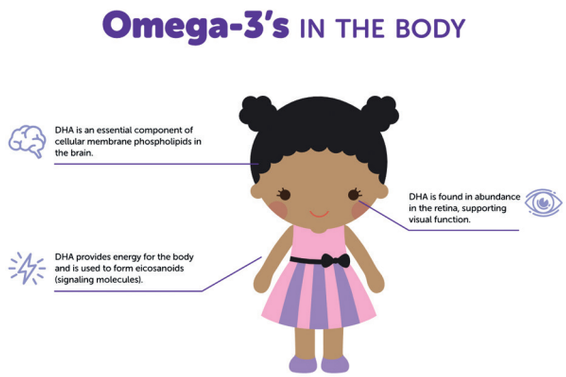

Fig.3.5 Role of Omega-3's in the Body

Minerals

Calcium is important in building strong bones and teeth. Bone density suffers when calcium needs are not met during childhood years. Osteoporosis, a disease associated with the softening of the bones affects a significant proportion of adults. This begins in childhood if diets do not provide adequate calcium-rich foods. Milk and dairy products and some dark green, leafy vegetables are good sources of calcium.

Children need iron because of rapidly expanding blood volume during growth. Meats, fish, poultry, and enriched breads and cereals are the best sources of dietary iron.

Vitamins

A child needs vitamins for the body to function properly and to boost the immune system.

A variety of fruits and vegetables of different colours should be added in the child's food. Vitamin A is essential for vision and a deficiency of the same can lead to night blindness (difficulty in seeing in night). Dark green leafy vegetables, yellow, orange coloured vegetables and fruits such as carrots, papaya, mangoes are good sources of Vitamin A.

Vitamin D helps in bone growth and development and it is essential for absorption of calcium. Children get most of their Vitamin D from sunlight and a small amount from some food items like fish oils, fatty fish, mushrooms, cheese and egg yolks.

3.2.2 Snacking in school-aged children

During the primary school years, a greater proportion of meals may be eaten away from home in the school setting. Most of these snacks consumed are high fat foods. Snacks may contribute up to a significant proportion of total daily energy and nutrient needs of the school child. Salty snacks, such as packets of crisps or chips, may be of poor value as they give few nutrients.

Children who are both physically active and growing need to refuel periodically

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throughout the day. Parents and other caretakers have the critical role in helping children to make nutritious snack choices. Frequent snacking may result in loss of appetite during the main meal. A healthy snack should be less in size or quantity to the amount of a regular meal and taken at least 2 hours before a regular meal.

Fig 3.6 Healthy snacks

3.2.3 Nutritional problems in school-aged children

Many major risk factors for disease in developed countries (that is, blood pressure, cholesterol, overweight, obesity, low fruit and vegetable intake, and iron deficiency) are nutrition related. Provision of adequate diet during the school age period will enhance learning capacity as well as prevent adult onset diseases such as ischaemic heart disease, hypertension, some types of cancer and diabetes. In principle therefore, nutritional problems in the school aged child may carry into adulthood. Patronage for convenience and junk foods which tend to have a high fat content are a major determinant of nutritional problems. Some of the nutritional problems in this age group include the following:

Obesity

There is an increasing trend of school children being overweight and obese which is mainly attributable to reduced physical activity. Eating diets high in fat and being less physically active leads to obesity which may be a predisposition to lifelong health problems (for example, hyperlipidemia, cardiovascular problems, type 2 diabetes mellitus and obesity) in the later years.

Underweight

Many school children consume inadequate diet and so they are malnourished. Sometimes ignorance on the part of parents to know the requirements of children quantitatively or qualitatively may lead to malnutrition of children. When the child is in a hurry to go to school, he may miss breakfast or may not carry proper lunch to school or may become too tired after school activities and sleep off without taking night meal and thus skip meals. Emotional disturbances at school due to poor academic performance or problems with siblings at home may reflect on the consumption of food. Psychological factors contributing to depression or poor motivation to eat should be identified.

Constipation

Constipation in children is a common problem. A constipated child has infrequent bowel movements or hard, dry stools. Encouraging the child to make simple dietary changes such as eating more fiber-rich fruits and vegetables and drinking more fluids can go a long way toward alleviating constipation. Children may not relish vegetables and fruits particularly green leafy vegetables. Parents should make an effort to motivate the child to eat by serving fruits and vegetables in different forms.

Dental caries

Dental caries are caused by over indulging in sugary foods such as soft drinks and confectionery which predisposes school aged children to poor dental health. The risk of tooth decay is greatest with the consumption of large amounts of sticky, sugary and starchy foods that stick to the teeth (for example, sweets, sodas, lollies and candies)

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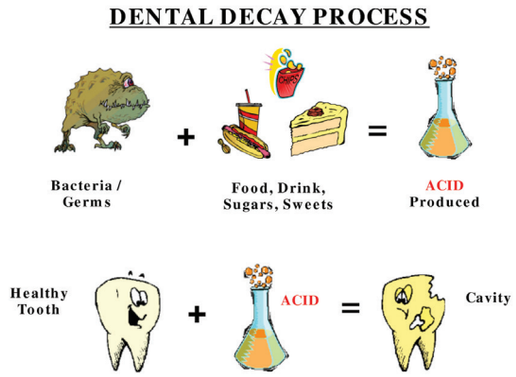

Fig. 3.7 Dental Decay process

Anaemia

Iron-deficiency anemia may develop in children whose diet is iron-deficient. Iron is an oxygen-carrying component of blood. Anemia in school-aged children may result in deleterious effects including lower school achievement due to impaired cognitive development, poor attention rate and general fatigue.

A study involving 5398 children between the ages of 6 and 16 in the United States, found that lower Maths test scores were seen in children with Iron deficiency. Children deficient in Iron were twice as likely to score below average on Maths tests and this finding was more pronounced in girls.

3.2.4 Key points for good nutrition in school-aged children

Habits developed in the formative years of life have a lasting effect on health. As a result parents need to set positive food culture through meal planning, keeping a variety of foods in supply, and setting a good example. The key points to remember as a parent/ caretaker include the following :-

- Adequate nutrition will help the child develop maximal intelligence (IQ) and well-being.
- The child should be guided to make independent food choices and eat a variety of foods.
- Malnutrition and its consequences can be prevented by eating the right kinds and amounts of foods.
- Encourage the child to practice proper hygiene at all times.

3.2.5 Dietary guidelines to keep children healthy

- The child should eat a variety of foods in order to have adequate nutrient intake.
- Nutritional requirement should meet their increasing activity and growth
- The diet should contain plenty of grain products, vegetables and fruits.
- The diet should provide enough calcium and iron to meet their growing body's requirements.
- Teach children from an early age about nutrition and healthy eating. They should be taught what happens to the food they consume.
- The diet should be moderate in sugars and salt. Avoid giving large amounts of sweet desserts, soft drinks, fruit-flavored drinks, sugar-coated cereals, chips or candy, as they have little nutritional value.
- Children tend to be bored with foods easily. so menus need to provide variety, colour, texture, taste and flavor.
- Children have varying appetites and often prefer snacky meals at frequent intervals instead of a few large ones.
- Fruits and dry fruits can be served as snack item on returning from school
- If the child does not like salads, they can be incorporated in recipes like sandwiches.

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- The young child should be encouraged to eat with the rest of the family.

3.3 Packed Lunch for School Children

Packed lunches have become a necessity for school going children as schools are either away or the lunch period is too short for the children to go home and have food. The packed lunch is a lunch that is packed in a tiffin box to be eaten by the child while away from home. Carrying food from home is less expensive, more convenient, more hygienic and meets the individual requirements. Eating in the middle of the day, several hours after breakfast, re-energizes the body.

3.3.1 Points to be considered in planning a packed lunch.

- The school lunch should meet one third daily requirement in calories, protein and other nutrients of the child, to boost concentration and energy for the rest of the school day
- Preferably the packed lunch should consist of all five food groups, though the number of dishes may be less
- Inclusion of one serving of green leafy vegetables would take care of one third requirements of mainly vitamins and minerals
- Some amount of good quality protein like milk or milk products like curd or paneer would improve vegetable protein or a combination of vegetables protein like cereals and pulses can be given for better utilization. Addition of egg also improves the quality of protein besides meeting many protective nutrient needs.
- To make the food appetizing, pack foods like whole fruit or butter milk in a bottle
- Monotony should be avoided in packed lunch. There should be variety
- It is sensible to have a different food in packed lunch than what one had for breakfast
- Containers should be clean and dried before packing the food.

3.3.2 Tips to encourage the child to eat packed lunch

- Involve the child in planning, preparing or packing the lunch box
- Make the lunch simple. Most children eat lunch quickly so that they can spend more time socializing or playing with friends
- Send easy to open packages, cut - up fruits and vegetables, roll chapattis with stuffing.
- Send small portions which he can complete during lunch period

3.3.3 Healthy packed lunches

- Vegetable pulao, boiled egg, tomato raita and orange fruit.
- Cheese sandwich or paneer sandwiches, with guava
- Stuffed idli with coconut chutney and potato
- Methi chapathi with thick dhal and buttermilk
- Chapathi, paruppuusili and carrot salad
- Cheese sandwiches or paneer sandwiches, guava
- Idli and kurma
- Curd rice, tomato or cucumber slices and lemon pickle

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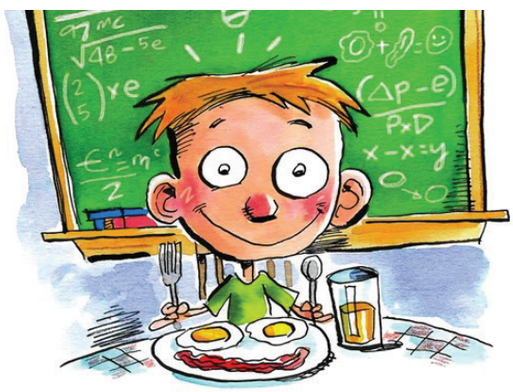
- Kichdi, buttermilk, coriander chutney
- Adai with drumstick leaves and coconut chutney

3.4 Breakfast - the most important meal of the Day

A nutritious breakfast is a central feature of a child's diet that supports healthy growth and development. Breakfast is the first meal of the day. A healthy breakfast refuels the body and replenishes the blood sugar (glucose), giving the energy necessary to start a new day. It is proven that breakfast is good for both physical and mental health. Nutrients missed from a skipped breakfast won't be "made up" at lunch and dinner but will be left out completely that day.



Eating breakfast is important for all ages, especially for children and adolescents. It is observed that children who eat breakfast are more likely to have better concentration, problem-solving skills and eye-hand coordination. They may also be more alert and attentive in class. Eating breakfast every day will help to maintain concentration in class.

A good breakfast should be able to provide one third of the total daily energy requirement. A typical breakfast includes a cereal (for example, rice, wheat and ragi), protein-rich food such as egg, a glass of milk and vitamin C rich fruit e.g. orange, and papaya

3.4.1 Advantages of a healthy breakfast

Children who eat a healthy breakfast are more likely to:

- **Have better concentration and be more productive throughout the morning :** This may be due to replenishing glucose, the brain's main energy source.
- **Control their weight:** Eating breakfast may reduce hunger later in the day and it may help eaters to avoid junk foods at later meals.
- **Have more strength and endurance:** People who eat breakfast have higher energy levels, and may engage in more physical activity than many people who don't eat breakfast.

DO YOU KNOW?

An overnight and morning fast among school children can have deleterious effects on memory and attention. Research shows that skipping breakfast can have adverse effects on both energy levels and cognition of school children.

THINK BEFORE YOU SKIP YOUR BREAKFAST

3.4.2 Tips for a healthy breakfast

A healthy breakfast should consist of a variety of foods. To make a healthy breakfast each day, choose one item from at least three of the following four food groups:

- **Fruits and vegetables:** Consider fresh, whole fruits and vegetables, or 100 percent fruit juice without added sugar.
- **Grains:** Choose whole-grain cereals, and not refined flour like maida.
- **Dairy :** Consider skim milk, low-fat yogurt or low-fat cheeses, such as cottage and natural cheeses.

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- **Protein :** Choose lentils and dals, hard-boiled eggs, lean slices of meat and poultry, or fish.
- Avoid breakfast loaded with simple sugars (gets digested early and may feel hungry soon) or dripping in oil (may cause drowsiness throughout the day)

Activity : 1

Choose one special day in the school calendar and decorate the classroom with balloons, tablecloths or student artwork and posters to highlight healthy foods and the importance of breakfast and invite the Principal or Headmistress of the school to eat Breakfast with the children

Activity : 2

Have a breakfast poster competition among students and hang the posters around the school

Nutrition for Adolescents

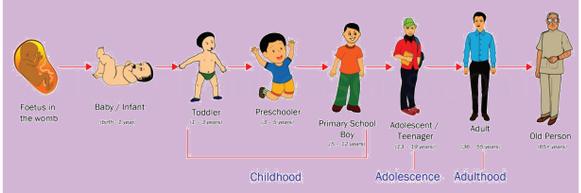
3.5 Adolescence

Adolescent growth spurt starts at about 10-12 years in girls and two years later in boys. Adolescence is characterized by rapid increase in height and weight, hormonal changes, sexual maturation and wide swings in emotion. Development of critical bone mass is essential during this period as this forms the ground for maintaining mineral integrity of the bone in later life. Adolescent girls are at greater physiological stress than boys because of menstruation. Their nutritional needs are of particular importance as they have to prepare for motherhood.

3.5.1 Growth and Development in Adolescence

According to WHO, individuals between 10 and 19 years are considered adolescents. The period of transition from childhood to adulthood is called adolescence with accelerated physical growth .

Out of all the stages of life, the most fascinating is the adolescent age



During this phase, a child is going through many changes in his/her body – changes occur in hormones, skin, height and weight. The child observes these changes and makes amendments in his/her eating habits without appropriate guidance.

Adolescence is a significant period for physical growth and sexual maturation. Nutrition being an important determinant of physical growth of adolescents is an important area that needs attention.

Inadequate nutritional intake during adolescence can have serious consequences throughout the reproductive years and beyond. Poor nutrition during adolescence can impair the work capacity and productivity of adolescent boys and girls in their later years. Further, an undernourished girl is at the risk of developing complications during pregnancy and the chances of her giving birth to a low birth weight baby increases, thus perpetuating a vicious cycle of malnutrition and ill-health.

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3.5.2 Physical, Physiological and Psychological changes

Body composition

Body composition changes during the period of maturation. The changes occur due to hormonal influences which regulate the development of sex characteristics. The skeletal growth continues for a longer period of time for boys than girls. Usually the skeleton reaches its full maturity by 17 years for girls and by 20 years for boys. As mineralization increases the water content decreases.

Girls tend to deposit more fat whereas boys add more muscle mass. The result of pubertal changes is that boys have more lean body mass, skeletal weight and less adipose tissue as a ratio of total body mass. This difference in body composition for boys and girls is reflected in their nutrient requirements.

Sexual maturity

The growth spurt is accompanied by sexual maturity. In girls there is development of breasts, auxiliary and pubic hair and menarche.

In boys the pubertal changes include deepening of voice, broadening of shoulders, development of auxiliary and pubic hair, growth of penis and testicles.

Psycho social changes

As this period is a transition to adulthood, they try to develop self-identity. The desire to be accepted in their peer group changes their food habits, dressing and group conduct. This in turn brings psychological, emotional and social stress.

3.5.3 Nutritional requirements

Adequate intake of nutrients during the adolescent period is critical in the phenotype expression of genetic potential of bone tissue growth and mineralization. Insufficient intake of nutrients inhibits growth promoting hormones, impeding or delaying the onset of pubertal development, causes poor concentration on studies and may even lower height gain during this period.

The Recommended Dietary Allowance for adolescents is presented in Table 3.3

Table. 3.3 ICMR recommended dietary allowances for Adolescents

Nutrient	Years			
	13-15		16-17	
	Boys	Girls	Boys	Girls
Weight (Kg)	47.6	46.6	55.4	52.1
Energy (kcal)	2750	2330	3020	2440
Protein (g)	54.3	51.9	61.5	55.5
Fat (g)	45	40	50	35
Calcium (mg)	800	800	800	800
Iron (mg)	32	27	28	26
Vitamin A (µg)	600	600	600	600
Beta carotene (µg)	4800	4800	4800	4800
Thiamine (mg)	1.4	1.2	1.5	1.07
Riboflavin (mg)	1.6	1.4	1.8	1.2
Nicotinic acid (mg)	16	14	17	14
Pyridoxine (mg)	2	2	2	2
Ascorbic acid (mg)	40	40	40	40
Folic acid (µg)	150	150	200	200
Vitamin B12(µg)	0.2-1	0.2-1	0.2-1	0.2-1

Source: Dietary Guidelines for Indians - A Manual by Kamala Krishnaswamy, B. Sesikeran (Second Edition 2011) , NIN, ICMR

Energy

The metabolic demands of growth and energy expenditure increases the calorie needs. The ICMR committee has suggested that energy should be provided on the basis of ideal weight for age. The energy requirements for boys are more than that of girls which is 2750 kcal and 3020 kcal for boys 13-15 years and 16-18 years respectively and 2330 kcal

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and 2440 kcal for girls of 13 -15 years and 16-18 years respectively. The difference in energy requirements can be attributed to the rapid increase in weight for boys.

Protein

The protein requirements are computed in the same way as for adults. The protein needs represent 12-14 percent of the total energy requirements. This meets the need for growth, for pubertal changes in both sexes and for developing lean body mass in boys.

Minerals

All mineral needs increase during adolescence. Adolescents at the peak of their growth velocity will require large quantities of nutrients. Adolescents require twice the amount of calcium, iron, zinc, magnesium and sodium during the years of the growth spurt compared with that during other years. Bone growth requires calcium. During adolescence 800 mg of calcium per day is needed. About 150 mg of calcium should be retained for increasing bone mass. Adolescents who have less bone mineral density are susceptible for osteoporosis later in their life.

The requirements for iron have been arrived at 32 mg/day and 27 mg/day for boys and girls 13 – 15 years of age, and 28 mg / day and 26 mg / day for boys and girls 16-18 years of age respectively. Iron requirements are generally high during adolescence due to the following reasons such as growth spurt, expansion of blood volume, increase in haemoglobin concentration, additional iron to compensate menstrual losses in girls and adding the basal loss of iron. Zinc supplements can also increase pubertal growth in adolescents.

Vitamins

The requirement for B vitamins namely thiamine, riboflavin and niacin increases in direct proportion with increase in calorie intake. Folic acid and vitamin B12 requirements also increase when there is rapid tissue synthesis as they participate in synthesis of DNA and RNA.

Transamination to synthesize non-essential amino acids requires more vitamin B6. The structural and functional integrity of newly formed cells depends on the availability of vitamins A, C and E

3.5.4 NUTRITIONAL PROBLEMS

Obesity

Obesity is a state in which there is a generalized accumulation of excess fat in adipose tissue in the body leading to more than 20% of desirable weight. Obesity has several adverse health effects and can even lead to premature death. Obesity leads to high blood cholesterol, high blood pressure, heart disease, diabetes, gallbladder stone and certain types of cancer.

Factors responsible for adolescent obesity

- Inactive life style
- Genetics and family history
- Junk food and over eating
- Psychological causes
- Environmental causes
- Diseases
- Drugs
- Tobacco and alcohol

The prevalence of adolescent obesity can be reduced by initiating programmes of health and nutrition education for school children, encouraging physical activity and healthy food habits.

Some of the factors contributing to adolescent obesity and solutions to prevent it are presented in Table 3.4

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Contributors to adolescent overweight/obesity	Adolescent behavior objective
Excessive TV, video, computer and mobile phone use	Limit the use of TV, computer and mobile phones to 1-2 hours per day and increase outdoor activities instead
Lack of physical activity	Increase daily active play and other outdoor fun activities. one hour of active play every day is recommended as part of a healthy lifestyle.
Over consumption of sugar sweetened beverages	Replace sugar sweetened beverages such as soda, carbonated drinks and soft drinks with water, tender coconut water, fresh fruit juices (without sugar) and butter milk
Large portion sizes	Eat small meals and reduce portion sizes of foods
High consumption of fast foods and junk foods	Eat fast foods no more than 1-2 times per week. Replace junk foods with healthier eating options
Skipping breakfast.	Eat a healthy breakfast daily. If in a hurry to go to school pack your breakfast and eat it on the way.
High consumption of fatty foods	Avoid deep fat fried items and increase the intake of steamed and boiled foods
Low fibre intake in the diet	Consume 3- 4 cups of fruits and vegetables every day. Consume whole grains and pulses whenever possible.

Nutritional Anaemia

Iron deficiency anemia is a major nutritional problem in adolescent boys and girls in India. The need for iron increases with rapid growth and expansion of blood volume and muscle mass. As boys gain lean body mass at a faster rate than girls, they require more iron than girls. The onset of menstruation imposes additional needs for girls.

Main causes of Anaemia

- Inadequate iron intake/absorption/stores
- Frequent dieting or restricted eating
- Meal skipping
- Substance abuse
- Heavy/lengthy menstrual periods
- Rapid growth
- Adolescent Pregnancy
- Parasitic infection

Signs and symptom

- Fatigue, lethargy, dizziness, headaches
- Shortness of breath, ringing in ears, taste disturbances
- Restless leg syndrome
- Pallor, Flattened, brittle nails (spoon nail)
- Angular stomatitis (cracks at mouth corners)
- Glossitis, Blue sclera (whites of eyes), Pale conjunctivae.

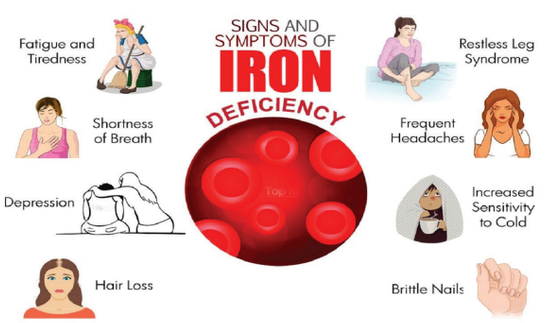

Fig. 3.8 Signs and symptoms of Iron Deficiency

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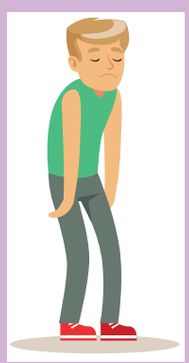
Key risk of Anaemia

- Impaired cognitive functioning and memory
- Decreased school performance
- Compromised growth and development
- Increased risk of pregnancy related complications
- Decreased work capacity
- Depressed immune function

Preventive measures

Adolescents should be encouraged to consume iron rich foods (green leafy vegetables, jaggery, meat) complemented with a Vitamin C source like Citrus fruits (oranges, lemon) and Indian gooseberry (Amla). Adolescent girls need additional requirement of Iron to compensate for menstrual blood loss



India is home to 243 million adolescents – children aged 10 to 19 years – the most adolescents of any country. Sadly, a large proportion of India's adolescents are anaemic: 56 per cent of girls and 30 per cent of boys.

Anaemia among adolescents adversely affects these young people's growth, resistance to infections, cognitive development and work productivity.

3.5.4 Eating disorders in adolescence

Anorexia Nervosa and Bulimia

Anorexia is described as a state of emaciation that has been brought on by voluntary starvation. It is seen primarily in adolescent girls from middle and upper class families where the victim refuses to eat. Anorectic adolescents usually experience amenorrhea and sometimes fatal electrolyte imbalances. They deny that they are emaciated, inspite of a skeleton like appearance and usually continue to pursue thinness by refusing to eat.

Another related phenomenon known as "gorge and purge" or Bulimia is seen among adolescent girls in socio economic backgrounds similar to those who develop anorexia nervosa. These individuals consume enormous quantities of food and then immediately induce vomiting or take laxatives to purge themselves of the food and thus the nutrients they provide.

3.5.5 Nutrition and the Menstrual Cycle

One of the many challenges girls face as they become women is the onset of menstruation. These hormones that regulate

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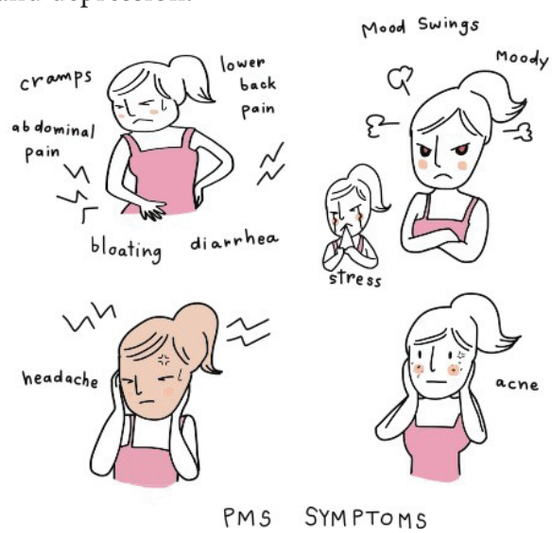
the menstrual cycle are powerful and they affect more than just the uterus and the ovaries. They alter the metabolic rate, glucose tolerance, appetite, food intake, mood and behavior. Most girls live easily with the cyclic rhythm of the menstrual cycle, but some are afflicted with physical and emotional pain prior to menstruation, a condition called Premenstrual syndrome or PMS

Premenstrual Syndrome (PMS) is a cluster of symptoms, including both physical and emotional pain, that some girls experience prior to and during menstruation.

The menstrual cycle may affect the adolescent girl's metabolism and appetites in a cyclic fashion. Premenstrual Syndrome (PMS) is probably a diverse set of conditions with no single cause. A sound diet is part of the recommended lifestyle to reduce symptoms of PMS

A girl suffering from PMS may complain of any or all of the following symptoms: cramps and aches in the abdomen, back pain, headaches, acne, swelling of face and limbs associated with water retention, food cravings (especially for sweets), abnormal thirst, pain and lumps in the breast, diarrhea and mood swings including both nervousness and depression.



3.5.6 Acne Vulgaris

Acne is a common concern among adolescents and about 80 percent of teens experience it. The main culprit of acne is over activity of sebaceous glands in the skin. Blockage in a duct in the gland can lead to infection and localized pressure resulting in an acne lesion. Adolescents are warned to avoid junk foods like nuts, chocolates, pizzas, chips, candies and ice creams to prevent acne.

Acne

Chronic inflammation of the skin's follicles and oil-producing glands, which leads to an accumulation of oils inside the ducts that surround hairs; usually associated with maturation of young adults

3.5.7 Malnutrition due to teenage pregnancy

Teenage mothers are considered to be at high risk as maternal death and infant mortality rates are higher among them. The biological immaturity has a greater impact on pregnancy. Malnutrition sets in when the pregnant adolescent girl fails to meet the demands of not only her growth but also that of the foetus. This has a direct bearing

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on the outcome of pregnancy. Lactation failure is also common. Teenage mothers fail to breast feed their infants adequately resulting in high infant morbidity rate. Good nutrition and fostering healthy eating habits during adolescence paves way for a healthy adulthood.

3.5.8 Changes in eating habits during adolescence

During adolescence, food habits change for the worse, and teenagers often miss out on the nutrients they need. They begin to skip breakfast; choose less milk, fruits and vegetables and consume more soft drinks each day. Skipping breakfast and eating fast foods contributes to weight gain and higher BMI values. Peer pressure is very high during adolescence. The need to be in step with the trends and belong to the peer group leads the adolescent to eating non-nutritious foods like pizzas, burgers, coffees, aerated drinks, chocolates and also other roadside junk foods which are nutritionally inadequate and rich in saturated fats and may skip meals at times.

Awareness about one's body and its appearance becomes the top priority. It is important for adolescents to realize that they are going through growth spurt and poor nutrition can lead to deficiencies which may cause metabolic disorders in adulthood.

Psychological pressures on adolescents' influence their eating habits. Boys generally tend to have a better appetite than girls and this helps them to meet their nutritional demands. The adolescent girls are at a disadvantage due to the following reasons.

1. with considerable amount of fat deposits and less physical activity than boys, girls may gain weight.

2. figure consciousness due to social pressure may force her into a self-imposed crash diet for weight loss or self-starvation leading to eating disorders like bulimia and anorexia nervosa.

Hence adolescents should be educated to consume a balanced nutritional diet including iron rich, calcium rich, and protein rich foods and avoiding junk foods providing empty calories. The adolescents should be advised not to miss meals and that emotions should not dominate during meal times.

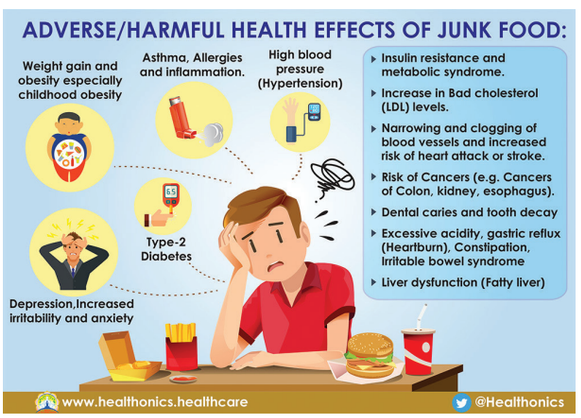

Fig. 3.9 Harmful health effects of junk foods

3.5.9 Dietary guidelines for adolescents

- Adolescence is the time to inculcate food and exercise habits which ensure good health forever. There are simple methods of taking care of health during this period.
- Eat at least two to three meals of fruits in a day for a glowing complexion and to keep constipation away.

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- Coconut water and fresh fruit juice will improve immunity and also provide vital vitamins.
- A minimum of two glasses of skimmed milk is a good midnight snack when it is exam time or when awake late for projects.
- Egg or chicken sandwich is a better option while meeting up with friends or after play.
- A milkshake is always a better choice as compared to an aerated drink.
- Breakfast is the most important meal, as it ensures minimum brain damage due to an overnight fast.
- A water intake of three-four litres per day clears all toxins from the body and keeps the skin healthy and glowing.
- A handful of raisins and almonds is a very good snack between during long hours of studies.
- Avoid foods that are processed or canned as they contain preservatives which can be carcinogenic in future life.
- Foods that are rich in sugar are responsible for obesity, gasse in the stomach and also cause skin eruptions.
- Fish, chicken, eggs are good sources of protein which help in growth and repair of worn out tissues.
- Always eat your breakfast and at least one meal with plenty of vegetables that is healthy and nutritious, at home.
- Sit and eat peacefully, because body absorbs nutrition under minimum anxiety and stress from the food we eat.
- Avoid crash diet and skipping meals to keep the metabolism high and also help in fat loss.
- Exercise daily for five days a week to ensure good health and a fit body.
- Whenever you happen to eat out in a restaurant, have a fresh pineapple juice along with your meal to prevent indigestion.
- Fried and oily foods and foods with cheese and cream take a long time to digest thus cause indigestion and are a very strong reason for pimples and obesity.
- Walnuts and dried apricots enhance brain function and concentration.
- Eat whenever you are hungry, not because everyone around is eating.
- Adolescents can be encouraged to cook their own healthy dishes

Thus from this lesson we have learnt that nutrient needs rise dramatically as children enter the rapid growth phase of the teen years. The busy lifestyles of adolescents add to the challenge of meeting their nutrient needs-especially for iron and calcium. Nutrition and lifestyle choices people make as children and adolescents have long-term as well as immediate effects on their health.

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Activity :3

Student Resource Sheet

"Changing my diet to improve my Health"

Name of the Student:

I would like to change	How will this improve my health?	How important is this to me?
Example: I would like to drink more water instead of fruit juice	It will hydrate me more effectively and contains no sugar	I know I drink too much juice and water will help me stay hydrated and concentrate better

Activity : 4

- On the school Annual day invite parents to join students for a fun space-themed breakfast in the school's auditorium. The children can set up MyPlate-theme "space stations," where other children can select foods from each food group to "help their day take off" – for example, milk at the dairy station, whole-wheat flour at the grains station, or apples at the fruit station. The student volunteers can explain the stations' connection to MyPlate.
- To emphasize the theme, students can dress in astronaut costumes or prepare a brief skit or presentation about how a healthy breakfast helps them "fuel up" like a rocket ship.
- Students can decorate stars with drawings of their favorite breakfast fruits, vegetables, low-fat dairy, protein foods, and whole grains, creating a starry sky of healthy food choices.

SUMMARY

- ❖ Nutrient needs change steadily throughout life into old age, depending on the rate of growth, gender, activities and many other factors.
- ❖ Childhood and adolescence are periods of continuous growth and development which places a great demand on nutrients.
- ❖ The energy requirements of toddlers and children vary greatly based on differences in growth rate and level of physical activity. Insufficient food will not only result in under nutrition in terms of inadequate weight gain but will also hinder growth.
- ❖ Toddlers and young children have an increased need for calcium to promote the rapid bone growth and skeletal development that takes place during these early years of life.
- ❖ The school- age period (6-12 years)is called the latent time of growth. School-aged children grow significantly, and are physically active in general. As a result, their nutritional needs are high and critical.

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- Maintaining a balanced diet and regular exercise is important for school-aged children. These children are required to eat a variety of foods from each food group to ensure optimal intake of all vitamins and minerals.
- At the same time, they may face new challenges regarding food choices and habits. Decisions about what to eat are partly determined by what is provided in school, at home, the influences from friends at school, and the media, especially television.
- Poor nutrition compromises both the quality of life of school-aged children and also their potential to benefit from education.
- Adequate nutrition of school aged children will also ensure that they grow to their full potential, and provide the stepping stones to a healthy life.
- Deficiency of essential fatty acids may have a negative impact on school performance.
- Bone density suffers when calcium needs are not met during childhood years
- Milk and dairy products and some dark green, leafy vegetables are good sources of calcium.
- Children need iron because of rapidly expanding blood volume during growth. Meat, fish, poultry, green leafy vegetables and millets are the best sources of dietary iron.
- A variety of fruits and vegetables of different colours should be added in the child's food.
- Dark green leafy vegetables, yellow, orange coloured vegetables and fruits (such as carrots, papaya, mangoes) are good sources of Vitamin A.
- Children get most of their Vitamin D from sunlight and a small amount from some food items like fish oils, fatty fish, mushrooms, cheese and egg yolks.
- Snacks may contribute up to a significant proportion of total daily energy and nutrient needs of the school child.
- Obesity, underweight, constipation, dental caries and anaemia are some of the nutritional problems during the school going period.
- Anaemia in school-aged children may result in deleterious effects including lower school achievement due to impaired cognitive development, poor attention rate and general fatigue.
- Packed lunches have become a necessity for school going children as schools are either away or the lunch period is too short for the children to go home and have food.
- The school lunch should meet one third daily requirement in calories, protein and other nutrients of the child, to boost concentration and energy for the rest of the school day
- A nutritious breakfast is a central feature of a child's diet that supports healthy growth and development. Breakfast is the first meal of the day.
- A healthy breakfast refuels the body and replenishes the blood sugar (glucose), giving the energy necessary to start a new day.
- According to WHO, individuals between 10 and 19 years are considered as adolescents. The period of transition from childhood to adulthood is called adolescence with accelerated physical growth
- The metabolic demands of growth and energy expenditure during adolescence

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increase the need for calories, protein, iron and calcium.

- ❖ Inadequate nutritional intake during adolescence can have serious consequences throughout the reproductive years and beyond
- ❖ Obesity and iron deficiency anaemia are major nutritional problems during the adolescent period and girls also suffer from eating disorders like Anorexia nervosa and Bulimia. Premenstrual syndrome and acne are some of the other problems during this period
- ❖ Peer pressure is very high during adolescence. They begin to skip breakfast; choose less milk, fruits and vegetables and consume more soft drinks each day.
- ❖ Finally Adolescence is the time to inculcate good eating and exercise habits which ensure good health forever.

GLOSSARY

Toddler - A toddler is a child 12 to 36 months old. The word is derived from "to toddle", which means to walk unsteadily, like a child of this age.

Bone mineralization - Bone mineralization is the process of laying down minerals like calcium and phosphorus on matrix of the bone

Cognitive functions - Cognitive functions encompass reasoning, memory, attention, and language and lead directly to the attainment of information and, thus, knowledge

Essential fatty acid - An unsaturated fatty acid that is essential to human health, but cannot be manufactured in the body

Omega 3 fatty acids - an unsaturated fatty acid of a kind occurring chiefly in fish oils

Ischemic heart disease - Ischaemic (or ischemic) heart disease is a disease characterized by reduced blood supply to the heart

Hypertension - Hypertension also known as high blood pressure, is a long-term medical condition in which the blood pressure in the arteries is persistently elevated

Diabetes - A disease in which the body's ability to produce or respond to the hormone insulin is impaired, resulting in abnormal metabolism of carbohydrates and elevated levels of glucose in the blood.

Constipation - Constipation is a condition of the digestive system characterized by hard feces that are difficult to pass.

Hyperlipidemia - Hyperlipidemia is a term used to describe high levels of fat in the blood, such as cholesterol and triglycerides.

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Dental caries	- Dental caries is the scientific term for tooth decay or cavities.
Menarche	- Menarche *is* the beginning of the menstrual function; especially the first menstrual period of an individual.
Transamination	- the transfer of an amino group from one molecule to another
Restless leg syndrome	- Restless leg syndrome is a disorder of the part of the nervous system that causes an urge to move the legs.
Foetus	- **A** foetus is the prenatal stage between the embryonic stage and birth
BMI	- **BMI (Body Mass Index)** is a person's weight in kilograms (kg) divided by his or her height in meters squared.
Peer pressure	- a feeling that one must do the same things as other people of one's age and social group in order to be liked or respected by them
Carcinogenic	- any substance or agent that tends to produce a cancer.
Xerophthalmia	- A condition resulting from deficiency of vitamin A affecting the eye, (Xero= dry, ophthalm= eye)
Bitot's spot	- shiny pearly spots of triangular shape occurring on the conjunctiva in severe vitamin A deficiency especially in children.
PEM	- **Protein-energy malnutrition (PEM)** is a potentially fatal body-depletion disorder. It is the leading cause of death in children in developing countries.

Evaluation

I. Choose the correct answer

1. An infant grows rapidly, doubling its birth weight by _____ and tripling it by 1 year of age.

a) six months b) two months c) three months

2. Protein intake of a pre-school child should be _____ g/kg body weight.

a) 2 to 3 b) 1.5 to 2 c) 3 to 4

3. _____ is the best source of calcium

a) rice b) milk c) wheat

4. The calcium requirement of a preschool child is_____ mg.

a) 600 b) 300 c) 400

5. _____ is a disorder which involves chronic ingestion of non-nutrient substances.

UMVT6

a) Pica b) anaemia
c) anorexia

6. The school- age period has been called the latent time of growth

a) infancy b) school age c) adolescence

7. Nutritional requirements of boys and girls are more or less the same till the first _____ years

a) six b) five c) nine

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8. _____ are essential fatty acids keep the brain healthy.

a) Omega 4 b) Omega 3 c) Omega 6

9. _____ begins in childhood if diets do not provide adequate calcium-rich foods

a) xerophthalmia b) anaemia c) osteoporosis

10. Children need iron because of rapidly expanding _____during growth.

a)Blood volume b)heart c)organs

11. Meat, fish, poultry, green leafy vegetables and millets are the best sources of dietary_____.

a)iron b) copper c) folic acid

12 _____ is essential for vision and a deficiency of the same can lead to night blindness

a)Vitamin C b)Vitamin A c)Vitamin B

13. Children get most of their _____ from sunlight

a) Vitamin C b)Vitamin A c)Vitamin D

14. Adolescent growth spurt starts at about _____ years in girls and two years later in boys

a) 15-16 b) 10-12 c) 8-10

15. Adolescent girls are at greater physiological stress than boys because of _____

a) menstruation b) constipation c) acne

16. According to WHO, individuals between 10 and 19 years are considered _____

a) Children b) adolescents c) adults

17. Adolescence is a significant period for physical growth and_____.

a) Sexual maturation b)muscle development

c) tissue development

18. Adolescents who have less _____density are susceptible for osteoporosis later in their life.

a) Bone mineral b) Skeletal c) Muscle

19. _____and vitamin B12 requirements also increase when there is rapid tissue synthesis as they participate in synthesis of DNA and RNA

a)Niacin b) Folic acid c) Thiamine

20. Transamination to synthesize non-essential amino acids requires more _____.

a)Vitamin B6 b)Vitamin C c)Vitamin D

21. Fatty liver is seen in _____

a) Kwashiorkor b) Marasmus
c) Anaemia

22. Old man's face is a classical symptom of

a) Kwashiorkor b) Marasmus
c) Xerophthalmia

23. _____ is caused due to deficiency of vitamin A

a) Acne b) Marasmus
c) Night blindness

II. Short answers

1. Why is calcium very important during preschool period?
2. What is restrictive food intake disorder?
3. What is osteoporosis?
4. Give some examples of foods rich in Vitamin A
5. What is the major reason for overweight and obesity in school children?
6. What is a packed Lunch?
7. Suggest a few healthy packed lunch recipes.
8. What are the signs and symptoms of Anaemia?

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9. What is Anorexia nervosa?
10. What are Junk foods?
11. Define Obesity
12. What is the requirement for Iron and calcium for adolescents?
13. Define Adolescence
14. What is PEM?

III. Brief answers

1. Give the RDA for a 5 year old child
2. How does anemia affect school children?
3. What causes dental caries in school children?
4. Give the RDA for a 11 year old girl.
5. Why is a packed lunch important? Suggest a few tips to encourage this.
6. Why is breakfast the most important meal of the day?
7. List the physiological changes in boys and girls during adolescence.
8. Why do girls require more iron during adolescence?
9. Explain the factors responsible for obesity in adolescents
10. Define PMS. List its symptoms.
11. What is Acne? How is it caused?
12. Give the RDA of a16 year old boy
13. List a few dietary guidelines for adolescents.
14. List the causes and symptoms of Kwashiorkor
15. List the causes and symptoms of Marasmus.
16. What is Bitot's spot?
17. What causes night blindness?
18. List a few foods rich in Vitamin A
19. What causes dental caries in children?

IV. Detailed answers

1. Explain the common feeding problems in children.
2. Explain the factors to be considered in planning a diet for a preschooler.
3. Suggest five tips for feeding picky eaters.
4. Explain the dietary guidelines to keep school children healthy
5. Explain the nutritional problems in school aged children
6. Explain the points to be considered while planning a packed lunch.
7. What are the advantages of a healthy breakfast?
8. What are the harmful effects of skipping breakfast?
9. Explain the physiological changes during adolescence.
10. Explain the causes and complications of Anaemia in adolescents.
11. Explain the eating disorders of adolescent girls.
12. Explain the nutritional problems of adolescent boys.
13. What are the harmful effects of junk foods?
14. Explain the changes in eating habits during adolescence
15. List the causes and symptoms of Kwashiorkor
16. List the causes and symptoms of Marasmus
17. Explain vitamin A deficiency diseases.

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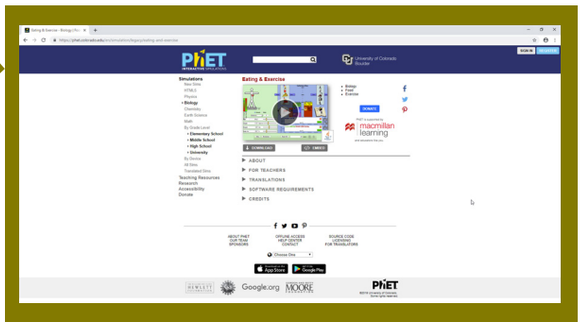
ICT CORNER

NUTRITION DURING PRE SCHOOL, SCHOOL AGE AND ADOLESCENCE

Let's check out the diet plan and know your nutrition.



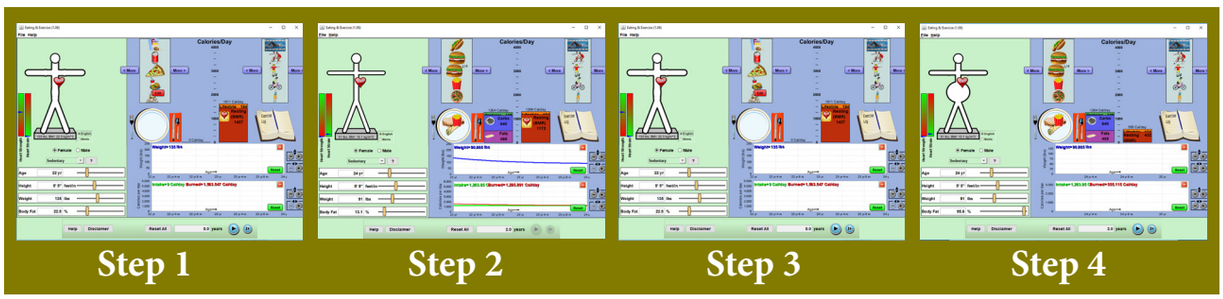
Steps:

Step 1: Use the **URL** or scan the **QR Code** to launch the page and get the activity downloaded to your device.

Step 2: Complete the details on the left side of the window such as Age, Sex, Height, Weight and other.

Step 3: Edit the calories by selecting the food items and drop it in the plate available below and activities on the right side of the window. Increase or decrease in Weight & Calories shall be done with the + , - buttons found on the right bottom of the window.

Step 4: Click the play button on the bottom of the page once after furnishing the details.



DOWNLOADING

To go inside the app directly you can either use **QR code** or the **given link**

https://phet.colorado.edu/en/simulation/legacy/eating-and-exercise

*Pictures are indicative only

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NUTRITION IN ADULTHOOD AND OLD AGE

Unit 4

OBJECTIVES

This chapter briefly discuss about:-

- Nutrient requirement of adult and elderly people,
- Factors affecting the intake of food among elderly,
- Modification of diet during old age,
- Major nutrition related problems among elderly.

Man needs a wide range of nutrients which performs various functions in the body. During adulthood nitrients are needed for energy , replacement of worn out tissues and maintenance of body function. Though there is no growth during adulthood , protein is required for the replacement of worn out tissues. Individuals are known to age at different rates. Ageing is not a disease but a biological process. It is a normal process begins at conception and ends only with death. The changes are associated with ageing are partly influenced by genetics, race and gender. Heredity and good nutrition may slow the ageing process so that the individual enjoys physical and mental vigour in his eighties. Goal of nutritional care should be to help the aged achieve to a healthy, purposeful and independent living.

4.1 Adult

People belonging to 18 to 40 years of age are called adults.

Reference Indian adult man and woman

Reference man is between 18 - 29 years of age and weighs 60 kg with a height of 1.73 m with a BMI of 20.3 and is free from disease and physically fit for active work. Reference woman is between 18-29 years of age, non-pregnant and non lactating (NPNL) and weighs 55 kg with a height of 1.61 m and a B.M.I of 21.2, is free from disease and physically fit for active work.

4.1.1 Nutrient requirement of adults

a) Energy

Nutrient requirements of an adult man and woman are based on reference man and reference woman. Important factor which determine the energy need is the nature and duration of physical activity whether moderate or heavy. For those whose occupation entails heavy work, allowances have to be higher than for those who are sedentary or engaged in moderate work

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b) Protein

Average daily protein requirement of an Indian adult, in terms of high quality protein like milk, egg at the physiological level is estimated to be 1 g/kg of body weight.

c) Fat

Recommended total calories obtained from fats is between 15-30 percent E(energy). In the diets of adults in India about 20% energy is derived from fats. All levels of calorie intake invisible fat furnishers about 9 % energy and visible fat 10%. This would come to 10-20 g of fat per day depending upon the level of calories consumed. It would appear prudent to choose the visible or cooking fat from unsaturated vegetable oils. Two or more vegetable oils ensure the recommended intake of fatty acids.

d) Minerals

i) Calcium and phosphorus

Based on the suggestion of expert committee, the RDA for calcium has been increased from 400 mg to 600 mg. The requirement of calcium prescribed by ICMR is same for both men and women. To meet this requirement an adult needs to take at least 350 ml of buffalo's milk on cereal legume diet.

Table 4.1 Recommended Dietary Allowances for an adult man and woman

Nutrients	Man			Woman		
	Sedentary	Moderate	Heavy	Sedentary	Moderate	Heavy
Energy Kcal	2320	2730	3490	1900	2230	2850
Protein gm	60	60	60	55	55	55
Fat gm	25	30	40	20	25	30
Calcium mg	600	600	600	600	600	600
Iron mg	17	17	17	21	21	21
Vitamin Aμg	600	600	600	600	600	600
β caroteneμg	4800	4800	4800	4800	4800	4800
Thiamine mg	1.2	1.4	1.7	1.0	1.1	1.4
Riboflavin mg	1.4	1.6	2.1	1.1	1.3	1.7
Niacin mg	16	18	21	12	14	16
Pyridoxine mg	2.0	2.0	2.0	2.0	2.0	2.0
Ascorbic acid mg	40	40	40	40	40	40
Dietary Folateμg	200	200	200	200	200	200
Vitamin B12μg	1.0	1.0	1.0	1.0	1.0	1.0
Magnesium mg	340	340	340	310	310	310
Zinc, mg	12	12	12	10	10	10

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It is suggested that a Ca: P in the diet should remain 1:1. Since the RDA of phosphorus is 600 mg. During infancy the Ca: P ratio suggested is 1:1.5. Bone mass increases during childhood and adolescence and peak between the age of 20 and 30 years. Peak bone mass is influenced by calcium intake. Other factors like age, sex, genetic factors, hormonal status and exercise also influence. After the age of 30, rate of withdrawal exceeds the rate of deposit, therefore establishing healthy bone mass in childhood and early adulthood is crucial.

ii) Iron

Iron requirement for women is 4mg higher than men. Iron lost through mensuration in women of reproductive age groups are 0.6 mg/day on an average, when spread over the whole month. Those who are taking vegetarian diet should ensure adequate amounts of Vitamin C for enhancing iron absorption.

iii) Zinc

The requirement of zinc is 2.7 mg/d. To get this amount the RDA suggested is 12 mg/d, correcting individual variation. In an Indian population the rate of absorption is 20- 25%.

iv) Vitamins

The requirement of Vitamin A is same for both men and women. The conversion ratio of retinol to ß- carotene is 1:8. The requirement of B vitamins is based on calorie requirement (0.5 mg of thiamine, 0.6 mg of riboflavin and 6.6 mg of niacin per 1000 calories). Hence requirements of B vitamin are higher for moderate and heavy workers. The previous recommendation of 2mg/d of pyridoxine of adults is retained.

An in take of 20 mg of Vitamin C may be sufficient to maintain the ascorbic acid level in the adults. Taken into account that 50% of Vitamin C is lost in cooking, 40 mg is suggested for all adults. FAO/WHO suggested 55µg of vitamin K and 400 IU of vitamin D for adults, where there is minimal exposure to sunlight.

Diet for nutritionally deficient can be improved by

1. Replacing a single cereal with mixed cereals.

2. Inclusion of green leafy vegetables to improve the intake of vitamin A, iron and calcium.

3. Inclusion of inexpensive yellow fruits like papaya or mango and greens to increase vitamin A and C intake.

4. Inclusion of at least 150 ml of milk improves intake of riboflavin, calcium besides improving protein quality of the diet.

According to WHO, a healthy diet for an adult should contain the following:

- Fruits, vegetables, legumes (e.g. lentils, beans), nuts and whole grains (e.g. unprocessed maize, millet, oats, wheat, brown rice) should be included in a days menu.
- At least 400grams (5 portions) of fruits and vegetables a day.
- Unsaturated fats (e.g. found in fish, avocado, nuts, sunflower, ground nut and gingerlly oil) are preferable to saturated fats found in fatty meat, butter, palm and coconut oil,

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cream, cheese, ghee and lard. Industrial trans fats found in processed food, fast food, snack food, fried food, frozen pizza, pies, cookies, margarines and spreads should be totally avoided.

- Less than 5 g of iodized salt per day is recommended.

4.1.2 Lifestyle Tips for Adults

- Eat breakfast every day.
- Select high-fiber foods like whole-grain breads and cereals, beans, vegetables, and fruits.
- Have three servings of vitamin D-fortified low-fat or fat-free milk, yogurt, every day to help keep your bones strong as you age.
- Drink plenty of water or water-based fluids.
- Try to be physically active everyday in life. Take short walks throughout your day.
- Stay connected with family, friends, and your community.

4.1.3 EXERCISE AND PHYSICAL ACTIVITY IN MAINTAINING HEALTH

1. Individuals over the age of 20 years should undertake a minimum of 30-45 minutes of physical activity of moderate intensity (such as brisk walking 5-6 km/hr)
2. Sedentary people embarking on a physical activity programme should undertake a moderate intensity activity of short duration to start with and gradually increase the duration or intensity.
3. Day-to-day activities like walking, housework, gardening, will be beneficial not only in weight reduction but also for lowering of blood pressure and serum triglycerides. It also elevates HDL (good) cholesterol in blood.
4. Simple modification in lifestyle like climbing up the stairs instead of using the lift and walking for short distance instead of using a vehicle could help.
5. Exercise programme should include 'warm up' and 'cool down' periods each lasting for 5 minutes. During exercise, the intensity of exercise should ensure 60-70% increase in heart rate.
6. Previously inactive men over the age of 40 years, and women over the age of 50 years and people at high risk of chronic diseases like heart disease and diabetes should first consult a physician before engaging in physical activities such as running and swimming.

Activity : 1

Plan a diet for a 25 years old women doing sedentary work.

DO YOU KNOW?

Gerontology is a branch of science dealing with psychological, sociological, economical, physiological, and medical aspects of aging with the last two often referred to as bio gerontology.

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4.2 Nutrition and aging

The study of the nutritional needs of aging people is complicated by the fact that the older the people, the more complex the nutritional needs from both a social and physiological point of view.

Geriatrics the branch of medicine dedicated to the care of the aging as well as an aged is concerned with expanding the length of the prime period of life delay in the onset of severely degenerative aspects of ageing, and reading the disease of the aged.

4.2.1 Factors affecting the intake of food

As with any age group the nutritional adequacy of the diet of the elderly is the result of variety of factors that determine dietary intake, the utilisation of nutrients and finally the nutrient requirements. All of these factors include environmental as well as biological considerations. The major influences on nutrient intake, use and in need are summarised in Table 4.2

Table 4.2 Factors affecting food intake, nutrient utilization, nutrient needs of elderly

	Food Intake	Nutrient Utilization	Nutrient needs
Physical	Loss of teeth Lack of neuromuscular coordination Impaired hearing and vision Physical weakness and disability Immobility Discomfort on ingestion of certain food	Immobility	Body composition, Decreased activity.
Physiological	Loss of sense of taste and smell Anorexia (lack of appetite)	Decreased salivation Decreased enzyme activity Decreased gastric activity Depressed gastric motility Depressed kidney function Chronic disease Malabsorption Decreased hormonal secretion	Use of drugs, Decreased metabolic efficiency.
Social	Long standing food habits Food preferences Beliefs about effects of food Economic considerations Susceptibility to food misinformation Failure to adapt to new environment	Meal pattern	
Psychological	Living alone Depression Anxiety	Anxiety	

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Activity : 2

Interview two senior citizens asking questions concerning there food beliefs, food preparations, changes in taste and smell, and the use of vitamin / minerals supplements.

4.2.2 Nutrition and food requirements of elderly.

These are based on the physiological changes that takes place during old age. The nutritional requirements change after the age of 40 years.

Energy.

Energy requirements declines with increasing age, particularly if physical activity is restricted.

After the age of 35 the basal metabolic rate decreases due to reduced muscle mass and other metabolically active tissue mass.

The calorie intake should be adjusted to maintain the body weight constant. In the case of obese, the calorie intake should be adjusted to reduce the body weight gradually to become normal level. Although the energy requirements decerease, the requirements for proteins ,vitamins and minerals do not diminish.

b) Carbohydrate

Emphasis is placed on increasing the consumption of complex carbohydrates and controlling the intake of simple sugars. Whole grain cereals and pulses should be included in the diet. It is necessary that at least 50 per cent of calories are derived from carbohydrates. Since caloric requirements are reduced, carbohydrates intake is also reduced.

DO YOU KNOW?

World Elders Day is on 1st October

c) Proteins

As people age, there is a decrease in skeletal tissue mass. This results in decrease in store of protein provided by skeletal muscle and may be inadequate to meet the needs of protein synthesis. Hence the dietary protein intake is more important to meet essential needs. A protein intake of 1g / kilogram body weight of a normal adult requirement, is safe during old age.

d) Fats

Elders who take sufficient omega 3 fatty acids have better visual acuity. Omega 3 fatty acids may help in conditions such as hair loss, impairment of vision, improper digestion and gas, poor kidney function, tissue inflammation, osteo-arthritis, painful joints and muscles and mental depression. Emphasis should be placed on reducing the intake of saturated fat and choosing monounsaturated or polyunsaturated fat sources.

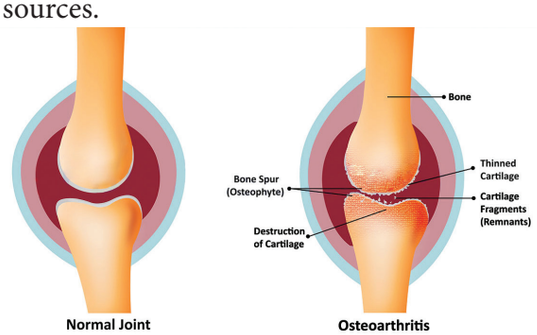

Fig 4.1 Wear and Tear Arthritis

e) Minerals

During old age calcium need increases. Women over 50 years of age who are not receiving oestrogens require more calcium to prevent demineralization of bone and osteoporosis. For women over fifty, 800 mg/ day is recommended. As caloric requirement decreases, total food consumption decreases, hence calcium supplement is essential.

Iron intake should be adequate to prevent anaemia. Iron requirement for men is 30mg. If there is anaemia, supplemental

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iron can be given. Consumption of liver once or twice a week is effective in combating such a tendency. Particular emphasis may be placed upon the inclusion of those green leafy vegetables which are good source of iron like cauliflower, greens and agathi and whole grain or enriched breads and to certain iron-rich dry fruits, and use of iron fortified salt.

Some features of old age such as delayed wound healing, decreased taste sensitivity and anorexia are also findings associated with zinc deficiency. However, healthy elderly subjects have been shown to be in zinc balance despite an apparent low dietary intake. Older people who avoid flash foods maybe at increased risk of poor zinc status.

f) Vitamins

Elderly people are at risk for vitamin D deficiency due to decreased exposure to sunlight or decrease in renal mass. Prudent dietary supplementation with calcium and Vitamin D improves bone density prevent fractures.. Recent studies have indicated that people with parkinson's disease are likely to have low Vitamin D levels.

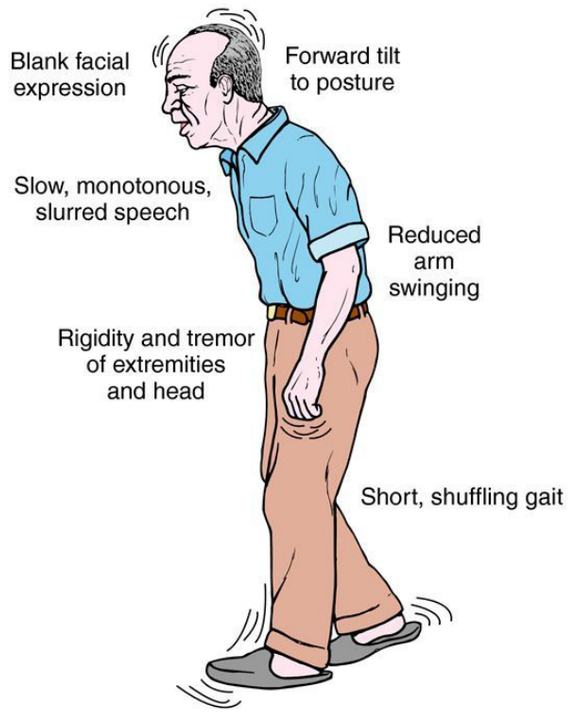

Fig 4.2 Parkinson's disease Symptoms

The antioxidant vitamins, such as vitamin E, carotenoids and vitamin C have been promoted as agents that enhance the health of the elderly.

Vitamin C may be protective against cataract at an intake level of between 150 and 250 mg per day.which is possible to achieve from dietary sources alone.

Vitamin E has also been found to be a potent nutrient for reducing the decline in cellular immunity that occur in the elderly. Changes in immune system can be overcome by taking 200 mg of vitamin E. Protection from DNA damage enhances the body's self defence mechanisms.

Requirements for the vitamin B6 are increased in many elderly persons owing to atrophic gastritis which interferes with absorption. Decrease absorption can lead to pernicious anemia. So consumption of folate rich foods should be encouraged.

Consumption of green leafy vegetables may supply enough vitamin K during old age.

All vitamin requirements remain the same as the adult requirement.

g) Water

It is essential for the older person as it is for the younger individual. The kidney can function more adequately when there is sufficient fluid (1.5 litres) to eliminate the solid waste. Water stimulates peristalsis and thus aids in combating constipation. Water can be consumed such or in the form of buttermilk, fruit juices porridge and soups.

h) Fibre.

Fibre stimulates peristalsis. There is great enthusiasm to encourage the consumption of fibre containing food but any increase should be gradual otherwise bowel discomfort, distension and flatulence will result. While rough fibre, bran and mature vegetables are

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not advised for the aged, the fibre of tender vegetables, fruits will make easier the passage of the food down the intestinal tract. Fibre also helps in reducing cholesterol which may reduce the incidence of atherosclerosis.

4.2.3 Dietary guidelines

- Empty calorie foods should be taken minimum and calorie dense foods should be avoided.
- Foods rich in protein, vitamin and mineral should be included.
- Vegetables and fruits are good sources of antioxidants. A minimum of 5 servings should be taken.
- As fat promotes weight gain. Saturated fat should be limited.
- Gas forming foods like sulphur containing vegetables and certain type of pulses have to be avoided.
- Soft well cooked foods are preferred.
- Food should be less salty and spicy.
- Fried and concentrated foods should be avoided.
- Caffeine containing beverages should be limited, otherwise they may suffer from insomnia.
- High fibre diet including greens and whole grains are to be included in the diet.
- Easily digestible steam foods like idlies or idiyappam can be part of the diet.
- Plenty of fluids and semi solid foods should be taken.
- 2-3 servings of low fat milk should be included in the diet.
- Consumption of Omega 3 fatty acids may help in reducing hair loss, impairment of vision, improper digestion and tissue inflammation.
- Tobacco chewing, smoking betel leaves chewing are the habits which may affect consumption of food in the elderly, hence should be avoided.

4.2.4 Major nutrition related problems

a) Obesity

Obesity is two to three times as prevalent in women as in men. Associated with obesity is an increased incidents of diabetes.

b) Osteoporosis

Osteoporosis is characterized by a significant decrease in bone mass occurring when mineral loss proceeds at a faster rate than mineral deposit enduring bone

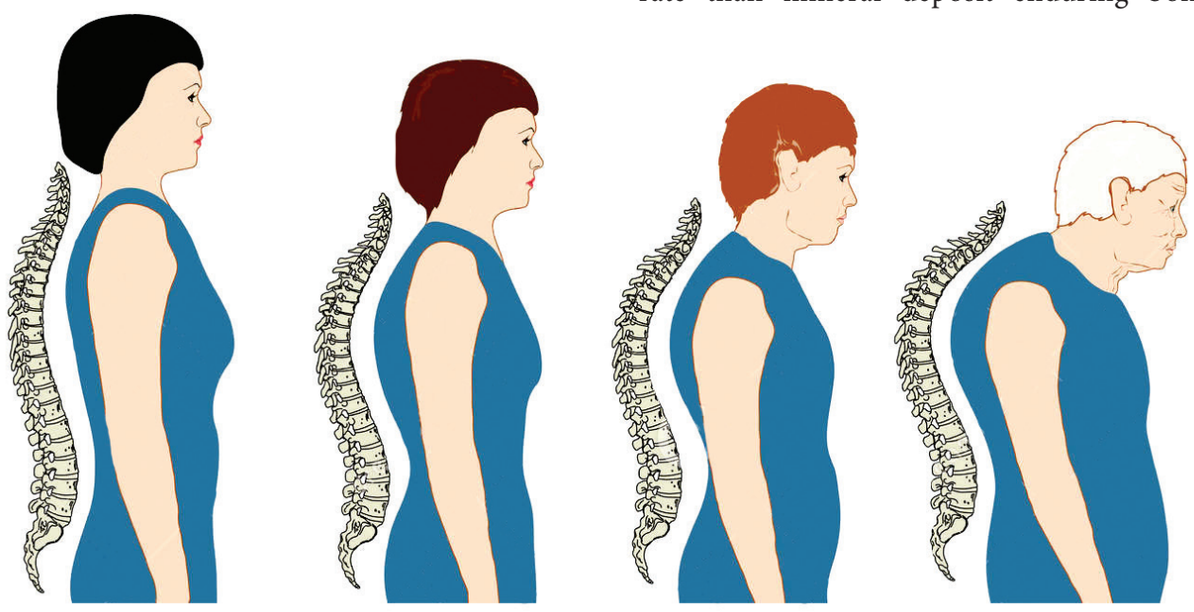

Fig 4.3 Symptoms of osteoporosis among adults

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remodelling. Osteoporosis is most common among post-menopausal women.

Negative calcium balance, which amounts to a 25% loss of bone mass between ages is 40 and 80, can be due to

1. low calcium intake
2. decreased intestine absorption
3. decreased reabsorption in the kidneys
4. decreased production of active metabolite of vitamin D normally formed in the kidneys, low protein or phosphorus intake, high fibre intakes or low oestrogen levels.
5. Vertebral fractures are also common in people with osteoporosis.
6. The compact bone mass in the vertebrate is responsible for the height loss, lower back pain, and humped backs characteristics of many elderly people.
7. Dissolution of the jawbone is another frequent symptom of osteoporosis; it is some major contributing factor in periodontal disease resulting in premature loss of teeth.

c) Neurological dysfunction

Problems of disorientation and slowing of neurological functioning, both seen in the elderly, have been attributed to various nutrient factors. A lack of niacin has long been associated with the dementia and depression of pellagra; a deficiency of chlorine hampers the synthesis of neurotransmitter acetylcholine; deficiencies of Vitamin B_6 and thiamine are associated with central nervous system problems.

d) Anaemia

Anaemia, characterized by fatigue, anxiety, lack of energy and sleeplessness, is a common result of inadequate iron. Iron inadequacy can be caused by low dietary intake; impaired absorption possibly resulting from lack of heme iron or Vitamin C or blood loss.

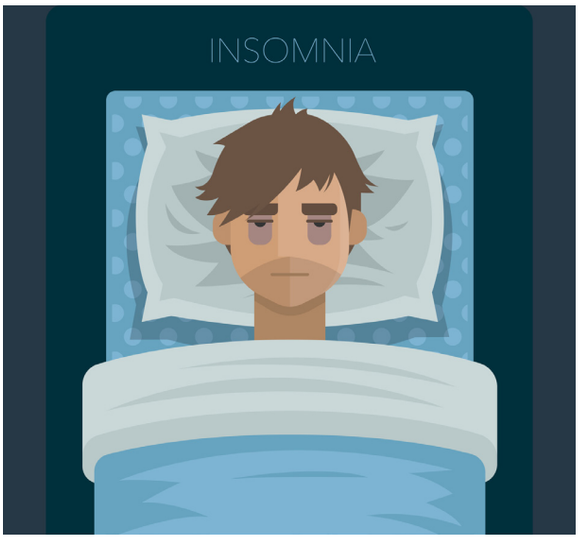

Fig 4.4 Insomnia

e) Drug related malnutrition

Usage of many of these influence the intake of nutrients through changes in taste, smell or unpleasant side effects, particularly in the gastrointestinal tract, which influences appetite and food intake. They also affect absorption of nutrients by binding the nutrients in the intestinal tract or by causing changes in the intestinal mucosa that reduces its capacity to accept nutrients for absorption. Because the rate of drug metabolism and detoxification in the liver is much slower in older people, drugs remain in the body longer to exit their influences on their metabolism of nutrients.

f) Food induced malnutrition

The extensive use of certain foods as implication for nutritional adequacy. The use of large amounts of tea increases the need for thiamine. The high phytate content of oatmeal and the tannin in tea reduce absorption of both iron and zinc. The use of foods high in added phosphorus creates and undesirably low calcium/phosphorus ratio that leads to poor bone calcification, especially when calcium intake is low. Extensive use of alcohol not only leads to diets of reduced nutrient content and multiple deficiencies but also has adverse effects on nutritional absorption.

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g) Immunity

While three quarters of individuals over 65 years of age have a decreased capacity to deal with illness such as infection, cancer and degenerative diseases, reminder are as responsive as young adults. Zinc, vitamin A, vitamin C, and folate are the nutrients most often identified with immune function. Although there are few cases of severe defeciencies of these nutrients, prolonges marginal intakes may be a factor in age-related depression of immune function.

h) Cardiovascular disease

Contrary to general opinion hypertension, hypercholesterolemia, glucose intolerance, obesity continue to be factors that increase the risk of cardiovascular disease with advancing age. Also these are not consequences of ageing and are influenced, modified, or delayed by appropriate diet. This usually involves adjusting caloric intake to maintain or achieve normal body weight, adjusting dietary fat, and for hypertension prone individuals, restricting use of discretionary or added salt.

SUMMARY

- Physical strength begins to decline from age 30 to age 80 and above.
- Internal changes refer to the symptoms of growing old that are not visible or obvious.
- Increasing age brings in several problems in vision.
- Loneliness is the feeling of emotional isolation, being locked inside oneself and unable to obtain the warmth and comfort from others.
- Physiological decline in body functions during aging is not uniform.
- Depression can lead to lack of appetite and malnutrition. Being malnourished can also bring on symptoms of depression.
- Many of the elderly are obese. They fail to make adjustments in their energy intake corresponding to decreased energy needs.
- Physical activity of moderate intensity has been recommended for healthy well being.

A-Z GLOSSARY

Coronary heart disease	A disease of the heart due to inadequate blood supply as a resultof narrowing/obstruction of coronary arteries which nourish heart muscle.
Demineralisation	It is a process to reduce the content of mineral substances in tissue or organism, such as bone demineralization.
Parkinson's disease	A disease of the central nervous system that affects movement, often including tremors
Menopause	It is defined as the point in time when menstrual cycles permanently cease due to the natural depletion of ovarian oocytes from aging.
Insomnia	Insomnia is a sleep disorder that is characterized by difficulty falling and\ or staying asleep
Osteo-arthritis	It is the most common chronic (long lasting) joint condition. This can cause pain, stiffness and other symptoms.
Osteoporosis	A condition in which bone become thin, porous and brittle, due to low levels of estrogen. Lack of calcium.

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Evaluation

I. Choose the correct answer

1. Average daily protein requirement of an Indian adult is ---------.

   (a) 2g/kg (b) 1.5g/kg

   (c)1g/kg (d) 0.5 g/kg.

2. Iron requirement for adult women is ---------higher than men.

   (a) 4mg (b) 3mg

   (c) 2mg (d) 5mg.

3. -------- is the branch of medicine dedicated to the care of the aging.

   (a) physiotherapy (b)Geriatrics

   (c) Anthropology (d) Bio Medicine

4. Vitamin C may be protective against -------- at an intake level of between 150 and 250 mg per day for adults.

   (a) Night blindness (b) Cataract

   (c) Drowsiness (d) Insomnia.

5. Consumption of -------rich foods can prevent pernicious anemia among adults.

   (a) fat (b) ascorbic acid

   (c) Folate (d) protein.

6. Negative ------- balance is due to low calcium intake.

   (a) Protein (b) Vitamin A

   (c) Calcium (d)Iron.

7. Deficiency of ------- hampers the synthesis of neurotransmitter acetylcholine

   (a) Chlorine (b) Iodine

   (c) Calcium (d)Iron.

II. Short answers

1. Define geriatrics.
2. Write notes on vitamin requirement of adults?
3. How will you give nutritional awareness to old age people in your family?
4. Write the advantages of consuming omega 3 fatty acid rich foods?

III. Brief answers

1. Energy is essential in adulthood Discuss.
2. Explain the nutritional requirements in old age.
3. List three Tip for Lifespan of Adults
4. Physical activity reduces body weight. Discuss.

IV. Detailed answers

1. Explain the factors affecting the intake of food.
2. Most of the adults are suffering from mental illness. This statement is true or false. Discuss.
3. Explain the ill effects of drugs.
4. Explain why water remains to be and important nutrient for persons over 65 years of age.

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Unit 5

THERAPEUTIC DIETS

OBJECTIVES

- Know the purposes of therapeutic diet adaptations.
- Explain the different ways by which the normal diet can be modified to suit therapeutic diet.
- Understand the principles of routine hospital diets.
- Elaborate on the different modes of feeding.
- Understand the role and responsibilities of dietitians ,
- Applications of computer in diet counseling

RQMKC

Therapeutic diet is the branch of Dietetics concerned with the use of foods for therapeutic purpose. It is a therapeutic approach for treating medical conditions and their associated symptoms by using specifically tailored diets devised and monitored by a registered dietitian.

5.1. PRINCIPLES OF THERAPEUTIC DIET

A well planned diet providing all the specified nutrients to the body helps to achieve the nutritional homeostasis in a normal healthy individual. However, in disease conditions, the body tissues either do not receive proper nutrients in sufficient amounts or cannot utilize the available nutrients due to faulty digestion, absorption or transportation of food elements, thus affecting the nutritional homeostasis of the sick person. The diet needs to be suitably modified. It is important that the basis for planning such modified diets should be the normal diet.

Therefore diet therapy is concerned with the modification of normal diet to meet the requirements of the sick individual.

5.1.1. The General objectives of therapeutic diet are:

- Maintenance of a sound nutritional status of the subject.

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- Rectifying existing nutritional deficiencies by the addition of foods rich in some necessary element, for instance supplementing the diet with iron in treating macrocytic anemia.
- By way of diet, supplying nutrients which do not burden the affected body part.
- Maintenance of healthy and ideal body weight. Increasing or reducing the weight as and when required medically to enhance quality of life.
- To adjust the diet to the body's ability to use certain foods.
- To produce specific effects as a remedy, like regulation of blood sugar in diabetes, controlling hypertension and regulating the amount of cholesterol.
- To provide ease of digestion by omitting irritating substances, such as fiber, spices or high fat foods.
- The therapeutic diets are modifications of regular / normal diet and are designed to meet the specific needs of the patients.

5.1.3. Factors to be considered in planning therapeutic diets :

- It is important to know the underlying disease condition or nutritional deficiency, which requires this intervention.
- The duration of the ailments - acute or chronic.
- Dietary modifications that need to be made to alleviate the symptoms and overcome the disease condition.
- Health condition of the patient – whether administering food orally or special feeding methods to be used.
- Social factors of the patient such as economic status and occupation.
- Personal food likes & dislikes.
- A normal routine of the patient keeping in mind meal times, recreational times & professional times.

Activity : 1

List out low fibre foods that are allowed and that are restricted in a therapeutic diet.

	Allowed	**restricted**
1.		
2.		
3.		

5.1.2. The modifications in therapeutic diet that can be made are as follows:-

Method of preparation	by baking, boiling, roasting or broiling.
Consistency	like soft, fluid, clear or mashed
Total calories	high calorie in under nutrition or PEM and low calorie in obesity
Amount and kind of nutrients	for instance altering carbohydrate, protein, fat, vitamins and minerals based on the condition
Amount of fluids,	high fluid diet in kidney stones while a low fluid diet in renal failure
Amount of fibres,	high fibre in constipation and low fibre in irritable bowel syndrome (IBS)
Restriction or allowance of only specific foods,	sugar restriction in diabetes and sodium restriction in hypertension
Taste of food	bland in GI disorders

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5.2. ROUTINE HOSPITAL DIETS

Hospital diet is an essential part of modern therapy in all medical departments. The integration of nutritional therapeutic problems into the treatments of patients require optimal scientific and practical forms of organization of nutrition in the clinic. Some of the hospital diets are regular diet, soft diet, liquid diet, clear liquid diet, full fluid diet, pureed diet and restricted diet.

5.2.1. Liquid diets

Liquid diets act as a transitional diet after illness or surgery. It consists of foods that are in a liquid state at body temperature. This type of diet is indicated in some post operative cases, in acute illness and in inflammatory conditions of the gastrointestinal tract. The three types of liquid diets are clear liquid, full liquid and pureed.

a) Clear liquid diet is given in –

Clear Liquid Diet

Definition:

- A Diet containing no solid foods, is often prescribed for gastrointestinal illness or before or after certain types of surgery involving the mouth or gastrointestinal tract.

Indication:

- Indicated for the postoperative patient
- Gastrointestinal illness
- Laboratory procedures
- Acute infections.
- Surgeryor acute illness which causes anorexia, nausea, vomiting, abdominal discomfort and diarrhea , since food intake is restricted.
- In cases when excretion through rectal route needs to be avoided.
- It is also advised to supply water to the tissues, satisfy thirst and gas removal.

Inclusion of a clear liquid diet:-

Clear broth, black tea or coffee, plain gelatin and clear fruit juices which leave no residue. It does not form gas, non -irritating and non- stimulating to the peristaltic action

This diet is inadequate in all nutrients including proteins, calories , minerals and vitamins. Due to this reason it should not be continued for more than 24 to 48 hours. The diet consists of feeding of 30 to 60 ml /hour initially with moving to feeding every 2 to 3 hours while the patient is awake. This diet provides only 300 k.cal, no protein, negligible fat and 100 – 120 mg of carbohydrates.

Activity : 1

List 5 recipes suitable for clear liquid diet

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b) Full fluid diet :

Full Liquid Diet

Definition:

- All Foods that are liquid are liquid at room temperature, It provides more Calories than the clear liquid diet, but is still liquid in the stomach and intestinal tract which is essential for patients who cannot chew or swallow solid foods.

Indication:

- For the postoperative patient
- Gastrointestinal illness

This diet bridges the gap between the clear fluid and soft diet.

This diet is given in

- the post operative stage
- acute gastritis
- acute infection
- diarrhea
- when the patient does not require a special diet, but are unable to chew solid or semi-solid foods .

The purpose of this diet is to provide an oral source of fluid for individual & who are incapable of chewing, swallowing & digesting solid foods. It is used as an intermediate progression to solid foods following surgery in conjunction with parental nutrition or in the presence of chewing or swallowing disorder or certain procedures such as jaw wiring. It is also used in the presence of oesophageal or gastrointestinal stiches, during moderate gastro intestinal inflammation and for acutely ill patients. Solid foods are completely not used.

Recommended food items:

- Soups and broths.
- Cereal porridges (refined cereals)
- Milk and milk beverages, yogurt
- Coffee, tea, fruit juices, carbonated beverages.
- Butter, cream and oil added to foods.
- Plain puddings, custard, ice cream, jelly.
- Sugar, honey, salt and mild flavorings.

The nutrient composition of the diet will depend upon the type and amount of liquids, the patient can consume. The diet is low in iron, vitamin B12, vitamin A and thiamine. Liquid nutritional supplements or blended foods could be added to improve nutritional adequacy. The feeds are usually given at 2- 4 hours intervals. This diet gives 1200kcal and 35g of protein. The diet can be made adequate for basic maintenance by careful planning.

c) Pureed diets:

A pureed diet refers to all foods blended in a blender. It is also called **"Blenderised diet".** It includes regular foods blended and strained in liquid form and all foods allowed in clear and full liquid diets. Vitamin and mineral supplements may be needed with this diet if the recommended amount of food are not taken.

Butter milk

Custard

Cream soup

Ragi kanji

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5.2.2. Soft diets:

A soft diet is soft in texture and consists of liquid and semi solid foods. The food in this diet may be liquid, chopped, pureed or regular foods with a very soft consistency. A soft diet is made up of simple, easily digestable food and contains no harsh fibre, low in fat and not rich and highly seasoned food. It is often modified further for certain pathological conditions as bland and low residue diet. This diet gives 1500kcal and 35-40g of protein. A light diet is given before regular diet.

Soft Diet

Definition:

- It is an adequate diet that is soft in consistancy, easy to chew, made up of simple easy digestible foods, It is appropriate for patients who have few or no teeth or ill-fitting dentures.

Indication:

- Acute Infections
- Certain gastrointestinal disorders and at the post operative stage

Salient features of soft diets are:

- ❖ It includes foods low in indigestible dietary fibre.
- ❖ Foods that can be mashed with a fork are included.
- ❖ Cooked fruits and vegetables, bananas, soft eggs and tender meats are included.
- ❖ Most raw fruits and vegetables, fried foods or foods containing seeds and dried fruits are avoided.
- ❖ Vegetables can be pureed and meats are ground for dental patients.
- ❖ Little or no spices are used in its preparation.
- ❖ A soft diet includes all liquids & Juices.
- ❖ A soft diet consist of well-cooked cereals, pastas, white bread, eggs, cheese, tender meat, fish, poultry and vegetables.
- ❖ Permitted desserts are custards, gelatin puddings, soft fruits, simple cakes and cookies.

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FOODS ALLOWED IN SOFT DIETS, FULL-FLUID DIETS AND CLEAR-FLUID DIETS

TYPE OF FOOD	SOFT DIET	FULL FLUID	CLEAR FLUID
Cereals	Refined, finely ground whole grain	Gruels, porridges kanji, ragi malt	Barley water
Pulses	All dhals	Dal soups, dal payasam	Dal water
Vegetables and Fruits	Juices, pureed, cooked and mashed, baked, ripe banana	Strained juices, cooked and pureed fruits	Clear strained fruit juice
Milk	Milk and milk products, cheese, fine cream	Milk and milk beverages, milk shakes, lassi	Whey water
Fats and oils	Butter, oil, cream, margarine	Butter, oil and cream	_
Meat and fish	All except pork, minced fish poultry	_	_
Eggs	All except fried	Only in beverages	Egg white well beaten in fruit juices
Sugar and jiggery	All	Sugar, jiggery and glucose	Sugar or glucose
Nuts and oil seeds	None	None	None
Beverages	All	Tea, coffee, egg, non-carbonated beverages	Tea, coffee(without milk), carbonated beverages, coconut water
Soups	All	Strained	Fat free broth
Desserts	Custards, kheer, puddings	Custards, ice cream plain gelatin	Plain gelatin

5.2.3. Restricted diets:

Restricted diets are a class of special diets that limit or restrict the amount of specific nutrients like calories, fats , salt and other substances based on the patient's medical needs. For example a restricted fat diet allows low fat version of milk, cheese and ice cream but does not place limit on the amount of fresh fruits and vegetables a patient may consume.

5.2.4. Regular diets:

Regular diets also known as normal diets or house diets are used to maintain or achieve the highest level of nutrition in patients who do not have special needs related to illness or injury. This kind of diet is used for ambulatory or bed patients. While regular diets are not customized to cater to personal choices, they are altered to meet the needs of the patient's age, condition

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and personal beliefs. The regular hospital diet is simple in character and preparation. This diet is easily digested. It gives maximum nourishment with minimum effort to the body. The diet is well balanced, adequate in nutritional value and attractively served to stimulate a possible poor appetite. This diet gives 1800-2000kcal and 42-45g of protein.

5.3. Special feeding methods:

In instances when a patient is unable to ingest food orally, through any of the routine hospital diets, special feeding methods are used to supply the adequate nutrients.

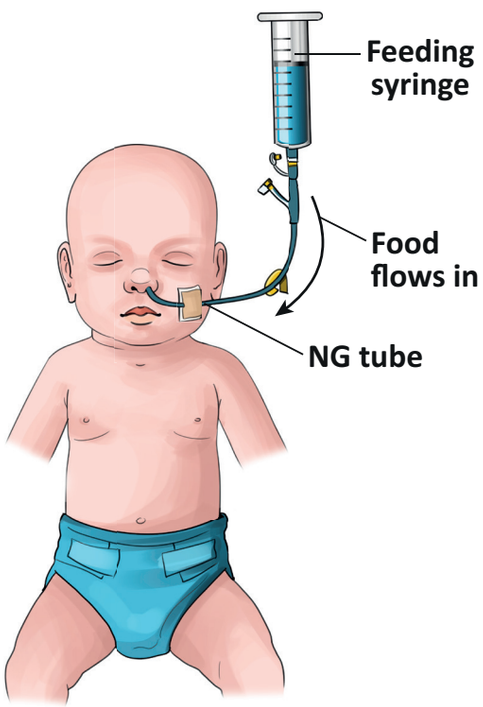
Resorting to special feeding methods are due to the below reasons:

- An acute illness which does not allow the patient to eat normally.
- Decreased appetite as side effects of drugs.
- Anorexia.
- Difficulties in swallowing due to oral / laryngeal cancer, paralysis of swallowing muscles as in diphtheria and poliomyelitis.
- Some type of surgery that interferes with eating.
- Short bowel syndrome.
- Very low birth weight in infants
- Severe malnutrition or malabsorption syndrome.
- Semi- conscious or unconscious patients.
- GI problems interfering digestion and absorption of food.
- Chronic neurological problems.
- Mechanical dysphagia.
- Gut dysfunction.
- Kidney disorders.

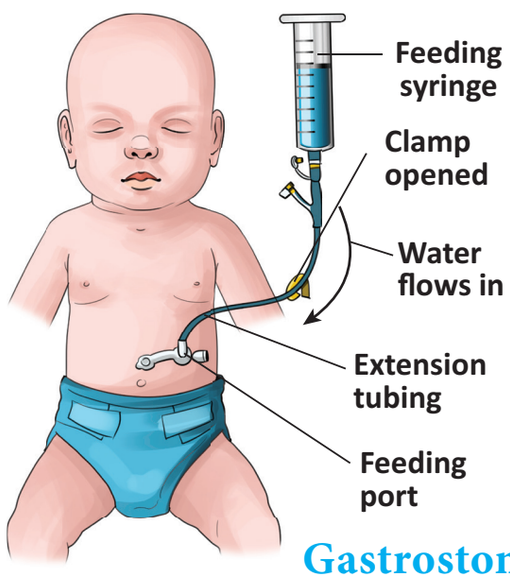
Types of special feeding methods:

5.3.1. Enteral or tube feeding:

Tube feeding is when a special liquid food mixture containing the necessary nutrients like protein, carbohydrates, fats, vitamins and minerals , is given through a tube into the stomach or duodenum. The process can be by insertion of a tube into the nose – nasogastric or nasoenteral feeding or surgically inserting into the stomach (duodenum – gastrostomy or jejunostomy).



Nasogastric



Gastrostomy

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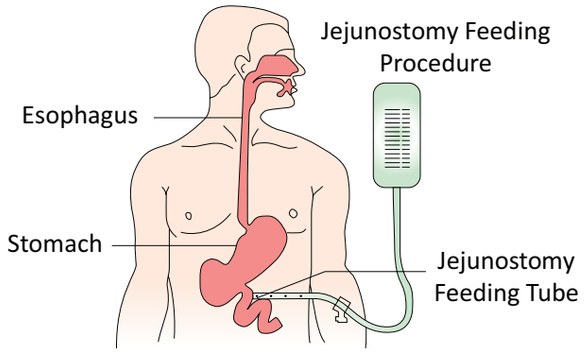
Jejunostomy



Infusion techniques :

- **Continous method** - It implies continuous feeding through tubes by using a gravity flow or infusion pump.
- **Cyclic method** - This implies following a cycle of infusion by " off and on " periods. For example infusion is on for 8 hours and then is stopped for 16 hours.
- **Interrupted method** – this is like cyclic method but with regular interruptions like 6 hours on and 6 hours off periods.
- **Bolus method** – when a large feed is administered in a short time for example 250 cc in 15 minutes.

Types of enteral feeds :

1. **Natural liquid feeds**

   These comprise milk – (whole or skimmed), egg mixtures, sugar, molasses, strained cooked cereals, strained fruit juices, coconut water, vegetable oil, cream, non fat dry milk.

2. **Blenderized feeds**

   Foods which cannot be swallowed are blended in a high speed blender into a smooth paste which is reconstituted with water to make a thin liquid.

3. **Commercial polymeric mixtures**

   These contain all the carbohydrate, protein, fat, water, electrolytes, micro nutrients and fibre required by a stable patient

4. **Elemental feeds**

   They are commercially predigested mixtures of amino acids , dextrins , sugars, electrolytes , vitamins and minerals with small amount of fat .

Enteral Formula Categories Polymeric

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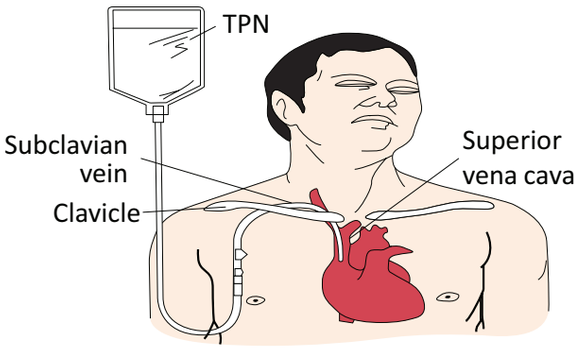
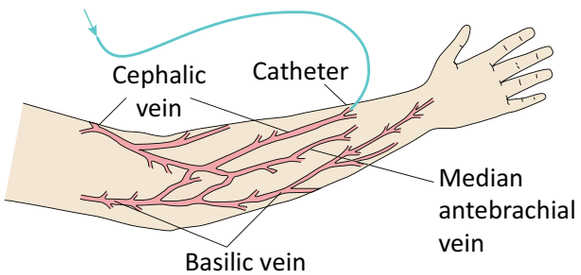
5.3.2 Parenteral Nutrition

It is another type of special feeding method where the patient is supplied the required nutrients intravenously , directly into a vein .





Types of Parenteral Nutrition	
Total Parenteral Nutrition (TPN)	is the feeding method when no significant nutrition is obtained by other routes.
Peripheral Parenteral Nutrition (PPN)	is the feeding method when administered through vein access in a limb , rather than through a central vein.

5.3.3. Feeding solutions used are

Glucose, Emulsified fat, crystalline amino acids, Vitamins (B 12, folic acid and K) electrolytes (sodium, chlorine, phosphorus, potassium, calcium and magnesium) trace minerals (zinc, copper , chromium , manganese and iodine) water.

5.4. DIETITIAN

A dietitian (also known as a clinical nutritionist) is a health professional who is qualified to give accurate advice and information on all aspects of nutrition and diet. Dietitians apply knowledge of food, nutrition and other related disciplines such as biochemistry, physiology and social science to promote health, prevent disease and aid in the management of illness.

Definition

A dietitian is a person with a qualification in nutrition and dietetics recognised by the national authority. The dietitian applies the science of nutrition to the feeding and education of groups of people and individuals in health and disease.

5.4.1. Administrative Dietitians

Administrative dietitian, called as "Food service systems management dietitian", is a member of the management team and is responsible for the nutritional care of groups through the management of food service systems providing optimal nutrition and quality food.

Typical responsibilities of an Administrative Dietitians include:

- Planning, controlling, and evaluating food service.

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- Managing budget resources.
- Establishing standards of sanitation, safety, and security;
- Developing menus and evaluating client acceptance;
- Developing specifications for the procurement of food, equipment, and supplies;
- Planning layout designs and determining equipment requirements.
- Conducting studies to improve the operations, efficiency, and quality of food service systems.

5.4.2 Clinical Dietitians

A clinical dietitian is a member of the health care team and is primarily concerned with

therapeutic diets for individuals or groups who are located in hospitals, normal and extended care facilities, and long-term care facilities.

The clinical dietitian assesses nutritional needs and the nutritional status of individuals through dietary histories of individuals, laboratory values, anthropometric tests and similar methods.

counsels individuals and families on dietary plans, adapting plans to the individual's therapeutic needs and life style, participates in 'health team rounds' and serves as the consultant on nutritional care, compiles or develops educational materials and uses them as an aid in nutrition education, interprets and utilizes pertinent current research related to nutritional care.

The largest percentage of dietitians are clinical dietitians involved in patient care, and may be responsible for one or more wards or clinics which treat patients with general or specialized problems, such as kidney disease, diabetes, gastro-intestinal disease, spinal cord injury and numerous others.

The area of critical care and nutrition support requires highly specialized knowledge on the part of the clinical dietitian in nutritional assessment, parenteral and enteral nutrition and critical care delivery systems.

5.4.3 Community Dietitian

The community dietitian functions as a member of the community health team, assessing the nutritional needs of individuals and groups within the community. Planning, coordinating and evaluating the nutritional component of health care services. The community dietitian, is based in a hospital and participates in out-placement programs for patients in private homes, group care facilities or nursing homes. The dietitian monitors and evaluates the nutritional services provided to these patients.

Duties of a Community Dietitian include:

- Developing and implementing a plan of care based on nutritional needs and available sources
- Evaluating food service systems and making recommendations
- Planning and conducting studies promoting and providing training in nutrition.

5.4.4. Research Dietitian

The primary purpose of a Research Dietitian is to plan, investigate, interpret, evaluate and expand knowledge in one or more areas of dietetics.

Research dietitians initiate, plan, carry out, and interpret their own research. It should also be noted that clinical dietitians are frequently called upon to assist physicians in

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experimental or research projects of limited scope, such as evaluating the course of a given diet on the status of a patient.

5.4.5. Teaching Dietitian

The teaching dietitian usually has advanced preparation in dietetics or education, and is responsible for planning, conducting, and evaluating training programs, which may include responsibility for an internship program. The responsibilities for teaching varies. For example, the continuing development of the professional dietetic staff, the in service training of the non professional staff and the instruction for patients is the function of all dietetic services. However, there are some situations where one or more dietitians are involved in the planning and conducting of training for dietetic interns, coordinated undergraduate students, medical students, medical and surgical interns, nurses, nursing students, house staff, and others in the allied health services.

5.4.6. Consultant Dietitian

A consultant dietitian, with experience in administrative or clinical dietetic practice, affects the management of resources by providing advice or services in nutritional care. The consultant dietitian performs functions such as evaluating food service systems and nutritional care plans, developing menus, budgets, records systems and educational materials. Recommending layout design and equipment needs, as well as sanitation, safety and security procedures. Counseling clients and consulting with health care teams.

5.5.1. Role of a dietitian

1. Identifying nutrition problems and assessing the nutritional status of patients in a clinical setting.
2. Developing diet plans and counseling patients on special diet modifications.
3. Assessing, promoting, protecting, and enhancing the health of the general public in a community setting and providing strategies for prevention of nutrition-related diseases.
4. Managing a cost effective food production operation, distributing high quality meals/snacks, monitoring sanitation and safety standards in a food service setting.
5. Operating private consulting practices to provide expertise in nutrition, as well as promote health and prevent disease.
6. Working with individuals, groups, workplaces and media to provide dietary advice for healthy living.
7. Working with food and pharmaceutical companies to provide research, develop products, educate consumers, promote and market better food and nutritional products in a business setting.
8. Teaching nutrition, food chemistry, or food service administration to students in any health profession and at all levels of education.

5.5.2. Responsibilities

1. Be listened to and treated with respect and consideration.
2. Services without exploitation.
3. Services without discrimination, of age, sex, culture, ethnicity, religion, political belief, sexual orientation or health status.

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4. Safe and high quality services supported by current evidence based knowledge.
5. Be included within decisions and choices about their treatment or care.
6. Receive sufficient information, in a form which they can understand, about their condition and its treatment options to allow them to make informed decisions and act on advice.
7. Be referred to another practitioner where another opinion or specialist service is required or requested.
8. Grant, withhold or withdraw consent to treatment or the performance of any procedure at any stage during a course of treatment or care.
9. Raise any concerns and have these addressed.
10. Have information relating to them kept confidential and released to others only with their permission or when the law or the safety of the public requires release.
11. Receive a copy of the results of any tests and analyses conducted.
12. Have a copy or summary of their records sent to another practitioner when required.
13. Receive an itemised account detailing fees and charges.
14. Complain without fear of any repercussions; and
15. Access a formal complaints process if an issue cannot be resolved with the practitioner.

5.5.3. Code of ethics of dietitians are given as follows:

- The dietetic practitioner avoids discrimination against other individuals on any basis.
- Fulfills professional commitment in good faith.
- Maintains confidentiality of information. Compiles with all laws and regulations concerned.

5.6. Use of computer in diet counseling.

5.6.1. Interview Techniques

a) If the software is well written the computer can carry on a friendly informatics dialogue with the patient.

b) Utilization of branch functions in the program design ensures that nothing is pertinent are unanswered.

c) Computerized interviewing saves professional time and obtains patients responses that are not biased.

d) Patients are honest about answering embarrassing questions by a computer than by a human interviewer.

e) Programs can collect information directly from the patients, summarize the relevant nutritional date and provide a printed summary before the patient is seen.

5.6.2. Artificial Intelligence (AI)

Computers are programmed to make decisions within a limit. This is useful in assisting nurses and dieticians in diagnosing nutritional problems, interpreting diagnostic tests, detecting genetic inborn errors and isolating drug-nutrient problems.

5.6.3. Nutrition care plan

Once the interview is conducted and nutritional assessment is analyzed a care plan must be devised.

a) Computers through their ability to analyse diet information, plan diets that meet the patients specific nutrient requirements.

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b) The computer can teach patients about the background of their medical disorder, reinforce information on their therapeutic diet, help patients apply diet requirements to their life style and make necessary diet changes.

5.6.4. Bed side Monitoring

Computer use include collecting patient's data. ECG analysis, urine output measurements and drug doses at bed side.

5.6.5. Follow-up

Microcomputers provide instant access to medical records, to schedule tests and retrieve laboratory data.

5.6. The actual instruction as the user sees in a computer is divided into:

1. **'Master file'** which stores patients information like age, sex, address, height, weight, patient number and condition.
2. Food site which stores information on food items with their calories, carbohydrates, protein and fat value. The food items are arranged alphabetically under the meal times. The quantity per serving and amount of individual serving will be displayed. Provision for adding and deleting food items is built in.

The diet counselling system begins with patients personal information. The counselling program is divided into 3 sections.

I. Analysis of food intake for a day

II. Summary

III. Printout

I. Analysis of the food intake

This assists the subject to sequentially list all the food items at meals and estimate quantities.

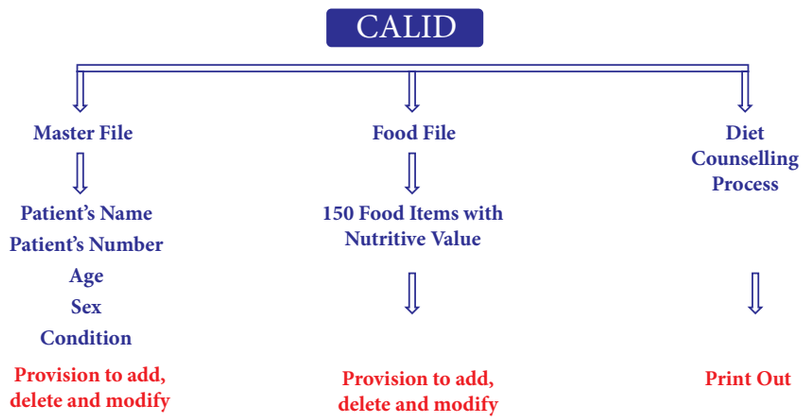
II. Summary

The summary would give the intake for the day for energy, carbohydrate, protein, fat along with the recommended dietary intake.

III. Printout

The printout would give the list of foods to be avoided and recommended along with the quantity per serving. The entire program is presented in Fig.

Computer aided learning in dietetics – CALID



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GLOSSARY

CALID:	Computer Aided Learning in Dietetics
Diet therapy:	the role of food and nutrients in the treatment of various diseases
Dietitian:	refers to a health professional who is qualified to give accurate advice and information on all aspects of nutrition and diet
Enteral or tube feeding:	Tube feeding is when a special liquid food mixture containing the necessary nutrients like protein , carbohydrates, fats, vitamins and minerals , is given through a tube into the stomach or duodenum.
Parenteral Nutrition:	It is a type of special feeding method , where the patient is supplied the required nutrients intravenously , directly into a vein
Routine hospital diets:	Hospital diet is an essential part of modern therapy in all medical departments. The integration of nutritional therapeutic problems into the treatments of patients requires optimal scientific and practical forms of organization of nutrition in the clinic.
Therapeutic diet:	is the branch of Dietetics concerned with the use of foods for therapeutic purpose.

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Evaluation

I . Choose the correct answer

1. Identify the clear fluid diet

   a .gruels b. milk

   c . barley water d . glucose

2. Which of the following is a soft diet ?

   a .ripe banana b. dalpayasam

   c . barley water d . strained custard

3. Each day nasogastric tube feeding can be given at a maximum of

   a . 1 time b. 2 times

   c . 3 times d . 4 times

4. Passing a tube into the stomach or duodenum through nose is called

   a . naso gastric b. naso entetric

   c .naso duodenal d .naso jejunal

5. Say true or false :

   a. Normal diet of an individual is the basis for planning therapeutic diet

   b . TPN is the preferred mode of feeding for a sick individual whose GI tract is functioning

II.Short answers

1. Define diet therapy
2. What is a clear liquid diet?
3. What is tube feeding?
4. List the types of tubes
5. What is parenteral nutrition
6. List the types ofparenteral nutrition
7. Define dietitian.
8. List the types of dietitians
9. What are the uses of computer in diet counselling?
10. What is restricted diet?

TG5AK

III.Brief answers

1. List the advantages of therapeutic diets.
2. What are the dietary modifications of normal diet ?
3. Mention the various liquid diets.
4. List the roles of dietitian.
5. What are the code of ethics of dietitian?

IV.Detailed answers

1. Explain routine hospital diets in detail
2. Describe special feeding methods
3. Discuss the responsibilities of dietitian
4. What are the types of enteral and parenteral feeds ?
5. Explain the application of computers in diet counselling.

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DIET IN FEVER

Unit 6

OBJECTIVES

This chapter will enable students

- To learn the different types of fever
- To learn and understand the causes and symptoms of fever
- To learn the dietary management in fever.

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Any disorder or abnormality of the body or mind that destroys good health is known as **disease**. Diseases can be categorized into communicable and non-communicable diseases. Communicable diseases are transmitted to other people from an infected person, animal or a source in the environment. Fever is one of the common symptoms for infectious diseases. Diseases such as heart disease, cancer and diabetes mellitus that are not transmitted between people are called Non-Communicable diseases.

6.1 Communicable and Non-Communicable Diseases

The term "**disease**" refers to a disturbance in the normal functioning of the body. Diseases may be broadly classified as Communicable and Non-Communicable.

Communicable diseases are diseases that are transmitted from an infected person, animal or a source in the environment to a healthy person. Communicable diseases are caused by infectious agents. Therefore these diseases are also called as **Infectious diseases**. Some examples of the communicable disease include Influenza, Typhoid, Tuberculosis, HIV, Hepatitis A, B and C, Measles etc.

Non - communicable diseases are the diseases that are not caused by infectious agents. Examples for non-communicable diseases include Heart disease, Cancer, Hypertension and Diabetes Mellitus.

DO YOU KNOW?

World Health Organization revises the classification of diseases periodically. WHO has recently released the International Classification of Diseases, Eleventh Revision (ICD-11) at Geneva in 2018. ICD-11 documents the diagnoses, diseases, signs and symptoms and social circumstances of each disease.

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Fig 6.1 : Modes of Transmission of Communicable Diseases

6.2. Definition of Fever

Fever is an increase in body temperature above the normal range (97.0°F to 98.4°F). Body temperature over 100.4°F is often considered as fever which is caused by infection or any illness. Fever is also known as "pyrexia". Fever is a natural response of the body to destroy the pathogens in the blood. This natural response of the body increases the metabolic rate of the person.

Activity : 1

What is my temperature?

Check your body temperature with digital thermometer during different parts of the day. Find out whether there is any change.

DO YOU KNOW?

Normal body temperatures are affected by factors like eating, exercise, sleeping and different time of the day. Our body temperature is usually at its highest at around six in the evening and at its lowest at three in the morning.

6.3. Causes of Fever

Fevers can be induced by "**Pyrogens**". Pyrogens are classified as follows:

1. Internal (Endogenous): These are produced within the body which causes fever. Examples are antigen-antibody reactions, malignant cancer and graft rejections
2. External (Exogenous): Fevers are caused by bacteria, fungi, virus etc. which invades the body.

Activity : 2

Refresh your memory. Remember the last time you had fever. Make a list of possible reasons for the fever.

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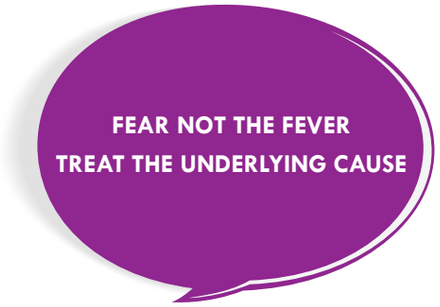

6.4. Classification of Fever

Fevers are classified according to the severity and duration of the fever.

BASED ON SEVERITY OF FEVER	BASED ON DURATION OF FEVER
Low Grade (100.5-102.1°F)	Acute or Short duration (if it lasts less than 7 days)
Moderate Grade (102.2-104.0°F)	Intermittent (if it lasts up to 14 days)
High Grade (104.1-106.0°F)	Chronic or Long duration (if it persists for over 14 days)
Hyperpyrexia (above 106.0°F)	Fevers of Undetermined Origin or FUO (exist for days or weeks)

6.4.1. Acute or Short Duration Fever

Acute fevers are of short duration with acute symptoms and the body temperature may rise to above 102°F. It may be for less than seven days. Examples are Influenza or Flu, Cold, Tonsillitis and Typhoid.

A) Influenza (The Flu)

Influenza is an acute respiratory tract infection caused by influenza virus A and B. The disease is characterized by sudden onset of chills, fever, dry cough, myalgia and generalized malaise.

The virus enters the respiratory tract and causes necrosis of superficial epithelium of trachea and bronchi. The incubation period for influenza virus is 18 to 72 hours.

Metabolic Changes During Fever

Basal Metabolic Rate (BMR) increases in severe infection with fever.
(7% increase in BMR with 1°F increase in body temperature
13% increase in BMR with 1°C increase in body temperature)

Nutrient losses are increased due to perspiration, vomiting and diarrhoea (Sodium, Potassium, Zinc, Magnesium and Phosphorus are lost)

Infection or fever accompanied by anorexia (loss of appetite) limits the food intake causing weight loss in patients

Infection can be related to state of physiological stress.
Increases catabolism in body (glycogenolysis, gluconeogenesis, protein breakdown, fat breakdown)

Absorption of nutrients also decreases if there are intestinal infections

Excessive sweat and urination is seen in severe infection or fever.
There is increased loss of body fluids and electrolytes.

Influenza is spread by droplet infection or droplet nuclei generated by coughing, sneezing or talking. Influenza affects all ages and both sexes. Often the epidemics have occurred in summer in India. Overcrowding enhances transmission of virus in the places like schools, institutions, ships, trains etc.

Activity : 3

Lights, Camera, Action!

Enact a scenario in class about different modes of transmission of diseases

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Table 6.4.1
Acute or Short Duration Fevers

	Influenza	Typhoid
Causative Organism	Influenza Virus A&B	Salmonella typhi
Signs and Symptoms	Sudden onset of chills Fever Dry cough Headache Myalgia Generalized malaise	Head ache Myalgia Drowsiness Constipation Diarrhea Vomiting
Mode of transmission	Air droplet infection	Fecal oral Route

Prevention

- Good ventilation of the buildings
- Avoidance of crowded places
- Encouraging the patients to cover their faces with handkerchiefs while sneezing or coughing
- Staying at home at the first sign of influenza
- Immunization with influenza vaccines.

Release of Influenza virus

Influenza A & B viruses have two antigens - the Haemagglutinin (H) and the Neuraminidase (N) antigens. The H antigen initiates the infection and attaches the virus to cells. The N antigen is responsible for the release of the virus from the infected cell.

B) Typhoid

Typhoid fever is an enteric fever. It is caused by bacteria Salmonella typhi. It is characterized by headache, myalgia, drowsiness, aching in the limb, bradycardia, cholecystitis and gastrointestinal symptoms like abdominal pain, vomiting, constipation and diarrhea.

It is called as enteric fever because the infection is found in the Payer's patches of the intestines. The bacteria attach to the intestinal wall, penetrate and multiply in the lymph nodes. It eventually reaches the blood causing secondary infection. This causes increase in body temperature.

The mode of spread of this infection is through fecal – oral route. The source of infection is the drinking water, milk and food contaminated by feces and urine of the infected person or carriers.

Prevention

- Purification of drinking water
- Promotion of food hygiene and personal hygiene
- Health education for hygiene and sanitation
- Immunization.

Salmonella typhi and *Salmonella paratyphi* live in the gallbladder of the carrier for months to years

Activity : 4

Prevention is better than cure!

Make a colourful pamphlet on the topic "Tips to prevent typhoid fever"

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Table 6.4.2
Intermittent Fevers

	Malaria	Dengue
Causative Organism	Genus Plasmodium P. falciparum P. vivax P. ovale P. malarae	Genus Flavivirus DEN 1 DEN 2 DEN 3 DEN 4
Mode of transmission	Mosquito-borne protozoan disease Anopheles mosquito	Mosquito- borne viral disease Aedes aegypti and Aedes albopictus

6.4.2. Intermittent Fever

Intermittent fever usually present for some hours of the day and the rest of the time, temperature is normal. The increase in body temperature can occur same time each day or every few days in a repetitive pattern. Examples are Malaria, Dengue and Chikungunya.

A) Malaria

Malaria is a protozoan disease transmitted by the bite of the infected anopheles mosquito. Four species of genus ***Plasmodium*** causes malarial infection in humans.

Malaria comprises three stages

a) Cold stage (fever with chills)

b) Hot stage (temperature rises to >105°F and persists for 4 to 6 hours)

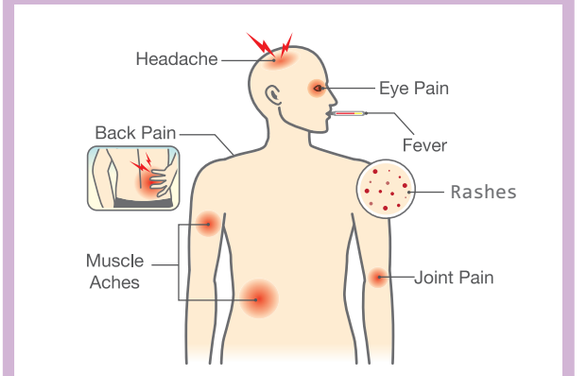
c) Sweating stage (fever subsides with sweating).

The clinical features are mild to severe fever, head ache, fatigue and muscle pain. The complications of malaria may be coma, convulsions, hyperpyrexia, hypoglycemia, liver damage, anemia and acute renal failure.

B) Dengue

Dengue is called as break bone fever. Dengue is caused by dengue virus which belongs to genus Flavivirus. It is spread through bite of infected Aedes mosquitoes, primarily Aedes aegypti and Aedes albopictus. It is characterized by nausea, vomiting, abdominal pain, rash, myalgia and bone pain and leukopenia. Two severe syndromes can be caused in young children. They are: Dengue Haemorrhagic Fever (DHF) and Dengue Shock Syndrome (DSS).

DHF, now called as "Severe Dengue" was recognized in 1950s in Philippines and Thailand.



Dengue fever symptoms and signs

Activity : 5

Hide and Seek!

Identify the areas in your house which attracts mosquitoes.

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DO YOU KNOW?

Ministry of Health and Family welfare, Government of India observes May 16th as National Dengue Day.

It is observed to create awareness about dengue and to intensify preventive measures for the control of disease in the country.

Prevention of Malaria and Dengue

- Avoid Mosquito bites by using mosquito repellents
- Wear long sleeve shirts, long pants and socks.
- Make sure the room doors and windows are closed.
- Doors and windows can be screened with net to prevent mosquitoes from getting in
- Avoid travelling to mosquito prone areas
- Keep your indoors clean. Aedes mosquitoes live indoors. These mosquitoes are found in dark, cool places, such as in closets, under beds etc
- Water from coolers and other small containers (plastic containers, buckets, used automobile tyres, water coolers, pet watering containers and flower vases) should be removed at least once in a week.
- Patients are advised to stay well hydrated.

DO YOU KNOW?

Difference between Aedes and Anopheles mosquitoes

Aedes

Anopheles

6.4.3. Chronic or Long Duration Fever

Chronic fevers are generally of longer and sustained duration. The patients have a past history of repeated episodes of infection. Chronic fevers have a slow, gradual onset and may be low grade in nature. Examples are Tuberculosis, HIV infection and AIDS

Table 6.4.3
Chronic or Long Duration Fevers

	Tuberculosis	HIV infection
Causative Organism	Mycobacterium tuberculosis	Human Immuno Virus – Retro virus
Mode of transmission	Air droplet infection	STD, Through body fluids, contaminated needles
Clinical symptoms	Wasting of tissues	AIDS wasting syndrome

A) Tuberculosis

Tuberculosis is a chronic infectious disease caused by *Mycobacterium tuberculosis.* The disease primarily affects lungs and also other parts of the body such as bones, joints, lymph glands, intestines, kidney and meninges. Mycobacterium tuberculosis is most commonly transmitted by droplet infection. The other rare routes of transmission are through skin and gastrointestinal tract.

The clinical features of pulmonary tuberculosis include anorexia, wasting of tissues, persistent cough, expectoration, night sweats, pain in the chest and fever.

In acute phase, patient presents with pneumonia with high fever. In chronic phase, patient will have low grade fever accompanied with exhaustion, cough, expectoration and loss of weight. The progression of the disease is slow with gradual worsening of the cough.

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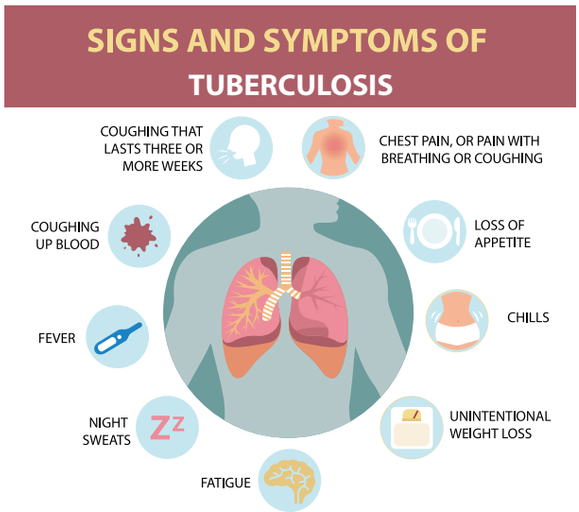

The disease can be treated with the help of antibiotic therapy, rest and nourishing food. The drug therapy should be continued for the stipulated period of time (six months to one year). The patients are monitored for progress under Revised National TB Control Programme – DOTS (Directly Observed Treatment Short Course).

DO YOU KNOW?

March 24th is observed as World Tuberculosis Day.

DOTS or Directly Observed Treatment Short Course is the internationally recommended strategy for TB control. This is a highly efficient and cost effective strategy. The treatment comprises of five components.http://www.searo.who.int/tb/topics/what_dots/en/

Prevention

- Houses should be adequately ventilated.
- The TB patients should always close their mouth while coughing or sneezing to avoid spread of infection.
- Patients can sleep alone in a separate, adequately ventilated room.
- Vaccination with BCG (Bacillus Calmette-Guerin) vaccine
- Isoniazid is the less expensive drug which is used to prevent latent TB from progressing to TB disease.

B) HIV Infection

HIV (Human Immuno Deficiency Virus) infection is an example for chronic infection. HIV infection can progress to AIDS (Acquired Immune Deficiency Syndrome). HIV infection is caused by retrovirus.

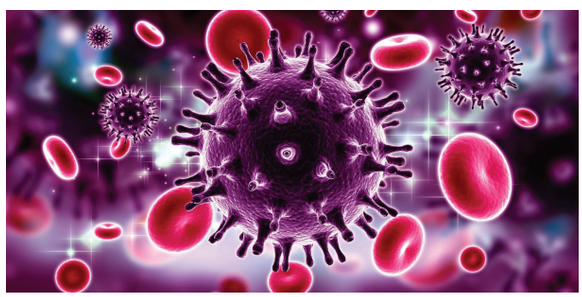

Fig 6.2 : HIV Virus

There are four stages of HIV disease. They are:

1. **Acute HIV infection:** This period is 4-7 weeks after the primary infection. There is rapid viral replication during this period.
2. **Asymptomatic infection:** This stage could even last for 10 years. There is an increased susceptibility to food and water –borne pathogens.
3. **Symptomatic HIV infection:** A decline in nutritional status and body composition may occur.
4. **AIDS:** AIDS is the terminal stage of HIV. AIDS encompasses life threatening clinical conditions linked to HIV induced immune suppression.

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Signs and Symptoms

- **First Stage:** Fever, malaise, pharyngitis, influenza, swollen and tender lymph nodes or cancer of lymph nodes.
- **Second Stage:** Very few symptoms may appear. Decrease in lean body mass without apparent change in weight is seen.
- **Third Stage:** Fevers, sweating, skin problems and fatigue may be seen.
- **Fourth Stage:** Infections with bacteria, virus and fungi are common. Symptoms like diarrhoea, malabsorption, fever and AIDS wasting syndrome (severe protein energy malnutrition) is seen.

1st December is observed as World AIDS day

Dr. Suniti Solomon was the Indian physician who diagnosed the first Indian AIDS case in Chennai in 1985 along with her student. She is the founder of YR Gaitonde Centre for AIDS Research and Education (YRG CARE) in Chennai. She was the torchbearer in the fight against HIV/AIDS till her last breath.

Prevention

- Avoid unprotected sex and sharing of contaminated needles. This can transfer the body fluids from the infected person to a healthy person.

Activity : 6

Social Responsibility!

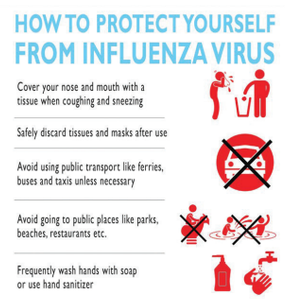
Visit YRG Care foundation to know more about their contribution towards HIV/AIDS research.

- Breast milk, saliva, tears and urine of infected person contain virus which affects human beings.
- The virus is not transmitted by casual contact, touching, hugging, kissing, or sharing plates or glasses.

6.5. Zoonotic Fevers

A zoonotic disease is a disease which is transmitted between animals and humans. A fever caused by the organism which is spread from animals to humans is called as Zoonotic fever. Examples are Swine flu, Leptospirosis and Nipah Virus Infection

A) Swine Flu: Swine flu is a highly contagious respiratory disease caused by influenza A virus in pigs. In rare cases, the flu is spread to humans.



B) Leptosiprosis: Leptospirosis is a rare bacterial infection which is transmitted from animals. It is spread through the

Table 6.5
Zoonotic fevers

	Swine Flu	Leptospirosis	Nipah Virus Infection
Causative Organism	Influenza A Virus	Leptospira Bacteria	Nipah Virus
Transmitted from	Pigs	Dogs, Rodents and Farm animals	Fruit Bats

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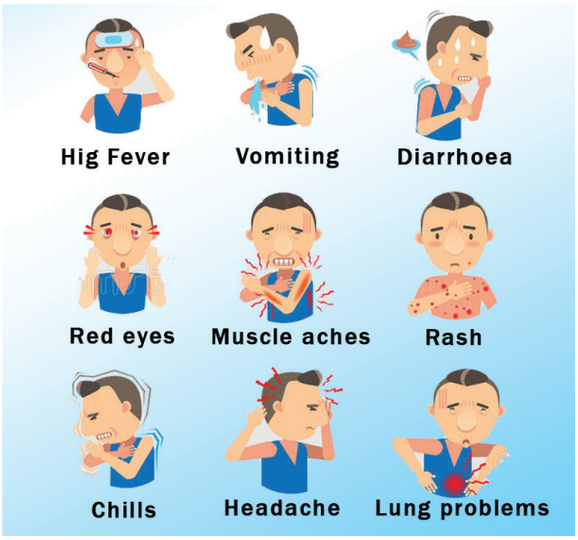
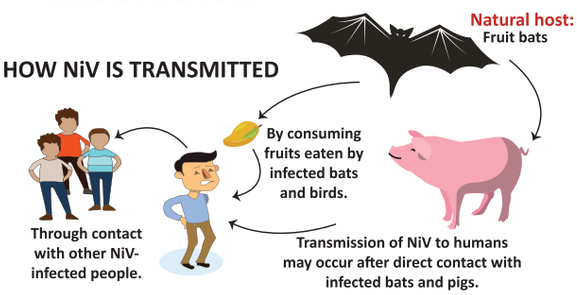
animal's urine especially dogs and rodents. Severe form of leptospirosis is called as Weil's disease.

Leptospirosis

Signs and symptoms



C) **Nipah Virus Infection**: Nipah virus is a zoonotic virus. The source of infection is the consumption of fruits or fruit products contaminated with urine or saliva from infected fruit bats.



Activity : 7

Cut me out!

Prepare a scrap book using articles from newspaper and magazines on the topic "Zoonotic fevers"

6.6. Diet Therapy in Fevers

Goals for diet therapy

- To improve the nutritional status of the patient.
- To enhance the overall immunity of the body.
- To meet the increasing metabolic demands of the body.
- To restore the depleted glycogen stores.
- To preserve optimal protein status.
- To hydrate the patient.
- To maintain the electrolyte balance.

The golden rule for diet therapy is "FEED THE FEVER'

Dietary Principle

A high calorie, high protein, high carbohydrate, adequate fat, adequate vitamins and minerals, high fluid, low fibre, less spicy and soft diet is prescribed for the patients.

Dietary Management

Energy

There is an increase in caloric requirements because of the elevated basal metabolic rate in fever, tissue destruction and restlessness. The energy requirements may increase up to 50% based on the extent of fever, its duration and weight loses. Initially, the patient may be able to tolerate only 600-1200 kcal/ day, but this should be increased rapidly. High energy drinks should be given.

Protein

The protein requirement is increased based on the muscle wasting. The protein intake should be around 1.5 to 2 g/kg body weight/ day. A high protein diet should be given with high carbohydrate to favour protein utilization. High Biological Value (HBV) protein should be included in liberal amounts.

Activity : 8

Recipe album!

Prepare an album by sticking pictures of 5 to 10 recipes of high energy drinks and high protein diet respectively.

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Fat

Fats are given adequately. Increased fat intake at early stages of fever may cause nausea and will be difficult to digest. Medium chain triglycerides (MCT) are preferred and are well tolerated by patients.

Carbohydrate

High carbohydrate diet is prescribed for patients to replenish the glycogen stores and for protein utilization. Well-cooked and easily digestible carbohydrates should be given liberally. These simple carbohydrates will be well assimilated. Examples: glucose, honey, custard, simple starches etc.

Vitamins

B complex vitamin requirements increase with increased energy needs. Antibiotic therapy given for infections alters microbial flora in the intestine. B complex vitamin deficiency may occur. Pyridoxine, Vitamin B_{12} and folic acid should be supplemented for the patients. Vitamin A and C are also essential for wound healing and to maintain the integrity of gut mucosa. Vitamin supplementation can be given at early stages of infections.

Minerals

The electrolytes (sodium, potassium and chloride) are lost excessively through perspiration during fever. In typhoid patients, iron supplementation is needed for patients to prevent anemia. Calcium and phosphorus supplementation is given for tuberculosis patients who are taking isoniazid drugs.

Fibre

Low fibre diet is given for the patients. The patient should be given 20-25g/day. In typhoid, intestinal lesions and diarrhoea may occur.

Fluid

Hydration is important during fevers. It is advisable to consume 2.5 to 3.5 liters of fluid per day. This includes juices, soups, thin dal, broths and water.

Other considerations

- Semi solid diet and Soft diet are desirable to improve appetite. This will also help the patient to consume nutritionally adequate diet.
- Small frequent meals can be given. Six to eight feedings will be sufficient.
- Less spicy foods are preferred.

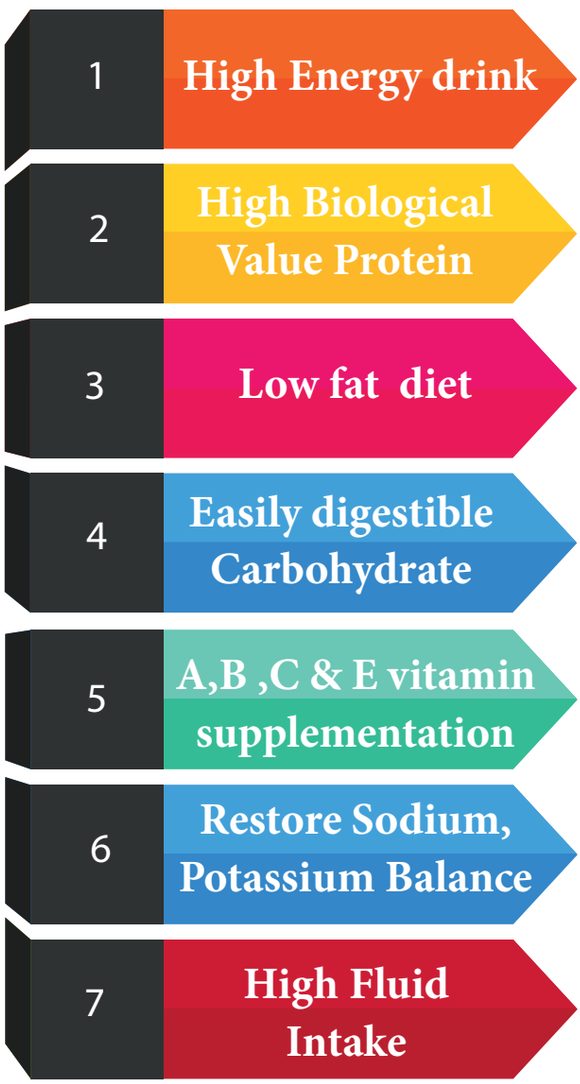

Fig 6.3 : Diet Therapy for Fevers

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Foods to be included and avoided for fevers

Foods to be included	Foods to be avoided
• Easily digestible carbohydrates like glucose, honey, custard, simple starches etc • Egg, milk sources and soy products • Juices, soups, thin dal, broths, tender coconut water and water	• Avoid fried fatty foods, spicy foods, • High fibre diet • Food which are hard to digest

HOME REMEDIES

Build your Immunity

- **Papaya Leaves:** It helps in increasing the platelet count and reduces the symptoms of dengue fever. Crush the leaves and consume the drink. This helps in flushing out the toxins.
- **Fenugreek Leaves:** It helps to reduce fever and act as sedative to ease pain and promote restful sleep for patients. Soak the leaves in water and then drink it.
- **Turmeric:** It boosts metabolism. Golden milk (turmeric with milk) is given for patients to help in healing process.
- **Tulsi Leaves and Black pepper:** Boil tulsi leaves and add two grams of black pepper to it. This drink helps in building your immunity.

Activity : 9

Case scenario!

An 18- year old female patient, Neeru came to the Emergency Department with complaints of fever, fatigue, headache, weakness, palpitation, abdominal pain, and diarrhea. She is college student who volunteered for cleaning around the college campus twenty days ago. Blood test revealed the presence of S. typhi.

a. What is Neeru suffering from?

b. According to you, why did Neeru get this condition?

c. What are the precautionary measures she should have taken to avoid this condition?

d. Give the diet principle for Neeru.

SUMMARY

- ❖ Any disorder or abnormality of the body or mind that destroys good health is known as disease.
- ❖ Diseases are categorized into communicable and non-communicable diseases.
- ❖ Communicable diseases are transmitted to other people from an infected person, animal or a source in the environment.
- ❖ Fever is an increase in body temperature above the normal range (97.0°F to 98.4°F) caused by an infection or any illness.

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- ❖ Acute fevers are of short duration with acute symptoms and the body temperature may rise to above 102°F.
- ❖ Intermittent fever usually present for some hours of the day and the rest of the time, temperature is normal.
- ❖ Chronic fevers are generally of longer and sustained duration. The patients have a past history of repeated episodes of infection.
- ❖ A fever caused by the organism which is spread from animals to humans is called as Zoonotic fever.
- ❖ The golden rule for diet therapy is "Feed the Fever"
- ❖ A high calorie, high protein, high carbohydrate, adequate fat, adequate vitamins and minerals, high fluid, low fibre, less spicy and soft diet is given for the patients.

A-Z GLOSSARY

Disease	Any disturbance in the normal functioning of the body or mind.
Infectious disease	It is a disease caused by ingestion of pathogens.
Pyrexia	Elevation in body temperature
Pyrogens	A pyrogen is a substance produced by a microorganism that induces fever.
Malaise	A feeling of general discomfort, pain and fatigue.
Myalgia	Muscle pain
Bradycardia	Abnormal slow heart rate
Cholecystitis	Inflammation of gall bladder
Enteric fever	An infection marked by intestinal inflammation and ulceration caused by Salmonella typhi ingested with food and water.
Convulsions	A sudden, violent, irregular movement of the body, caused by involuntary contraction of muscles.
Hyperpyrexia	A severe increase of a person's body temperature, which reaches up to 41.5°C.
Hypoglycemia	Low levels of blood sugar.
Pneumonia	A respiratory disease characterized by inflammation of the lung parenchyma (excluding the bronchi) with congestion caused by viruses or bacteria or irritants
Expectoration	The process of coughing up and spitting out
Zoonosis	A disease which can be transmitted to humans from animals.

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Evaluation

I. Choose the correct answer

1. Any disorder of the body or mind is known as _____
   a. Disease b. Infection
   c. Pathogen d. Pyrogen
2. Fever is also called as _____
   a. Expectoration b. Pyrexia
   c. Malaise d. Myalgia
3. FUO is _____
   a. Fever of unknown origin
   b. Fever of unique origin
   c. Fever of undesired origin
   d. Fever of unseen organism
4. Malaria is spread through the bite of infected _____ mosquito.
   a. Aedes b. Anopheles
   c. Plasmodium d. Culex
5. _____ infection may progress to AIDS
   a Fever b. HIV
   c. Hepatitis d. Gastritis

II. Short answers

1. How are diseases classified?
2. Define the term "Fever".
3. What is acute or short duration fevers? List the causative organisms and mode of transmission for the following fevers
   a Influenza
   b. Tuberculosis
   c. Typhoid

4. Give examples for high energy drinks.

III. Brief answers

1. What are the causes for fevers?
2. Why is typhoid called as enteric fever?
3. How do you prevent the spread of influenza?
4. What is AIDS wasting syndrome?
5. What are zoonotic fevers?

IV. Detailed answers

1. Write in detail the classification of fever.
2. How do you prevent the intermittent fevers?
3. Explain briefly the four stages of HIV infection
4. What are the goals for dietary treatment in fevers?
5. Explain in detail the diet therapy for fevers.

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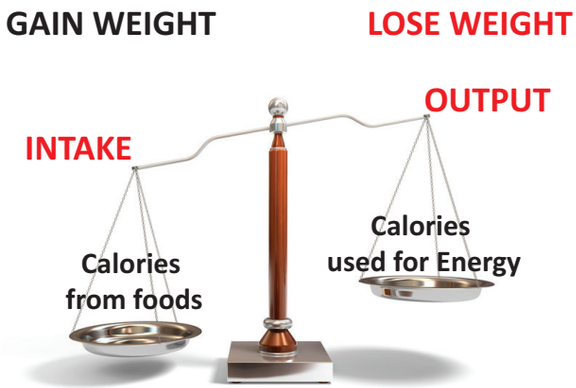
DIET IN OBESITY AND UNDERWEIGHT

Unit 7

OBJECTIVES

- Describe the causative factors of obesity.
- Explain importance of maintaining a desirableweight throughout life.
- Enumerate the guidelines for calculating ideal body weight. prevention and treatment for various conditions related to weight management.
- Learns the importance of maintaining a desirable weight throughout life.

Body weight is the sum of bones, muscles, organs, body fluids and adipose tissue. All these components are subjected to normal changes as a reflection of growth, reproductive status, variation in exercise levels and the effects of aging. Maintaining a constant body weight is a complex system of neural, hormonal and chemical mechanism that keeps the balance between energy intake and energy expenditure within limits. In order to maintain an ideal body weight the calorie burnt out should be greater than the calorie consumption.



DO YOU KNOW?

Nearly 40-50 million Indians belonging to upper middle class are overweight. With increasing numbers every years, obesity could become a public health problem in adults.

Obesity is a condition of excessive fatness either generalized or localized, resulting in an increase of more than 20 percent of the desirable body weight. WHO B defines obesity

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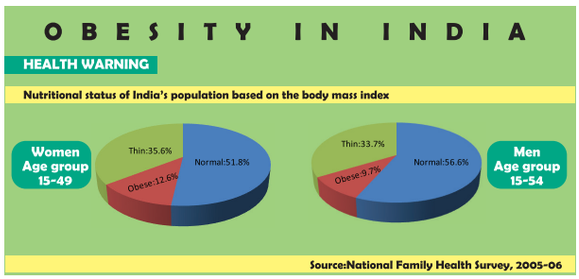
as "abnormal or excessive fat accumulation that may impair health". B



7.1.1 Aetiology

The factors causing obesity are given below:

Heredity: Heredity has a major role to play in obesity, as genes contribute to it. The involvement of genetic factors in the development of obesity is estimated to be 40-70%.

Physical Activity: Sedentary life style with lack of an exercise schedule tends to make one obese. Obesity is more common after the age of 35, when physical activity generally decreases without a corresponding decrease in food consumption.

Dietary Habits: Consuming high calorie food without burning off the calories leads to positive energy balance, which is one of the major contributory factor for obesity. Eating food at a very fast rate tend to chew less and lands up eating more food. Nibbling between meals may contribute extra calories leads to obesity.

Endocrine Factors: Endocrine abnormalities in conditions like hypothyroidism, Cushing's syndrome, polycystic ovarian syndrome is often associated with obesity.

Psychological Factors: Lonely, bored and depressed individuals find solace in piling on fast food and junk foods.

Affluence and Abundant availability of food: Eating out has become fashionable leading to an increased consumption of junk food which is rich in calories and short on essential nutrients.

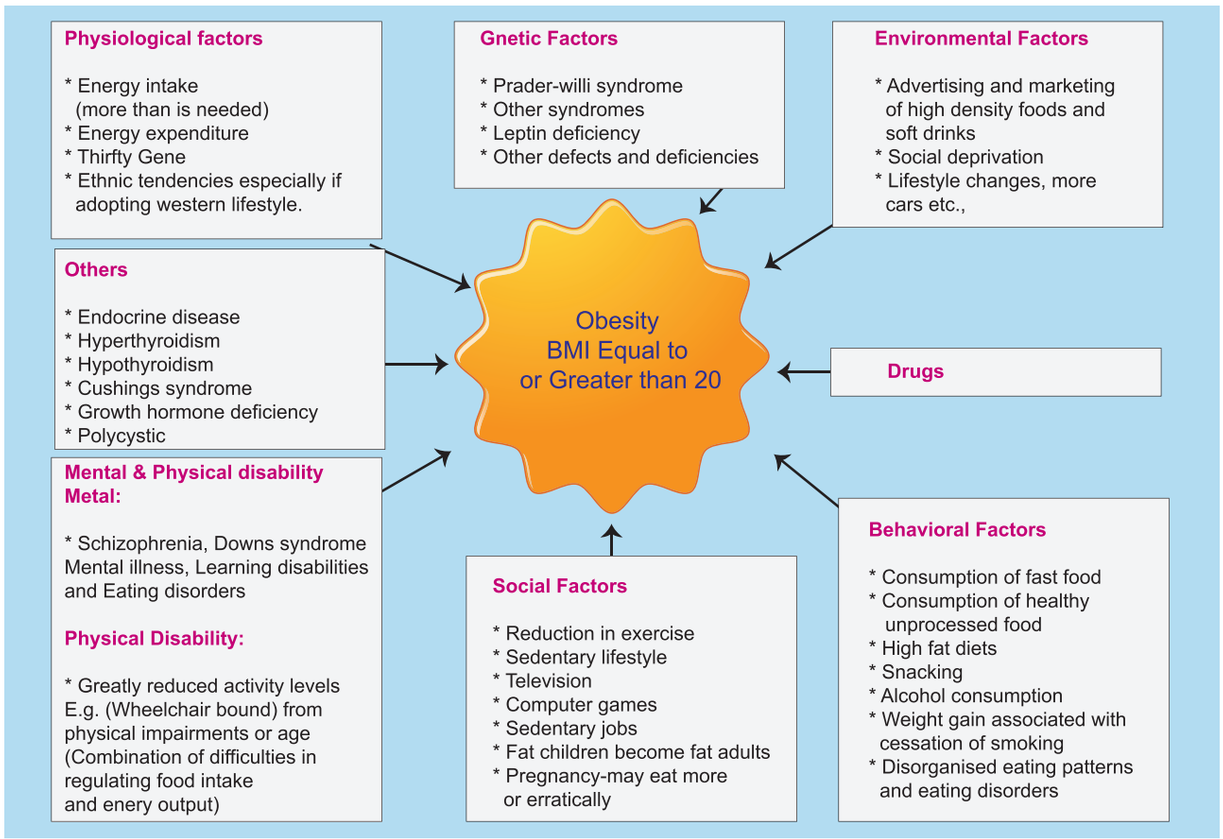


Fig 7.3 Factors causing obesity

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7.1.2 Assessment of Obesity

Standard height and weight for Indian men and women is given in Table below

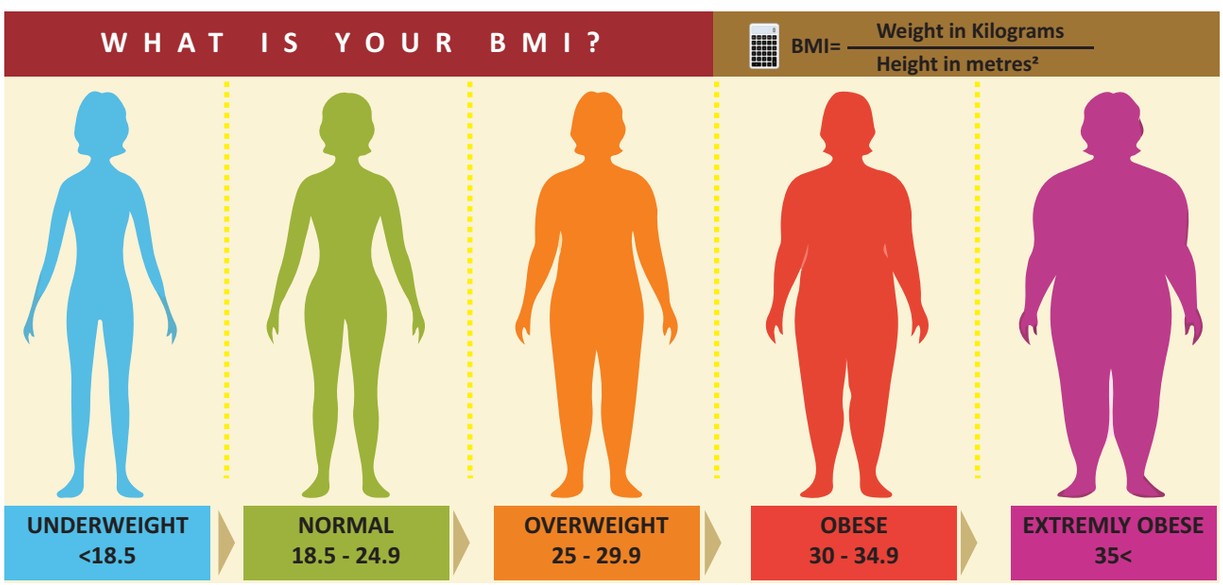
Height	Men		women	
	Weight (kg)	Weight (lb)	Weight (kg)	Weight (lb)
1.52M (5' 0")	_	_	50-54	112 -120
1.54M (5' 1")	_	_	51-55	114 -122
1.57M (5' 2")	56-60	124 -133	53-56	117 -125
1.59M (5'3")	57-61	127 -136	54-58	120 -128
1.62M (5'4")	59-63	130 -140	56-60	124 -132
1.65M (5'5")	61-65	134 -144	58-61	127 -135
1.67M (5' 6")	62-67	137 -147	59-64	130 -140
1.70M (5' 7")	64-68	141-151	61-65	134 -144
1.72M (5' 8")	66-71	145 -156	62-67	137 -147
1.75M (5' 9")	68- 73	149-160	64-69	141 -151
1.77M (5' 10")	69-74	153 -164	66-70	145 -155
1.80M (5' 11")	71-76	157 -168	67-72	148 -158
1.82M (6' 0")	73- 78	161 -173	69-74	151 -163
1.85M (6' 1")	75-81	166 -178	_	_
1.87M (6' 2")	77- 84	171 -184	_	_

Source: Life Insurance Corporation of India

Body Weight: If a person weighs 10% more than the standard body weight for the specific age, sex and height of the person is termed as overweight. If a person weighs 20%more, he is termed 'obese' B.

Body Mass Index: BMI is calculated from a person's weight and height and it provides an indicator of body fat and is used to indicate weight categories.

BMI = Weight (Kg) / Height² (m)



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Weight status according to BMI range

Weight status	BMI range
Underweight	< 18.5
Normal	18.5 to 24.9
Overweight	25 to 29.9
Obesity (Grade 1)	30 to 34.9
Obesity (Grade 2)	35 to 39.9
Obesity (Grade 3)	40 and above

Grade 1 obesity - It is a self manageable condition and does not interfere with day to day activities. The person leads a healthy normal life.

Grade 2 obesity – Medical and dietetic intervention is needed to manage the situation. The person appear obese and have poor stamina. They are predisposed to diabetes, hypertension, heart ailments, fatty liver, arthritis and varicose vein. This excess weight reduces life expectancy and increases the mortality rate .

Grade 3 obesity– Excess fat interferes with day to day activities. They are susceptible to atherosclerosis and have serious psychological disturbances.

Activity : 1

Calculate your BMI from your weight and height.

BMI =Wt (kg) / Ht^2 (m)

Categorise yourself as: Normal / over weight / grade 1 obesity/ grade 2 obesity/ grade 3 obesity.

Waist Circumference:B

The circumference of the waist is used to evaluate a person's abdominal fat.

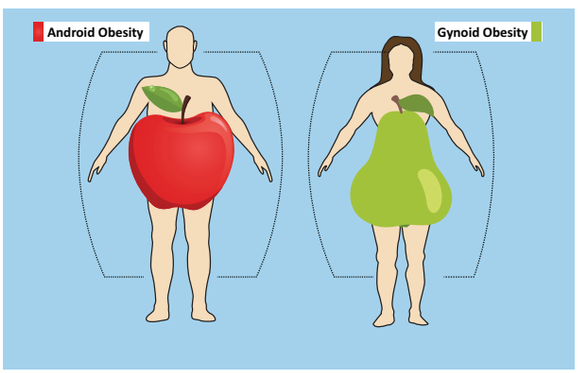
High risk of health problem is indicated as given below:

- Men ≥ 94cms and Women ≥ 80cms of waist circumference.
- Very high risk of health problem is indicated as in
- Men ≥ 102 cms and Women ≥ 88 cms of waist circumference.

Waist to Hip Ratio (WHR):

The normal waist to hip ratio should be 0.7 In upper body obesity ratio for: Women is 0.85 and Men is > 1.0 A WHR of 1.0 or greater in men and 0.8 or greater in women is indicative of android obesity and increased risk of obesity related disease. Fat is deposited in males and females which cause difference in types of obesity apple or android or male pattern and pear or gynoid or female pattern of fat distribution.

ADIPOSE TISSUE DISTRIBUTION IN MEN AND WOMEN



Broka's Index: This is by far the simplest formula to calculate.

(IBW) = Height (cm) – 100 = Ideal Body Weight

7.1.3. Complications of Obesity:

General Mortality and Morbidity: Obese are more prone to chronic diseases like cardio vascular disease, including hypertension and dyslipidaemia, non-insulin dependent diabetes, gall bladder disease and gout

Cardiovascular disease and stroke: Obesity may be independent risk factor for coronary heart disease. A reduction in weight leads to improvement in cardiovascular risk factors like hypertension and abnormal lipid levels. When the blood vessels of the brain are

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diseased, they may rupture or there may be inadequate blood supply to brain resulting in stroke. This may be due to hypertension or fatty deposits in blood vessels of obese.

Type II Diabetes: It is an important contributor to morbidity and mortality in obese people. It is associated with insulin resistance and hyperinsulinaemia. A balanced diet, physical activity and drugs can control blood sugars.

Gall bladder disease: Obesity is one of the risk factors for formation of gallstones. The excess adipose tissue contain large amount of cholesterol. The super saturation of bile with cholesterol in obese makes them prone to formation of gallstones.

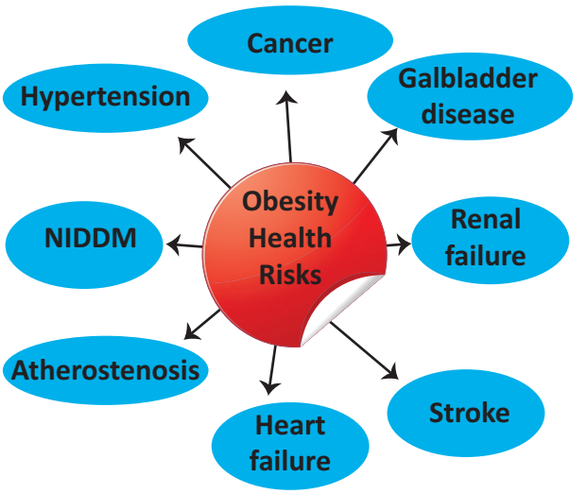
Cancer: Risk of cancers of colon, rectum and prostate increases in obese men, whereas obese women likely to develop cancer of breast, ovary, endometrial and cervix.

Infertility: Obese women are reported to suffer more from menstrual disorder, infertility and PCOS (Polycystic Ovary Syndrome), all of which tend to improve on reduction of weight.

Sleep Disorder: Commonly known as sleep apnoea is one of the common problems in obese men and women. Obesity causes narrowing of the upper airway when the person is in supine position.

Back pain and Arthritis: Abdominal obesity increases risk of back pain because of extra load on spinal column. The extra stress on weight bearing joints contributes to the development of osteoarthritis.

Psychological Problems: Obese people may be exposed to ridicule and discrimination in areas like employment, promotions and social interactions. This results in low self-esteem and depression leading to over eating for consolations.



(NIDDM-Non Insulin Dependent diabetes Mellitus)

Management of Obesity: Comprises the Following Three Approaches.

1. Dietary modifications
2. Physical activity
3. Lifestyle modifications

7.1.4. Dietary Principles:

A low calorie, restricted carbohydrate, high protein, restricted fat, normal vitamins and minerals (except sodium), liberal fluid and high fibre diet is suggested.

Energy: A low calorie diet helps the body to go into negative energy balance. This promotes use of stored fat as opposed to calories from food. 20 Kcal/kg ideal body weight for sedentary lifestyle and 25 Kcal / kg ideal body weight for moderate lifestyle is prescribed.

Carbohydrates: Milled and refined grains and foods made with refined grains like white rice, white bread, white pasta, processed breakfast cereals, potatoes and sugary drinks are rich in rapidly digested carbohydrate having high glycemic index and glycemic load. These kinds of carbohydrate increase the blood glucose and insulin levels rapidly, hence it causes hunger spikes leading to overeating and resulting in weight gain and consumption should be restricted.

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Food Groups	Examples	
Grains	Whole wheat bread and rolls, Whole wheat pasta, oatmeal, brown rice, unsalted popcorn	
Fruits	Apples, apricots, bananas, dates, grapes, oranges, grapefruit, grapefruit juice, mangoes, melons, peaches, pineapples, raisins, strawberries.	
Vegetables	Broccoli, carrots, green beans, lima beans, potatoes, spinach, sweet potatoes, tomatoes	
Fat - free or low - fat milk and milk products	Fat - free (skim) or low - fat (1%) milk or butter milk, fat - free, low - fat or reduced - fat cheese, fat - free or low fat regular or frozen yogurt	
Lean meats, poultry and fish	Beef, poultry, pork, game meats, fish, shellfish select only lean;trim away visible fats; broil,roast or poach; remove skin from poultry	
Nuts, seeds and legumes	Almonds, hazelnuts, mixed nuts, peanuts, walnuts, sunflower seeds, peanut butter, kidney beans, lentils, split peas	

Whole grains, whole wheat, brown rice, barley, fruits and vegetables are digested more slowly than refined grains. So they have a slower effect on blood sugar and insulin, which may keep hunger at bay. This results in controlled eating and weight management .

Proteins: Protein rich foods provide higher satiety, high specific dynamic action and

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Simple tasty home made foods provide less calories. Knowing the calories in the food helps to maintain weight.

improved body composition. About 1g protein per kg body weight is suggested. Inclusion of plant proteins like nuts and beans are low in fat but high in dietary fibre and replacing red and processed meat with fish and poultry are emphasized.

Fats: Fat, being a concentrated source of energy need to be restricted. Include fat in the form of vegetable oils (rich in MUFA and PUFA) so that sufficient essential fatty acids are supplied and at the same time the risk of developing coronary artery disease can be minimized.

Vitamins: Inclusion of fruits and vegetables in the diet will avoid deficiency of water soluble vitamins due to restriction of fat.

Minerals: Sodium in common salt causes retention of fluid and therefore salt should be restricted in the diet .

Fluids: Liberal amounts of water and low calorie fluids may be included in the diet . A glass of water intake before meal will reduce food intake .

Fibre: Fibre provide satiety, bulk, slow digestion and increased transit time. High fibre foods such as fruits and green leafy vegetables are low in calorie density, help in regulating bowel movement, reduce blood cholesterol, promote chewing and decrease the rate of ingestion

Here are some weight loss friendly snack ideas:

1. Small handful of nuts.
2. Sliced fruit with unsweetened yogurt.
3. Vegetable chat.
4. Sprout salad.
5. Roasted pumpkin seeds.
6. Sliced fruit with nuts or nut butter.
7. Roasted chickpeas

Activity : 2

List FIVE foods to be included and FIVE foods to be avoided

7.1.5 Physical Activity:

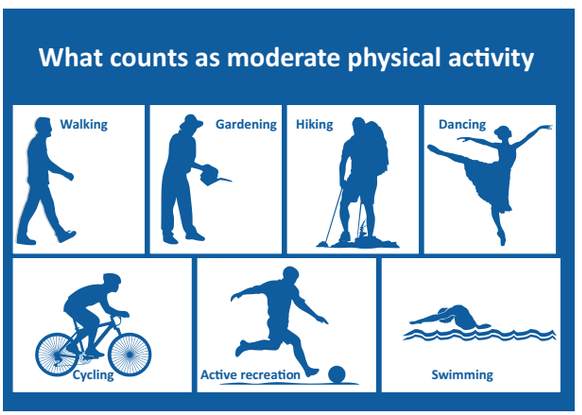
Higher levels of regular activity are associated with lower mortality.

Effect of Physical Activity On Health Reduces The Risk Of Following:

- Cardio vascular disease
- Non insulin dependent diabetes mellitus
- Obesity
- Osteoporosis
- Cancer

Although it is difficult to prescribe the optimum amount physical activity, it is important to note that any exercise programme has to be consistent for affecting some degree of weight loss.

Types of Exercise to Loose Weight



The benefits of exercise as follows:

1. Reduces blood pressure
2. Helps lessen angina pain
3. Decreases body fat
4. Increases HDL cholesterol

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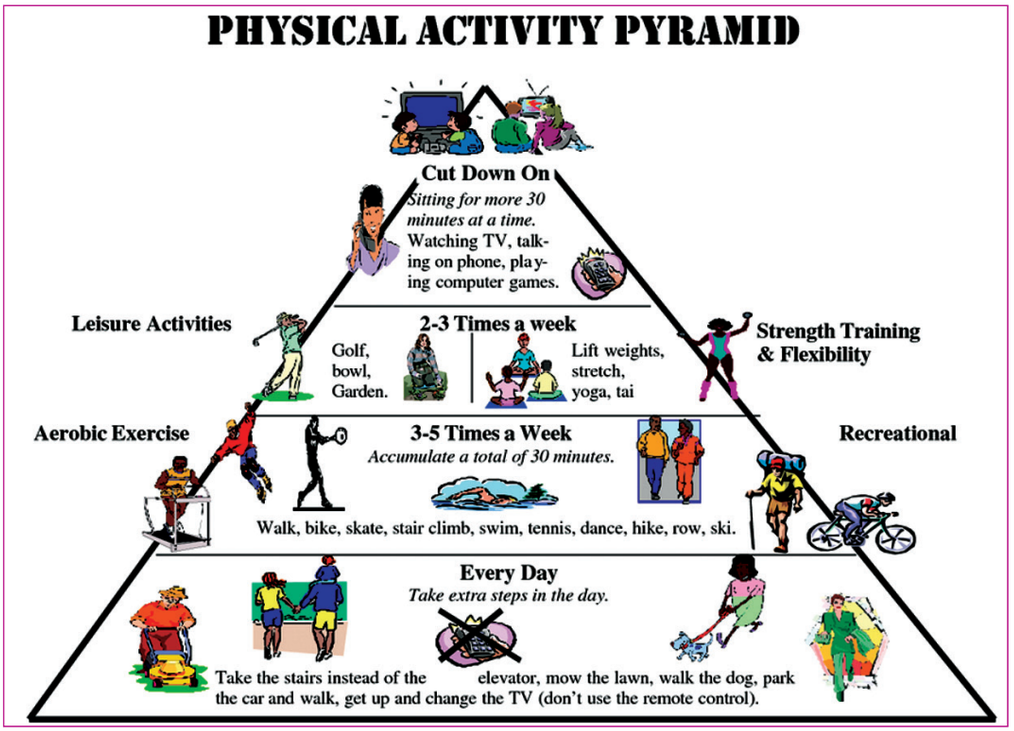

5. Makes the heart stronger and more efficient
6. Helps in increasing bone density
7. Reduces risk of cancers
8. Increases longevity

7.1.6 Life Style Modification:

The following strategies related to lifestyle modifications are helpful.

1. Have regular meal time. Irregular eating habits put a lot of strain on the body
2. Do not read or watch television while eating.
3. Keep healthy snacks at home like fruits, vegetables and sprouts.
4. Avoid nibbling between meals
5. Eat slowly, chewing the food properly.
6. Include a regimented exercise routine in the day.
7. Handle stress in a positive manner through exercises, yoga and meditation
8. Avoid drinking of alcohol and smoking
9. Wake up early and sleep early. Sleep for at least 6-8 hours daily as poor sleep has been linked to weight gain

What are junk foods?

Foods that are pre - prepared are packed and the low nutritional value.

Junk Food varieties

- Chips
- Candy
- Soft drinks
- Gum
- Chocolates
- Cookies
- Cake
- Sugar
- Butter
- Fired fast food

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DO YOU KNOW?

How can stress be managed?

Stress management can be done by meditation, guided imagery, music therapy, dance therapy, aroma therapy, sleep, humour, touch and rearing a pet.

CONCLUSION

A balanced diet with adequate amounts of vegetables, proteins, and fruits is the key to managing weight. Do not Diet to lose weight but Eat Right.

- Include more fiber in the diet
- Reduce junk food and snacks
- Consume low-fat dairy products, lean meat and nuts
- Do not skip meals
- Eat small and frequent meals, follow 6 meal patterns a day.
- King size Breakfast. This indicates not the quantity, as misunderstood by many, instead indicate the quality of your Breakfast.
- Control or limit the intake of sugar, salt, spices and oil.

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- Eat low-fat meals
- Exercise regularly 4–5 times a week
- Monitor weight regularly.

Case Study

A lady aged 30 is a rich housewife without much work. She is fond of eating sweets, fried foods, ice creams etc. She spends most of her time by watching T.V. Her height is 5.5" and weight is 100 kg. Her blood cholesterol level is 220 mg / dl. Her BP is 90mm/130mm. She thinks putting on weight is natural phenomena, Suggest her a diet and behavior modification to reduce her weight.

DO YOU KNOW?

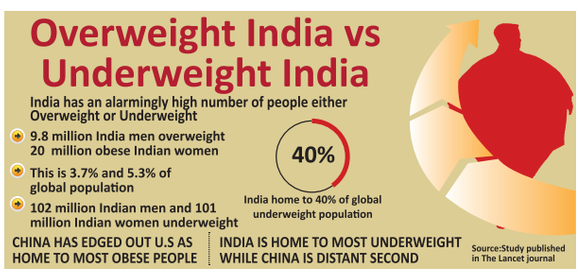
Anti obesity day is on 26th November

7.2. UNDERWEIGHT

Underweight is defined as people with a Body Mass Index (BMI) of less than 18.5 or a body weight 15% to 20 % below the normal for their age and height. Underweight results when the energy balance is negative.

DO YOU KNOW?

An estimated 50 million adult women are classified as being severely underweight in developing countries.



7.2.1 Aetiology

Genes

There is a genetic cause associated with being under weight. The weight of an individual is inherited basically from his biological mother. If the biological mother being thin, there is 75% likelihood of the individual being thin also.

Dietary factors:

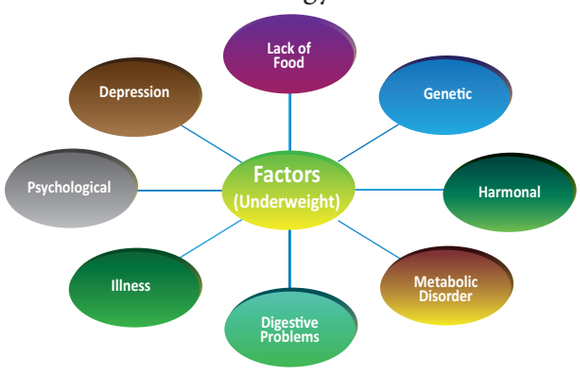
Poor selection of food along with irregular eating habits may be responsible for insufficient food intake and hence calorie intake. It may be due to ignorance or a lack of purchasing power of the family.

Physical activity and psychological factor:

Individuals who are tense, nervous and extremely active and who do not rest sufficiently tend to expend more energy than what they are able to eat. This can cause under nutrition.

Pathologic condition:

Fever and infections, increase the demand for energy, if not met because of poor appetite, lead to loss of weight. Food intake may be severely limited by nausea, vomiting or diarrhoea in gastrointestinal disturbances. Metabolic rate may be greatly increased in hyperthyroidism resulting in underweight. Drug therapy may also alter taste or reduce appetite, leading to weight loss. Wasting diseases such as tuberculosis, diabetes, cancer and malabsorption syndrome increases the metabolic rate and energy needs.



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7.2.2 Complications:

Poor immunity:

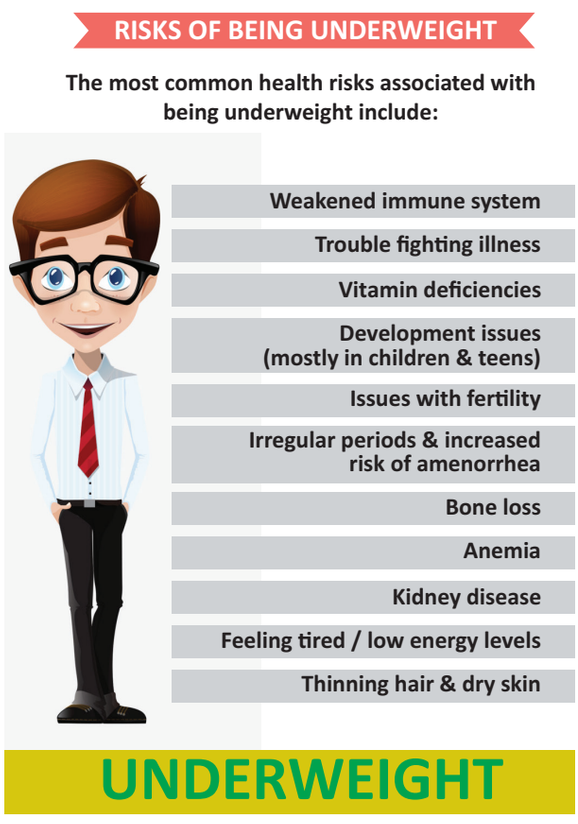
Low body weight puts a person at increased risk for infections and disease.Due to less consumption of protein, fat and other nutrients, such as antioxidants which help support a strong, functioning immune system.

Gynaecological problems:

Amenorrhoea, infertility and pregnancy related complications and low birth weight babies are common in underweight mothers .

Osteoporosis:

Drastic weight loss impairs the nutrient absorption capabilities of the individual. When calcium is not consumed and absorbed in proper amounts may lead to weak and fragile bones causing osteoporosis.



7.2.3 Dietary Principles:

Any underlying cause of underweight must be dealt with as a first priority. Nutrition support and dietary changes are effective along with or after treatment of the underlying disorder. Then a balanced diet should be planned based on the requirement.

A high calorie, high protein, high fat, diet liberal vitamin intake is recommended.

Energy:

The total calorie intake should be 500 to 1000 Kcal in excess of the daily needs in order to result a gain in weight by half to one kilogram in a week. The person may be given 30 – 35 Kcal per Kg body weight per day. The calorie should be increased gradually over a period of one or two weeks to avoid digestive disturbances.

Carbohydrates:

Gradual amounts of easy to digest carbohydrates should be included in the diet. The intake of dietary fibre should be minimized so as to prepare meals which are nutrient dense and have a small volume. Include more of high calorie vegetables like potatoes, colocasia and yam instead of raddish, cucumber, leafy vegetables which are low in carbohydrate content.

Proteins:

Underweight individuals generally have lean body mass and may benefit by consuming around 1.2 g per kg body weight of protein per day. A combination of both animal and plant proteins should be incorporated.

Fats:

Fats are capable of increasing energy value of diet without adding much bulk to it. Add extra fat gradually, a sudden increase in fatty foods like butter, cream and oil may produce diarrhoea. About 30 % of calories should come from unsaturated sources of fat.

Vitamins and minerals:

If the diet provides good amount of fresh fruits and vegetables, vitamin or mineral supplements are usually not required.

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Health Risks of Being...

Under Weight

- Heart irregularities
- Lowered resistance to infection
- Reduced ability to fight disease
- Chronicfatigue (tired!)
- Anemia = low iron
- Diarrhea
- Osteoporosis later in life (weak bones)
- Psychological distress, depression (from low confidence and low self-esteem)
- Eating disorders
- Distorted body image

Over weight

- Heart disease
- Depression
- Poor self - esteem
- Hypertension (High Bp)
- Complications in pregnancy
- Maturity Onset diabetes (Type 2)
- Respiratory illness
- High blood cholesterol levels
- Some cancers
- Gallbladder disease
- Arthritis (Sore joints)
- Eating disorders
- Distorted body image
- The above risks become more prevalent among those who are obese for a long period of time.

Fluids:

Take fluids only after a meal instead of taking before meals so that food intake is not reduced. High calorie nourishing beverages such as milk shakes, egg not over low nutrient beverages such as cold – drinks, barley water etc., should be taken.

Exercise:

Regular outdoor exercise helps to stimulate appetite. Emotional well- being is essential to have good appetite. Constipation may reduce the appetite so the bowel movements should be regulated with adequate fluids, exercise and fruits.

A-Z GLOSSARY

Android fat deposition	deposition of fat around thewaist and upper abdomen,apple shape fatdistribution
Body Mass Index	A mathematical formula that correlates with body fat, expressed as weight in kilogram divided by height in meters squared
Cushing's syndrome	A glandular disorder caused by excessive steroid hormone resulting in greater than normal functioning of adrenal gland, due to obesity.
Essential fat	Fat that is present in the internal organs, bone marrow and nerve tissue that is necessary for survival.

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Gynoid fat distribution	pear shape fat distribution deposition of fat in the thighs and buttocks.
Hypercholesterolaemia	Elevated blood cholesterol levels.
Lifestyle modification	change in the behaviour, eating habits, exercise and thinking pattern.
Lipogenesis	Fat formation.
Obesity	A state of adiposity in which body fatness is above the ideal, BMI of 30 -39.9.
Osteoporosis	loss of bony tissue resulting in bones that are brittle and liable to fracture.

Evaluation

I. Choose the correct answer (1 mark)

1. Which of the following should be restricted the most by an obese person?
   a. soups b. tea
   c. cakes d. fruit juices
2. The principle of diet for underweight people is
   a. high calorie, high protein,
   b. high calorie, low protein
   c. low calorie, high protein
   d. high calorie, low fat
3. State whether the following statements are true or false
   a. When people are offered variety of foods , their intake is likely to be less than when a single food is available.
   b. Obesity predisposes to hypoinsulinemia and decreased glucagon levels
4. Match the following :

i) WHR	a) <18.5
ii) underweight	b) >0.85 for women
iii) ideal BMI	c) 30 to 34.9
iv) obesity grade 1	d) 18.5 to 24.9

II. Write short answers (2 marks)

1. Define obesity.
2. What is BMI?
3. What is Broka's index?
4. Define underweight.
5. List the physical activity to reduce weight
6. List the causes of a person being underweight.
7. What are the complications of underweight?
8. What are the methods of managing stress.
9. What is android obesity?
10. What is gynoid obesity?

UIYCP

III. Answer in brief (3 marks)

1. List out the causes of obesity.
2. What are the complications of obesity?
3. How will you assess obesity?
4. Mention the advantages of doing exercise.
5. Bring out the difference between obesity and underweight.

IV. Answer in detail (5 marks)

1. Explain the factors causing obesity.
2. Describe the complications of obesity.
3. Plan a days diet for obesity
4. What are the causes and effects of underweight ?
5. Explain the dietary modifications in the treatment of underweight .

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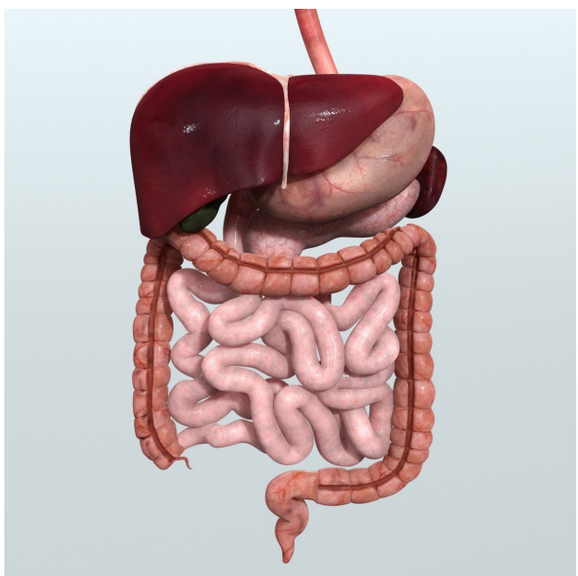
DIET IN GASTRO INTESTINAL AND LIVER DISORDERS

Unit 8

OBJECTIVES

This chapter will enable students

- To understand the functions of gastrointestinal system
- To learn and understand the causes, symptoms and diet therapy for diarrhea, constipation and peptic ulcer.
- To understand the functions of liver
- To learn and understand the causes, symptoms and diet therapy for hepatitis and cirrhosis



8.1 GASTROINTESTINAL DISORDERS

The gastrointestinal tract is an active organ which digests and modifies the nutrients for absorption. Gastro intestinal tract acts in unison with its glands and accessory organs like liver, pancreas and gall bladder to carry out the process. Gastrointestinal diseases refer to diseases involving gastrointestinal tract that is esophagus, stomach, small intestine and large intestine and accessory organs of digestion.

Functions of Gastrointestinal Tract

The gastro intestinal tract consists of esophagus, stomach, small intestine and large intestine. The functions of gastrointestinal system are:

- Ingestion of food,
- Propulsion of food,
- Digestion and absorption of food and
- Excretion of waste products.

The diseases of the upper gastrointestinal tract interfere with the intake of food by reducing appetite, inducing nausea and vomiting, evoking pain or by producing obstruction. The diseases of lower gastrointestinal tract impair the functions of intestinal tract and result in poor utilization of ingested food. The common disorders of stomach and intestine are diarrhoea, constipation and peptic ulcer.

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8.1.1 DIARRHOEA

Diarrhoea is the leading cause of malnutrition and death in children under 5 years old. Diarrhoea is characterized by the frequent evacuation of liquid stools, accompanied by an excessive loss of fluid and electrolytes. Diarrhoea is the condition when there is rapid transit of intestinal contents through the small intestine, reduced enzymatic digestion of foods and decreased absorption of nutrients.

Types of diarrhoea

Diarrhoea can be acute or chronic in nature.

- **Acute diarrhoea** is an episode of recent origin. It is the condition with passage of watery stools without visible blood. Acute diarrhoea is caused by viral infection, bacterial toxins, bacterial infection, metal poisoning, side effects of drugs and structural or functional abnormalities of intestine.
- **Chronic diarrhoea** is when the duration of symptoms is longer than one month. It is characterized by frothy and acidic stools. Chronic diarrhoea is a result of long term diseases such as malabsorption syndrome, metabolic diseases, chronic deficiencies, allergy, cirrhosis of liver and carcinoma of small intestine and colon.

Causes of diarrhoea:

The causes of diarrhoea are:

- Overeating or eating of foods difficult to digest
- Viral infection (rotavirus)
- Bacterial infection (E.coli , Shigella)
- Bacterial toxins (Salmonella toxin)
- Protozoa infection (Giardia, Entamoeba histolytica)
- Malabsorption syndrome (Steatorrhea, Lactose intolerance)
- Metabolic disease (Diabetic neuropathy, Addison's disease)

DEHYDRATION

- One of the important consequences of diarrhoea is dehydration.
- Dehydration is loss of water and electrolytes from the body.
- Dehydration results in reduction in extracellular blood volume and hence a reduction in the total blood volume.
- Low blood volume is associated with hypotension and a low cardiac output.
- Severe dehydration leads to ischemic damage to the tissues and organs due to reduced supply of oxygen and nutrients.
- In severe dehydration, death may also occur.

Signs of dehydration: Inelastic and dry skin, dry lips and mouth, furred tongue, cold extremities, dizziness, weakness and anorexia

How to identify the signs of dehydration?

Skin turgor is a sign of dehydration. Skin pinch test is used to identify dehydration. Follow the steps given below:

- Pinch the skin on the back of patient's hand, lower arm or abdomen, between thumb and first finger. Do not use finger tips because it causes pain.
- Hold the skin for a few seconds and release.
- Observe how quickly the skin returns to its normal shape.
- If the skin is quick to return to normal, it is a sign that the patient is hydrated, whereas if it takes longer, the patient could be dehydrated.

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- Allergy and Food sensitivity
- Carcinoma of small intestine and colon
- Cirrhosis of liver

Goals for dietary treatment

- To watch for the symptoms of dehydration and prevent dehydration
- To replace the fluid and electrolytes
- To remove the cause especially the infection
- To correct the nutritional deficiencies

Golden rule for diet treatment

FEEDING THE CHILD IS BETTER THAN STARVING THE CHILD

Dietary principle

A high calorie, adequate carbohydrate, adequate protein, low fat, low fibre, adequate vitamins and minerals, liberal fluid, bland and lactose free diet is prescribed for the patients.

Diet therapy for diarrhea

The therapy for diarrhoea consists of:

- Fluid and electrolyte management
- Dietary Management

1. Fluid and Electrolyte management

Early replacement of fluids and electrolytes through intravenous or oral route is necessary to reduce mortality associated with dehydration. Severe cases of diarrhoea need administration of dextrose and electrolyte solutions intravenously and hospitalization. Mild cases of diarrhoea can be treated at home by giving fluids like tender coconut water, buttermilk and rice kanji. This is referred to as the Oral Rehydration Therapy (ORT).

DO IT YOURSELF!

ORAL REHYDRATION THERAPY (ORT)

Oral Rehydration Therapy refers to providing oral salt solutions to the patients. An oral rehydration solution can be prepared by mixing 1 teaspoon of salt, 3 tablespoons of sugar with or without lemon juice in a litre of drinking water.

2. Dietary Management

Adequate nutritional care is important to ensure enhanced recovery and proper rehabilitation. The nutrient requirements and quality of diet may not be the same for all forms of diarrhoea. The demand for fluids and electrolytes are high during acute diarrhoea whereas the demand for macro and micro nutrients increases along with fluids and electrolytes during chronic diarrhoea.

Energy

During acute phase of diarrhoea, the intake of calories can be adjusted gradually as per patient's tolerance. A gradual increase of 200-300 kcal can be achieved easily. Easily digestible carbohydrates can be given for patients to improve calorie intake.

Protein

Protein requirements are increased in chronic diarrhoea because of tissue depletion. In chronic diarrhoea, an additional 10 g of protein is recommended above the normal requirement. In acute diarrhoea, adequate protein that is 1g per kg body weight is recommended. Protein rich foods that are easily digested like minced meat, egg, skimmed milk can be given for the

Oral Rehydration Solution (ORS)

Sodium Chloride	= 3.5g
Glucose	= 20g
Sodium bi carbonate	= 2.5g
Potassium chloride	= 1.5g

Dissolved in one litre of potable water

WHO STANDARD FORMULATION

ORS provides

Glucose	= 2g
Sodium	= 90 mEq/L
Potassium	= 20 mEq/L
Chloride	= 80 mEq/L
Bicarbonate	= 30 mEq/L
Osmolality	= 330 mOsm/L

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patients. Milk is restricted as it is a high residue diet. Fermented, cooked and diluted milk products are tolerated well than whole milk by the patients.

Fat

Fat is restricted as it may aggravate diarrhoea. Invisible fat (fat in an invisible form or already present in the food) like egg yolk, whole milk, paneer, curd, meat, sea foods etc is preferred more as compared to visible fat like oils and dalda. Fried food must be avoided.

Carbohydrate

Adequate carbohydrate should be given (60-65% of total calories). Easily assimilated carbohydrates are preferred. Potato, yam, sago, semolina, refined flour, honey, jaggery can be given for patients with diarrhoea to reduce the volume of stools.

Fibre

Low fibre diet is prescribed for the patient. Insoluble fibre in the form of skins, seeds and bran should be avoided to minimize irritation of gastro intestinal tract. Soluble fibre foods like stewed fruits and vegetables help in binding the stool and favour beneficial gut health.

Vitamins and Minerals

The water soluble vitamins especially folic acid, vitamin B_{12} and vitamin C should be supplemented. Fat soluble vitamins (A, D, E and K) are supplemented if fat is not digested and lost in stools. Sodium and potassium should be replaced.

Fluids

Intake of fluids should be liberal to minimize risk of dehydration. Diluted drinks are preferred than concentrated drinks.

Activity : 1

Circle the food which can be given for diarrhoea from the following.

1. Curd 2. Fried foods 3. Milk
4. Biriyani 5. Egg yolk

Stages of diet therapy in Chronic Diarrhoea

Level I diet
Low milk diet, curd, rice and milk
Level II diet
Milk free diet, amylase rich food
Level III diet
Lactose free, Sucrose free, starch free diet, Soy, chicken and egg

HOME REMEDIES
For Diarrhoea

- Thyme can settle churning stomach and kill bacteria. Add a teaspoon of thyme in one cup of boiling water, steep, strain and drink.
- A plate of carrots can soothe the digestive system
- Mix cumin seed powder with curd and take it three times a day

Foods to be included and avoided for Diarrhoea

Foods to be included	Foods to be avoided
Buttermilk	Whole milk
Thin dal and soft cooked dal	Legumes, nuts
Boiled Egg	Fried foods
Vegetable soups	Raw vegetables
Vegetable juices or cooked pureed vegetables	Pickles
Fruit juices	Coarse cereals
Banana, Apple, Papaya and Melons	Whole grain breads
Coconut Water	
Kheer, homemade jelly and custard	
Soft cooked rice and refined cereals	

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Simple dietary tips for diarrhoea patients!

- Include plenty of fluids like fruit and vegetable juices, soups, thin dals and coconut water
- Small and light meals is preferred than three big meals to replenish the lost nutrients
- Boiling, steaming, baking, pressure cooking should be encouraged
- Include banana and apple as they are rich in potassium
- Restrict consumption of milk and milk products
- Try to avoid raw vegetables
- Avoid fried foods

8.1.2 CONSTIPATION

Constipation is defined as difficulty or infrequent passage of stools. Patients with constipation have hard stools, physical discomfort of straining and incomplete evacuation. It usually occurs in children, adolescents and adults taking low fibre diets, patients who are confined to bed and in elderly people.

There are three types of constipation. These are:

a. Atonic constipation

In atonic constipation, there is loss of muscle tone. This results in weak peristalsis. The causes of atonic constipation are lack of fluids, low fibre diet, irregular defecation habit, poor personal hygiene, sedentary lifestyle and excessive use of laxatives

b. Spastic constipation

Constipation due to excessive tonicity of the colon wall is known as spastic constipation. The increase in muscle tone in colon causes spasms in intestine which leads to constipation.

The spasm is usually accompanied by pain, flatulence and abdominal cramps.

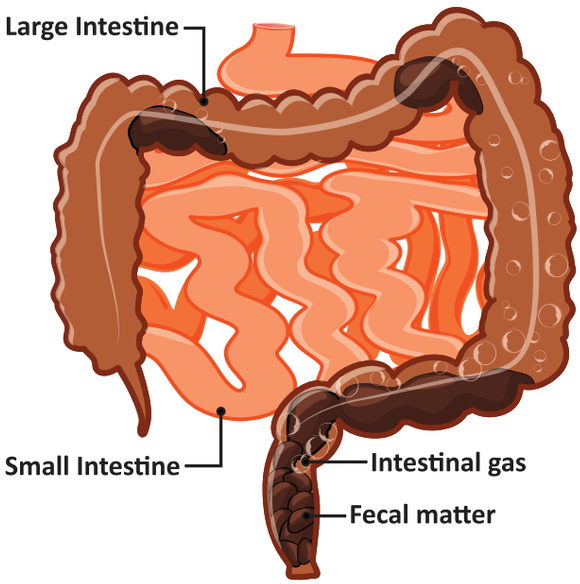
c. Obstructive constipation

Constipation occurs due to any obstruction in the colon. The obstruction is caused by cancer or inflammation which narrows the lumen resulting in constipation

Causes of constipation

The common causes of constipation are:

- Lack of fibre in diet
- Insufficient intake of fluids
- Poor elimination habits
- Ignoring the urge to defecate
- Overuse of laxatives
- Side effects of medications
- Lack of exercise
- Pregnancy
- Hypothyroidism
- Other causes like celiac disease, duodenal ulcer, gastric cancer, anal fissures and hemorrhoids



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Complications Associated With Constipation

Anal fissure	Diarrhoea
Hemorrhoids	Fecal incontinence
Rectal hernia	Rectal bleeding

Activity : 2

Self-monitoring! Are you at risk?

- What is the fibre rich food you had today?
- how many minutes did you exercise today?
- how many glasses of water did you have today?
- do you take any medications on your own without consulting doctor?

Goals for dietary and lifestyle management

- To follow regular meal timings
- To increase the intake of fluids
- To include high fibre diet
- To increase physical activity
- To develop regularity in bowel evacuation

Dietary principle

Adequate calorie, adequate protein, adequate fat and carbohydrates, high fibre and high fluid diet are prescribed for patients. Vitamins and minerals are given according to the prescribed daily requirement of an individual.

Diet therapy for constipation

The primary nutrition therapy for constipation is including adequate amounts of dietary fibre, both soluble and insoluble and adequate amounts of fluids.

Energy

Energy intake should be adequate to meet the nutritional needs of the patient. The patient should be provided with 2000 to 2500 kcal per day. The calorie should be provided by carbohydrate and fat.

Protein

Adequate or normal protein diet can be given for patient. Protein requirement of 1g/kg body weight/ day is recommended for the patients. Patients can be given 60g of protein per day.

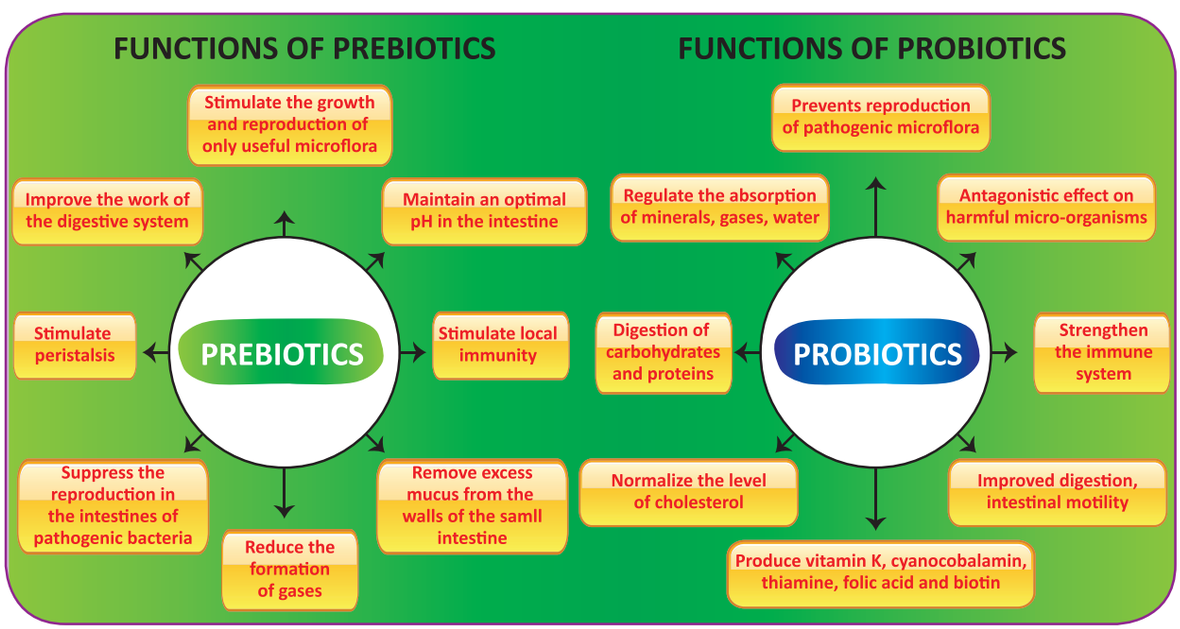

Fig 8.1 : Need for Prebiotics and Probiotics for Gut Health

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Carbohydrate

Carbohydrate intake should be around 60-65 % of total calories. Whole wheat and millets are preferred than refined foods for the patients. The insoluble fibre present in whole grains, pulses, fruits and vegetables help in increasing the intestinal bulk.

Fat

Adequate fat is given for the patient. Fats are calorie dense and therefore must be included to meet the energy needs. Fat intake of 20-25% of total calories can be recommended. Fat containing foods such as bacon, meat, butter, ghee, cream etc must be included in the diet as the fatty acids present in them stimulate mucosal movements.

Fibre

A high fibre diet which includes both soluble and insoluble fibres is recommended for the patients. Fibre requirement for adult women is 25g per day, for adult men is 38g and for children, it is approximately 19 to 25 g daily. Bran and powdered fibre commercial supplements may be helpful for people who do not consume enough fibre in the diet.

Fluid

High fluid foods may help in constipation. Tea and coffee should be taken in moderation. Clear soups or cream soups are nourishing and provide good amount of electrolytes and water.

EXERCISE WHEN YOU ARE CONSTIPATED

Constipation is common in adolescents. Insufficient physical activity and sedentary lifestyle are positively associated with constipation. Awareness on increasing physical activity and reduction in sedentary lifestyle may help to relieve constipation in adolescents. Exercise stimulates the contractions of muscle in the large intestines thereby relieving the constipation.

Activity : 3

Categorize the following foods into prebiotics and probiotics

Food stuffs	Prebiotics	Probiotics
Whole grains		
Curd/Yoghurt		
Legumes		
Fermented vegetables		
Fruits & vegetables		

Foods to be included and avoided for Constipation

Foods to be included	Foods to be avoided
Whole wheat, maize and millets	Refined foods, pastas, maida, semolina, baked products, pizza and biscuits
Pulses such as rajma, whole green gram	Deep fried foods
Green leafy vegetables, peas, beans	Pureed vegetables and fruits
Guavas, pomegranate, apples, cherries, pear and peaches	
Clear soups, juices	

HOME REMEDIES

For Constipation

- Prune juice is a very good laxative
- Aloe vera is very good for chronic constipation and detoxing the system generally.
- Taking 2 to 5 tablespoon a day of psyllium seeds along with lot of water can help in bowel movements

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Activity : 4

A 10 year old boy was admitted in the hospital with complaints of severe abdominal pain for the past three days and has pain during evacuation. He was passing hard and dark coloured stools.

- Identify the disease condition of the boy.
- Give the dietary guidelines for the boy

8.1.3 PEPTIC ULCER

Peptic ulcer is a term used to describe any localized erosion or necrosis of the mucosal lining that comes in contact with gastric juice. Mostly ulcer is formed in lower part of oesophagus (oesophageal ulcer), lesser curvature of the antrum of stomach (gastric ulcer) and first portion of duodenum (duodenal ulcer).

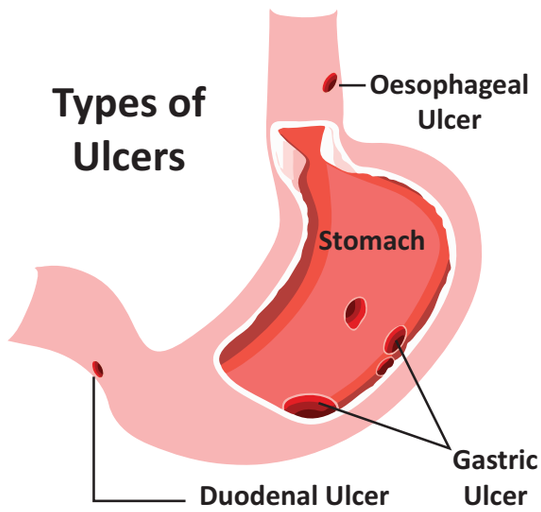

Fig 8.2 : Types of Ulcers

Causes of peptic ulcer

Over secretion of gastric juices is one of the direct causes of peptic ulcer disease. The other common causes are as follows :

a) Heredity: Peptic ulcer is not genetic disorder but patients with a family history of peptic ulcer have higher chances of developing the ulcers.

b) Helicobacter pylori infection: Chronic inflammation due to Helicobacter pylori is a major cause for gastric ulcers. The gastritis can stimulate hyper secretion of gastric juices causing erosion of the lining resulting in ulcers

c) Non-steroidal Anti - Inflammatory Drugs (NSAIDs): Excessive use of pain killers can cause ulcers. Prostaglandin protects the mucosal lining of the stomach. NSAIDs block and reduce the production of prostaglandins.

d) Excessive alcohol intake: Alcohol consumption increases risk with helicobacter pylori infection. Alcoholic beverages erode the protective stomach lining and lead to inflammation or bleeding.

e) Smoking and tobacco use: Nicotine and tobacco may increase the risk of developing ulcers.

f) Gender: Higher incidence of ulcers are seen in males than in females.

g) Dietary factors: Eating at irregular intervals, long gaps between each meal, high intake of spices, coffee or caffeine increases the risk of peptic ulcers.

h) Poor sanitation: Unsafe drinking water and Poor sanitation increases the risk of infection with Helicobacter pylori.

i) Stress and Anxiety: Emotional disturbances, fear, stress, worry and anxiety increases the chances for ulcers because of hypersecretion and hypermotility of the stomach.

Signs and symptoms of peptic ulcer

Ulcer may or may not give symptoms. A gastric ulcer may give epigastric pain during the meal. Duodenal ulcer pain may manifest after 2-3 hours of the meal. The symptoms also vary with the age of the patients.

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Peptic Ulcer Disease

Pathogenesis

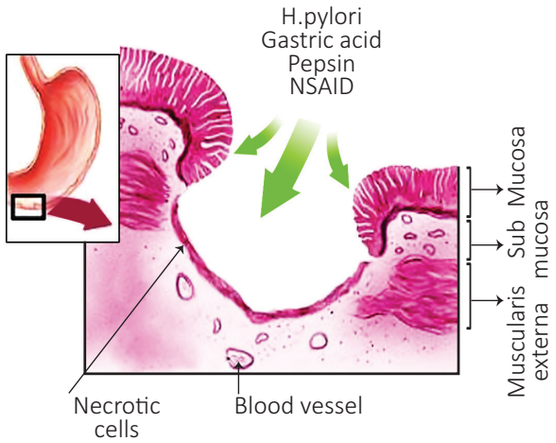

Fig 8.3 : Pathogenisis of Peptic Ulcer

The common symptoms are

- Abdominal pain
- Abdominal discomfort
- Nausea
- Vomiting
- Hematemesis (blood vomit)
- Heart burn
- Loss of appetite
- Weight loss
- Melena (dark and foul smelling stool)

COMPLICATIONS OF PEPTIC ULCER!

- Gastrointestinal bleeding
- Gastric outlet obstruction
- Perforation in the lining
- Penetration of ulcers
- Stomach Cancer

Activity : 5

Know the drugs!

List any five NSAIDs which are commonly present in medicine cabinet.

DO YOU KNOW?

Zollinger Ellison Syndrome

It is a type of cancer which releases gastrin hormone that causes excess acid production leading to peptic ulcer.

Goals for dietary and lifestyle management

- To restore good nutritional status
- To reduce the signs and symptoms of ulcer
- To neutralize acids
- To decrease the acid secretion
- To preserve the epithelial lining of the GI tract to the destructive action of gastric juices

Dietary principle

Adequate calorie, high protein, adequate fat, adequate carbohydrates, low fibre, adequate fluid and bland diet is prescribed for the patients. Vitamins and Minerals are given as per the prescribed daily requirement of the individual.

Diet therapy for Peptic Ulcer

It is important to provide rest to the affected area and support tissue healing. The key to the management of peptic ulcer is the judicious choice of drug therapy and dietary modifications.

Good nutritional status and good dietary regime can help in reducing the impact of the disease on the overall wellbeing of the patient.

Energy

Adequate energy should be taken to maintain the ideal body weight of the patient and to prevent weight loss and spare the proteins for healing the ulcer.

Protein

High protein intake ensures synthesis of new tissues essential for healing. Milk protein is valued for its buffering action. The buffering action is effective only for 20-60 minutes

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after its ingestion. After some time, it may stimulate acid production because of high calcium content. Therefore, use of milk should be limited. It gives relief for short period only. Proteins from egg, chicken, cheese and fish is beneficial for regeneration of tissue.

Fat

Fats delay the gastric emptying. Poly unsaturated fatty acids have been found to be effective against duodenal ulcer by inhibiting the growth of Helicobacter pylori. Around 25-30g of visible fat may be given to the patient. Fried foods should be avoided.

Carbohydrate

Carbohydrates should provide around 55-65% of the total calories. Simple and Complex carbohydrates can be consumed in soft well-cooked form.

Fibre

Low fibre may be given for the patient. Soluble fibre is more beneficial than insoluble fibre. The presence of fibre in the diet is preferred because it delays gastric emptying time and hence prevents the mucosal damage by acidic gastric juice. The fibre requirement is around 20g per day for the patient.

BLAND DIET!

Mechanically irritating foods

Foods which contain indigestible carbohydrates or roughage;

Eg. Whole grains, Raw vegetables and fruits

Chemically irritating foods

Foods which have a stimulatory effect on the gastric secretions;

Eg. Alcohol, Meat extracts, Caffeine, Spicy foods, Chillies, garlic Powder.

Thermally irritating foods

Foods which are consumed at extremely hot or cold temperatures;

Eg. Hot broths or soups, Iced liquids.

Bland diet

A diet which contains mechanically, chemically and thermally non-irritating foods that are generally soft, well cooked, low in dietary fibre and not spicy.

Foods to be included and avoided for Peptic Ulcer

Foods to be included	Foods to be avoided
• Soft cooked rice	• Whole grains
• Legumes, Flax seeds, nuts, oats, barley	• Pulses, Soyabean
• Oily fish, egg, chicken	• Raw vegetable and fruits
• Cheddar cheese, Almonds,	• Cabbage, cauliflower, onions
• Vegetable juices or cooked pureed vegetables	• Chillies, Garlic Powder,
	• Coffee or Tea
	• Alcohol

HOME REMEDIES

For Peptic Ulcer

- Raw Cabbage juice is an old folk remedy for ulcers.
- Banana powder has been used to treat ulcers in India

8.2 LIVER DISORDERS

Liver is the largest gland in the body weighing around 1500g. The liver has the ability to regenerate itself. Approximately 1500ml of blood per minute circulates through the liver and exits via left and right hepatic veins. The liver is integral part of all metabolic functions in the body.

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Functions of Liver

The main functions of liver include:

- Metabolism of carbohydrates, protein and fats
- The liver plays a major role in storage, activation and transport of many vitamins and minerals
- It helps in the formation and excretion of bile, conversion of ammonia to urea and metabolism of steroids.
- The liver converts carotene to retinol, a form of vitamin A. It synthesizes heparin which prevents coagulation of the blood.

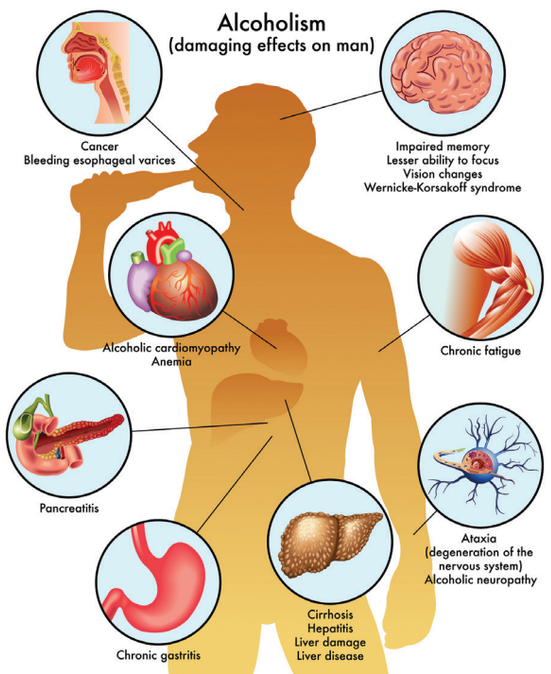
Any inflammation, infection or damage to liver hinders its functions and the liver becomes sluggish. Some of the common liver disorders are hepatitis, cirrhosis of liver, hepatic encephalopathy and liver cancer.

How does excess alcohol consumption causes liver disease?

Chronic abuse of alcohol has a hepatotoxic effect leading to malnutrition in an individual. Excess alcohol consumption can harm the liver causing inflammation and necrosis due to fat accumulation in the cells. A toxic byproduct of excessive alcohol intake is acetaldehyde which causes damage to the structure and function of the mitochondria in body cells, particularly in the liver. This reduces the normal functioning of liver causing severe vitamin and protein deficiency.

Excess alcohol intake can cause multiple complications such as:

- Most serious complication is vitamin and mineral deficiencies. Thiamine or vitamin B_1 deficiency is the most common vitamin deficiency and can cause Wernicke's encephalopathy. Severe vitamin A deficiency can also occur, leading to night blindness. In addition, deficiencies of folic acid, vitamins B_6, C, D, E and K are common. In regard to minerals, alcoholics may suffer from calcium, magnesium, phosphate and zinc deficiency.
- Protein deficiency in alcoholics can cause encephalopathy and result in coma
- Clotting defects can occur. This precipitates excess bleeding
- Portal hypertension resulting in ruptured varices and ascites.
- It can also affect kidney, heart and the blood vessels



8.2.1 HEPATITIS

Diseases of the liver can be acute or chronic, inherited or acquired. Hepatitis is an inflammation of liver. It is classified as follows:

1. Acute Viral Hepatitis
2. Chronic Hepatitis

DO YOU KNOW?

Hepar' is the Greek term for liver. Liver related medical terms actually start with 'hepatic or hepato'. According to Greeks, the liver is the organ which is closest to divine presence as it is considered a home of all emotions

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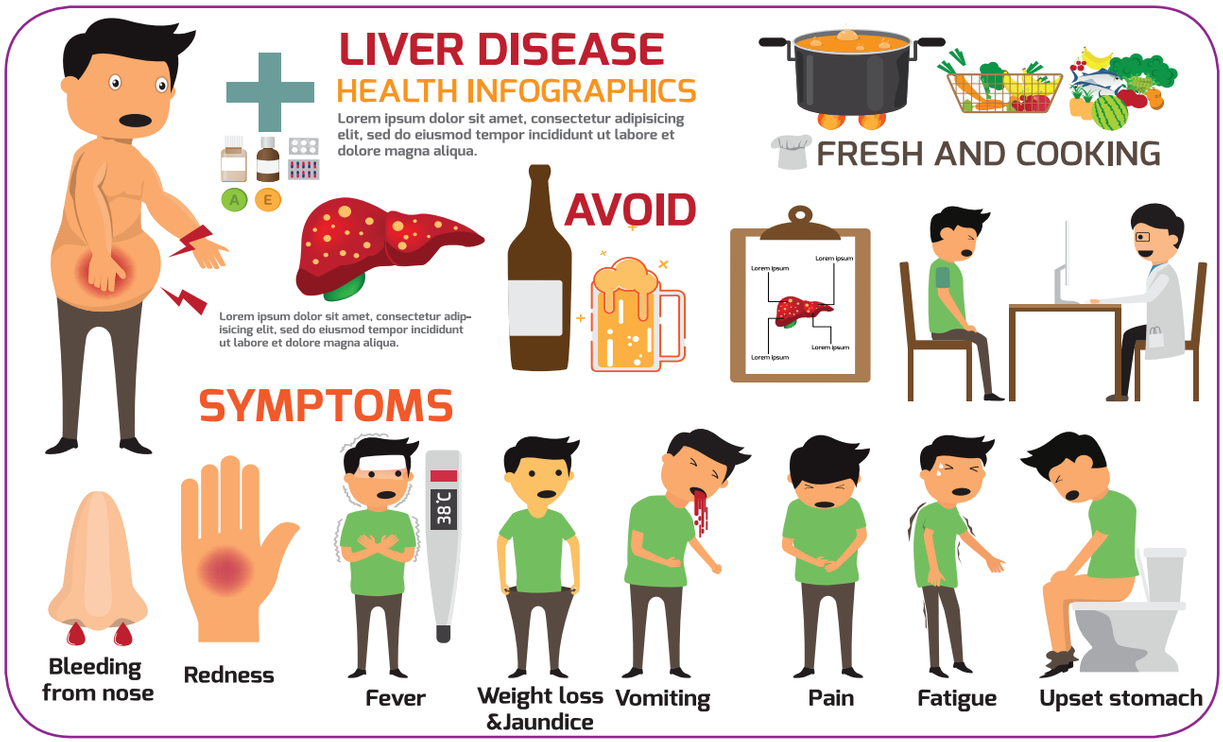

a) Acute Viral Hepatitis

Acute viral hepatitis is a sudden onset of inflammation in liver. It is caused by hepatitis viruses A, B, C, D and E. Hepatitis A and E are infectious which is spread by fecal oral route. Hepatitis B, C and D are transmitted through blood and body fluids.

The general symptoms of viral hepatitis are:

- Fever
- Arthalgia
- Arthritis
- Rash
- Malaise
- Fatigue
- Myalgia
- Anorexia
- Nausea
- Vomiting
- Jaundice (Icterus)

Chronic Hepatitis

When hepatitis is prolonged for more than six months, it is called as chronic hepatitis. Chronic hepatitis is serious and may lead to serious damage to the liver. The causes for chronic hepatitis can be autoimmune, viral, metabolic disorders and drugs or toxin. Clinical symptoms of chronic hepatitis are non-specific and are mild.

Common symptoms include fatigue, sleep disorders, mild right upper quadrant pain, jaundice, muscle wasting, tea coloured urine, ascites, and hepatic encephalopathy.

Jaundice in Liver Diseases!

Jaundice is the yellow discolouration of the skin, mucous membranes and sclera. Jaundice occurs due to accumulation of bile pigments in the blood. If the liver is infected or diseased or the flow of bile is obstructed, then it gets accumulated in the blood resulting in jaundice.

Jaundice can be of three types:

- **Haemolytic Jaundice or Pre- hepatic Jaundice:** Increased unconjugated plasma bilirubin
- **Hepatic Jaundice:** Liver cells are damaged
- **Obstructive or Post – hepatic Jaundice:** Obstruction in the flow of bile into duodenum due to stones or cancer

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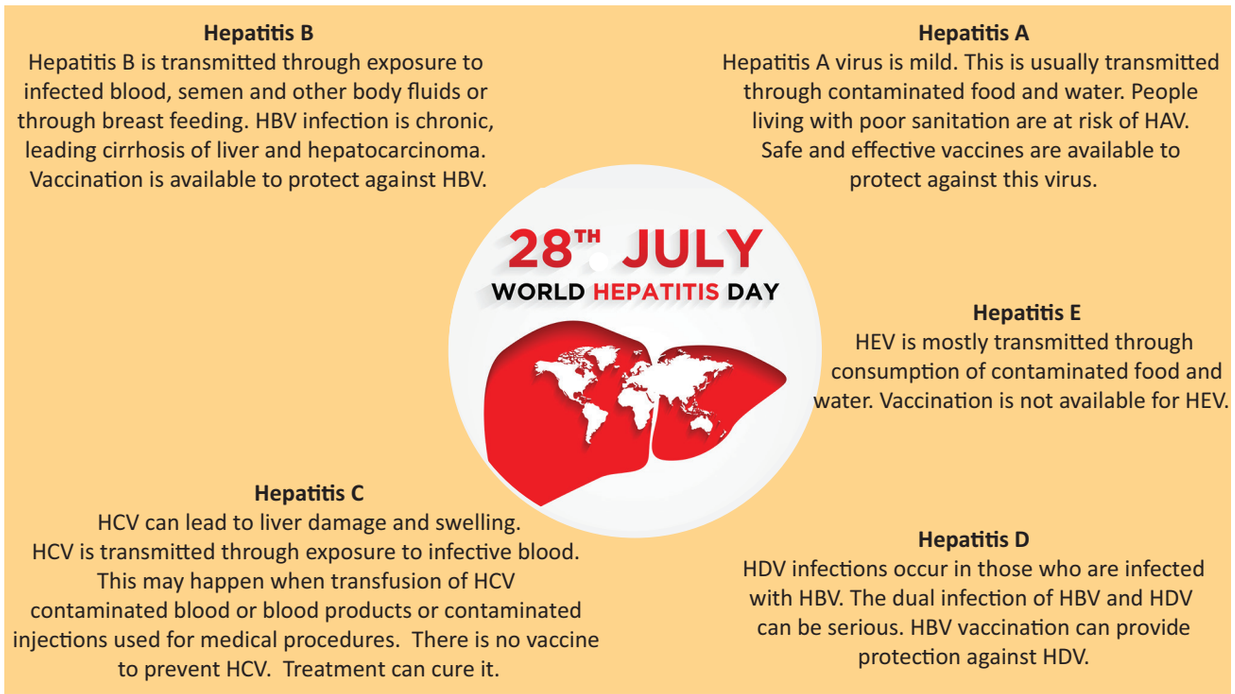

Fig 8.4 HEPATITIS VIRUSES

Goals for dietary treatment

- To provide adequate nutrition to the patient
- To avoid malnutrition
- To relieve symptoms of the disease
- To support the regeneration of liver tissues
- To prevent progression of the disease

Dietary Principle

A diet which has adequate calorie, high protein, high carbohydrate, low fat, adequate fibre and adequate fluid diet is prescribed for the patient. Small frequent meals are better tolerated than three large meals.

Diet therapy for Hepatitis

Energy

Energy intake can be increased gradually based on the tolerance of the patient. At initial stage, patient may not be able to eat enough due to anorexia. Gradually the energy intake can be increased to 1600-2000 kcal per day. This is to prevent endogenous breakdown of protein.

Protein

High protein diet promotes regeneration of the liver. Around 1.5g to 2g per kg body weight is recommended. Good quality protein is preferred for the patient. If the patient has jaundice, 40-60 grams of protein can be given. In case of hepatic coma, protein intake should be withheld till condition improves.

Fat

Fat digestion and absorption is impaired in hepatitis. Low fat diet is preferred for the patient with hepatitis. Easily digested fats like medium chain triglycerides or emulsified fats such as milk, butter, cream, eggs should be given. For a patient with jaundice, 20-30 grams of fat per day can be given.

Activity : 6

Match the causes for the Hepatitis!

Viral hepatitis	-	Autoimmune
Alcoholic Hepatitis	-	Hepatitis virus
Chronic Hepatitis	-	Alcohol

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Carbohydrate

A high carbohydrate diet is recommended to supply enough calories and spare protein for tissue regeneration. High carbohydrate foods like sugar, jaggery and fruit juices can be given. A requirement of 300-400 grams per day can be given for the patient.

Vitamins and Minerals

The requirement of Vitamin B, C and K are increased. It should be met through supplementation or through diet. The diet should be provided with minerals such as calcium and iron in adequate amounts. Serum sodium and potassium levels are monitored and electrolyte balance should be maintained.

Foods to be included and avoided for Hepatitis

Foods to be included	Foods to be avoided
Sugar, honey, Glucose	Fried and fatty foods.
Cereals, Pulses	Fats, Oils
Milk and milk products, Eggs	Nuts and Oilseeds
Fruits and vegetables	Strongly flavoured vegetables

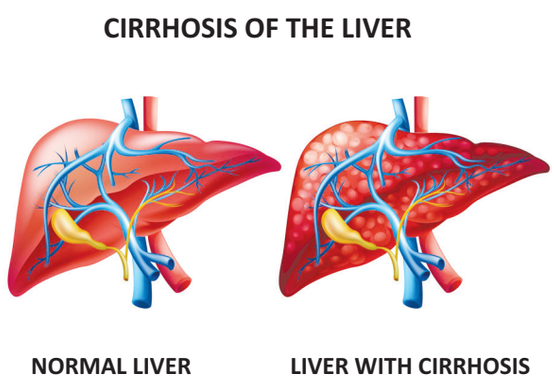

Fig 8.5 : Cirrhosis of the Liver

HOME REMEDIES
FOR JAUNDICE

- Sunlight is used in the treatment of neonatal jaundice.
- Prepare juice of the green leaves of radish and mix some sugar. Filtrate can be taken 2 times a day for a week.
- Mix one teaspoon of aloe vera pulp with black salt and dry ginger powder. This is taken for 10 days every morning.
- Take clean leaves of keezhanelli (without stem) and the seeds below the leaves (very small). Put it in the blender with some water to make an extract. Add buttermilk to the keezhanelli extract. Add crushed black pepper on it. Drink it everyday

8.2.2 CIRRHOSIS

Liver cirrhosis is a degenerative disease characterized by inflamed liver cells, abnormal fibrosis and development of nodules leading to obstruction and liver failure.

The etiology of liver cirrhosis is:

- Neglected acute or chronic hepatitis
- Alcoholism associated with malnutrition
- Viral infection
- Toxins
- Metabolic disorders
- Biliary obstruction
- Altered immune system

The symptoms of liver cirrhosis include:

- GI disturbances (anorexia, nausea, vomiting and abdominal pain)
- Electrolyte and fluid imbalance
- Ascites (accumulation of water in abdominal cavity)

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- Severe jaundice (yellow colouration of eyes and skin)
- Chronic inflammation of the liver
- Fibrosis and fatty infiltration of the liver
- Weight loss and muscle wasting
- Necrosis (death of cells)

STAGES OF CIRRHOSIS!

The pathogenesis of alcoholic liver disease progresses in three stages.

Stage 1: Hepatic Steatosis or Fatty Liver: During this stage, the fat infiltrates in to functioning liver cells and causes problems in normal functioning of liver. This stage is reversible if alcohol abuse is stopped.

Stage 2: Alcoholic Hepatitis: This is characterized by enlargement of liver. If alcohol intake is discontinued, hepatitis may resolve or it progresses to cirrhosis.

Stage 3: Alcoholic Cirrhosis: Patient develops further complications of ascites, gastrointestinal bleeding, portal hypertension and hepatic encephalopathy in this stage.

Goals for dietary treatment

- To maintain adequate nutrition
- To prevent breakdown of body protein tissue
- To control ascites
- To prevent progression of the disease
- To prevent the symptoms of hepatic encephalopathy

Dietary principle

A high calorie, high carbohydrate, adequate protein and low fat, low fluid and restricted sodium (in case of ascites), adequate fibre and high vitamins and minerals diet is prescribed for the patients with liver cirrhosis.

Diet therapy for cirrhosis

Energy

Approximately 35-40 kcal/ kg body weight is recommended. Energy intake of 2000 to 3000 kcal per day is given to maintain adequate nutrition and to prevent protein breakdown.

Protein

Protein intake should be adjusted as per the individual requirement. A protein intake of 1g/ kg body weight per day is given to achieve positive nitrogen balance. In case of hepatic coma, protein requirement is reduced to 0.5g/ kg bodyweight per day.

Fat

Steatorrhoea or fatty infiltration of liver may be seen in cirrhosis patient. A low intake of fat in the form of medium chain triglyceride (eg Coconut oil) may prove to be effective in reducing the malabsorption of fat.

Carbohydrate

High carbohydrate (300-400g/day) may be given for its protein sparing effect. This protects and supports liver function. Carbohydrate intake also helps in maintaining the weight of the patient.

MALNUTRITION IN CIRRHOSIS!

Malnutrition is common and predominant in liver diseases. The factors resulting in malnutrition are:

- Decreased food intake because of anorexia, nausea and vomiting, unpalatable diet and the drugs
- Impaired digestion and absorption of nutrients due to pancreatic insufficiency, bile salt deficiency and mucosal defect
- Increased energy requirement
- Insufficient protein synthesis
- Alcohol consumption

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Vitamins and minerals

Supplementation of vitamins is needed to replenish liver stores and repair tissue damage. The important vitamins are pyridoxine, cyanocobalamin, folate, niacin and thiamine. Supplementation of minerals such as calcium, magnesium and zinc should be given in adequate doses. Restriction of sodium is essential if ascites is present. Sodium restriction up to 500mg per day is seen with ascites. Low sodium foods should be encouraged.

Fibre

Adequate fibre can be given for the patient. In severe cases of cirrhosis, low fibre diet is necessary.

Fluid

Restricted fluid is given if ascites is present. The fluid requirement is 1500ml per day. If the ascites is corrected, normal fluid intake may be emphasized.

Foods to be included and avoided for Cirrhosis

Foods to be included	Foods to be avoided
• Bread, rice, maize, jowar, breakfast cereals, pasta and refined cereals	• Fried and fatty foods.
• Tonned milk and milk products like paneer and curd	• Fats, Oils
• Split pulses and beans	• Nuts and Oilseeds
• Sugar, jaggery, honey, jam or jellies	• Strongly flavoured vegetables
• Lean meat, egg white, fish or chicken	
• Potato, sweet potato, yam	
• Beverages, fruit juices	

HEPATIC ENCEPHALOPATHY!

Hepatic encephalopathy is a damage of brain and nervous system that occurs as a complication of liver disorders. Hepatic encephalopathy is characterized by neurological disturbances, elevated ammonia levels (ammonia which is not converted to urea by liver), high blood concentration of aromatic amino acids and low levels of branched chain amino acids.

The symptoms of hepatic encephalopathy are mild confusion, euphoria or depression, decreased attention, irritability, disturbance in sleep patterns, lethargy, speech disorientation, and finally coma.

Restriction of dietary protein is the first step. The diet should be rich in calories, low protein (BCAA protein can be given) and restricted fluid. Electrolyte imbalance should be corrected and vitamin supplementation especially vitamin B and C may be given

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SUMMARY

- The gastrointestinal tract is an active organ which digests and modifies the nutrients for absorption.
- Gastrointestinal diseases refer to diseases involving gastrointestinal tract that is esophagus, stomach, small intestine and large intestine and accessory organs of digestion.
- Diarrhoea is the condition when there is rapid transit of intestinal contents through the small intestine, reduced enzymatic digestion of foods and decreased absorption of nutrients. The therapy for diarrhoea consists of fluid and electrolyte management and dietary management.
- Constipation is defined as difficulty or infrequent passage of stools. There are three types of constipation. The primary nutrition therapy for constipation is including adequate amounts of dietary fibre, both soluble and insoluble and adequate amounts of fluids.
- Peptic ulcer is a term used to describe any localized erosion or necrosis of the mucosal lining that comes in contact with gastric juice. The key to the management of peptic ulcer is the judicious choice of drug therapy and dietary modifications.
- Hepatitis is an inflammation of liver. Hepatitis is classified as acute viral hepatitis and chronic hepatitis.
- Liver cirrhosis is a degenerative disease which is characterized by inflamed liver cells, abnormal fibrosis and development of nodules leading to obstruction and liver failure. One of the common symptoms of liver diseases is Jaundice.

A-Z GLOSSARY

Addison's disease	Addison's disease, also known as primary adrenal insufficiency and hypocortisolism, is a long-term endocrine disorder in which the adrenal glands do not produce enough steroid hormones.
Anal fissures	An anal fissure is a small, oval shaped tear in skin that lines the opening of the anus
Ascites	Accumulation of fluid in abdominal cavity
Atonic Constipation	Atonic constipation is the condition where bowel activity is reduced because of lack of normal muscle tone or strength in the colon
BCAA protein	Protein sources which are rich in branched chain amino acids (Leucine, Isoleucine and Valine)
Bland diet	A diet which contains mechanically, chemically and thermally non-irritating foods that are generally soft, well cooked, low in dietary fibre and not spicy.
Carcinoma	Carcinoma is the most common type of cancer. It begins in the epithelial tissue of the skin, or in the tissue that lines the internal organs, such as the liver or kidneys.

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Celiac disease	Celiac disease is a serious digestive disorder caused by an abnormal immune reaction to gluten.
Epigastric pain	It is pain or discomfort right below the ribs or upper abdomen. It can be a sign of gastro intestinal disease
Fecal Oral Route	Diseases can be transmitted when the stool of one host ends up in other person's mouth.
Fatty liver	A condition characterized by the accumulation of fat in liver
Fulminant liver disease	Absence of preexisting liver disease but development of hepatic coma.
Hepatic coma	Coma that can occur in severe cases of liver diseases
Hepatic encephalopathy	Hepatic encephalopathy is a decline in brain function that occurs as a result of severe liver disease
Hepatomegaly	Enlargement of liver
Hepatic Ischemia	Hepatic ischemia is a condition in which the liver does not get enough oxygen or blood. This causes injury to liver cells.
Hemorrhoids	Hemorrhoids are swollen and inflamed veins in the rectum and anus that cause discomfort and bleeding.
Hematemesis	Blood vomit
Icterus	Increaed level of plasma bilirubin levels. Also called as Jaundice
Laxatives	Laxatives are substances or drugs that loosen stools and increase bowel movements. They are used to treat and prevent constipation.
Melena	Black tarry stools indicative gastrointestinal bleeding
Malabsorption syndrome	Malabsorption syndrome refers to a number of disorders in which the small intestine is unable to absorb certain nutrients such as carbohydrates, protein, fat and fluids.
Necrosis	Damage or death of tissues
Obstructive Constipation	It is the inability to pass stool through the digestive tract out the rectum because of any obstruction in the intestines.
Oral Rehydration Therapy	Oral Rehydration Therapy (ORT) is a type of fluid replacement used to prevent and treat dehydration, especially which is due to diarrhea.
Portal hypertension	High blood pressure in the portal vein which carries blood to the liver
Prebiotics	Non-digestible food that stimulates the growth of symbiotic bacteria present in the colon
Probiotics	Live microbial flora that can be used to reestablish the intestinal flora and improve the gut health

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Prostaglandins	Prostaglandins are found in tissues and organs. They are synthesized in the cell from the essential fatty acids (EFAs). Prostaglandins are made at sites of tissue damage or infection, where they cause inflammation, pain and fever as part of the healing process
Reye's syndrome	Reye's syndrome is a rare but serious condition that causes swelling in the liver and brain.
Spastic Constipation	Constipation due to excessive tonicity of the large intestinal wall.
Steatorhoea	Presence of excess fat in the stool because of fat malabsorption
Wilson's disease	Wilson's disease is a rare inherited disorder that causes copper to accumulate in the liver, brain and other vital organs.

Evaluation

I. Choose the correct answer

1. Accumulation of fluid in the abdominal cavity is _____.
   a. Oedema b. Swelling
   c. Ascitis d. Dialysis
2. Jaundice is also called as _____.
   a.Hepatitis b. Icterus
   c. Cirrhosis d. Hemolysis

3 _____ is the common cause for alcoholic hepatitis.
   a.Virus b. Chemical
   c. Alcohol d. Food & Water

4 _____ replacement is the principle diet goal in diarrhoea.
   a.Calorie b. Fat
   c. Fluid d. Calcium

5. Frequent evacuation of watery stools is called as _____.
   a. Constipation b. Ulcers
   c. Colitis d. Diarrhoea

II. Short answers

1. What are the functions of gastrointestinal system?
2. List the different types of hepatitis virus
3. List the functions of liver
4. What is hepatitis?
5. Give examples for low fibre foods?
6. What is bland diet?

1HEUN

III. Brief answers

1. What are the types of constipation?
2. What are the causes of constipation?
3. Describe the causes for peptic ulcer?
4. Give the dietary principle for hepatitis
5. List five foods for high protein foods.
6. Differentiate gastric ulcer from duodenal ulcer

IV. Detailed answers

1. Differentiate the diet therapy of diarrhoea from constipation
2. What are the types of hepatitis?
3. What is Oral Rehydration Therapy?
4. What are the goals for treatment in peptic ulcer?
5. Explain in detail the diet therapy in cirrhosis.

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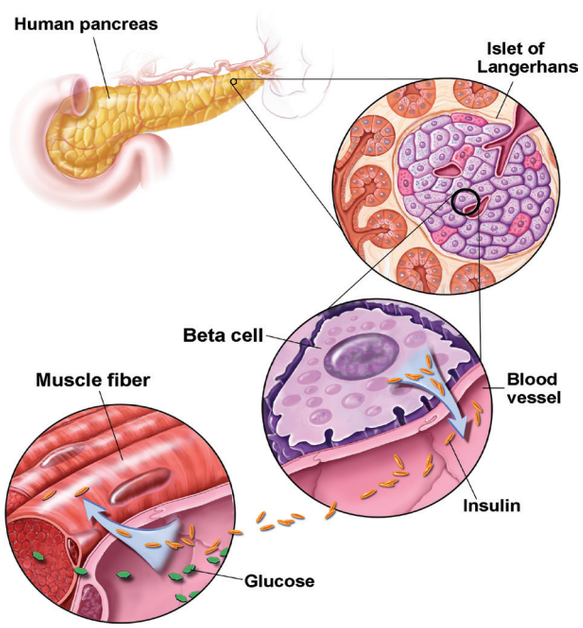
DIET IN DIABETES MELLITUS

Unit 9

OBJECTIVES

- Know the prevalence of Diabetes in India.
- Learn about the types of Diabetes.
- Understand the signs, symptoms and metabolic changes in Diabetes.
- Understand the diagnosis and complications of Diabetes..
- Know about the treatment of diabetes.
- Understand the significance of lifestyle modifications in managing Diabetes.



Diabetes mellitus is a chronic disease in which the body's ability to produce or respond to the hormone insulin is impaired, resulting in abnormal metabolism of carbohydrates and elevated levels of glucose in the blood. Diabetes is no longer a dreaded disease; a well managed diabetic has a good life expectancy.

Diabetes mellitus is a metabolic disorder that prevents the body to utilize glucose completely or partially. It is characterized by raised glucose concentration in the blood and alterations in carbohydrate, fat and protein metabolism. This can be due to failure in the formation of insulin or liberation or action.

9.1. Prevalence of Diabetes

Diabetes mellitus is a serious metabolic disease, affecting people of all geographic, ethnic or racial origin and its prevalence is increasing globally. Burden from this costly disease is high on the low and middle income countries (LMIC) where the impacts of modernization and urbanization have caused marked adverse changes in lifestyle parameters.

In 2013, of the estimated 382 million people with diabetes globally, more than 80 per cent lived in LMIC. It was estimated that India had 65.1 million adults with diabetes in 2013, and had the 2nd position among the top 10 countries with the largest number of diabetes. This number is predicted to increase to 109

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million by 2035 for an estimated population of 1.5 billion. unless steps are taken to prevent new cases of diabetes. One in every eight individuals in India is a diabetic. The average age for the onset of diabetes is around 40 years while it is around 55 years in other countries.

Key facts about Diabetes

- The number of people with diabetes has risen from 108 million in 1980 to 422 million in 2014 .
- The global prevalence of diabetes among adults over 18 years of age has risen from 4.7% in 1980 to 8.5% in 2014 .
- Diabetes prevalence has been rising more rapidly in middle- and low-income countries.
- Diabetes is a major cause of blindness, kidney failure, heart attacks, stroke and lower limb amputation.
- In 2015, an estimated 1.6 million deaths were directly caused by diabetes. Another 2.2 million deaths were attributable to high blood glucose in 2012.
- Almost half of all deaths attributable to high blood glucose occur before the age of 70 years. WHO projects that diabetes will be the seventh leading cause of death in 2030.
- Healthy diet, regular physical activity, maintaining a normal body weight and avoiding tobacco use are ways to prevent or delay the onset of type 2 diabetes.
- Diabetes can be treated and its consequences avoided or delayed with diet, physical activity, medication and regular screening and treatment for complications.

9.2. Types of Diabetes

1. Insulin Dependent Diabetes Mellitus (IDDM or Type 1 Diabetes Mellitus)

- ❖ The onset is abrupt.
- ❖ Occurs at childhood or as young adult. However may occur at late age also.
- ❖ This is identified as auto immune disorder.
- ❖ They depend on exogenous insulin for survival and to maintain life.
- ❖ Type I patients are ketosis prone.

2. Non Insulin Dependent Diabetes Mellitus (NIDDM or Type II)

It is a heterogenous disorder characterized by liver, muscle and adipose tissue sensitivity to insulin and impaired beta cell function and associated with defects in both insulin secretion and insulin action.

- ❖ They are not ketosis prone, except during periods of severe stress, such as those caused by infections, trauma and surgery.
- ❖ They don't depend on exogenous insulin.
- ❖ Onset is gradual.
- ❖ Occurs only after the age of 30 years. However now even seen in young children due to stress and modern lifestyle.
- ❖ Many have a family history of Diabetes.
- ❖ Most are obese.
- ❖ Glucose levels improve on weight loss.
- ❖ Many type II diabetics need supplement of exogenous insulin.
- ❖ May present with micro vascular and macro vascular chronic complications.

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3. Gestational Diabetes Mellitus (GDM)

This appears during pregnancy and disappears after pregnancy is terminated. Women with GDM have an increased future risk for progression to Type II or rarely Type I. The incidence of gestational diabetes is 15-17 percent in Indian pregnant women. In addition to ketoacidosis, pregnant woman with diabetes are more prone to preeclampsia, toxaemia and urinary tract infections. Uncontrolled diabetes during the first three months of pregnancy increases the risk of abortions and congenital malformations in the fetus. Elevated blood sugar should therefore be adequately controlled by dietary means and treatment with insulin.

Why the birth weight of the baby born to diabetic mothers are more?

- Mother's blood brings extra glucose to the fetus.
- Fetus make more insulin to handle the extra glucose.
- Extra glucose gets stored as fat and fetus becomes larger than normal.

4. Secondary Diabetes Mellitus

This may occur as a result of some other disorders such as Haemochromatosis, chronic pancreatitis, Down's syndrome, etc.

5. Malnutrition Related Diabetes Mellitus (MRDM)

Malnutrition-related diabetes mellitus (MRDM) is a rare type of diabetes associated with long term malnutrition. This type of diabetes is characterized by insulinopenia, insulin resistance, hyperglycemia and failure of the beta-cells in the pancreas. It is also known as tropical diabetes or tropical pancreatic diabetes mellitus. These patients are thin, young, severely hyperglycemic, but in contrast to IDDM do not have ketonuria and requires high doses of insulin for control.

6. Insulin Resistance

It is state in which a normal amount of insulin produces a subnormal amount of insulin response. These patients can present with diabetes or some of these patients can compensate for this defect with elevated serum levels and may have only impaired glucose tolerance. It can be due to:

- ❖ Genetic disorders
- ❖ Immune disorders
- ❖ Endocrine and metabolic conditions

Maturity Onset Diabetes of the Young (MODY) is a relatively rare type of Type 2 Diabetes that is characterized by an early age of onset (age 9-25) and autosomal dominant inheritance. Unlike type 2 Diabetes, often associated with insulin resistance, MODY is caused by a primary defect in pancreatic beta cell function resulting in decreased insulin secretion. Patients with MODY are not usually obese.

9.3. Causes

Primary or Idiopathic diabetes

Heredity: There is a familial tendency to develop Diabetes.

- ❖ If both parents are diabetic, all their children will be diabetic.
- ❖ If one parent is s diabetic, and the other is a diabetic carrier, half of their children will be potential diabetics.
- ❖ If one parent is diabetic and the other a non diabetic and also a non carrier, none of their children will be diabetic, but they all will be carriers.

However, environmental and other factors play a role in unmasking an underlying diabetes genotype and whether a person with a genetic predisposition actually develops the disease or not.

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Age: The disease may occur at any age but about 80 % of the cases occur after the age of 45.

Sex: In the younger age groups, diabetes is more commonly seen in males than in females. In middle age, women are more affected and the chances increase with pregnancy and increasing parity.

Obesity: There is a strong association between diabetes and obesity. In obesity, there is hyperinsulinaemia and insulin resistance or impaired insulin uptake by receptors in target tissues. Obese people are also less physically active than normal weight individuals which increase the risk of diabetes.

Why weight is a risk factor for Diabetes?

- Overweight people have fewer available insulin receptors.
- More fat requires more insulin, promoting insulin resistance.
- Fat cells release free fatty acids which interfere with glucose metabolism.

Dietary factors/Nutritional factors: A high intake of sugar has also been related to obesity and may predispose to diabetes. A low intake of fibre due to consumption of refined foods is associated with high prevalence of Diabetes.

Infections: Type I diabetes usually occurs after viral infection, which brings about an auto immune reaction that may destroy the beta cells of the pancreas and impairs insulin secretion.

Stress: It elucidates adrenaline and thereby precipitates diabetes.

Secondary Diabetes

Diabetes can also occur secondary to the following disorders:

- ❖ Diseases which destroy the pancreas and lead to impaired secretion and release of insulin. E.g., pancreatitis, haemochromatosis, carcinoma of pancreas and pancreatectomy.
- ❖ Abnormal concentration of certain hormones in the circulation which are insulin antagonist. These include:
  - Growth hormone
  - Adrenocortical hormone (Cushing syndrome, Addison's disease, Hypopituitarism)
  - Adrenaline
  - Thyroid hormone

Activity : 1

Meet any two diabetics and find out the reason for them developing diabetes.

1. Diabetic 1 -
2. Diabetic 2 -

Women of reproductive age who have developed polycystic ovarian syndrome (PCOS) are at an increased risk of type 2 diabetes. PCOS is a hormonal disorder characterized by enlarged ovaries containing fluid filled cysts. Women with PCOS have irregular menstrual cycles and high circulating levels of male hormones like testosterone. Insulin resistance and impaired glucose tolerance are manifestations of PCOS.

Activity : 2

Sita is overweight, but none in her family has diabetes. Should she be really concerned with her weight?

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Diabetes insipidus is a condition where the body loses too much fluid through urination, causing a significant risk of dangerous dehydration as well as a range of other illnesses and conditions. It is a rare disorder affecting the regulation of body fluid levels. People with diabetes insipidus produce excessive amounts of urine, resulting in frequent urination and thirst. However, the underlying cause of these two symptoms differs from types 1 and 2 diabetes.

9.4. Signs and Symptoms

- Polyuria or increased urination due to large volume of urine.
- Polydipsia or increased thirst due to excessive water loss and the need for its replacement in the tissues.
- Polyphagia or increased hunger due to a failure to utilize food for nourishment of the body.
- General weakness.
- Decreased resistance to infection.
- Decreased ability of wound healing due to a high blood sugar and poor fluid balance.
- Dehydration as a result of excessive water and electrolyte loss from the body, causing dry furred tongue and cracked lips.
- Ketosis or ketoacidosis i.e., accumulation of ketone bodies in the blood as a result of increased lipolysis. Breathing may be deep and rapid and the breath has acetone smell. Ketosis, if not controlled, may lead to coma and finally death.
- Rapid weight loss.
- Sleepiness
- Fatigue
- Degenerative changes in advanced cases include peripheral neuritis, retinitis, atherosclerosis with associated diseases of coronary arteries and vascular changes in kidneys causing nephropathy. Associated symptoms are failing or blurred vision, pain, numbness of the limbs and proteinuria.

9.5. Metabolic changes in Diabetes

Carbohydrate metabolism: Insulin lack produces and causes fundamental changes in carbohydrate metabolism which leads to hyperglycaemia. The primary is inability to regulate glucose in blood stream and the following changes in carbohydrate metabolism:

- Reduced entry and oxidation of glucose in muscle and tissues.
- Decreased formation of glycogen in liver.
- Decreased synthesis of fat as fats are mobilized as energy source instead of carbohydrates.
- Release of glucose into blood from increased breakdown of glycogen in liver.

Fat metabolism: Fat metabolism is also altered during diabetes mellitus. Due to the fact that the tissues are unable to oxidize sufficient quantities of glucose to meet energy needs, the body has to use fats as a source of energy. This results in mobilisation of large quantities of fat from adipose tissue and circulating as free fatty acids. This causes a considerable increase of fatty acid and triglycerides in the blood stream.

In the absence of normal carbohydrate metabolism, the liver oxidizes fatty acids on a larger scale producing large amounts of acetyl CoA which leads to the formation of large amounts of ketone bodies like acetoacetate, betahydroxy butyric acid and acetone. A metabolic acidosis develops known as ketosis which leads to coma in severe diabetes.

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Protein metabolism: Since diabetic patients cannot meet the energy requirements from the oxidation of glucose and fats, there is breakdown of tissue proteins. There is increased protein catabolism leading to negative nitrogen metabolism.

9.6. Diagnosis of Diabetes

Several laboratory tests are available to both health care providers and people in order to confirm a diagnosis of Diabetes.

Fasting Plasma Glucose (FPG) Test: The Fasting Plasma Glucose Test involves asking the person to abstain from eating or drinking anything for eight hours prior to having a blood sample drawn. If the person's glucose level while they are fasting is greater than or equal to 126 mg/dl they are most likely to have diabetes. If the person has a fasting glucose level that is more than 100, but less than 126 mg/dl - they are considered to have Pre-Diabetes. They do not yet have Diabetes, but they are at greater risk of developing it in the near future.

Oral Glucose Tolerance Test: An Oral Glucose Tolerance Test involves first drawing the person's fasting blood sugar level, and then drawing another blood sugar level two hours after they have consumed a drink containing seventy-five grams of sugar. If the person's blood sugar level after they have consumed the sugar drink is greater than or equal to 200 mg/dl they have Diabetes. If their blood sugar level is between 140 and 199 mg/dl, they are considered to have Pre-Diabetes.

Finger Stick Blood Glucose Test or Random Plasma Glucose (RPG) Test: This test can be performed in community-based screening programs, or anywhere, and provides rapid results. The test is not as accurate as blood testing in a laboratory; however, it provides rapid results, and it is very easy to perform. The results are accurate within ten-percent of laboratory values. Testing involves a minor finger-stick of the person's finger in order to obtain a tiny blood sample, which is then placed onto a strip. The strip is placed into a small machine that interprets the person's blood sugar level. At very high or low blood sugar levels, the finger-stick test may prove inaccurate, and is considered a preliminary screening. The majority of persons with diabetes use the finger-stick test to monitor their blood sugar levels.

The following image shows small diabetes blood sugar meter - reading 4.8 - a finger pricker, syringe, and blood glucose test strips.

Monitoring Urine Glucose and Ketone levels

Glycosuria is usually measured by

- Clinitest (modification of Benedict's test)
- Clinistix, Testape, Diastix (Paper strip method)

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Diagnosis	A1C (percent)	Fasting plasma glucose (FPG)[a]	Oral glucose tolerance test (OGTT)[b]	Random plasma glucose test (RPG)[a]
Normal	below 5.7	99 or below	139 or below	
Prediabetes	5.7 to 6.4	100 to 125	140 to 199	
Diabetes	6.5 or above	126 or above	200 or above	200 or above

(a) Glucose values are in milligrams per deci liter, or mg/dL.

(b) At 2 hours after drinking 75 grams of glucose.

Source: Adapted from American Diabetes Association. Classification and diagnosis of diabetes. Diabetes Care.2016;39(1):S14–S20, tables 2.1, 2.3.

Both methods are dependent upon a normal glomerular filtration rate (120ml/min) and renal threshold for glucose reabsorption by the tubules (180mg/dl).

Glycosylated Hemoglobin or 'Hemoglobin A1c' Test:

The Hemoglobin A1c test measures how high the person's blood sugar levels have been over the last 120 days. The test involves drawing a blood sample, and is the best way to measure blood sugar control in persons with diabetes. If the test results show 7% or less, the person has good blood glucose control. If the person has 8% or higher test results, their blood sugar has been too high for too long.

Activity : 3

Write the normal blood sugar levels for an adult ------ mg/dl.

9.7. Management

Although it is not possible to cure diabetes completely, diabetics can lead almost a normal life if they follow certain dos and don'ts scrupulously. Cooperation of the patient is very important in the management of Diabetes.

The main modes of treatment in Diabetes are:

1. Diet
2. Insulin
3. Drugs
4. Exercise
5. Education

9.7.1. Dietary management

A well designed meal plan is an important cornerstone in the management of diabetes mellitus.

Goals of nutritional therapy

- Achieve physiologic blood glucose levels.
- Maintain desirable plasma lipid levels.
- Reduce complications of diabetes mellitus.
- Attain and maintain desirable body weight.
- Meet energy needs in a timely manner.
- Individualize to preferences and food available.

The nutrition plan

Calories

Calorie requirement depends on the weight of a person. The calorie content of all diabetics should be set at a level which will permit them to maintain their desired body weight and in children and adolescents allow for a normal rate of growth and development.

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Table 9.1 Calorie requirement based on Weight/Age

Category	Calorie requirement
Overweight	20Kcal/kg/day
Ideal weight	20Kcal/kg/day
Underweight	20Kcal/kg/day
Elderly person above 50 years	10 % less calories for each additional decade
Children 1st year	1000 calories
For girls 1-12 years	1000+ 100 calories per year of age upto 12 years
For boys 1-12 years	1000+ 125 calories per year of age upto 12 years

Carbohydrates

Carbohydrates should provide 50-60 percent of total energy. Among this, 60-70 percent should be complex carbohydrates and 30-40 percent should be simple carbohydrates. It is the type of carbohydrate that determines the glycaemic response than the actual quantity. Simple carbohydrates tend to raise the blood glucose more than complex carbohydrates. Glucose, maltose and sucrose produce large increase in blood glucose but fructose does not. Fructose can be used as a sweetener for a diabetic. Acarbose, an enzyme inhibitor present only in wheat reduces blood glucose response.

Activity : 4

Why is wheat preferred for a Diabetic than Rice? Give reasons.

Glycaemic Index

Glycaemic Index of the food is determined by measuring the area under blood glucose curve obtained by the consumption of the test food expressed as a percentage of the area obtained by giving the same quantity of carbohydrates in the form of glucose.

Fibre

High fibre diet intake improves glycaemic control and reduces insulin requirements. Patients using more fibre have exhibited reductions in fasting blood sugar levels and glycosuria and increased sensitivity to insulin. It is the soluble fibres that are most effective in producing favourable effect in carbohydrate

Table 9.2 GLYCAEMIC INDEX OF SOME COMMON FOODS

Item	Glycaemic index	Item	Glycaemic index
Bread	70	Rice	72
Wheat	70	Idli	80
Sundal	80	Milk	33
Ice cream	36	Curds	36
Groundnuts	13	Tomato soup	38
Apple	39	Banana	69
Orange	40	Beans	79
Glucose	100	Honey	87
Green gram	29	Channa	29

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and lipid metabolism when compared to insoluble fibres. Soluble fibre prolongs the rate of and gastric emptying and intestinal transit time. It forms a gel with water and thickens the unstirred layer. Carbohydrates are thus packed and insulated from the action of the digestive enzymes in the intestines thus reducing the rate of absorption. Insoluble fibre reduces gastric emptying and intestinal transit time. High fibre diet enhances the response of gastric inhibitory polypeptide (GIP) which is a stimulus for insulin secretion.

Activity : 5

List any five foods that are high in fibre and can be consumed by a diabetic.

1.

2.

3.

4.

5.

Always consume plenty of water at least 2 litres, if you are eating a fibre rich diet. Fibre without adequate fluids can lead to constipation. Increasing fibre intake slowly can also help to ease bloating or other unwanted gastrointestinal distress.

Protein

Protein should provide 12-20 % of energy intake. An additional 30 grams may be necessary during pregnancy and lactation. High protein intake helps to increase insulin production and promotes satiety. Protein requirements are increased in malnutrition, surgery or wound healing. Protein from vegetable source is preferable to that from animal sources.

Fat

The amount and type of fat plays an important role in the diet of a diabetic. Diabetics have a greater incidence of hyperlipidemia and atherosclerosis than do nondiabetics. The present recommendation of total fat is 20-30 % of total calories. Fat intake should be monitored carefully.

Saturated, monounsaturated and polyunsaturated fats are given in the ratio of 1:1:1.

Food Exchange lists

Food exchange lists are groups of measured foods of the same calorific value and similar protein, fat and carbohydrate and can be substituted for one another in a meal plan. The food exchange lists helps the patient to:

1. restrict the food intake according to the insulin prescription so that both hyperglycaemia and hypoglycaemia can be prevented.
2. have variety in the diet so that he can adhere to it always.
3. learn easily the principles of diet.

Dietary Guidelines

- Daily energy intake must be estimated after considering such fact as age, sex, activity and occupation.
- The total intake of calories is more important for a diabetic than the exact proportions of protein, fat and carbohydrate.
- A diabetic should maintain standard body weight or slightly lower.
- Simple sugars should be restricted since they are easily absorbed and have a high glycaemic index.
- Food exchange lists should be followed to prevent hypo and hyperglycaemia. The exchange lists should be followed to avoid monotony, dietary constancy and flexibility.
- Patients should avoid fasting and feasting.

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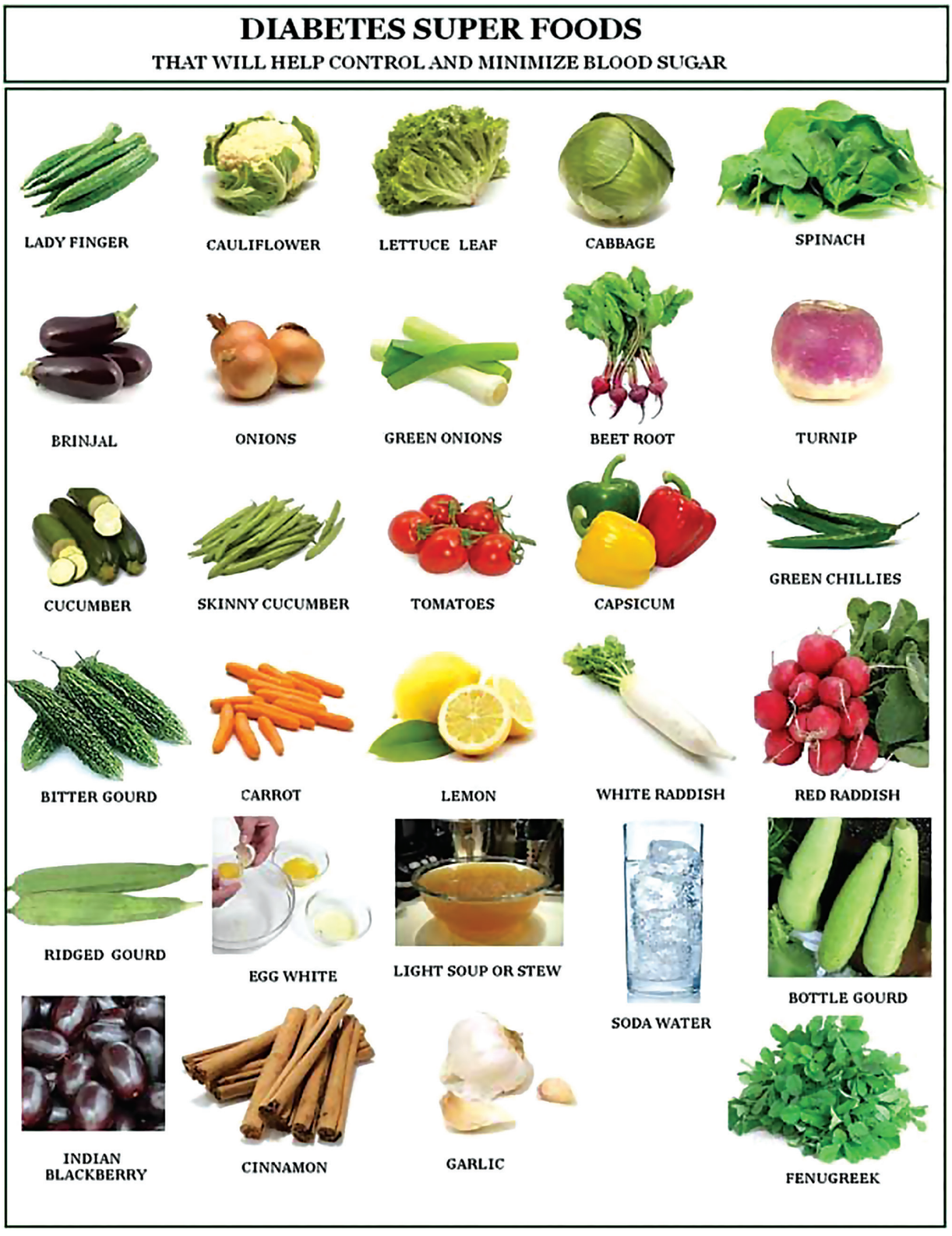

Foods to be avoided

- ❖ Simple sugars (glucose, honey, syrup)
- ❖ Sweets
- ❖ Dried fruits
- ❖ Cake
- ❖ Candy

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- Fried foods
- Alcohol
- Jaggery
- Sweetened juices

Foods to be eaten in moderation

- Fats
- Cereals
- Pulses
- Meat
- Eggs
- Milk and milk products
- Roots
- Fruits
- Nuts

Foods permitted

- Green leafy vegetables
- Other vegetables
- Clear soups
- Salads
- Plain coffee or tea
- Skimmed and butter milk
- Spices

Activity : 6

List any five vegetables and fruits that can be consumed by a diabetic.

Vegetables	Fruits
1	1
2	2
3	3
4	4
5	5

Get your fibre fix

- Go for grains. Look for 100% whole wheat or whole grains and check fibre grams on food labels.
- Feast on low sugar fruits. Eat a piece of fruit instead of drinking juice.
- Put away your peeler. Eat fruits and vegetables along with the skin if it is possible. Just be sure to wash them well first.
- Boost breakfast. Mix a high fibre cereal (more than 5 grams of fibre per serving) and top with fruit.
- Skip the chips.

9.7.2. Insulin

The philosophy of diet therapy for the juvenile diabetic is that while in a healthy person, the insulin secretion matches the food intake, in a diabetic the food intake has to match the injected insulin. Dietary measures should be used to control blood glucose and to minimize the risk of hypoglycaemia and to reduce the long-term complications.

DO YOU KNOW?

How insulin works

Insulin is a hormone that comes from a gland situated behind and below the stomach (pancreas).

1. The pancreas secretes insulin into the bloodstream.
2. The insulin circulates, enabling sugar to enter your cells.
3. Insulin lowers the amount of sugar in your bloodstream.

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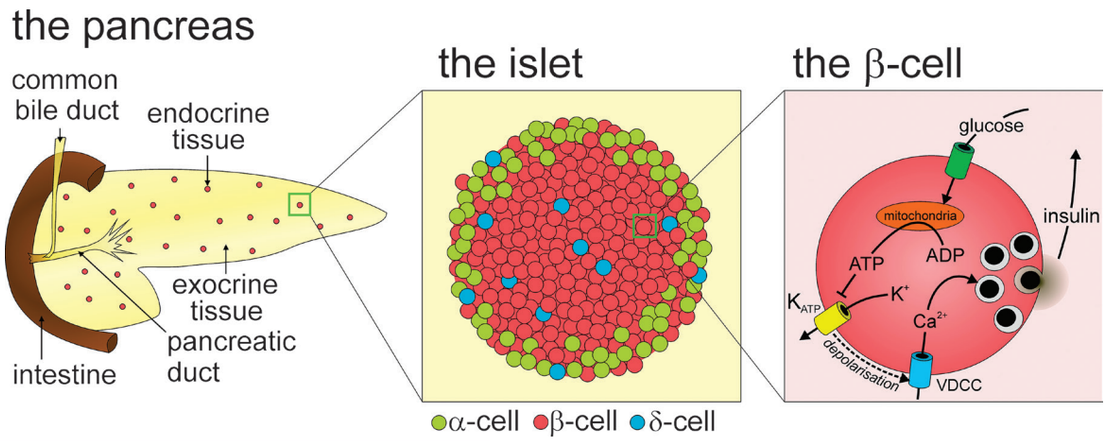
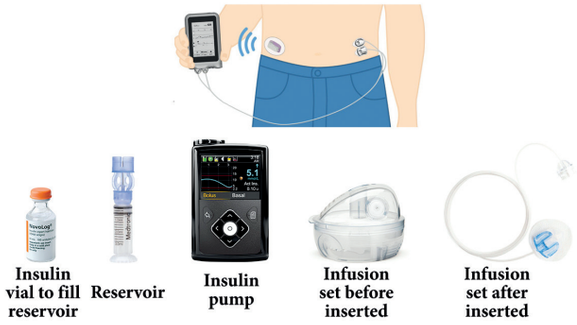


An Insulin pump administers insulin through a catheter in the abdomen to help control a person's blood sugar levels.

Insulin pump



9.7.3. Oral Hypoglycaemic drugs

Action of oral anti diabetic drugs in controlling the blood sugar levels may be due to:

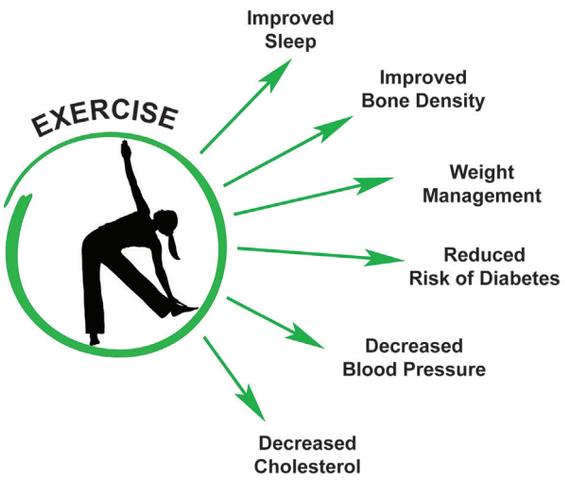
- ❖ Stimulation of insulin production from beta cells of Langerhans.
- ❖ Effect in making circulating insulin more effective.
- ❖ Action on intestinal mucosa decreasing the rate of absorption of glucose.
- ❖ Acting directly on peripheral muscle tissue increasing utilization of glucose.

Some of the common oral hypoglycaemic drugs are Biguanides and Sulphonylureas.

9.7.4. Exercise

Regular physical activity affects overall glycemic control through improved insulin sensitivity, lowered insulin requirements, and improved glucose tolerance. Collectively, these health benefits may contribute to a reduction in the risk for long-term diabetes complications, slow the progression of existing complications and enhance quality of life. In addition, exercise is known to reduce stress and strain and enhance the quality of life.

Benifits of Exercise for Diabetics



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Yoga and diabetes mellitus

Practice of Pranayama produces a significant fall in the fasting blood sugar and post prandial blood sugar. Blood pressure is maintained at normal levels with significant reduction in the dosage requirement of antihypertensive. A significant decrease in LDL and VLDL with increase in HDL cholesterol is noted after the practice of yoga in diabetic individuals.

Women who watch twenty hours or more of television each week are more likely to experience obesity, diabetes and other health risks. Researchers found that every two hours spent on watching television was associated with a 14 percent increase in diabetes risk.

9.7.5. Education

The Diabetics should be educated on the nature of the disease they have and the possibility of development of acute and long term complications of the disease if the blood sugar is not kept under control. Adequate basic information on diabetes enables the diabetic to comprehend and improve their psychological acceptance of the disease. In addition, the importance of following the Doctor's and Dietitian's instructions regarding diet, drugs and exercise should be explained.

Diabetics should be aware of the importance of monitoring urine and blood sugar and serum lipids at regular intervals to ensure overall wellbeing. Diabetics should understand the principles of dietary modifications and comply. Diabetics should be aware of complications and preventing methods.

Metabolic syndrome is a cluster of several medical conditions or comorbidities namely central (visceral) obesity, hypertension, insulin resistance and abnormal lipid metabolism which together increase the risk of type 2 Diabetes mellitus and cardiovascular diseases. A person is designated as having the metabolic syndrome if he or she has three of the following abnormalities:

- Abdominal obesity
- Prediabetes
- High blood pressure
- Low serum HDL cholesterol
- Elevated serum triglycerides

9.8. Complications of Diabetes

9.8.1. Acute complications

Hypoglycaemia: This is a condition of low glucose in the blood stream which can be caused by:

- ❖ An overdose of insulin
- ❖ Omission of food
- ❖ Loss of food by vomiting or diarrhoea
- ❖ Increase in exercise without accompanying modification of insulin dosages

Patient experiencing hypoglycaemia becomes uneasy, nervous, restless, weak and hungry. They appear pale and the skin becomes moist with excessive perspiration. There may be trembling, dizziness and double vision. Nausea or vomiting and convulsions can occur. If untreated, it may lead to coma and death.

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Immediately, the patient should be administered a readily available carbohydrate source like glucose, candy, syrup, honey or fruit juices. Therefore diabetics should always be advised to carry sugar candy to control the condition causing symptoms when they are still mild.

Diabetic acidosis and Coma: Diabetic ketoacidosis is a case of severe insulin deficiency characterized by hyperglycaemia, elevated glucagon levels, acidosis and elevated blood ketones. This is caused due to the following reasons:

- The patient ingests extra /additional food which is more than that is controlled by the insulin dose.
- The patient omitted taking the insulin dose.
- The patient forgot to take the correct insulin dose.
- Injury
- Trauma
- Surgery

The symptoms are weakness, headache, pain, nausea, vomiting, flushed, dry and hot skin and dry mouth with increased thirst. One key symptom is acetone odour in the breath accompanied with painful and rapid breathing and dizziness. Clinical symptoms of shock are exhibited with unconsciousness followed by death unless prompt measures are taken.

9.8.2. Chronic complications

Retinopathy: Diabetic retinopathy also known as diabetic eye disease is caused due to damage occurring to the retina of the eye as a result of diabetes. It can eventually lead to blindness. Early detection, timely treatment and appropriate follow-up care of diabetic eye disease can protect against vision loss.

Nephropathy: Diabetic nephropathy is the damage caused to the kidneys or development of kidney disease due to diabetes. It involves functional or structural damage to the nephrons and associated organ systems. This results in malfunctioning of the kidneys eventually leading to kidney failure.

Neuropathy: Patients with diabetes are especially vulnerable to the development of nerve damage and diminished transmission of nerve impulses which affect muscle function and sensory perception in vein-less parts of the body.

Diabetic Cardiomyopathy: It is a disease that damages the structure and function of the heart due to diabetes. This disease can lead to heart failure and arrhythmias.

Eight symptoms of Diabetes not to be ignored to prevent complications

1. Tingling sensation in feet
2. Occurrence of sores and blisters
3. Poor wound healing
4. Skin problems
5. Swelling in the feet
6. Digestive problems
7. Blurry vision
8. Chest pain

Stress is a well known offender in causing blood glucose levels to rise, particularly in patients with type 2 diabetes. Yoga, progressive relaxation, massage therapy, exercise and meditation are just a few ways to distress. Talk therapy, either one-to-one with a counselor or in a support group, can also be extremely helpful.

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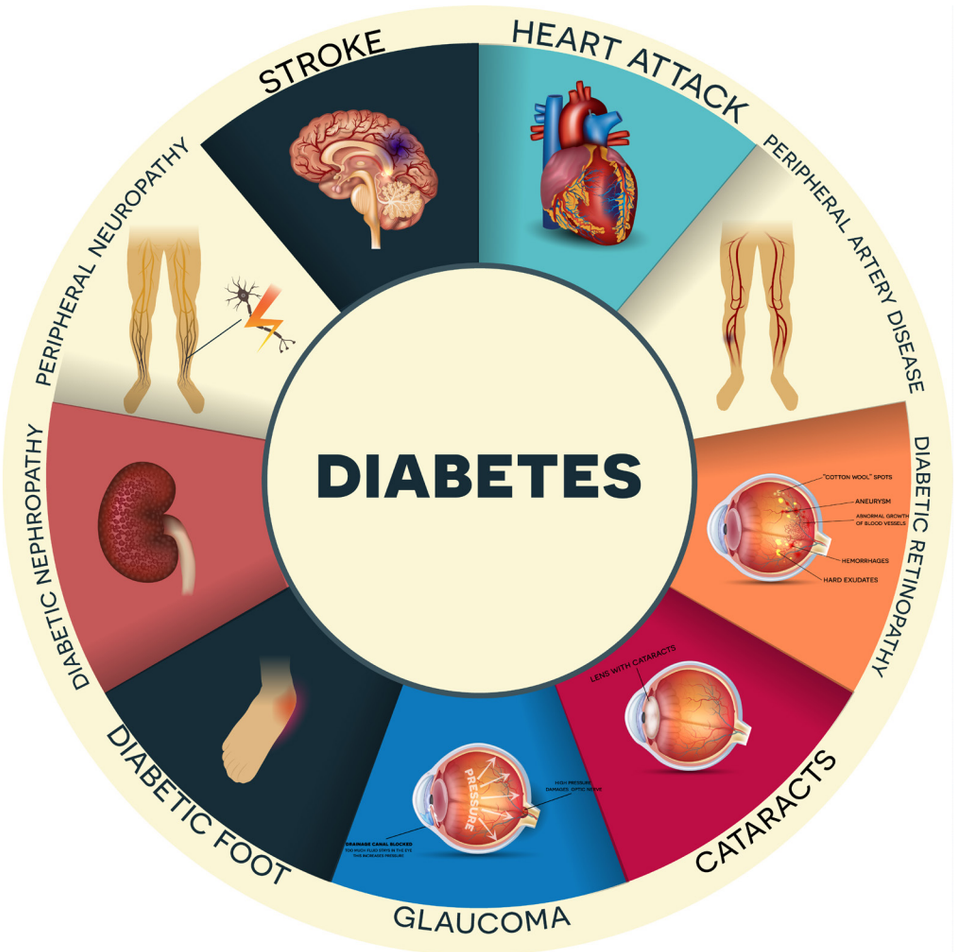

9.8.3. Tips to avoid Diabetes complications

- ❖ Choose carbohydrates carefully.
- ❖ Loose weight if you need to.
- ❖ Get enough sleep.
- ❖ Be active.
- ❖ Monitor blood sugar regularly.
- ❖ Manage stress.
- ❖ Say no to salt.
- ❖ Avoid smoking and alcohol.
- ❖ Maintain the blood pressure and blood cholesterol levels.

9.9. Artificial Sweeteners

High content of sugar consumption is undesirable for diabetics. Non caloric and high intense sweeteners are available as sugar substitutes. An ideal sweetener is as sweet or sweeter than sucrose, has a pleasant taste with no after taste, is colourless, odourless, readily soluble, stable, functional and economically feasible. It is non toxic, does not promote dental cavities and is either metabolized normally or excreted from the body without contributing to any metabolic abnormalities. Some of the sweeteners available in the market are Aspartame, Saccharin and sucrulose. Use of sweeteners by a diabetic patient is not encouraged as it does not help the patient to wean away from sweet foods.

Activity : 7

Do you think artificial sweeteners can be consumed by a diabetic in any amount? What are their side effects?

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DIABETES PREVENTION

1 Exercise

Workout and morning exercise can lower your chances.

Control 2

Control the amount of Junk Food and weight gain factors.

3 Healthy Food

A diabetes diet is a plan that's naturally rich in nutrients and low in fat and calories.

Avoid 4

Sometimes excess alcohol can cause blood sugar level to drop into dangerous levels.

5 Consult a Doctor

Consult a Doctor for your Risk Analysis and Early Diagnosis.

BRIGHTOWL.PRO

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9.10. Home remedies

The following foods are suggested to reduce the blood sugar levels and complications of diabetes:

- Fenugreek
- Jamun fruit
- Green leafy vegetables
- Sprouts
- Varagu
- Thinai
- Curry leaves
- Cinnamon

14th November is World Diabetes Day

Effective blood glucose control measures with healthy diet, physical activity and drugs not only allow the diabetics to lead a normal healthy life but also prevent the complications associated with diabetes.

YOU SHOULD CONTROL DIABETES OTHERWISE IT WILL CONTROL YOU

SUMMARY

- Diabetes mellitus is a chronic metabolic disorder that prevents the body to utilize glucose completely or partially.
- It is characterized by raised glucose concentration in the blood and alterations in carbohydrate, fat and protein metabolism.
- One in every eight individuals in India is a diabetic.
- The average age for the onset of diabetes is around 40 years while it is around 55 years in other countries.
- The types of Diabetes are Type 1 or Insulin dependent Diabetes mellitus, Type 2 or Non insulin dependent Diabetes mellitus. Gestational diabetes, Malnutrition related Diabetes mellitus and Secondary Diabetes.
- The main cause of type 1 diabetes is infection.
- The main causes of type 2 Diabetes are heredity, age, stress and obesity.
- The main symptoms of diabetes are polyuria, polyphagia, polydipsia, fatigue and delayed wound healing.
- There are alterations in carbohydrate, protein and fat metabolism for a diabetic. The following are the diagnostic test for Diabetes- Fasting blood glucose, Random plasma glucose and Oral Glucose Tolerance Test.
- The main modes of treatment in Diabetes are Diet, Insulin, Drugs, Exercise and Education.
- The acute complications of Diabetes include hypoglycaemia and Diabetic acidosis and coma.
- The chronic complications are retinopathy, nephropathy, neuropathy and cardiomyopathy.
- Non caloric and high intense sweeteners are available as sugar substitutes for a diabetic.
- Effective blood glucose control measures with healthy diet, physical activity and drugs not only allow the diabetics to lead a normal healthy life but also prevent the complications associated with diabetes.

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A-Z GLOSSARY

Terms	Meanings
Acidosis	A buildup of acid in the blood stream
Ketosis	A metabolic state characterized by raised levels of ketone bodies in the body tissues.
Hyperglycaemia	Increased blood sugar level
Hypoglycemia	Decreased blood sugar level
Glycosuria	Sugar in the urine
Somatostatin	Hormone produced by many tissues in the body and regulates the endocrine system
Polyuria	Increased urination
Polydipsia	Increased thirst
Polyphagia	Increased hunger
Haemochromatosis	It is an inherited condition wherein the iron levels in the body slowly builds up.
Chronic pancreatitis	It is long standing inflammation of the pancreas that alters the organ's normal structure and functions.
Down's syndrome	A genetic chromosome 21 disorder causing developmental and intellectual delays.
Carcinoma of pancreas	Cancer in the pancreas
Pancreatectomy	Surgical removal of all or part of the pancreas
Cushing's syndrome	A condition that occurs due to exposure to high cortisol levels for a long time.
Addison's disease	A disorder in which the adrenal glands don't produce enough hormones.
Hypopituiturism	Diminished hormone secretion by the pituitary gland
Insulinopenia	Deficient secretion of the insulin by the pancreas resulting in hyperglycaemia.
Oral Hypoglycaemic drugs	Drugs used to lower the level of blood glucose.
Retinopathy	Damage occurring to the retina of the eye as a result of diabetes.
Nephropathy	Damage caused to the kidneys or development of kidney disease due to diabetes.
Neuropathy	Damage to the nerves due to diabetes.
Diabetic Cardiomyopathy	It is a disease that damages the structure and function of the heart due to diabetes.
Glycaemic Index	It is an ability of a food item to raise the blood glucose levels.
Food exchange lists	Food exchange lists are groups of measured foods of the same calorific value and similar protein, fat and carbohydrate and can be substituted for one another in a meal plan.

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Evaluation

I. Choose the correct answer (1 mark)

1. Excess thirst in diabetes is called as

   (a) polyuria (b) polyphagia

   (c) polydipsia (d) ketonemia.

2. This is avoided for a diabetic patient.

   (a) vegetable salad (b) fruit salad

   (c) wheat (d) honey.

3. The normal blood sugar level is --------mg/dl.

   (a) 80-120 (b) 60-100

   (c) 40-80 (d) 140-180.

4. For a diabetic with normal weight, ----------kcal/kg body weight is prescribed.

   (a) 15 (b) 20

   (c)25 (d)30.

5. This is an acute complication of diabetes.

   (a) retinopathy (b) neuropathy

   (c) nephropathy (d) hypoglycaemia.

II. Write short answer (2 marks)

1. What is Diabetes mellitus?
2. What is meant by gestational diabetes?
3. Why is exercise important for a diabetic?
4. How will you avoid diabetes complications?
5. What are the causes of secondary diabetes?
6. Write on the prevalence of diabetes in India.
7. Explain diabetic ketoacidosis.

III. Answer in brief (3 marks)

1. List the symptoms of diabetes.
2. Explain the causes for diabetes.
3. Explain glycaemic index.
4. Discuss artificial sweeteners.
5. How will you diagnose diabetes?
6. Explain how types of insulin affect modification of diet.
7. What are the dietary guidelines to be followed for a diabetic?
8. Write on the home remedies for diabetic.

IV. Answer in detail (5 marks)

1. Write on the acute complications of diabetes.
2. Differentiate between type 1 and type 2 diabetes.
3. Explain the metabolic changes in diabetes.
4. Write on principles of planning diet for a diabetic.
5. Write on the chronic complications of diabetes.

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DIET IN KIDNEY DISEASES

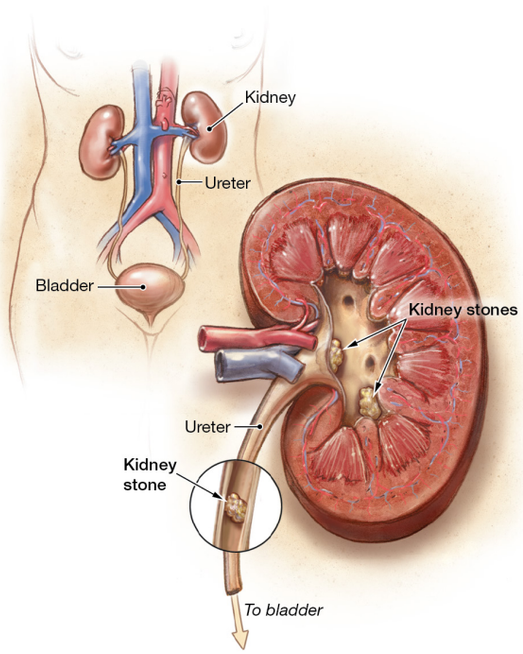
Unit 10

OBJECTIVES

- Understand the functions of kidney.
- Know the causes, symptoms and dietary management of glomerulonephritis.
- Understand the causes, management and prevention of kidney stones.

C3QKT

The kidneys are very important organ in the body which is responsible for getting rid of waste products, drugs and toxins through urine. The kidneys excrete waste products of the body in general, and the end products of protein metabolism in particular. Kidneys diseases means kidneys are damaged and can't filter as well. Hypertension and Diabetes are the major causative factors for kidney failure.



At the onset of acute kidney disease, the urine output is markedly diminished. Urea and the other end products of protein metabolism are retained. The formation of these waste products can be considerably diminished by restricting the intake of dietary proteins and diminishing the breakdown of tissue proteins by supplying protein sparers like carbohydrates and fats.

DO YOU KNOW?

Each kidney has approximately one million nephrons which filter water and other substances out of the blood to produce urine.

10.1 FUNCTIONS OF KIDNEYS

- As excretory organs, kidneys remove waste products of nitrogen metabolism. Urea, uric acid and creatinine are excreted.
- Kidneys regulate the amount of water, sodium and hydrogen ions in the body.
- Kidneys are exclusive site for the production of 1, 25, dihydroxy cholecalciferol, the active form of vitamin D.

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- Kidneys also produce erythropoietin, which is essential for the synthesis of RBC.
- Renin is released from the kidneys in response to low BP directly and also stimulates the production of aldosterone.
- Parathyroid hormones, calcitonin, insulin and gastrin are degraded by the kidneys.

10.2. TYPES OF KIDNEY DISEASES

The following are the types of kidney diseases:

- **Glomerulonephritis:** This is an inflammation of the glomeruli. Glomerulonephritis can be caused by infections, drugs or congenital abnormalities.
- **Kidney stones:** Kidney stones are another common kidney problem. Passing kidney stones can be extremely painful, but they rarely cause significant problems.
- **Chronic kidney disease:** The most common form of kidney disease is chronic kidney disease. Chronic kidney disease is a long-term condition that doesn't improve over time. It is commonly caused by high blood pressure. Diabetes is also a major cause of chronic kidney disease.
- **Polycystic kidney disease:** Polycystic kidney disease is a genetic disorder that causes numerous cysts (small sacs of fluid) to grow in the kidneys. These cysts can interfere with kidney function and cause kidney failure.
- **Urinary tract infections:** Urinary tract infections (UTIs) are bacterial infections of any part of the urinary system. Infections in the bladder and urethra are the most common. They are easily treatable and rarely lead to more health problems. However, if left untreated, these infections can spread to the kidneys and cause kidney failure.

Glomerular Filtration Rate (GFR)

GRF is a test used to check how well the kidneys are working. Specifically, it estimates how much blood passes through each unit of glomeruli. A GFR of 60 or higher is in the normal range. A GFR of 15 or lower may mean kidney failure.

10.3 GLOMERULONEPHRITIS

It is an inflammatory process affecting the glomeruli, the small blood vessels in the head of the nephron. It is most common in its acute form in children 3 to 10 years of age although it can also occur in adults past age 50.

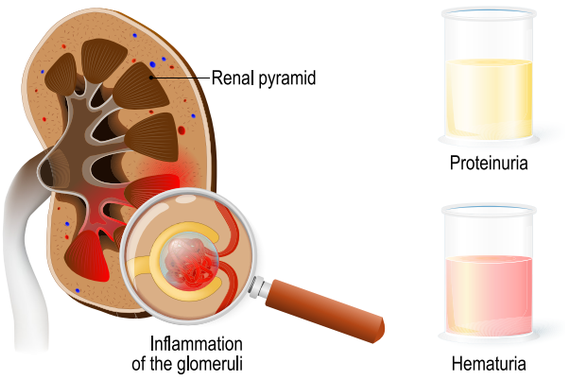

Fig 10.1 GLOMERULONEPHRITIS

10.3.1. Causes

The most common cause of glomerulonephritis is streptococcal infection. Renal infarction, acute pyelonephritis and metallic poisoning also cause glomerulonephritis. Other causes include primary kidney diseases such as IgA nephropathy and hereditary nephritis. Secondary nephritis can occur due to Systematic Lupus erythromatous (SLE).

Blood Urea Nitrogen (BUN)

BUN can provide important information about the kidney function. The test measures the amount of urea nitrogen in the blood. In general, around 7-20 mg/dl is considered as normal. High level BUN is a sign that the kidneys are not working.

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10.3.2 Symptoms

The symptoms of nephritis are:

- Haematuria (blood in the urine)
- Proteinuria (protein the urine)
- Oedema (fluid retention)
- Shortness of breath
- Tachycardia (increased heartbeat)
- Elevated blood pressure
- Anorexia
- Oliguria (low excretion of urine) /anuria (no excretion of urine)
- Uraemia (increased serum urea)

Activity : 1

Write the normal values of the following:

1. Blood Urea Men: ---------- mg/dl
2. Women: ----------mg/dl
3. Serum creatinine Men: ---------- mg/dl
4. Women: ----------mg/dl
5. Serum Uric acid Men: ---------- mg/
   Women: ---------- mg/dl

10.3.3. Dietary management

Objectives

- Reduce elevated serum nitrogen levels from breakdown of exogenous or endogenous proteins.
- Reduce elevated blood pressure or oedema.
- Spare protein for tissue repair.
- Improve renal functioning.
- In children, avoid growth retardation over time.

The dietary management provides optimal nutrition support. Adequate proteins should be given, unless there is oliguria or anuria. Salt is restricted if there is oedema, hypertension or oliguria.

Energy: 80kcal/ kg body weight and 10 percent for infection is suggested. Sufficient calories are given without increasing the protein intake by means of sugar, honey, glucose, sago and other starchy foods like arrowroot. Above mentioned foods are not only rich in calories but also poor in protein, sodium and potassium.

Protein: Usually the diet contains 0.5 grams of protein/kg of ideal body weight. The intake of protein is reduced to a minimum by excluding protein rich foods. A low protein diet is recommended so as to give rest to the kidneys. Complete proteins like milk, fish, etc are better to ensure maximum utilization. Second quality proteins like pulses are restricted. Rice is preferable as it has low amount of protein but better quality of protein than wheat.

Fluids: Daily fluid replacement should be 500ml plus daily amount excreted in urine. The fluid is calculated taking into account the water consumed with drugs, water present in milk, curds, buttermilk, tea, coffee, fruit juice and water used in sambhar and rasam.

Sodium: The sodium is restricted to 500 to 1000mg/day. In sodium restricted diets, the following foods are avoided:

- Salt during cooking or on the table.
- Baked products containing baking soda and sodium bicarbonate.
- Papads
- Pickles
- Salted chips
- Salted nuts
- Foods where sodium salts are used as a preservative like squashes and sauces.
- Dried fruits
- Dried fish.

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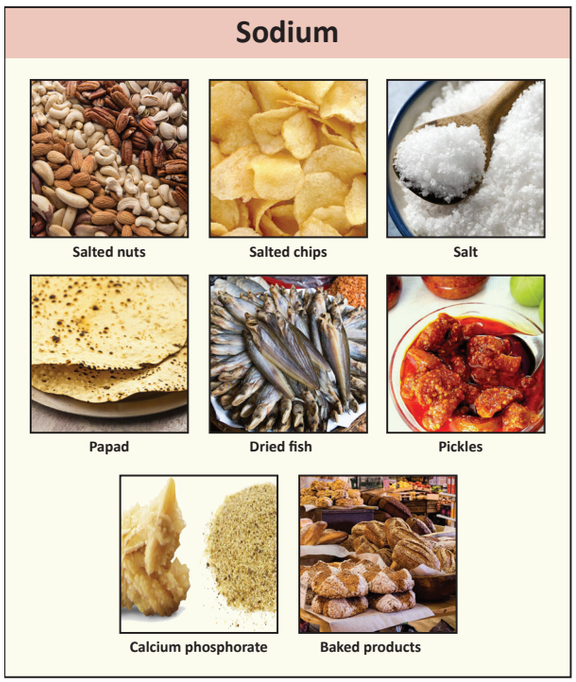

Fig 10.2 Sodium rich foods

Potassium: Potassium is found naturally in almost all foods particularly in fruits, vegetables and meats. Potassium content can be reduced in vegetables by cooking in excess water and then discarding the water. This is called leeching. Spices and condiments can be used in small quantities as they are rich in potassium. The following foods which are high in potassium are restricted in a patient suffering from glomerulonephritis:

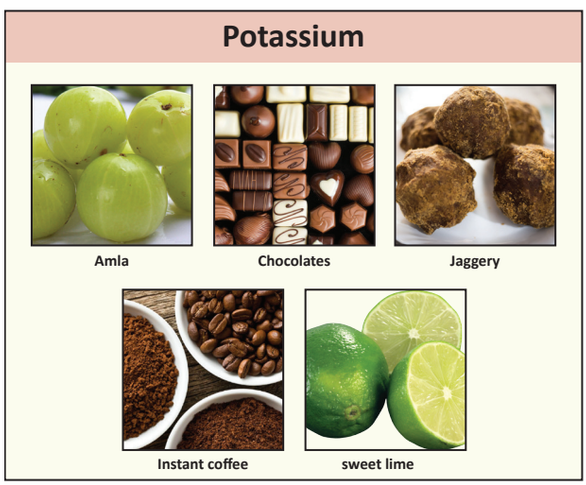

Fig 10.3 Potassium rich foods

- Nuts
- Jaggery
- Instant coffee
- Chocolate
- Cocoa powder
- Amaranth
- Spinach
- Colocasia
- Yam
- Mango
- Sweet lime
- Amla
- Lemon

Phosphorus: Eating foods high in phosphorus will raise the phosphorus in blood and this can cause calcium to be pulled from bones. This will make bones weak and cause them to break easily. The following foods which are rich in phosphorus should be restricted in the diet:

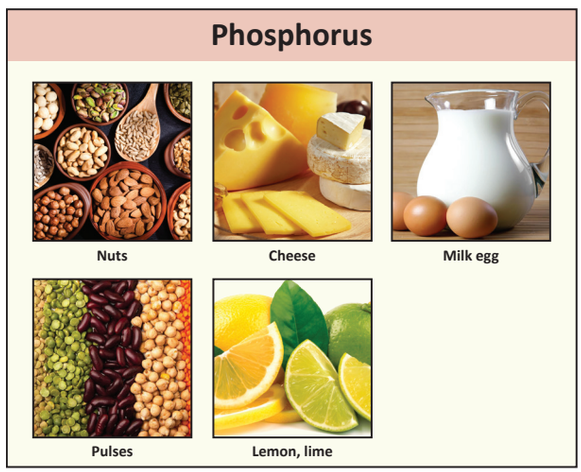

Fig 10.4 Phosphorus rich foods

- Milk
- Cheese
- Nuts
- Bakery products
- Pulses
- Mango
- Amla
- Lemon
- Eggs

Foods permitted and avoided in glomerulonephritis

Foods permitted

- Rice
- Milk or milk products, not more than 300-400 ml

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- Vegetables, cooked in large amount of water with excess of water that is drained out
- Potato, sweet potato or yam
- Sugar
- Sago
- Gourd vegetables

Foods avoided

- Pulses
- Soups
- Meat,
- Fish
- Fruits rich in potassium
- Dried fruits
- Nuts
- Condiments and spices
- Papads and pickles

Activity : 2

Justify why the following foods are avoided or restricted in glomerulonephritis.

- Meat
- Milk
- Pulses
- Baked foods
- Nuts
- Jaggery
- Pickles
- Dried fruits
- Chocolate
- Eggs

Activity : 3

List any 5 foods that can be included in a diet for a patient suffering from glomerulonephritis.

1.

2.

3.

4.

5.

10.4. KIDNEY STONES (UROLITHIASIS)

Renal stones are prevalent between 35-40 years of age with the incidence declining after the age of 50. Urolithiasis or renal calculi can be found lodged in the urinary tract namely, kidney, ureters, bladder or urethra. The essential phase in stone formation is condensation of specific molecules within the collecting system. These molecules of mucopolysaccharides and mucoproteins form a matrix united by a strong chemical bond, with deposition of crystals in them as a secondary phenomenon.

10.4.1.Causes

The occurrence of kidney stones may be an outcome of different nutritional status, dietary habits and environmental factors such as temperature and humidity. The causes of renal stones are:

- **Heredity:** Some of the blood relations of patients with kidney stones develop the same problem.
- **Climate:** Those residing in hot tropical climates are prone to develop urinary calculi. During hot weather, less urine is formed as more water is lost through perspiration.
- **Fluids:** In the tropics, a lot of fluid is lost through perspiration, and so crystals are easily precipitated in the concentrated urine.
- **Vitamin B complex:** The metabolites excreted in the urine are significantly altered by the vitamin content in the diet. The administration of tryptophan increases, while vitamin B6 decreases urinary oxalate excretion.
- **Vitamin D and Calcium:** Excessive urinary excretion of calcium predisposes to formation of calcium stones. Vitamin D increases calcium absorption from the intestinal tract.

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- **Primary Hyperparathyroiodism:** Parathyroid hormones increases the synthesis of 1,25, dihydroxy vitamin D3 (calcitrol), which increases calcium absorption in the intestines and reabsorption from the kidney tubules.
- **Recumbency:** Prolonged bed rest, particularly when a patient is immobilized, leads to generalized decalcification of the bones. The breakdown products of bones are excreted through the urine, and may form urinary stones if liquid intake is scanty.
- **Congenital malformations and infections:** Congenital malformations of the renal pelvis, and repeated urinary tract infections predispose to kidney stones formation.

10.4.2. Types of kidney stones

The most common constituents of kidney stones are oxalates, urates or phosphates, combined with calcium.

Calcium: The prevalence of calcium stones is higher in those taking a low fibre diet. A vegetarian diet predisposes to urinary bladder stones while meat diet is claimed to predispose to kidney stones. Increasing the protein intake enhances urinary calcium excretion in normal subjects as well as in those with urinary stones.

Oxalate: Crystals of calcium oxalate are found mostly in acid urine, but may also be present in neutral or oxalate urine; they may not be associated with increased urinary calcium excretion. Ingestion of rhubarb, spinach, tomatoes, strawberries, chocolate or tea produces temporary increase in oxalates in all individuals (secondary hyperoxaluria). It is possible to decrease the oxalate content of vegetables by using phosphate fertilizer.

Uric acid: Uric acid stones are common in patients with gout and are also seen in the tropics.

Phosphate: Phosphate stones tend to form in the bladder when there is infection. Some infecting organisms split urea into ammonia, and phosphates precipitate in the strongly

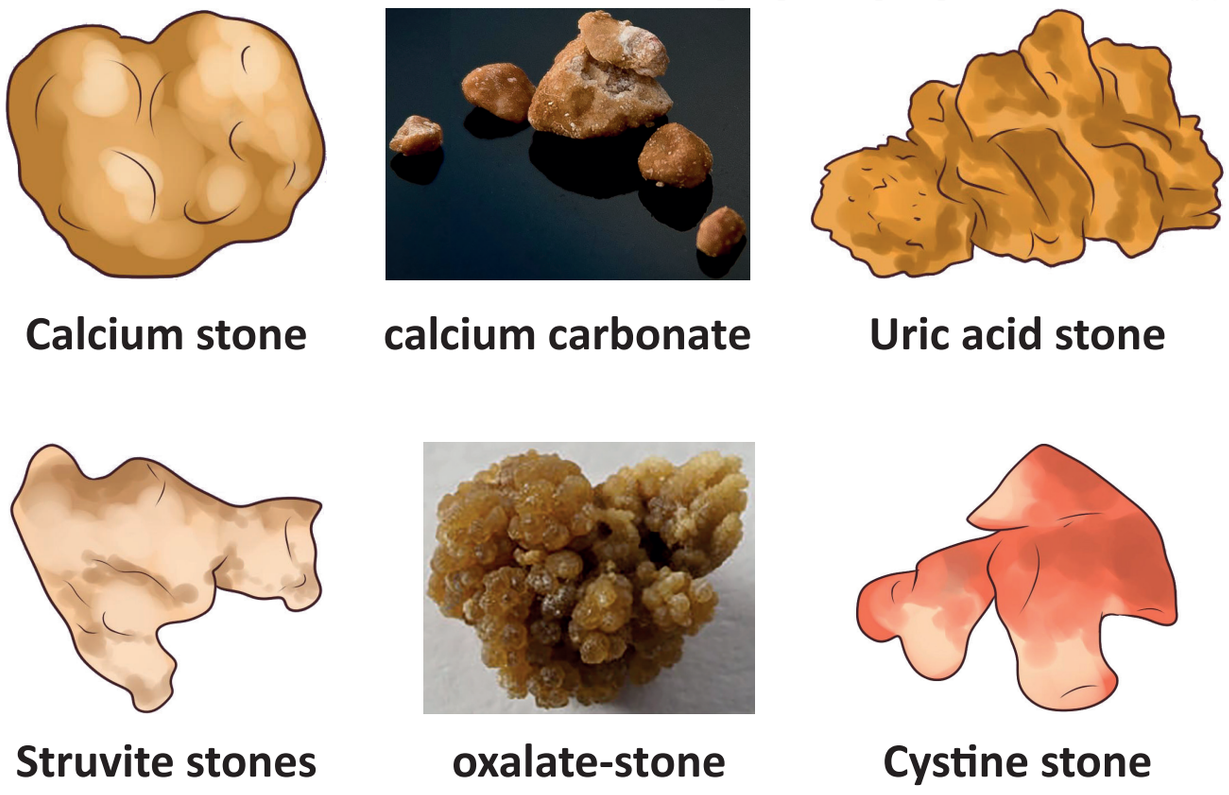

Fig 10.5 Types of kidney stones

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alkaline urine and are bound together by a matrix.

Magnesium: Low urinary magnesium excretion and high urinary calcium excretion predispose individuals with hyperparathyroidism with stone formation.

Struvite stones: Struvite stones can occur mostly in women with urinary tract infections in which bacteria make ammonia that builds up in the urine. Struvite stones are made up of magnesium, ammonium and phosphate.

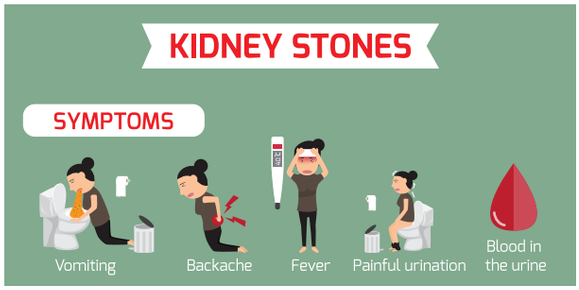
Cystine: Cystinuria is an inherited condition with defective reabsorption by the renal tubule of the aminoacid cystine, lysine, arginine and carnitine. Some of these patients excrete a large amount of cystine in the urine.

DO YOU KNOW?

Sometimes stones block the flow of urine. This is called a urinary obstruction. Urinary obstructions can lead to kidney infection and kidney damage.

10.4.3. Symptoms of kidney stones

- Sudden severe onset of pain in the lower back, abdomen and sides.
- Blood in the urine
- Fever and chills in case of infection
- Pain while urinating
- Vomiting
- Nausea
- discolored or foul smelling urine
- frequent need to urinate
- urinating small amounts of urine



DO YOU KNOW?

Diagnosis of kidney stones requires a complete health history assessment and a physical examination. Other tests include:

- blood tests for calcium, phosphorus, uric acid, and electrolytes.
- blood urea nitrogen (BUN) and creatinine to assess kidney functioning.
- urine analysis to check for crystals, bacteria, blood, and white cells.
- examination of passed stones to determine their type.

Kidney stones are diagnosed by excluding other possible causes of abdominal pain and associated symptoms. Imaging tests including an X-ray called a KUB view (kidney, ureter, bladder), or a helical CT scan are often used to confirm the diagnosis of kidney stones. Although the amount of radiation exposure associated with these tests are minimal, pregnant women and others may need to avoid even these low levels of radiation. In these cases, an ultrasound may be used to diagnose the kidney stone.

10.4.4. Treatment

Treatment during the acute stage included the relief of pain and administration of large quantity of fluids. Stones less than 5 mm in diameter may pass in the urine spontaneously and need no specific treatment. Cystine stones may be dissolved by a daily water intake of 2000 ml. Ensure that the fluid intake is 4 litres minimum and the ideal intake is 5-7 itres per day. Uric acid stones may be dissolved over a period of six months by liberal fluid intake and oral alkalies to maintain urinary pH between 6.4 and 7.

Lithotripsy is a procedure that uses shock waves to break a kidney stone into smaller pieces that can be more easily expelled from

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Fig 10.6 Different shapes of kidney stones

the body. The device used for this procedure is called a Lithotripter. Kidney stones can also be removed surgically. A percutaneous nephrolithotomy is a procedure in which a kidney stone is removed via a small incision in the skin. A kidney stone may also be removed with a ureteroscope, an instrument that is advanced up through the urethra and bladder to the ureter.

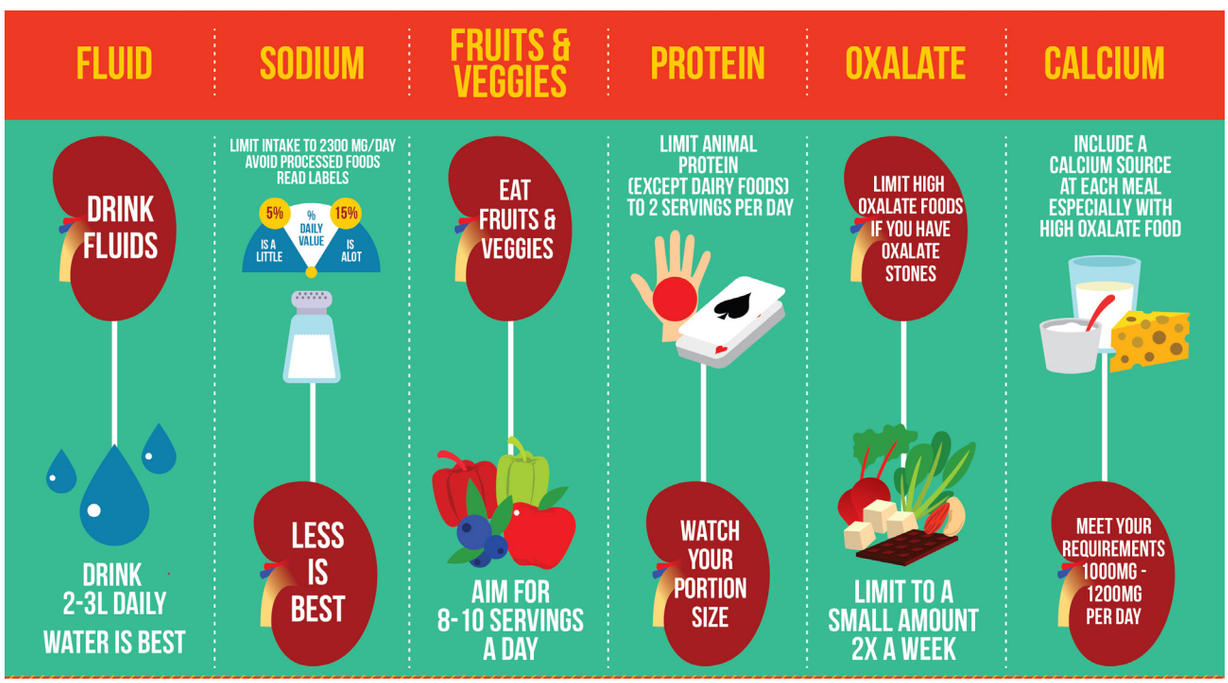
10.4.5.Dietary management

Fluids: Stone formation is a gradual process, and the tendency in a susceptible person persists throughout life. Vigilance with adequate fluid intake and diet is needed indefinitely.

The fundamental principle in the treatment of kidney stones is to supply adequate fluids like water, coconut water, barley water, fruit juices and weak tea in order to ensure the passage of over 2000ml of urine per day. A heavy manual worker in a hot humid climate should drink more fluids than a sedentary office worker in a cooler climate to compensate for fluid loss through perspiration. The simplest guide is to drink enough fluids to see that the urine is very light in colour.

Dilute urine avoids concentration of solids and also tends to make the urine neutral, thus preventing the acid or alkaline reaction which predisposes to precipitation of crystals.

Foods: Although the role of diet in the formation of urinary stones is not well established, it is advisable to restrict foods that are rich in calcium, oxalate or uric acid according to the type of stone formed. The following table gives the list of foods that are rich in calcium, oxalate or uric acid.



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FOODS RICH IN CALCIUM, OXALATE AND URIC ACID

Calcium	Oxalate	Uric acid
Milk	Beef	Fish
Cheese	Cashewnuts	Kidney
Curd	Chocolates	Liver
Paneer	Cocoa	Meat extracts
Egg yolk	Custard apple	Soups
Figs	Groundnuts	Sweet breads
Beans	Spinach	
Cauliflower	Strawberries	
	Tea	
	Tomato	

Activity : 4

List five foods each to be avoided for patient who has

1. Calcium stones

(i)

(ii)

(iii)

(iv)

(v)

2. Oxalate stones

(i)

(ii)

(iii)

(iv)

(v)

3. Uric acid stones

(i)

(ii)

(iii)

(iv)

(v)

10.4.6. Home remedies for kidney stones

Before taking any home remedies, it is a good idea to talk with the doctor, especially for people with preexisting medical conditions or who are taking medications. The following are suggested as home remedies for kidney stones:

- **Water** - Drinking water is one of the easiest ways to prevent and treat kidney stones. Drinking 12 glasses per day may help ease the passage or slow the growth of deposits in the kidney.
- **Lemon juice** - Lemons contain citrate, a compound that helps break down calcium deposits and slow their growth.
- **Coconut water** - Coconut water is one of the healthiest drinks and is considered to be good for the dissolution of kidney stones. It has been proven effective in breaking and flushing out the kidney stones from the body through urine.
- **Ladies finger** - It is rich in magnesium with anti inflammatory and antioxidant properties. It helps in the prevention of crystallization of chemicals in the kidney thus making it an excellent remedy for kidney stones.
- **Basil (thulasi)** - Basil contains compounds known to help stabilize uric acid levels, making it harder for kidney stones to form.
- **Horse gram** - Horse gram helps in breaking the stones into smaller pieces that would come out of the urinary tract easily.
- **Apple cider vinegar** - This contains citric acid that may help dissolve calcium deposits.
- **Wheat grass juice** - It contains compounds that increase urine production, allowing stones to pass more easily and reducing the risk of their formation.
- **Celery juice** - Celery contains antioxidants and compounds known to increase urine production.

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Fig 10.6 Natural remedies for kidney disease

- **Kidney bean broth** - They contain a lot of magnesium, a compound known to help reduce kidney stones and their symptoms.
- **Extra virgin olive oil** - This is a thick recoil that may help ease the passage of kidney stones by lubricating the urinary tract.
- **Pomegranate juice** - The astringent and antioxidant properties of pomegranates are thought to reduce the chances of developing kidney stones and ease their passage.
- **Onion decoction** - Onions have antioxidant properties which prevent crystallization and further growth of kidney stones.
- **Water melon** - This helps maintain the acid levels in urine. Because of its high water and

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potassium content, it helps in cleansing the kidneys and flushing out kidney stones.

- **Radish** - Radish can be soaked in water overnight. The water if strained and drunk twice a day is a popular remedy for kidney stones.
- **Figs** - Boiling two figs in a cup of water and drinking it on an empty stomach every morning could be helpful in dissolving kidney stones.
- **Loose weight** - A healthy weight combined with a healthy diet rich in nutritious, fibre filled fruits is considered essential to the prevention of kidney stones and for their treatment.

10.4.7. Prevention

People with a history of stone formation can probably diminish their chances of stone formation by the following measures:

- Adequate fluid intake, ensuring over 2 litres of urine daily.
- Treat urinary infection promptly. Decrease dietary calcium. Restrict intake to less than 600 mg by decreasing intake of milk products.
- Reduce calcium absorption.
- Restrict protein intake.

SUMMARY

- ❖ Kidneys remove waste products of nitrogen metabolism. Urea, uric acid and creatinine are excreted.
- ❖ Glomerulonephritis is an inflammatory process affecting the glomeruli, the small blood vessels in the head of the nephron.
- ❖ The main cause of glomerulonephritis is streptococcal infection.
- ❖ The symptoms of nephritis are haematuria, proteinuria, oedema, shortness of breath, tachycardia, elevated blood pressure, anorexia, oliguria or anuria and uraemia.
- ❖ High calorie, low protein with restricted fluid, sodium, potassium and phosphorus diet is given for a patient suffering from glomerulonephritis.
- ❖ Urolithiasis or renal calculi can be found lodged in the urinary tract namely, kidney, ureters, bladder or urethra.
- ❖ The essential phase in stone formation is condensation of specific molecules within the collecting system. These molecules of mucopolysaccharides and mucoproteins form a matrix united by a strong chemical bond, with deposition of crystals in them as a secondary phenomenon.
- ❖ The main causes of kidney stones are hot climate, heredity, low fluid intake and repeated urinary tract infection. Excessive urinary excretion of calcium predisposes to formation of calcium stones.
- ❖ The most common constituents of kidney stones are oxalates, urates or phosphates, combined with calcium.
- ❖ The fundamental principle in the treatment of kidney stones is to supply adequate fluids like water, coconut water, barley water, fruit juices and weak tea in order to ensure the passage of over 2000ml of urine per day.
- ❖ Depending on the type of stones, the foods rich in that particular constituent is avoided.

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GLOSSARY

Anorexia	Lack or loss of appetite for food
Glomeruli	A cluster of nerve endings, spores or small blood vessels, especially a cluster of capillaries around the end of a kidney tubule.
Aldosterone	It is a steroid hormone produced by the adrenal cortex. It is essential for sodium conservation in the kidneys, salivary glands, sweat glands and the colon.
Renin	It is a hormone secreted from kidney cells and its primary function is to eventually cause an increase in blood pressure.
IgA nephropathy	It is a kidney disease that occurs when an antibody called immunoglobulin A (IgA) lodges in the kidneys.
Heriditary nephritis	It is a genetically heterogenous disorder caused by gene mutation.
SLE	Systemic Lupus Erythromatosus (SLE) is an inflammatory disease caused when the immune system attacks its own tissues.
RBC	Red Blood Cells
Lithotripsy	Extracorporeal shockwave Lithotripsy is a noninvasive technique for the removal of kidney stones. Most ESWL is carried out when the stone is present near the renal pelvis. ESWL involves the use of a lithotriptor machine to deliver externally applied, focused, high-intensity pulses of ultrasonic energy to cause fragmentation of a stone over a period of around 30–60 minutes.
CT scan	Computed tomography (CT) is the most effective way to look for kidney stones. It uses radiation and computers to generate a cross-sectional view of the abdomen and pelvis.
Percutaneous nephrolithotomy (PCNL)	Clearance of stones working through a tunnel created through the back into the kidney. Stones are destroyed or removed intact.
Ureteroscope	Specialized endoscope for examination and treatment of ureteral disease. Usually less than 3 mm in diameter
Diuretics	These drugs inhibit the formation of calcium-containing stones by reducing urinary calcium excretion.
Renal colic	Term used to describe the common severe symptoms associated with a kidney stone obstructing the ureter. Common complaints include unpredictable onset of severe pain, usually beginning in the back and radiating to the groin. Nausea and vomiting often accompany this severe pain.
Ureter	The ureter is the long narrow muscular tube which allows urine to drain from the kidney to the bladder.
Urethra	the connection between the bladder and the outside world.
Bladder	the storage area for urine between episodes of urination.

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Evaluvation

I. Choose the correct answer

1. Tachycardia is due to excess amount of ----- in the blood.

   (a) sodium (b) Potassium

   (c) protein (d) Fat.

2. For nephritis, daily fluid replacement should be --------- ml plus daily amount excreted in urine.

   (a) 200 (b) 300

   (c) 300 (d) 40

3. ------- is rich in uric acid.

   (a) Meat extracts (b) Tea

   (c) Tomato (d) Milk.

4. ---------- is released from the kidneys in response to low BP.

   (a) Renin (b) Calcitonin

   (c) Insulin (d) Gastrin.

5. This food is rich in oxalate.

   (a) Milk (b) Tomato

   (c) Liver (d) Fish.

II. Short answers

1. What is meant by leeching?
2. What are the causes of glomerulonephritis?
3. Differentiate between oliguria and anuria.
4. What is renal colic?
5. List the foods rich in potassium.
6. What is Lithotripsy?

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III. Brief answers

1. What are the foods restricted in sodium rich diets?
2. Write on the causes of kidney stones.
3. How can stone formation be prevented?
4. Write on oxalate stones and calcium stones.
5. How are kidney stones treated?

IV. Detailed answers

1. Explain the functions of kidneys.
2. Write on the types of kidney diseases.
3. Write on the symptoms of nephritis.
4. Discuss the dietary management of glomerulonephritis.
5. Explain the dietary management for kidney stones.
6. Discuss the home remedies for kidney stones.

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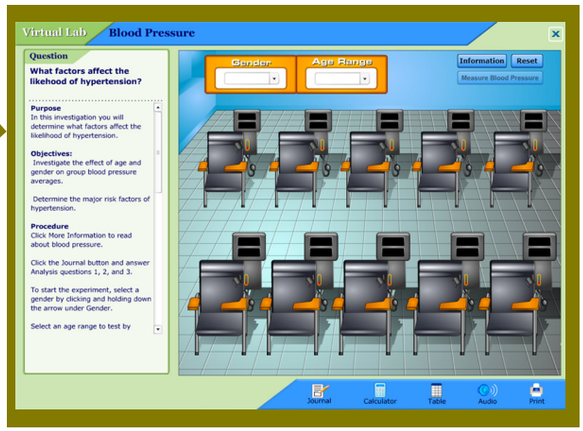
ICT CORNER

Hypertension and Cardiovascular diseases

Measure the pressure



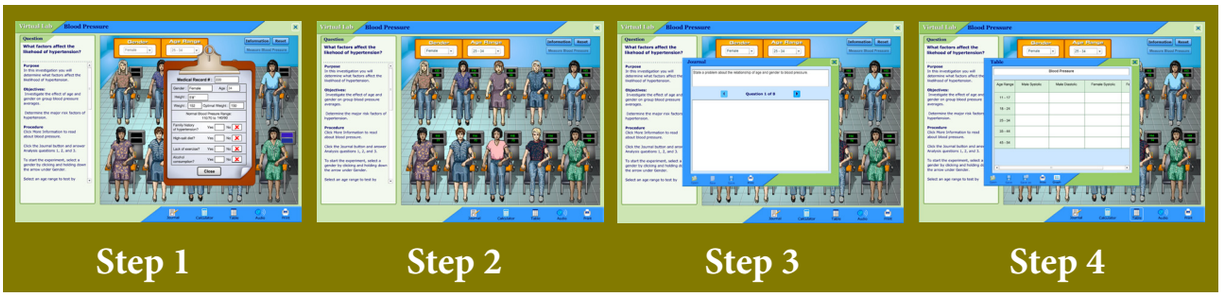
Steps:

Step 1: Use the **URL** or scan the **QR Code** to launch the activity page.

Step 2: Input the details such as Sex, Age Range and Click **"Measure Blood Pressure"** button on the right top of the activity page to know the systolic and diastolic measurements.

Step 3: Click any of the sample member to know about the medical record of the particular case.

Step 4: Answer the question given in the Journal and by clicking **"Table"** to table the details observed. Click **"Information"** to know the more details about Hypertension.



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*Pictures are indicative only

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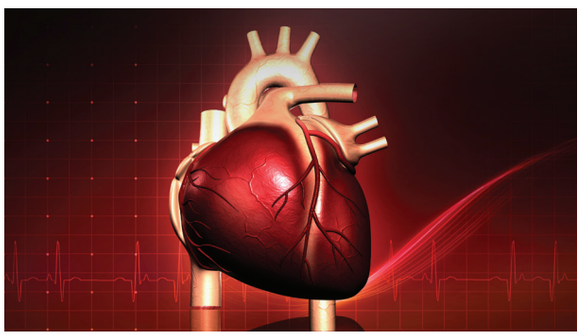
Unit 11

NUTRITION IN HYPERTENSION AND CARDIO-VASCULAR DISEASE

OBJECTIVES

This chapter will enable students to

- Know about factors that contribute to hypertension
- explain the relationship between sodium and hypertension
- identify foods that are limited or avoided in sodium-restricted diets
- list the risk factors for cardiovascular conditions
- identify foods to avoid or limit in Cardiovascular Disease



Hypertension or high blood pressure is one of the risk factors for Cardiovascular Diseases **(CVD)**. Treating high blood pressure significantly decreases the risk of stroke, myocardial infarction and cardiovascular death. Lifestyle modification can have a significant protective effect as well. This chapter will give an overview of the causes, symptoms and complications of hypertension and CVD as well as the role of food in the prevention and management of the same.

11.1 HYPERTENSION

Blood pressure is a measurement of the force exerted by the blood upon the walls of the blood vessels as it flows through it. It is measured using a **sphygmomanometer** and the reading is expressed as systolic blood pressure **(SBP)** / diastolic blood pressure **(DBP)** in mm Hg. Normal blood pressure is **120/80 mm Hg**.

Hypertension is a condition that results because of chronically elevated blood pressure. It is referred to as the **"silent killer"** because it may not cause any symptoms initially. Hypertension may lead to other complications such as heart attack, stroke, heart failure, and kidney failure.

Blood pressure categories given by the American College of Cardiology and the American Heart Association (ACC/AHA, 2017) are as follows:

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Normal: Less than 120/80 mm Hg;

Elevated Blood Pressure : Systolic between 120-129 and diastolic less than 80 mm Hg

Stage 1 Hypertension : Systolic between 130-139 or diastolic between 80-89 mm Hg

Stage 2 Hypertension : Systolic atleast 140 or diastolic at least 90 mm Hg

Hypertensive crisis: Systolic over 180 and/or diastolic over 120 mm Hg.

When the cause for hypertension is unknown, it is called **"essential or idiopathic or primary hypertension".** Hypertension of unknown causes is present in a majority of hypertensive individuals. In a small percentage of individuals, it is caused because of some other underlying health problem which may include kidney disease and diseases of the adrenal gland. This is referred to as **"secondary hypertension".**

Heredity and obesity are predisposing factors in hypertension. Smoking and stress also contribute to hypertension

Fig 11.1 Sphygmomanometer used in the measurement of blood pressure

11.2 Risk factors for hypertension

Factors responsible for hypertension are discussed below:

- **Heredity:** Children of hypertensive parents tend to have a higher risk of developing hypertension at an early age. This strongly suggests that there is a genetic basis for developing high blood pressure.
- **Age:** The prevalence of hypertension increases with age. Increase in blood pressure with age may be due to the blood vessels becoming more rigid and less elastic as one ages.
- **Gender:** Higher prevalence of hypertension has been found among males from adolescence till 45 years of age. But after the age of 45, mean blood pressure values are higher in women.
- **Obesity:** Obesity is an independent risk factor for CVD and hypertension. The severity of hypertension increases with increasing Body Mass Index also known as BMI (BMI = Weight in Kg / Height in m^2). The risk of hypertension in individuals with abdominal obesity is higher than those with normal waist circumference.

Fig 11.2 Central obesity increases the risk of hypertension

- **Physical activity:** A person who is physically inactive is prone to hypertension. Regular physical activity lowers blood pressure and improves cardiovascular health. It also helps in maintaining a healthy body weight which is an important way to control blood pressure.
- **Stress:** Chronic emotional and mental stress leads to high blood pressure.

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- **Diabetes:** Diabetes makes arteries less elastic, which may increase the workload for the heart. Therefore, diabetics develop hypertension because of the effect of diabetes on the blood vessels.
- **Alcohol:** Excess alcohol intake could cause a rise in blood pressure and also increase the risk of stroke.
- **Dietary Factors :**

1. Increased intake of energy has been associated with an increase in blood pressure.
2. Higher intakes of cholesterol and saturated fat are associated with elevated blood pressure levels.
3. A high-fibre diet that includes a liberal intake of greens and vegetables causes a significant reduction in blood pressure levels of hypertensive individuals.
4. High intake of sodium is directly linked with hypertension.
5. Dietary calcium and magnesium intake have been related to lower blood pressure.
6. Caffeine present in coffee can produce a short term significant increase in blood pressure.

Salt is sodium chloride. Sodium makes up 40% of sodium chloride. One gram of salt contains 400 milligrams sodium. Now we can calculate the sodium content in varying quantities of salt

Salt in grams	Spoon Measurement	Sodium in milligrams
1	A pinch of salt	400
1.25	¼ tsp salt	500
2.5	½ tsp salt	1000
5	1 tsp salt	2000
10	2 tsp salt	4000

11.3 Symptoms and complications of hypertension

Common symptoms observed in hypertension are the following:

- Headache
- Dizziness
- Impaired vision
- Irregular heart beat
- Fatigue
- Failing memory
- Confusion
- Shortness of breath
- Gastrointestinal disturbances
- Anxiety
- Bleeding from nose
- Excess sweating
- Tinnitus or ringing in the ears

The extent of symptoms depends on the elevation of the blood pressure and the duration of time it has been present. Untreated high blood pressure can lead to heart attack, stroke, heart failure, kidney damage, fluid build-up in the lungs and memory loss.

11.4 Sodium intake and hypertension

A high intake of table salt is considered to be a causative factor for hypertension. **Salt is sodium chloride** where sodium makes up 40 percent of the sodium chloride. Both sodium and chloride are essential for maintaining fluid and electrolyte balance and thus blood pressure. This balance gets disturbed when the salt intake is excessive leading to fluid collection in tissues of the body especially that of the feet and hands. This condition is called **"oedema".** A sodium-restricted diet is recommended to alleviate this condition. When the sodium content in the diet is reduced, the water and salts in the tissues flow back into the blood to be excreted by the kidneys. Thereby, oedema is relieved.

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Besides table salt, other sources of sodium include **sodium bicarbonate** in baking powder and baking soda, **sodium benzoate** (preservative added to sauces), **sodium citrate** (flavour enhancer), **monosodium glutamate** (MSG - additive used in Chinese cuisine), **sodium alginate** (texture enhancer in ice creams), **sodium propionate** (used in processed cheese, bread etc to inhibit growth of mold) and **sodium sulphite** (added to prevent discolouration of dried fruits).

Fig 11.3 Oedema of the feet

11.5 Sodium restricted diet

A sodium-restricted diet is a regular diet in which the amount of sodium is limited. Such a diet is used to reduce oedema and hypertension. Most individuals obtain far too much sodium from their diets. The main source of sodium is table salt. The American Heart Association (2017) recommends no more than 2,300 milligrams (mg) of sodium a day and an ideal limit of less than 1,500 mg per day especially for those with high blood pressure.

Diets that are very low in sodium must be used with caution since it may deplete the body's sodium content to dangerously low levels. Symptoms associated with low blood sodium levels **(Hyponatremia)** include weakness, cramps, lethargy, lack of appetite, nausea, irritability, restlessness, headache and confusion.

Foods that are limited or avoided in a sodium restricted diet include processed meat, processed cheese, canned food, pickles, papads, salty snacks, salted butter, soups, pizzas, sauces, salad dressings, spreads etc. Sodium content of some foods per 100 grams is given in table 11.1.

The DASH (Dietary Approaches to Stop Hypertension) diet plan is used to reduce high blood pressure. This eating plan helps to lower blood pressure by emphasizing on the intake of fruits, vegetables, and low-fat milk thus providing a generous supply of potassium, magnesium, calcium, and fibre. It includes more whole grains and less refined grains compared to a typical diet.

11.6 Dietary management and life style modification in hypertension

A critical step in the prevention and management of hypertension is adopting a healthy life style which includes the following:

1. Dietary modification:

The objectives of dietary management for hypertension are

a) To achieve a gradual weight loss in overweight and obese individuals

b) To reduce the sodium intake

c) To maintain adequate nutrition

- **Energy:** Hypertension is often controlled with weight loss in obese individuals. Therefore, energy intake should be adjusted in such a manner so as to bring about weight loss until ideal body weight is attained.
- **Protein:** Plant sources of protein such as legumes and pulses are also rich in fibre and low in sodium. Therefore, these should be included in the diet. Animal

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Table 11.1 : Sodium content of foods per 100 grams

<25 mg Low	25–50 mg Moderate	50–100 mg Moderately High	>100 mg High
Amla	Raisins	Cauliflower	Amaranth
Bitter gourd	Broad beans	Field beans	Bacon
Bottle gourd	Carrots	Fenugreek	Egg
Brinjal	Reddish (white)	Lettuce	Lobster
Cabbage	Black gram dal	Beetroot	
Lady's finger	Green gram dal	Water melon	
Colocasia	Red gram dal	Bengal gram dal	
Cucumber	Lentil	Red gram tender	
French beans	whole Bengal gram	Liver	
Peas	whole Banana	Prawns	
Onion	Pineapple	Beef	
Potato	Apple	Chicken	
Tomato	Mutton		
Yam			
Cow pea			
Horse gram			
Ragi			
Vermicelli			
Semolina			
Wheat			
Maida			
Milk			
Grapes			
Sweetlime			
Papaya			
Orange			
Sapota			

Source: Indian guidelines on hypertension-III – 2013. JAPI. 2013 Feb;61(2) suppl:16–19

sources of protein are high in saturated fat and therefore should be included in limited quantities.

- **Carbohydrate:** Simple Carbohydrates like sugar should be avoided. Complex carbohydrate from whole grains, pulses,

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vegetable and fruits should be included. As such, carbohydrate should account for 60-65 percent of the energy.

- **Fats:** Fats should not provide more than 20 percent of the energy in the diet. Increased dietary intake of cholesterol and saturated fat has been linked with hypertension. Intake of polyunsaturated fatty acids has been shown to positively affect hypertension.
- **Sodium:** A decrease in sodium intake is associated with a decrease in blood pressure. Dietary sodium restriction is strongly recommended for the prevention and treatment of hypertension.
- **Potassium and Calcium:** Potassium along with sodium regulates the body's water balance. An adequate amount of potassium is an essential part of hypertension treatment. It can be achieved by including sufficient amount of food rich in potassium such as milk, fruits and vegetables. Studies have suggested that an optimum intake of calcium has a beneficial effect in hypertension; hence, calcium rich food like low fat milk and leafy vegetables should be included in the diet.

2. Weight management:

Obesity is clearly associated with the risk of hypertension. A 10 percent weight loss can reduce blood pressure by 7/5 mm Hg. Moreover, weight loss improves the blood lipid profile further reducing CVD risk.

3. Smoking and alcohol consumption:

Smoking cessation is the most important lifestyle modification that is required for reducing CVD risk. Excessive consumption of alcohol (binge drinking) can lead to a significant rise in blood pressure.

4. Exercise:

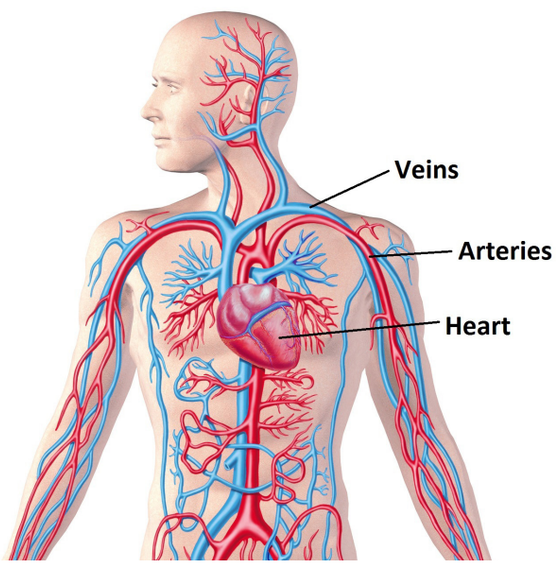
Regular aerobic exercise has been shown to decrease blood pressure. Active exercises such as walking, cycling and swimming for 45-60 minutes, three to four times a week has a positive impact on blood pressure.

Natural Salt substitutes

Herbs and spices can be used as flavour enhancers in place of salt. Thus these natural salt substitutes may help in reducing salt intake. Some examples are basil, coriander, paprika, mint, rosemary, parsley, chives, cinnamon, oregano, nutmeg and turmeric.

11.7 CARDIOVASCULAR DISEASE

The heart is a hollow, muscular, four chambered organ, located in the centre of the chest that pumps blood to every part of the body. Blood vessels such as arteries and veins are tubular structures that carry blood to and from the heart. Therefore, the heart pumps blood through a network of arteries and veins which together comprise the cardiovascular system.



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The four major functions of the cardiovascular system are:

- Transportation of nutrients and gases to every cell and waste products to the lungs and kidneys for elimination.
- Protection of the body from infection and blood loss
- Regulation of body temperature
- Maintenance of fluid and electrolyte balance

Cardiovascular disease (CVD) is a term that is used to refer to a group of disorders of the heart and blood vessels. The most common cardiovascular diseases include atherosclerosis, coronary heart disease (CHD), arrhythmia (irregular heart beat), heart failure, hypertension, and congenital heart disease (heart disease at birth).

The most common reason for heart disease is a build-up of fatty deposits on the inner walls of blood vessels which is called **'atherosclerosis'.** The risk of CVD may be increased by smoking, hypertension, elevated blood lipids, an unhealthy diet, lack of exercise, and obesity. **CVD remains the leading cause of death and disability in our society.**

11.8 Pathophysiology of atherosclerosis

Normal blood vessels are flexible and elastic. **'Arteriosclerosis'** is a condition where the arteries harden, making the passage of blood difficult and sometimes impossible. It occurs when the blood vessels that carry oxygen and nutrients from the heart to the rest of the body become thick and stiff. **'Atherosclerosis'** refers to the accumulation of fats, cholesterol and other substances in the inner lining of arteries over time leading to the formation of a **'plaque'.**

As the plaque increases in size, it gradually reduces the size of the lumen of the artery (space within tubular structures, in this case, artery) and consequently the amount of blood flow through it. The reduced blood flow causes an inadequate supply of nutrients and oxygen to the tissues. This condition is called **'ischemia'.** The reduced oxygen supply causes pain. If the pain occurs in the chest and radiates down the left arm, it is called **'angina pectoris'**.

When the lumen of the coronary artery which is the blood vessel that nourishes the heart muscles become too narrow, it cuts off the blood flow to the heart muscle (myocardium) depriving it of oxygen. This is termed as a **'heart attack or myocardial infarction'.** When blood flow to the brain is blocked in this way, it results in a **'stroke'.**

Pathophysiology of atherosclerosis

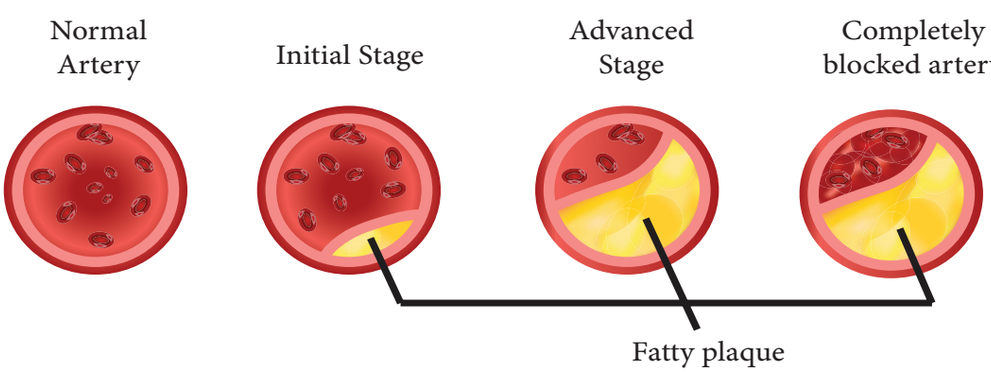

Fig 11.4 Stages of atherosclerosis

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Activity : 1

Match the following

a) Myocardial infarction	-	disruption of blood flow to the brain
b) Plaque	-	chest pain
c) Angina pectoris	-	inadequate blood supply to tissues
d) Ischemia	-	fatty deposits in arteries
e) Stroke	-	heart attack

11.9 Blood lipids

Fatty substances such as cholesterol and triglycerides found in the blood are termed as 'blood lipids'.

- **Cholesterol:** It is a steroid alcohol found exclusively in animals. Our body can synthesize cholesterol in the liver irrespective of whether it is provided in the diet. This is called **"endogenous cholesterol".** A cholesterol level of less than 200mg/dl of blood is desirable (National Cholesterol Education Program (NCEP), 2002).
- **Triglycerides (TG):** Triglycerides are made up of glycerol and fatty acids. They are the main constituents of natural fats and oils. TG is the most common type of fat in the body. A TG level of less than 150 mg/dl of blood is considered desirable (NCEP), 2002). For improved metabolic health and protection to the heart and blood vessels in individuals with increased risk of CVD, the American Heart Association now recommends an optimum fasting TG level of 100 mg/dL (AHA, 2011). AHA also recommends that this may be achieved with diet, weight loss, and increased physical activity.
- **Phospholipids:** It is a lipid containing a phosphate group in its structure. They are an important component of all cell membranes.

11.10 Blood lipoproteins

Lipids, such as cholesterol and triglyceride are insoluble in plasma which is the liquid component of blood. Therefore they bind with circulating lipoproteins that transport lipids to various tissues. Lipoproteins in blood are the mode of transport for cholesterol through the bloodstream and lymphatic fluid. Lipoproteins consist of cholesterol, triglycerides, phospholipids, and protein.

There are five major lipoproteins in the blood

1. **Chylomicrons:** They are the largest and the least dense lipoproteins. They transport triglycerides from the intestine to the cells of the body.
2. **Very low-density lipoprotein (VLDL):** They are responsible for transporting lipids from the liver to the cells of the body.
3. **Intermediate-density lipoprotein (IDL):** This is formed during the conversion of VLDL to LDL.
4. **Low-density lipoprotein (LDL):** These are formed from VLDLs and carry cholesterol from the liver to different cells. They are termed as **'bad cholesterol'** since they aid in the fatty build up within arteries (atherosclerosis) blocking the free flow of blood. High levels of LDL is associated with an increased risk of CVD. LDL cholesterol level below 100 mg/dl of blood is considered ideal. When the level increases beyond this, it increases the risk of heart disease (NCEP, 2002).
5. **High-density lipoprotein (HDL:** They are involved in **"reverse cholesterol transport"** where HDL carries LDL (bad cholesterol) from the arteries to the liver, where it is broken down and eliminated from the body. Therefore,

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HDL is also called **'good cholesterol'**, because it prevents atherosclerosis. High HDL levels are associated with lowered risk of CVD. HDL level below 40 mg/dl of blood is considered to be a major risk factor for developing heart disease whereas HDL levels of 60 mg/dl or more greatly lowers the risk for CVD (NCEP, 2002).

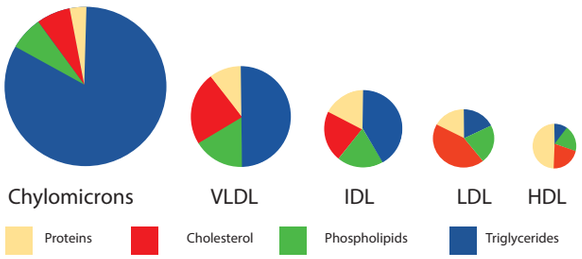

Fig 11.5: Types of lipoproteins

A plaque is a fatty deposit of cholesterol within the arterial wall that accumulates over a period of time. It may grow in size eventually blocking the artery and cutting off the blood supply to the tissue.

11.11 Risk Factors for CVD

Risk factors for CVD may be categorised as Non-modifiable risk factors and Modifiable risk factors :

I) Non-modifiable risk factors for CVD

Non-modifiable risk factors are those that cannot be changed. For CVD, **the most important non-modifiable risk factors are as follows:**

1. **Age:** Advancing age increases the risk of developing heart disease. It occurs mostly in men over 55 years of age and women over 65 years of age. Nowadays, CVD is seen in people in their 30s also.
2. **Gender:** Men are at a higher risk of developing CVD than women until women reach menopause. Post-menopausal women are at a similar risk as men.
3. **Ethnicity:** Risk of CVD changes around the world among ethnic groups. South Asians and African-Americans are at higher risk. Both genetics and lifestyle are likely to play a part.
4. **Family history:** Having a parent or sibling with a history of CVD increases the risk of developing CVD.

II) Modifiable risk factors for CVD

Modifiable risk factors are those which can be changed. By changing attitudes and practices, the risk of developing CVD can be reduced.

The major modifiable risk factors for CVD are:

1. **Hypertension:** Hypertension is the most common risk factor for CVD. If ignored, it can lead to stroke, coronary heart disease, angina, heart attack, and congestive heart failure. A diet high in salt and fat and low in fibre can contribute to the development of hypertension. Smoking, excessive alcohol consumption and a lack of physical activity can result in obesity and hypertension.
2. **Diabetes:** Insulin is required to carry glucose into the cells in order to be utilized for the release of energy. In diabetes, either the body does not produce sufficient insulin or the cells are unable to use it. This results in high circulating levels of blood glucose which may damage small blood vessels, mainly of the eyes, kidneys, and heart. Uncontrolled diabetes coupled with atherosclerosis further raises the risk of CVD.
3. **Elevated blood cholesterol levels:** High levels of LDL cholesterol contribute to plaque formation within the arteries, increasing the risk of heart attack. HDL cholesterol reduces the risk of CVD as it removes cholesterol from the arteries and takes it to the liver. High levels of HDL and low levels of LDL cholesterol lower risk of

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CVD. High levels of triglyceride combined with high levels of LDL cholesterol speed up atherosclerosis.

4. **Body weight:** Obesity results when **energy intake** (i.e. food intake) is more than the **energy output** (i.e. physical activity). Obesity often occurs in combination with elevated blood cholesterol level, hypertension, and diabetes thereby increasing the risk of stroke, heart attack and heart failure. Increasing physical activity can help to reduce the risk of obesity and associated CVD.

5. **Unbalanced diet:** A regular intake of foods rich in saturated fat, trans fat, and salt, coupled with a low intake of fruits, vegetables, legumes, whole grains and lean protein is unhealthy and can significantly increase the risk of CVD. A balanced diet which contains foods from different food groups in proportions needed by the body is recommended to reduce risk.

6. **Unhealthy fat:** Some sources of unhealthy fat include red meat, bakery products, butter, junk food, fried foods and pre-packaged snack foods. It is advisable to replace such fat with healthier sources such as vegetable and plant - based oils.

7. **Salt intake:** Increased salt consumption results in increased blood pressure, which contributes to the overall CVD risk. Indians have been consuming far more salt as against the 5 gms per day limit recommended by the World Health Organisation (WHO, 2012).

8. **Dietary fibre:** Dietary fibre is available only from plant sources such as fruits, vegetables, beans, pulses and whole grains. Greater dietary fibre intake is associated with a lower risk of CVD. Research shows that soluble fibre reduces LDL cholesterol levels.

9. **Physical activity:** Being physically active helps in maintaining blood pressure, blood glucose and blood lipid levels within normal limits and thereby reduces the risk of obesity and CVD.

10. **Smoking:** Smoking is extremely harmful to the heart and lungs, and it is the main contributing factor for atherosclerosis and cancer. Passive smoking is also responsible for CVD, and therefore those who smoke are also putting people around them at an increased risk of developing CVD.

11. **Stress :** Stress may lead to an increase in blood pressure and blood lipid levels which may, in turn, increase the risk for CVD. Some individuals try to cope with stress in wrong ways like smoking, consuming alcohol and indulging in comfort eating like consuming high sugar, high fat foods which may result in obesity further increasing their risk for CVD. Positive stress coping strategies that could be adopted include regular physical activity, pursuing a hobby, travelling, yoga and ofcourse taking a balanced diet.

11.12 Diet in CVD

A heart healthy diet ensures a calorie balanced diet that is low in cholesterol, saturated fat, sugar, salt and sodium with an adequate supply of omega 3 fatty acids, complex carbohydrate, protein and dietary fibre.

Carbohydrate

Complex carbohydrate from whole grains, fruits and vegetables are recommended. Excess consumption of refined carbohydrates like maida and simple sugars coupled with overweight and obesity can lead to elevated LDL and triglyceride levels and lower HDL levels.

Dietary fibre

Increased consumption of insoluble as well as soluble dietary fibre reduces the risk of developing CVD by lowering serum LDL cholesterol levels. Besides this, dietary fibre binds with bile acids and makes them unavailable for fat digestion.

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Fat

Fats can be of three types: Good, bad and dangerous fats. The health implications of these fats, food sources and recommendations are discussed in table 11.2.

Table 11.2: Food sources and health implications of different fats.

Type of fat	Health implications	Food sources	Recommendation
Good fats Monounsaturated fatty acids (MUFA) and polyunsaturated fatty acids (PUFA) are termed good fats because of their numerous health benefits. Omega-3 and omega-6 are the two main classes of polyunsaturated fatty acids.	• Provide essential fats that our body needs • Lowers bad cholesterol level • By keeping the heart healthy, they lower risk of heart disease and stroke	• Plant-based oils, avocado, olive, peanut, safflower and sesame seeds. • Fatty fish (such as tuna, herring, lake trout, mackerel, salmon and sardines) • Nuts and seeds (such as flaxseed, sunflower seeds, walnuts and almonds).	• Include good fats but in moderate amounts since excessive intake of even good fats may lead to obesity.
Bad fats This includes fat from animal origin like meat fat and dairy products which are primarily saturated fats.	Increases the risk of heart disease and stroke by raising bad cholesterol level and lowering good cholesterol level.	Most saturated fats come from animal sources. Eg., Beef, pork, lard and chicken fat, whole milk, cheese, ice cream, butter and ghee. Plant sources of saturated fat include coconut oil and palm kernel oil.	Limit intake of saturated fats
Dangerous fats Trans fat is the most dangerous fat that is prepared by a process known as "hydrogenation" where hydrogen is added to liquid vegetable oil to make it more solid at room temperature	• Raises bad cholesterol level • Lowers good cholesterol level • Increases risk of heart disease, stroke and type 2 diabetes	• Processed snack foods made with hydrogenated oils, baked food, fried food, and margarine.	Avoid intake of foods that contain trans-fat.

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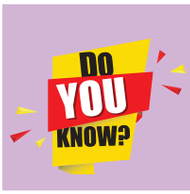

Statins are a group of drugs that help in reducing blood cholesterol levels

Protein

Adequate protein intake from lean meat, egg white, pulses, small oily fish rich in omega 3 fatty acids, low - fat milk, nuts and whole grains should be provided. Legumes, beans, peas, and lentils are good sources of plant protein that contain less fat, making them good substitutes for meat. Substituting plant protein for animal protein will reduce cholesterol intake and increase fibre intake.

Vitamins and minerals

Vitamins and minerals play an important role in maintaining good health. In CVD, sodium intake should be restricted by restricting salt intake. Low - fat dairy can be included in the diet to ensure adequate calcium intake. Inclusion of foods rich in B vitamins such as folic acid, B6 and B12 reduces risk for CVD.

11.13 Cardio protective effect of functional foods

The National Academy of Sciences (1994) defines functional foods as "any food or food ingredient that may provide a health benefit beyond the traditional nutrients it contains".

The most common functional foods that have a cardio-protective effect include omega-3 fatty acids in fish and nuts, dietary fibre, and phytochemicals present in vegetables particularly soy. Some of the functional foods, their potential mechanism of action and the bioactive compounds responsible for it are tabulated in table 11.3.

Table 11.3 : Possible cardio-protective effects of functional foods

Functional foods	Bioactive compound	Potential mechanism
Nuts (walnuts, almond)	Tocopherols, omega-3 fatty Acids	Lowers blood cholesterol
Legumes	Fibre and polyphenols	
Garlic	Allicin	
Whole grains	Fibre and phytochemicals	
Dark chocolate	Flavonoid	
Small oily fish	Omega-3 fatty acids	• Lowers blood cholesterol • Inhibits of LDL-C oxidation • Lowers blood triglycerides
Citrus fruits and vegetables	Vitamin C	• Inhibits of LDL-C oxidation • Antioxidant action • Lowers blood pressure
Green tea and black tea	Polyphenols	
Tomato	Lycopene	
Soy proteins	Genistein and Daidzein	• Lowers blood cholesterol • Inhibits of LDL-C oxidation • Antioxidant action

Source: Eman M. Alissa and Gordon A. Ferns (2012), Functional Foods and Nutraceuticals in the Primary Prevention of Cardiovascular Diseases, Journal of Nutrition and Metabolism, pg 4,5.

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Activity : 2

State whether true or false

Question	True	False
As a person gets older, their risk for CVD decreases		
When energy intake is more than the energy expended, it results in obesity		
Smoking is a risk factor for hypertension		
Blood pressure above 140/90 mmHg is stage 2 hypertension		
Cholesterol can be synthesized by the body		
A healthy diet contains lots of fatty food.		
Low level of HDL is associated with atherosclerosis and CVD.		

11.14 Recommendations to reduce risk of CVD

Here are a few recommendations to reduce risk of CVD:

- Maintain a healthy body weight by balancing energy intake and physical activity.
- Consume a variety of whole fruits and vegetables to ensure adequate fibre, mineral and vitamin intake.
- Include whole grains as they provide complex carbohydrates, vitamins, minerals and fibre that have been associated with reduced risk of CVD.
- Limit intake of saturated fat to < 7 % of calories. A reduction in cholesterol intake to much lower levels (<200 mg/day) is advised for individuals with elevated LDL cholesterol levels, diabetes, and/or cardiovascular disease (AACE, 2017).
- Oily fish like tuna, mackerel, lake trout, herring, and sardines are rich in omega-3 fatty acids and can be included in the diet atleast 2 times a week.
- Limit intake of salt (sodium chloride) to 5g / day. This will ensure maintaining a normal blood pressure (WHO, 2012).
- Include low - fat dairy products and lean animal protein in the diet.
- Avoid intake of alcohol, beverages and foods with added sugars and fats especially trans fat.
- Achieve and maintain a healthy lipid and lipoprotein profile

Case Study

Mr. X is a 48 year old bank official whose height is 160 cm and weight is 98 kg. His occupation keeps him mostly sedentary which has resulted in central obesity. He was recently diagnosed with elevated triglyceride and cholesterol levels and high blood pressure. What dietary advice would you give him to get his blood lipids and blood pressure back to normal? What other advice would you suggest to reduce weight?

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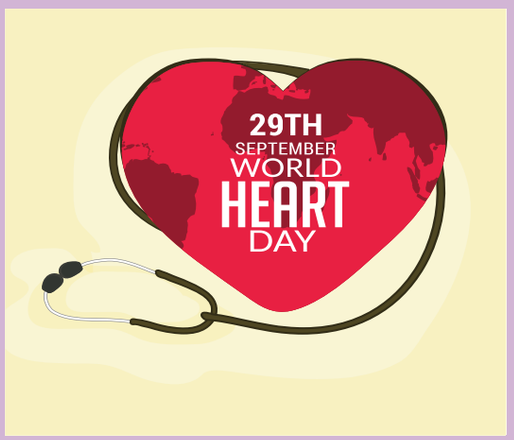
SUMMARY

- Hypertension (high blood pressure) is a major risk factor for CVD. Hypertension is usually asymptomatic until complications develop.
- Excessive bodyweight, lack of physical activity, excessive consumption of alcohol and sodium, and a low intake of potassium are factors that increase the risk of hypertension.
- Prolonged hypertension damages the cardiovascular system, brain, and kidneys, increasing risk of myocardial infarction, stroke, and renal failure.
- Treatment involves lifestyle changes together with dietary intervention.
- CVD is the major cause of death worldwide. It is a disease that affects the blood vessels.
- Primary prevention can be achieved by targeting cardiovascular risk factors such as hyperlipidaemia, hypertension, and diabetes mellitus.
- Weight control, healthy diet and physical activity are the three focus areas in the prevention and management of CVD.



A-Z GLOSSARY

Atherosclerosis	A disease of the arteries characterized by the deposition of fatty material on their inner walls
Hypertension	Abnormally high blood pressure.
Plaque	Plaque is made up of fat, cholesterol, calcium, and other substances found in the blood. This builds up inside the arteries.
LDL	Bad cholesterol. Transports cholesterol to the tissues. Leads to atherosclerosis.
HDL	Good Cholesterol. Carries cholesterol from other parts of the body back to the liver. Prevents atherosclerosis.
Essential hypertension	Essential hypertension (also called primary hypertension or idiopathic hypertension) is the form of hypertension that has no identifiable cause

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Evaluation

I. Choose the correct answer (1 mark)

1. Fatty deposits within the arteries are called _____

   a) plaque b)scales

   c) adipose tissue d) callus tissue

2. _____ is an example for trans fat

   a) butter b) ghee

   c) margarine d) sunflower oil

3. _____ is known as good cholesterol.

   a) HDL b) LDL

   c) VLDL d) chylomicron

4. Elevated blood pressure is called _____

   a) hyperglycemia b) hypertension

   c) hyponatremia d) hypervolemia

5. Intake of _____ is restricted when the blood pressure is above normal.

   a) iron b) thiamine

   c) carbohydrate d) sodium

6. _____ intake reduces blood cholesterol levels.

   a) dietary fibre b) simple carbohydrate

   c) starch d) animal protein

7. Retention of water in the tissues of the body is termed as_____

   a) oedema b) inflammation

   c) hyperemesis d) hypertension

II. Write short answers (2 marks)

1. Define atherosclerosis
2. What are lipids?
3. What is cholesterol?
4. What are lipoproteins?
5. Define myocardial infarction
6. Give two examples each for saturated and poly unsaturated fat
7. List two foods other than salt which contain high levels of sodium

III. Answer in brief (3 marks)

1. Define hypertension
2. Give the classification for hypertension
3. Why is sodium restricted in hypertension?
4. Define cardiovascular disease
5. List the different lipoproteins

IV. Answer in detail (5 marks)

1. Briefly write about the types of hypertension
2. Spell out the risk factors for hypertension
3. What are the dietary and life style modifications to be adopted in the prevention and management of hypertension?
4. Give the pathophysiology of atherosclerosis
5. Explain the risk factors for CVD
6. Write about good and bad cholesterol
7. Discuss the role of functional food in reducing the risk for CVD
8. Explain the dietary management in CVD

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ICT CORNER

Open Heart Surgery

Come.. Let us operate the heart.

Steps:

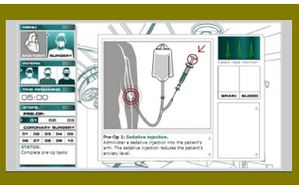
Step 1: Use the **URL** or scan the **QR Code** to launch the activity page. Click **"Enter"** to go into the activity.

Step 2: Click the anatomy (Left side of the window) to know the parts of the heart.

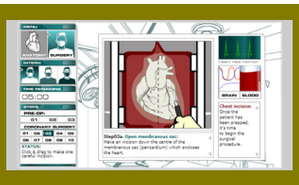
Step 3: Go to the surgery, Select the grade level (Intern/Surgeon./Expert) and go to the Pre –Op Stages.

Step 4: Go to the coronary Surgery and complete the virtual surgery.

Step 1



Step 2



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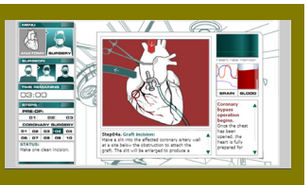

Step 4

DOWNLOADING

To go inside the app directly you can either use **QR code** or the **given link**

https://www.abc.net.au/science/lcs/heart.htm

*Pictures are indicative only

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NUTRITION IN CANCER

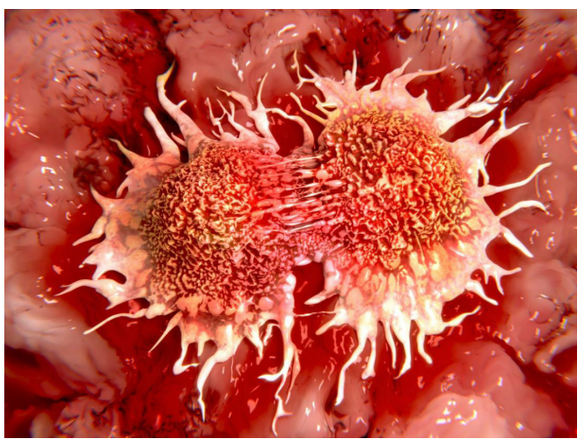
Unit 12

OBJECTIVES

This chapter will enable students to

- Know what cancer is
- Know the causes, symptoms and major types of cancer
- Learn treatment procedures
- Understand role of specific nutrients in the prevention of cancer
- Understand nutritional intervention in cancer

AQMHF



Cancer is an uncontrolled division of abnormal cells in the body which may invade other normal and healthy tissues. Cancer is also referred to as a **"malignant tumor."** It can affect any part of the body, and originates from a single cell that transforms into a cancer cell through interactions between DNA/genes and external agents. Presently in India, it is a major cause of morbidity and mortality.

12.1 What is cancer?

The process of origin and development of cancer is termed as **"carcinogenesis."** It is a multistage process that consists of three phases: **Initiation, promotion** and **tumor progression.**

Fig 12.1 Process of carcinogenesis

Initiation:

Initiation involves a genetic change in the normal cells caused by their interactions with chemicals, radiation or viruses. These substances are termed as **carcinogens**. A carcinogen may be any substance that has the ability to initiate cancer. Carcinogens enter the body through inhalation (e.g., of cigarette smoke), ingestion of heavy metals and pesticides, and by the absorption of chemicals through skin. Initiation occurs rapidly but the initiated cells remain inactive until it is activated by a promoting agent.

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Promotion:

In the promotion phase, the initiated cells multiply and a new abnormal tissue with no useful function is formed. This is called **"neoplasm".** Promotion takes place by a continuous exposure of the initiated cells to promoting agents.

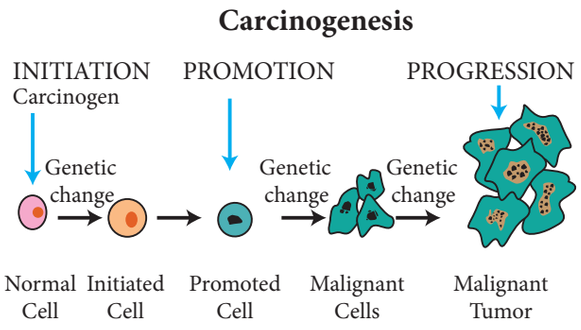

Fig 12.2 Genetic mutation of a normal cell to a cancer cell

Progression:

During the progression phase, the abnormal tissue grows and leads to the development of a fully malignant tumor. This tumor has the capacity to invade normal tissues which may ultimately lead to the spread of cancer to other parts of the body. This is called as **"metastasis."** A Cancer that has spread to other parts of the body is said to have "metastasized".

A tumor is an abnormal growth of cells that serves no purpose.

There are two types of tumors : Malignant and benign tumors

A benign tumor is a non-cancerous tumor that does not spread to other parts of the body. A malignant tumor is a cancerous tumor that may spread to other parts of the body

12.2 Classification of cancer

Cancers are of four main types based on the type of cell that produces it. They are carcinoma, sarcoma, lymphoma, and leukemia.

1. **Carcinoma** is cancer of the epithelial cells that line the digestive tract, urinary bladder and the uterus.
2. **Sarcoma** is cancer of the soft tissues of the body, such as muscle, fat, nerves, tendons, blood and lymph vessels.
3. **Lymphoma** is cancer of the lymphoid tissue. This includes the lymph nodes, bone marrow, spleen, and thymus gland.
4. **Leukemia** develops from the white blood cells and also affects the bone marrow and spleen.

The most common cancers in men are that of the lung, colon, pancreas, liver and prostrate gland. In women, cancer of the breast, ovary, cervix, uterus and colon are common. Besides this, cancer can occur in any part of the body like the thyroid gland, stomach, oral cavity, esophagus, skin, brain etc.

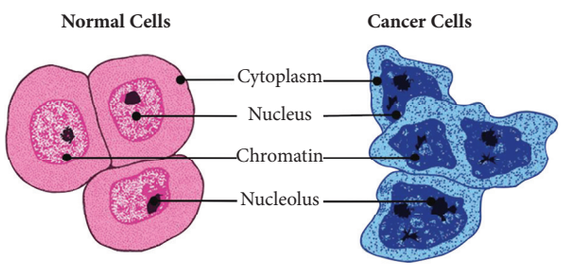

Fig 12.3 Comparison between a normal cell and a cancer cell

Carcinogenesis is the process in which normal cells turn into cancer cells.

Alterations (mutations) in DNA/ genes occur during carcinogenesis. A carcinogen is a physical, chemical or viral agent that induces cancer by bringing about changes in the DNA.

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12.3 Causes of cancer

Some of the causes of cancer are:

1. Exposure to toxic compounds such as benzene, asbestos, nickel, cadmium, vinyl chloride, benzidine and N-nitrosamines.
2. Exposure to radiations from x-rays, radioactive materials and atomic exhausts.
3. Exposure to cigarette smoke, pesticide residues, water and air pollutants, synthetic food additives and contaminants.
4. Non-ionizing radiation from sunlight may damage the DNA of cells leading to cancer.
5. Tumor-producing viruses are called oncogenic viruses. Some of the viruses associated with human cancers are Human papillomavirus (HPV), EBV or Epstein-Barr virus, hepatitis viruses and Kaposi's sarcoma-associated herpes virus (KSHV).
6. Salted, smoked and processed meats contain nitrites and their related compounds which get converted to carcinogenic N-nitroso compounds in the colon.
7. Fat that drips from meat while being barbecued / grilled creates smoke that contains carcinogenic chemicals called **polycyclic aromatic hydrocarbons** which surrounds the meat. Another group of carcinogenic chemicals known as **hetero cyclic amines** are found in meat that has been fried or grilled for long periods of time.
8. Aflatoxins are toxins that are produced by certain fungi that grow on groundnuts. Ingestion of foods contaminated with aflatoxin is associated with cancer risk.
9. High-fat diets have been associated with cancer of the prostate gland, colon, breast, and uterus. By promoting obesity, a high sugar intake may indirectly increase cancer risk.
10. Individuals with reduced physical activity may be at an increased risk of developing cancer.

12.4 Symptoms of cancer

The American Cancer Society (2014) describes seven warning signs that a cancer may be present. They are:

- Changes in bowel or bladder habits
- A sore throat that does not heal
- Unusual bleeding or discharge
- Thickening or lump in the breast, testicles, or elsewhere
- Chronic indigestion and difficulty swallowing
- Noticeable change in the size, colour, shape, or thickness of a wart or mole
- Persistent cough or hoarseness.

Other signs may include the following:

- Loss of appetite
- Unexplained weight loss
- Persistent fatigue, nausea, or vomiting
- Unexplained low-grade fevers that may be either persistent or temporary

Oncology is a branch of medicine that deals with the prevention, diagnosis, and treatment of cancer. A doctor who specializes in treating cancer is called an **Oncologist**.

12.5 Stages of cancer

Staging describes the extent or spread of cancer at the time of diagnosis. Cancers fall between the stages of 0 to IV.

Stage 0: In this stage, cancers are still located in the place they started and have not spread to the surrounding tissues.

Stage I: It is also called e arly-stage cancer. This stage is usually a small cancer or tumor

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that has not grown deeply into nearby tissues. It has also not spread to the lymph nodes or other parts of the body.

Stage II and Stage III: These 2 stages indicate bigger tumors that have grown more deeply into the nearby tissues. They may have also spread to lymph nodes but not to other parts of the body.

Stage IV: This stage means that the cancer has spread to other parts of the body. It may also be called advanced or metastatic cancer.

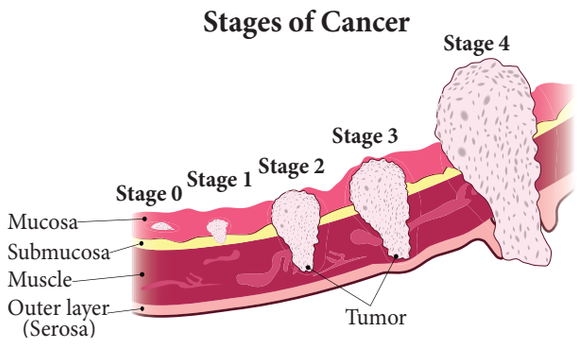

Fig 12.4 Stages of cancer

A classification system known as **TNM** is used to identify the size, the degree of growth and spread of the tumor.

- **T** stands for **"Tumor"** - it shows how large the primary tumor is and where it is located.
- **N** stands for **"Node"** - it shows whether the tumor has spread to the lymph nodes. If so, where and how many?
- **M** stands for **"Metastasis"** – it shows whether the cancer has spread to other parts of the body. If so, where and how much?

12.6 Diagnosis of cancer:

Detecting cancer is a multistage process which includes the following:

Imaging : Cancer detection often involves radiological imaging. Imaging involves creating pictures of areas inside the body that will help medical professionals to detect tumors. It is also used to check the spread of cancer and the progress of treatment. The most common imaging techniques used are

- Computed Tomography (CT)
- Magnetic Resonance Imaging (MRI)
- Positron Emission Tomography (PET)
- Ultra sound examination
- Endoscopic examinations
- Mammography and
- Isotopic diagnostics.

Tumor markers: These are biochemical substances that are produced by tumor cells or by other cells of the body in response to cancer. These substances can be found in the urine, blood, stool, tumor tissue and body fluids of individuals with cancer. They are produced at much higher levels in cancerous conditions. A tumor marker may be used along with other procedures to diagnose cancer. A few examples of tumor markers are **CA-125** (in ovarian cancer), **CA 15-3** (in breast cancer), **CEA** (in colon cancer), and **PSA** (in prostate cancer).

Biopsy test: A confirmatory test for the diagnosis of cancer involves an examination of the suspected tissue under a microscope by a pathologist. This is called a **"biopsy."** A Biopsy is an analysis of tissue removed from a living body to find out the presence, cause, or extent of cancer.

A pathologist is one who interprets and diagnoses the changes caused by disease in tissues and body fluids.

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12.7 Nutritional implications of cancer

There are three major nutrition related problems that are often exhibited in a cancer patient:

1. Anorexia
2. Drastic weight loss
3. Cancer cachexia.

1. Anorexia

Anorexia means "loss of appetite". The anorexia of cancer may be related to depression, the trauma of the disease, as well as to the side effects of treatment. Chronic anorexia observed in cancer leads to "cancer cachexia which is characterised by severe loss of muscle mass and body weight.

2. Drastic weight loss

Weight loss in cancer patients may be attributed to a chronic loss of appetite, persistent fever and changes in taste perception that reduces food intake. Individuals with cancer often lose weight drastically. Cancer cells compete with normal cells in utilizing nutrients and energy reserves of the body to grow. On the other hand, normal cells require energy to fight this abnormal growth. This increase in demand for nutrients and energy by both normal and cancer cells, results in a hypermetabolic state that causes a significant loss of weight. As cancer progresses, the individual becomes weaker and is less able to fight infections.

3. Cancer cachexia

Cancer cachexia is a "wasting syndrome" characterized by extreme loss of the body's muscle and fat mass, anorexia, asthenia (abnormal physical weakness) and anemia (a deficiency of red cells or of haemoglobin in the blood). Tumor cells release substances that reduce appetite. Cancer and its treatment can also cause severe nausea and may damage the digestive system, leading to poor absorption of nutrients. As the body gets fewer nutrients, it burns fat and muscle. Cancer cachexia is the most common indicator of advanced stage of the disease.

Fig 12.5 Wasting syndrome – Cancer cachexia

Consequences of malnutrition in cancer are:

- Severe loss of tissue proteins
- Compromised immune function increasing the individual's susceptibility to infections.
- Poor wound healing
- Abnormal reactions to cancer drugs and treatment

Activity : 1

Match the following

Anorexia	-	wasting syndrome
Chemotherapy	-	spread of cancer to other parts of the body
Cachexia	-	The study of cancer
Oncology	-	treatment procedure for cancer
Metastasis	-	loss of appetite

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12.8 Treatment procedures

Recommended treatment depends on the stage and the actual type of the cancer. Treatment may include surgery, chemotherapy, radiation therapy or a combination of these.

Surgery

Surgery is performed to remove the tumor. If all of it is successfully removed and there are no metastases, surgery may be the only treatment required.

Chemotherapy

Chemotherapy involves the use of chemical substances to kill cancer cells. Chemotherapy may be administered intravenously. These drugs stop the cancer cells from multiplying.

Fig 12.6 Administration of chemotherapy

Some of the effects of chemotherapy include hair loss, reproductive changes, diarrhoea, malabsorption, nausea, vomiting and loss of sense of taste.

Radiation therapy

Fig 12.7 Administration of radiation therapy

The person receives specific doses of radiation at the cancerous areas of the body for a period of time. The aim of this treatment is to ensure that tumor cells do not grow again. It does not affect the entire body, as chemotherapy does. Healthy cells grow back after the treatment.

Activity : 2

Cancer Awareness Ribbons

Looped ribbons of different colours are used to create awareness on different types of cancers. Can you match the colours with the type of cancers they represent?

Pink loop	-	lung cancer
White loop	–	breast cancer
Yellow loop	–	cervical cancer
Teal loop	–	bone cancer
White and Teal loop	–	ovarian cancer

12.9 Nutrition related side effects of treatment

Some of the side effects of treatment procedures adopted in cancer that may hinder food intake are discussed as follows:

1. **Anorexia:** It is a common problem which may be minimized with a schedule of small meals and snacks.

2. **Fatty diarrhoea:** Radiation therapy may damage the cells of the small intestine leading to "fatty diarrhoea" also known as "steatorrhea" or "radiation enteritis" Dietary treatment involves limiting the intake of

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fat, fiber, gas producing and spicy foods. Sometimes very hot or very cold foods may irritate the intestines. Foods that are only warm or cool may be better accepted.

3. **Dry and sore mouth:** Patients may suffer from dry and sore mouth and may have problems with chewing and swallowing. Soft, bland and pureed foods are better tolerated. Frequent liquid intake is recommended. Using a straw instead of a spoon makes swallowing easier.

4. **Nausea and vomiting:** It may occur in any type of treatment. Eating dry foods such as crackers, toast, rice or other grain products, drinking beverage separate from meals, and serving foods cool instead of steaming hot are recommended.

12.10 Nutritional care in cancer

A well balanced nutritious diet is essential in order to maintain a healthy body weight and also to cope with the side effects of treatment procedures.

1. **Energy, carbohydrate, protein and fat:** The nutrient and calorie needs of a cancer patient are greater than they were before the onset of the disease. Tissues must be rebuilt and the nutrients lost to the cancer must be replaced. Therefore additional protein intake is required to rebuild tissues and to maintain a healthy immune system. Energy demands are high in cancer. Carbohydrates and fat will be needed to provide this energy and spare protein for tissue building and immune function. A high-protein and high calorie diet may be recommended during the treatment phase.

2. **Vitamins and minerals:** They are essential for metabolism and tissue maintenance. Vitamin and mineral supplements are provided to enhance immune function.

3. **Fluids:** Adequate fluid intake is required to keep the body hydrated and to maintain electrolyte balance. Fluids are important to help the kidneys eliminate the metabolic wastes and the toxins from drugs.

4. **Neutropenic diet:** A neutropenic diet is given to individuals with weakened immune systems. This diet helps to protect them from bacteria and other harmful organisms found in some food and drinks. In this diet, all raw fruits, vegetables and nuts are avoided. Fruits and vegetables may be consumed in the well-cooked form.

5. If chewing is a problem, a soft diet may be helpful. In case of diarrhoea, a low-residue diet may be recommended. A low residue diet limits the intake of fibre rich foods such as greens, whole grains, nuts and raw fruits and vegetables.

6. Oral feedings are preferred. However in extreme cachexia, enteral (tube feeding) or total parenteral (intravenous) feedings may become necessary.

Case Study

Mrs. R is a 45 year old woman who was diagnosed with stage III breast cancer. She underwent mastectomy (surgical removal of the whole breast). This was followed by chemo and radiation therapies. As an associated effect of the treatment procedures, she has developed mouth ulcers, diarrhoea and anorexia. What kind of dietary modification would you recommend to ensure nutritional adequacy?

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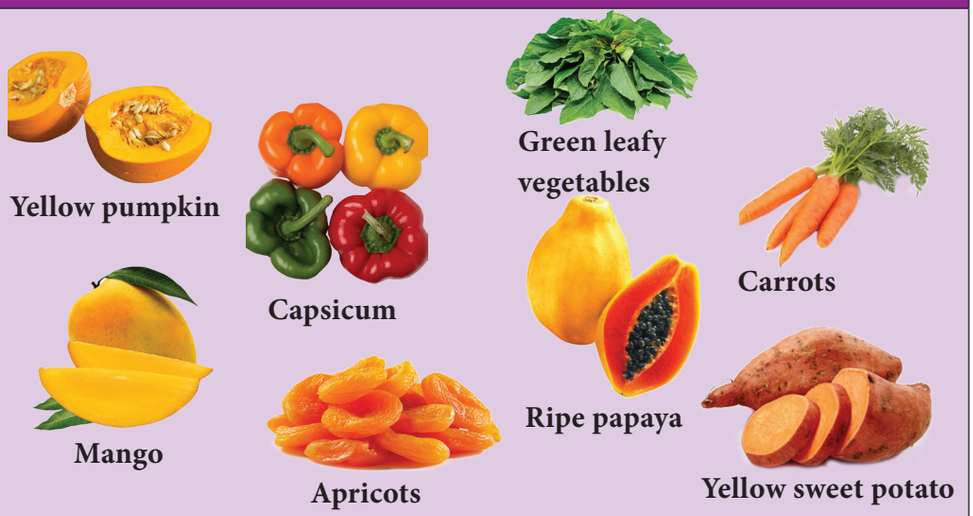
12.11 Role of food in the prevention of cancer

A diet rich in plant - based foods can help lower the risk of cancers. Specific components found in certain plant foods aid in preventing cancer. Here are a few:

1. Antioxidants

A number of free radicals are constantly produced in our body. These free radicals are highly reactive and can damage cellular components such as the cell membrane and DNA. This leads to an increased risk of cancer. Antioxidants play a role in cancer prevention by scavenging these free radicals. Antioxidants are compounds present in fruits and vegetables which help protect tissues from being damaged by the attack of free radicals. Vitamin C, vitamin E, and vitamin A are called antioxidant vitamins. The body cannot synthesize these vitamins and therefore they need to be provided in the diet.

Table 12.1 Foods rich in antioxidant vitamins A, C and E

Vitamin	Food Source
A	
C	

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E	Almonds Avocado Walnuts Spinach Sunflower seeds Wheat germ Groundnuts

2. Phytonutrients

Phytonutrients are natural compounds found in plant-based foods that give plants their rich pigment as well as their distinctive taste and smell. These pigments have several protective compounds that exhibit cancer-fighting and immune-boosting power. This is shown in table 12.2.

Table 12.2 The rainbow of natural pigments in plants

Colour	Protective substance	Foods present
Red	**Lycopene**	**Tomatoes, water melon, guava**
Orange	Carotene	Sweet potato, yellow pumpkin, mango, carrot
Yellow-orange	Flavonoids	Orange, lemon, grapefruit, papaya, peach
Green	**Folate**	**All green leafy vegetables**
Green- white	**Indoles, lutein**	**Broccoli, Brussels sprouts, cauliflower, cabbage**
White-green	Allyl sulphides	Garlic, onion, chive, asparagus
Blue	**Anthocyanins**	**Blue berries, purple grapes, plums, red cabbage**
Red- purple	**Resveratrol**	**Red grapes, cranberries**
Brown	**fibre**	**Whole grains, legumes**

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3. Cruciferous vegetables

The Brassica (Brassicaceae) family includes cruciferous vegetables such as cabbage, broccoli, kale, turnips, cauliflower, and brussels sprouts. These contain flavones and indoles which are thought to have anti-cancer activities.

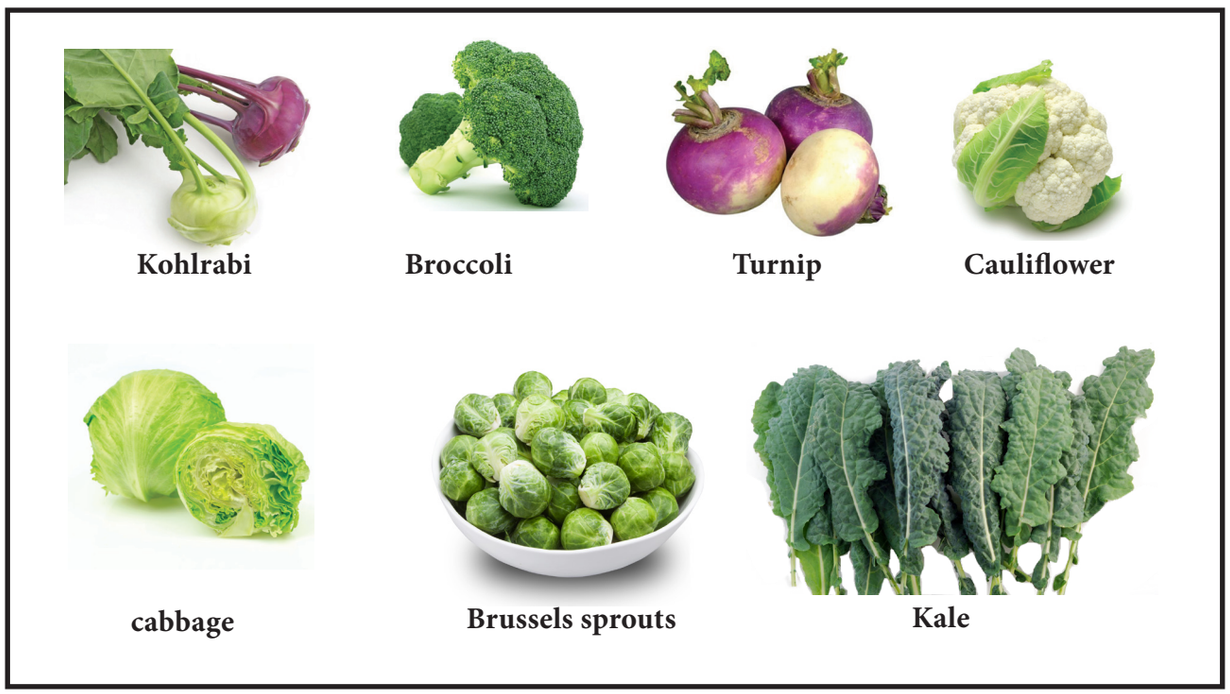

Fig 12.8 Cruciferous vegetables of the Brassica family

Activity : 2

Prepare a rainbow salad rich in antioxidants and phytonutrients by choosing vegetables and fruits of different colours.

4. Fibre intake

Dietary fibre increases stool bulk and speeds the transit of food through the colon, thus reducing the absorption of carcinogens.

Bile acids are secreted into the intestine to help digest fat. There, bacteria act on the bile acids and produce chemicals which may promote colon cancer. Dietary fibre binds with these bile acids and expels them from the intestines.

12.12 General recommendations to prevent cancer

- Reusing cooking oil is very harmful to health. Carcinogenic aldehydes form when the same cooking oil is reused.
- Frying, broiling, or grilling meat at very high temperatures forms chemicals such as polycyclic aromatic hydrocarbons and heterocyclic aromatic amines that are potent carcinogens. Limiting the intake of such foods is recommended to reduce cancer risk.

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Fig 12.9 High temperature grilling of meat produces polycyclic aromatic hydrocarbons

- Fats and oils can become oxidized on exposure to light, air or heat. Many of the oxidation products are carcinogenic. Storing oil in airtight containers prevents the oil from getting oxidized.
- Avoid intake of processed meat.
- Avoid ingestion of foods that look or smell mouldy, as they may contain toxic carcinogens like aflatoxin.
- The inclusion of fresh organic fruits and vegetables containing different natural plant pigments in the daily diet ensures meeting the phytochemical and antioxidant needs.
- Liberal intake of water prevents accumulation of toxic wastes by flushing them out of the body.
- A healthy diet, adequate physical activity and maintaining an ideal body weight reduce cancer risk.
- Excess intake of calories in the form of sugar and fat lead to excess body fat that has been strongly linked to several types of cancers.
- Trans fats are formed when liquid vegetable oils are made solid by the process of called hydrogenation. These fats are commonly used in processed food such as cookies, crackers, snack foods, fried foods, and pastries as they give foods the desirable taste, shape, and texture. Research has shown that regular intake of foods rich in trans-fat increases the risk for cancer.
- Smoking and tobacco chewing are the most preventable factors in the incidence of oral and lung cancer.
- Excessive intake of alcohol may act as an irritant, especially in the mouth and throat. Cells that are damaged by alcohol may undergo alteration in their DNA leading to cancer.
- Avoid exposure to harmful radiation and chemicals that cause cancer.

SUMMARY

- ❖ Cancer is a disease characterized by abnormal cell division. It can occur in any body tissue.
- ❖ Energy and nutrients needs increase during cancer as the tumour and normal cells compete with each other for their supply of nutrients. This hypermetabolic state coupled with a lack of appetite and poor intake of food leads to extreme muscle wasting termed cancer cachexia.
- ❖ Treatment of cancer includes surgery, radiation, and chemotherapy.
- ❖ Improving the patient's nutritional status is a challenge due to the aggressive nature of the illness and anorexia. In such a scenario, resorting to parenteral or enteral nutrition may be necessary.

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GLOSSARY

Carcinogen	Any agent capable of causing cancer
Carcinogenesis	The initiation of cancer formation.
Neoplasm	Abnormal growth of tissue
Metastasis	The development of cancer in other parts of the body, away from its first site of occurrence.
Free radicals	Highly unstable and reactive molecules that can damage tissues of the body.
Antioxidants	A substance that inhibits oxidation and protects the tissues from the damage caused by free radicals
Phytonutrients	Phytochemicals are compounds naturally present in plants that keep plants healthy. They are found to be beneficial to humans as well.

Evaluation

I. Choose the correct answer

1. _____ is an uncontrolled division of abnormal cells in the body which may invade other tissues

   a) cancer b) fibroid

   c) apoptosis d) neoplasm

2. The process of origin and development of cancer is termed as _____

   a) carcinogenesis b) Oogenesis

   c) metastasis d) sarcoma

3. _____ is a carcinogen

   a) turmeric b) vitamin A

   c) vitamin C d) cigarette smoke

4. Radiation therapy may damage the cells of the small intestine leading to "fatty diarrhoea" also known as _____

   a) steatorrhea b) loose motion

   c) constipation d) dysentery

5. _____ scavenge free radicals

   a) electrons b) antioxidants

   c) water d) oil

6. _____ is a plant pigment

   a) carotenoids b) hydrocarbons

   c) amines d) aldehydes

7. _____ is a cruciferous vegetable that helps in preventing cancer

   a) cauliflower b) tomato

   c) potato d) brinjal

8. _____ are formed while reusing cooking oils which is carcinogenic

   a) aldehydes b) ketones

   c) amides d) amines

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II. Write short answer (2 marks)

1. Define neoplasm
2. What is metastasis?
3. What is a malignant tumor?
4. Define the term "cancer cachexia"
5. Define anorexia
6. Differentiate between carcinoma and sarcoma
7. Why should one restrict the intake of barbecued food?

III. Answer in brief (3 marks)

1. List the risks associated with malnutrition in cancer
2. Why does a cancer patient lose weight?
3. Is high calorie high protein liquid supplement useful for improving the nutritional status of cancer patients? Explain
4. What are antioxidants? Give the food sources for the same
5. What is a neutropenic diet?
6. What does consuming a rainbow of fruits and vegetables ensure?

IV. Answer in detail (5 marks)

1. Define cancer and explain the three phases in the development of cancer.
2. Give the classification of cancer based on the type of cell that produces it.
3. Spell out the risk factors for cancer
4. List the symptoms of cancer.
5. Explain the stages of cancer.
6. Elaborate on the techniques used in the diagnosis of cancer.
7. Spell out the nutritional implications of cancer
8. What treatment procedures are adopted in cancer? Explain the nutrition related side effects of the treatment.
9. Discuss what kind of nutritional intervention would be needed during the treatment phase of cancer.
10. Explain the role of antioxidants and phytonutrients in the prevention of cancer

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ICT CORNER

Cancer

Find the causes of Cancer by exploring your internal body.

Steps:

Step 1: Use the **URL** or **scan** the **QR Code** to launch the page. And click **'Let's Go'** to play the game.

Step 2: Scroll the launched page to have an overview of the complete map of the organs. Click the spot where the cursor gets changed as Indicator (Hand Symbol – Use this in other following steps too) to go to the lung region and to observe the changes over there.

Step 3: In the lung region, nullify the smoking and take appropriate medication to understand the process.

Step 4: Repeat the same with the other regions like liver and stomach to know the causes of cancer.

Step 1

Step 2

Step 3

Step 4

DOWNLOADING

To go inside the app directly you can either use **QR code** or the **given link**

http://veevia.com/playgame/cancergame.html

*Pictures are indicative only

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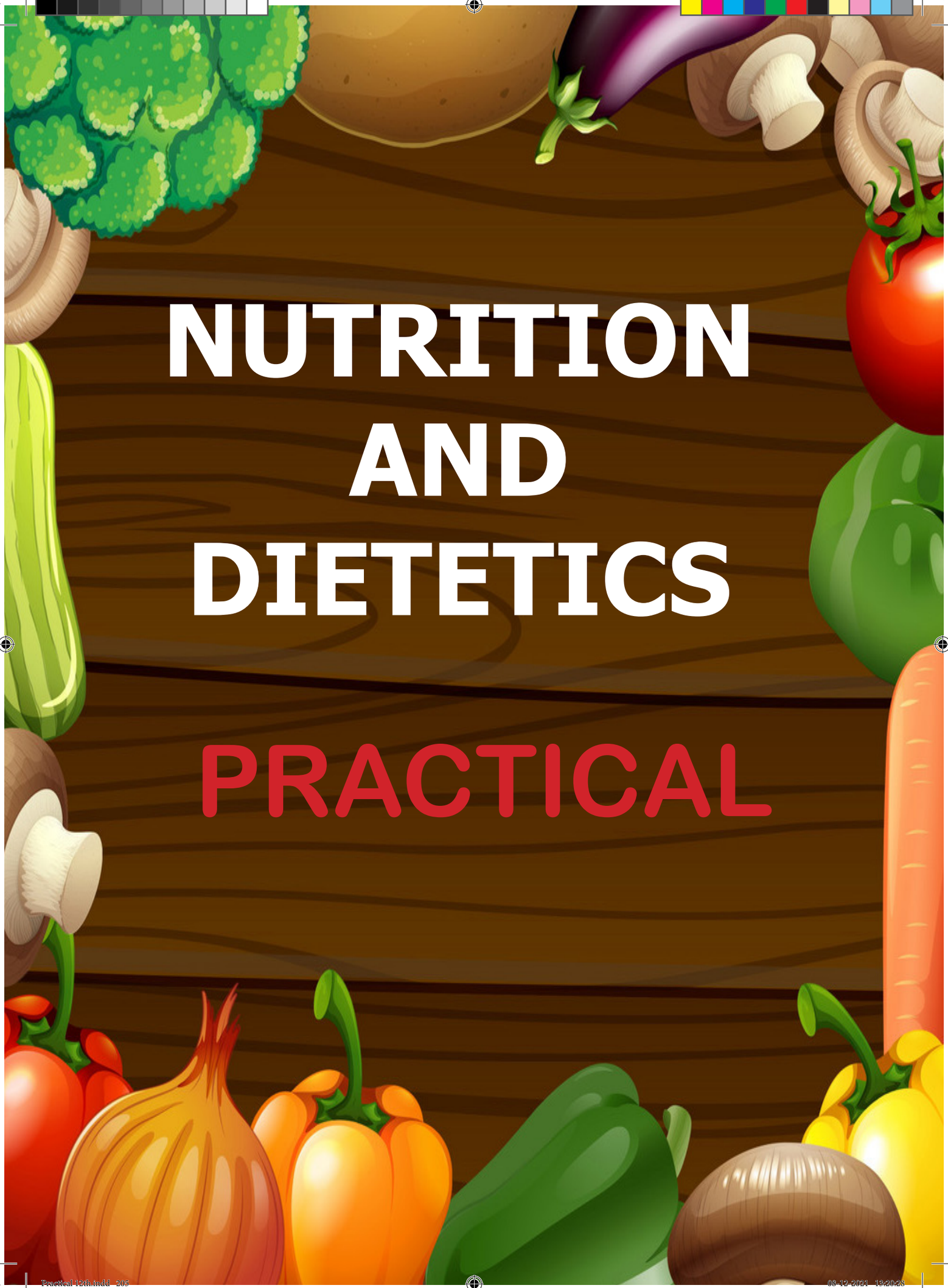

Practical 12th.indd 205 03-12-2021 13:20:23

1 DIET IN PREGNANCY

RDA for a pregnant women doing moderate works:

Energy	-	2230 + 350 kcal
Protein	-	50 + 23 gms
Calcium	-	1200 mg
Iron	-	35 mg
BetaCarotene	-	6400 I.U.

Appropriate food items : Green leafy vegetables, fruits, milk, carrot and liver.

Justification for selection :

Green leafy vegetables	To meet the required fibre, iron and vitamin A.
Fruits	To provide minerals, vitamins and fibre.
Milk	To meet the requirement of protein, calcium and fluids.
Carrot	To provide beta carotene and anti oxidants
Liver	To provide iron and vitamin A

A Day's Menu:

Early Morning	Milk
Breakfast	Idles (4no.), Sambar, Chutney, Carrot.
Midmorning	Mango milk shake / apple milk shake.
Lunch	Vegetable soup, vegetable pulav, cucumber raita, rice, rasam, liver fry.
Evening Tea	Aval uppuma and tea.
Dinner	Vegetable paratha, panner curry, fruit salad.
Bed time	hot milk (1 cup).

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Recipe for Vegetable soup:

Ingredients		Quantity
Carrot	-	25gms
Beans	-	25gms
Tomato	-	10gms
Onion	-	10gms
Peas	-	10gms
Cabbage	-	10gms
Cloves	-	4
Cinnamon	-	a small piece
Garlic	-	required no.
White sauce	-	as needed.
Salt and pepper	-	to taste.
Coriander leaves	-	few.

Discussion:

Appearance	-	Colourful.
Taste	-	Good.
Texture	-	correct consistency vegetables are well cooked.
Flavour	-	Delightful aroma.
Over all acceptability	-	Good.

Conclusion:

A very good starter with rich sources of vitamins, minerals and calories.

Method:

Clean all the vegetables take 10gms of carrot and beans cut into small pieces and boil with peas. Boil the rest separately with garlic, cloves and cinnamon Grind all boiled vegetables except cloves and cinnamon. Strain the content. Add small pieces of boiled carrot, peas and beans to it. Add salt and pepper to taste. Garnish with white sauce and coriander. Serve with toasted bread.

Nutritive value calculation for vegetable soup:

Ingredients	Quality gms	Energy kcal	Protein gms	Calcium mg	Iron mg	B-Carotene mg
Carrots	10	4.8	0.09	8.0	0.1	18.9
Beans	10	15.8	74	5.0	26	3.4
Peas	10	9.3	72	2.0	15	8.3
Cabbage	10	2.7	18	3.9	08	12.0
Total		32.6	1.73	18.9	1.49	212.7

Practical 12th.indd 207 08-12-2021 13:20:29

2 DIET FOR LACTATING MOTHERS (0-6 MONTHS)

RDAfor Lactating women doing moderate works:

Energy	-	2230 + 600kcal
Protein	-	55 + 19gms
Calcium	-	1200mg
Iron	-	21mg
B- Carotene	-	7600 I.U.

Appropriate food items: Badam, garlic, vegetables, fruits, egg.

Justification for selection:

Badam	Energy dense and lactogogue.
Garlic	Lactogogue and helps in digestion
Vegetables and fruits	Good source of fibre and provides essential minerals and vitamins.
Egg	provides good quality Protein.

A Day's Menu:

Early morning	Milk with malt.
Break fast	Pongal with coconut chutney, vadai and tea.
Mid morning	Mixed vegetables soup and rice vadam.
Lunch	White rice, dhal, rasam, curd, vegetable porial, egg Manchurian, Banana.
Evening Tea	Badam Kheer, thattai.
Dinner	Chappathi with fish garlic curry, rice, rasam, vegetable salad and fruits.
Bed time	Milk.

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Recipe for Badam Kheer:

Ingredients		Quantity
Badam	-	50gms
Milk	-	250gms
Sugar	-	100gms
Cardamon	-	2

Method:

Soak badam overnight. Remove the skin and grind it to a paste. Mix it to 100ml milk and cook well. Add the rest of boiled milk, sugar and cardamom to it. Decorate it with chopped cashewnuts, pista, cherry and serve chill.

Discussion

Appearance	-	Yellowish white.
Taste	-	Excellent
Texture	-	Liquid Consistency.
Flavor	-	Good
Acceptability	-	Taste good.

Conclusion :

It is an excellent evening snacks. It provides protein, fats and calories.

Nutritive value calculation for Badam Kheer :

Ingredients	Quantity	Energy	Protein	Calcium	Iron	B-Carotene
Badam	50	393	7.8	50	1.32	3
Milk	250	167	80.0	300	0.5	132
Sugar	100	398	0.1	12	0.15	-
Total		958	87.9	362	1.67	135

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3 DIET FOR INFANTS (6-12 MONTHS)

RDA for an infant:

Energy	-	80 k.cal / kg of body weight
Protein	-	1.69gm/kg of body weight
Calcium	–	500mg
Iron	-	5mg /1kg
B.Carotene	-	2800 I.U.

Appropriate food items:

- Fruits
- Dhal
- Vegetables
- Egg
- Cereals

Justification for selection:

Fruits	Source of vitamin C which is not present in milk.
Vegetables	Provides minerals and get familiarized with new taste.
Dhal and cereals	Calories and good quality proteins.
Egg	Mashed Yolk of an egg provides essential amino acids.

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A Day's Menu:

An infant must be fed every 2-3 hours to meet the needs of rapid growth. and feeding should be adjusted with brest feeding.

06.00 am	Breast feeding or artificial feeding.
08.00 am	Ragi kangi with milk.
10.00 am	Mixed vegetables soup and boiled egg yolk.
12.00 noon	Boiled rice and dhal, vegetables.
02.00 pm	Breast feeding or artificial feeding.
04.00 pm	Fruits juice or mashed fruits.
06.00 pm	Breast feeding or artificial feeding.
08.00 pm	Amirtham
10.00 pm to next day morning	Breast feeding or artificial feeding.

Recipe for Amirtham

Composition per 100gms

Ingredients		Quantity
Wheat	-	40gms
Rosted bengal gram	-	20gms
Ground nut	-	15gms
Jaggery	-	25gms

Method:

Wheat, Bengal gram and ground nut should be cleaned and roasted over medium flame. Grind all the ingrediants to a fine powder. Take 15gms of ground powder mix well with juggary and water. Cook well till it becomes a smooth paste.

Discussion:

Appearance - Pale yellow

Taste - Good

Texture - Semisolid

Acceptability - Children like it very much.

Flavour - Good

Conclusion:

It is a very good weaning food which provides calories, protein, iron and calcium.

Practical 12th.indd 211 08-12-2021 13:20:30

4 DIET FOR PRE SCHOOL CHILDREN (AGE GROUP - 4 TO-6 YEARS)

RDA for Pre - school children:

Energy	-	1350K.cal
Protein	-	20.1gms
Calcium	-	600mg
Iron	-	13mg
B. Carotene	-	3200I.U.

Appropriate food items:

Nuts and oil seed, whole grains, fruits, vegetables (especially carrot) and egg.

Justification for selection:

Nuts and oil seeds	To supply more energy for growth and activity.
Whole grains	To meet the increased and demand for iron.
Fruits	It provide calcium, Iron ,Minerals, vitamin A and fat.
Egg	Quality protein.
Carrot	Vitamin A and antioxidants.

A Day's Menu:

Early morning	Milk.
Break fast	Idly and sambar.
Mid Morning	Apple Juice.
Lunch	Rice, dhal, egg fry, cabbage poriyal, curd.
Evening	Ground nut sundal, Fruit juice
Dinner	Appam, Kadalai curry and orange.
Bed time	Milk.

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Recipe for ground nut sundal

Ingredients		Quantity
Ground Nut	-	50gms
Oil	-	1tsp
Mustard	-	For seasoning
Black gram dhal	-	For seasoning
Curry leaves and asafoetida	-	For seasoning
Salt	-	To taste
Mango and carrot scraping	-	10gms each.

Method:

Soak ground nut seeds overnight. Add salt and boil it by pressure cooking. Drain the excess water. Season it with curry leaves, green chilies, mango scrapings and serve hot.

Discussion:

Appearance	-	Attractive
Taste	-	Good
Texture	-	soft
Flavour	-	Delightful aroma
Over all acceptability	-	liked by everyone.

Conclusion:

It is rich in protein and can be given as snacks to pre-school children.

Nutritive value calculation for ground nut sundal

Ingredients	Quantity gms	Energy K.cal	Protein gms	Calcium mg	Iron mg	B. Carotene mg
Ground	50	28.35	12.6	45	1.25	18.5
Mango	10	4.4	0.07	1	0.03	9
Carrot	10	4.8	0.09	8	0.1	189
Total		292.7	12.76	54	1.38	216.5

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5 DIET FOR SCHOOL GOING BOYS (10 - 12 YEARS)

RDA of a school going boy (10 – 12 years)

Energy	-	2190 kcal
Protein	-	39.9gms
Calcium	-	800mg
Iron	-	21mg
B. Carotene	-	4800 I.U.

Appropriate food items:

Milk, green leafy vegetables, curd, ragi and fruits.

Justification for selection:

Milk	To meet the increased need of calcium
Green leafy vegetables	To provide more iron
Curd	To provide calcium and vitamin B
Ragi	To provide calcium and fibre
Fruits	To provide vitamin C and Fibre.

A Day's Menu:

Early Morning	Milk
Breakfast	Dosai with vegetable kurma.
Mid morning	Cheese and cakes.
Lunch	Cauliflower paratha, Cucumber, raitha.
Evening Tea	Ragi plain cake, murukku and tea.
Dinner	Rice, Green kootu, egg omlet, Rasam, and fruit salad.
Bed time	Milk with malt.

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Recipe for Cauliflower stuffed Paratha

Ingredients		Quantity
Cauliflower	-	1cup
Onion	-	1
Green chilies	-	1
Chilly powder	-	½ tespoon
Wheat	-	1cup
Salt	-	add to taste
Oil	-	to fry
Coriander leaf	-	little

Method:

Saute shredded cauliflower, chopped onion, green chilies. Add salt , chilly powder and coriander. Cook the content for some time. Make a dough with wheat flour and kneed well. Roll again and fry paratha's on a tawa.

Discussion

Appearance	-	Attractive
Taste	-	Good
Texture	-	crispy
Flavour	-	nice flavor
Over all acceptability	-	Liked by all

Conclusion:

It can be eaten as breakfast and it is rich in energy, Protein and minerals.

Nutritive value calculation for Cauliflower stuffed Paratha

Ingredients	Quantity gms	Energy Kcal	Protein gms	Calcium mgs	Iron mgs	B. Carotene mg
Cauliflower	50	15	1.0	16.5	0.6	25
Wheat	100	341	12.1	48	4.9	29
Oil	20	180	0	0	0	0
Total		536	13.1	64.5	5.5	54

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6 DIET FOR ADOLSCENCT GIRLS (10 – 18 YEAR OLD GIRL)

RDA for an Adolescent Girl:

Energy	-	2440 Kcal
Protein	-	55.5 gms
Calcium	-	800 mgs
Iron	-	26 mgs
B.Carotene	-	4800 I.U.

Appropriate Food items:

Whole grains, green leafy vegetables , sweets, fruit juices and milk.

Justification for selection:

Sweets	:	Energy dense food to support growth and activity.
Fruit Juices	:	To provide vitamins, and minerals.
Whole grains	:	Provides carbohydrate and protein.
Greeny Vegetables	:	Provides iron, calcium, fibre.
Milk	:	To provide quality protein.

A Day's Menu:

Early Morning	Tea
Breakfast	Tomato uthappam with chutney.
Midmorning	Samosa and fruit juices
Lunch	Rice, Chicken gravy, fish fry, vegetable salad.
Evening Tea	Sweet bonda or bengal gram sweet and tea.
Dinner	Naan, palak paneer, apple.
Bed time	Milk.

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Recipe for Bengal gram sweet

Ingredients		Quantity
Roasted Bengal gram flour	-	1cup
Ghee	-	1cup
Milk	-	1cup
Coconut scraping	-	1cup
Sugar	-	1cup

Method:

Mix all ingredients well to avoid lump formation. Cook in low fire with constant stirring. cook until it does not stick to the pan. Pour this mixture on to a greased plate. Allow is to cool and cut into diamond slabs and serve.

Discussion:

Apperance	-	very attractive
Taste	-	very good
Texture	-	soft in nature
Flavour	-	very good
Acceptability	-	liked by everyone.

Conclusion:

It is rich in energy and protein and it can be taken as an evening snack.

Nutritive value calculation for Bengal gram sweet

Ingredients	Quantity gm	Energy kcal	Protein gms	Calcium gms	Iron gm	B. Carotene mg
Roasted Bengal Gram-flour	100	369	22.5	58	9.5	113
Ghee	100	900	0	0	0	600
Milk	100	67	3.2	120	0.2	53
Coconut Scraping	100	444	4.5	0	1.7	0
Sugar	300	1194	0.3	36	0.3	0

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7 DIET IN OLD AGE

RDA for an old man (60 years of Age):

Low carbohydrate, low fat

Protein	-	1 gm / 1kg body wt
Calcium	-	600 mg
Iron	-	21 mg
B.Carotene	-	4800 I.U.

Appropriate food items:

Milk, green leafy vegetables, fruits, broken cereals, vegetables.

Justification for selection:

Milk	-	To provide more calcium
Green Leafy vegetables	-	Fibre and mineral source.
Fruit	-	To provide vitamins
Broken cereals	-	To provide energy and fibre
Vegetables	-	To provide minerals

A Days Menu:

Early Morning	Malted milk
Break Fast	Varagu uppuma with mint chutney.
Mid morning	Mixed fruits milk shake.
Lunch	Rice, carrot, sambar, greens poriyal, rasam, and sapota fruit.
Evening Tea	Vegetable uthappam
Dinner	Idyappam with sugar
Bed time	Milk

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Recipe for Vegetable uthappam

Ingredients		Quantity
Rice	-	1cup
Black gram dhal	-	¼ cup
Oil	-	½ cup
Salt	-	to taste

Method:

Soak rice and black gram dhal for 3 hours. Grind it and allow it to ferment and add grated vegetables to the batter. Pour a ladle full of batter on to the tawa , spread it , pour oil and cook till it is done.

Discussion

Apperance	-	Brown
Taste	-	Good
Texture	-	Soft
Flavour	-	Good
Acceptablity	-	Liked by all age group.

Conclusion:

It is a soft diet for the old age people. This is rich in protein, calories, vitamin and minerals.

Nutritive value calculation for Vegetable uthappam

Ingredients	Quantity gms	Energy kcal	Protein gm	Calcium mg	Iron mg	B. Carotene mg
Rice	100	345	6.8	10	0.7	0
Black gram dhal	25	36.7	6	38.5	0.9	9
Carrot	10	4.8	0.09	8.0	0.1	189
Capsicum	10	2.1	0.11	0.2	0.15	2.1
Onion	10	5	0.2	4.69	0.06	0
Total	155	493.6	13.12	61.39	1.91	200.1

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8 DIET IN FEVER

Principle of the diet:

calories	-	high
Carbohydrate	-	high
Fat	-	Low
Proteins	-	high
Vitamins	-	Vitamin A,C and B.
Minerals	-	required amount

Permitted food:

Fruit Juices with glucose, barley water, milk shake, gruel, porridge, and soup.

Restricted Food:

Fried food, pastries, butter, ghee, chillies and spices.

A Day's Menu:

Break Fast	Rice porridge with boiled vegetables.
Mid morning	Tender coconut water or fruit juice with glucose and biscuits.
Lunch	Minced meat soup, steamed vegetables rice and curd.
Evening Tea	Ragi malt or Biscuits.
Dinner	Idiappam, thin dhal and boiled vegetables
Bed time	Milk

Recipe for ragi malt:

Ingredients		**Quantity**
Ragi flour	-	15gms
Sugar	-	10gms
Milk	-	200gms

Method:

1. Take 100 gms of ragi , soak it in water for 6 -8 hours. Drain the water and keep it for 8 – 10 hours in a web cloth. Dry it in shade and powder well.

2. Take 15gms of ragi flour mix with water and make a paste. Add 100ml of milk and cook well. To this add another 100ml milk and sugar serve hot.

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Discussion :

Appearance	-	Brownish white
Taste	-	Good
Texture	-	Thick Liquid consistency.
Flavour	-	Delightful aroma
Acceptability	-	Good

Conclusion:

Ragi malt is rich in calories, Proteins, Calcium, phosphorous and vitamin A.

Nutritive value calculation for ragi malt

Ingredients	Quantity gms	Energy (kcal)	Proteins gms	Calcium mg	Iron mg	B – Carotene mg
Ragi	15	49.2	1.09	51.6	5.85	6.3
Sugar	20	79.6	0.02	2.4	0.03	0
Milk	200ml	134	6.4	240	0.04	106
Total		7.51	294	6.28	6.28	112.3

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9 DIET IN OBESITY (ADULT MAN)

Principle of the diet:

- Low Calories Restricted carbohydrate - 25kcal/1kg body weight
- Restricted fat.
- Normal proteins vitamins and minerals, (except sodium).
- Liberal intake of fluid, high fibre.

Permitted Foods:

Vegetables, fruits, green leafy, vegetables, whole grams and pulses, and butter milk.

Restricted Foods:

Potatoes, rice, banana, nuts, oil seeds and fried foods.

A Day's Menu:

Morning	Green tea
Break fast	Red rice porridge .
Mid Morning	Butter milk and cucumber slices.
Lunch	Chappathi without oil (2no) Rice – 1 cup, green porial, Baked fish, rasam, butter milk fruit salad without cream.
Evening Tea	Samai uppuma and tea.
Dinner	Phulka with vegetable stew, sprouted green gram salad, any fruit.

Recipe for Green gram salad

Ingredients		Quantity
Sprouted green gram	-	50gms
Tomato	-	15gms
Cucumber	-	20gms
Mango	-	10gms
Corriander	-	few
Green chillies	-	1 no.
Salt, pepper	-	to taste
cumin powder	-	if required

Method:

Soak green gram for 6 – 8 hours. Drain the water and tie it in a muslin cloth for 9 – 10 hours. Small sprouts will appear. Take sprouted green grams of around 50gms. Add chopped tomatoes, cucumber, mango, green chilly, salt, coriander and cumin powder to it, and can be served with pepper if needed.

Practical 12th.indd 222 08-12-2021 13:20:32

Discussion

Appearance - Colourful

Taste - Good

Texture - solid

Flavour - not so flavourable

Acceptability - Good.

Conclusion:

It is the best recipe for obese person to reduce weight. It contains high fibre. Minerals, vitamins, proteins and restricted carbohydrates.

Nutritive value calculation for Green gram salad

Ingredients	Quantity	Energy	Proteins	Calcium	Iron	B.Carotene mg
Sprouted Green grams	50	162	12.0	62	2.2	47
Cucumber	20	2.06	0.08	2	0.12	0
Mango	10	4.4	0.07	1	0.03	9
Total		169	12.15	65	2.35	56

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10 DIET IN DIABETES MELLITUS

Principle of diet:

Calories	-	20 kcal/kg/day
Proteins	-	1gm/ 1kg body wt
Vitamin	-	C and E are essential
Minerals	-	Magnesium, Zinc to be supplemented.
Fat	-	Restricted fat.

Foods to be permitted:

Green leafy vegetables, clear soup, fruits except banana,skimmed butter milk, plain tea or coffee.

Foods to be restricted:

Glucose, Honey syrup, sweet dried fruit , Sweetened juices, fired foods, cakes and candy.

A Day's Menu:

Early Morning	Parartha with tomato chutney.
Breakfast	Brown bread with vegetable stew.
Mid Morning	Oats porridge.
Lunch	Chappathi, greens, rice with butter milk, cabbage porial and orange.
Evening Tea	Plain tea, channa sundal.
Dinner	Plain chappathi, Dhal and boiled vegetables.

Recipe for Pesaruttu

Ingredients		Quantity
Split green gram	-	100gms
Rice	-	10gm
Onion	-	1
Ginger	-	½tsp.
Cumin seeds	-	½ tsp.
Salt	-	to taste
Oil	-	to fry

Method:

oak split green gram and rice for 3 hours and grind. Add salt, cumin seeds, green chilly, ginger, and coriander to the dough make dosa and serve hot with suitable chutney.

Practical 12th.indd 224 08-12-2021 13:20:33

Discussion

Appearance - Greenish yellow

Taste - Good

Texture - Soft

Flavour - very good

Acceptability - Good

Conclusion:

This diet is rich in protein and it can be prepared for breakfast and dinner. It is good for diabetic patients and liked by all.

Nutritive value calculation for Pesaruttu

Ingredients	Quantity gms	Energy Kcal	Protein gms	Calcium mg	Iron mg	B.Carotene mg
Green Gram	100	334	24.0	124	4.4	94
Rice	10	34.6	64	0.9	0.01	0.0
Oil	10	90	0	0	0	0
Total		458.6	24.64	124.9	4.41	94

Practical 12th.indd 225 08-12-2021 13:20:33

11 DIET IN KIDNEY DISEASES

Principle of diet:

- Carbohydrate - 80 Kcal / kg of body wt
- Moderate Fat
- Restricted protein
- Salt Restricted

Foods to be permitted:

Sugar, honey, glucose, rice, fruit, starchy food and vegetables.

Foods to be restricted:

Pulses, meat, fish, cake, pastries, pickles, nuts, dried fruits.

A Day's Menu

Early Morning	Coffee
Break Fast	Idly with coconut chutney
Mid morning	Sapotta milk shake
Lunch	Rice, Poriyal, potato fry, rasam
Evening Tea	Tea, Vegetables sandwich
Dinner	Idiyappam with vegetable stew

Recipe for Idly

Ingredients		Quantity
Par boiled rice	-	1 cup
Black gram dhal	-	$^1/_4$ cup
Salt	-	to taste

Method:

Soak rice and dhal separately. Grind dhal finely and rice coarsely. Mix and ferment over night, then steam in idly cooker and serve hot.

Discussion :

Appearance	-	White
Taste	-	Good
Texture	-	Soft
Flavour	-	Good flavor
Acceptability	-	Liked by everyone.

Conclusion:

It is rich in protein and carbohydrate . And it is very good for kidney patients.

Practical 12th.indd 226 08-12-2021 13:20:33

Nutritive value calculation for idly

Ingredients	Quantity gms	Energy Kcal	Protein gms	Calcium mg	Iron mg	B.Caroten mg
Rice	150	577.5	10.2	15.0	10.5	0
Black gram dhal	40	138.8	9.6	61.6	1.5	15.2
Total		716.3	19.8	76.6	12.0	15.2

Practical 12th.indd 227 08-12-2021 13:20:33

12 DIET IN ATHEROSCLEROSIS

Principle of Diet:

Low fat, Low carbohydrate and High fibre. Protein and vitamins - same as adults. Restricted sodium

Foods to be permitted:

Fish, groundnut oil, whole gram, cereals, fruits and vegetables.

Foods to be restricted:

Whole milk, meat, egg, amaranth.

A Day's menu:

Break Fast	Ragi porridge 1 cup, seasonal channah ½ a cup
Mid morning	Buttermilk, 1 beetroot, cut fruit 1 cup.
Lunch	Rice, dhal, rasam ,vegetables , porial without coconut, grilled fish and fruit salad.
Evening Tea	Vegetable sandwich with tea.
Dinner	Pulka, carrot salad, any one fruit.

Recipe for Cabbage poriyal

Ingredients		Quantity
Red chilli powoder	-	¼
cummin powder	-	¼ tsp
Turmeric powder	-	¼ tsp
Garam masala powder	-	¼ tsp
Cumin seeds	-	½ tsp
Oil	-	½ tsp
Salt	–	½ taste

Method:

Take oil in a pan and add a few cumin seeds and let it crack. Saute chopped garlic till it turns light brown. Add cabbage flakes with rest of the above ingredients stir for some time and keep it covered on slow flame till it is done, serve hot.

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Discussion

Appearance	-	yellow or light green in colour
Taste	-	Good
Texture	-	soft with texture
Flavour	-	Good
Acceptability	-	Liked by all age group

Conclusion:

It can be given as a side dish for lunch. Cabbage is rich in vitamin and it can be eaten raw also.

Nutritive value calculation for Cabbage poriyal

Ingredients	Quantity gms	Energy kcal	Protein gms	Calcium mg	Iron mg	B. carotene mg
Cabbage	100	27	1.8	39	0.8	120
Onion	10	5	0.12	4.69	0.06	0
Oil	10	90	0	0	0	0
Total	120	122	1.92	43.69	0.80	120

QUESTION PATTERN

Plan and prepare a day's menu for

1. Pregnant woman doing moderate work
2. Lactating mother (0-6 months)
3. Infants (6-12 months)
4. Pre-school children (4-6 years)
5. Underweight school going children (10-12 years)
6. Anaemic adolescents
7. Old man doing sedentary work
8. Fever patient
9. Obese woman doing moderate work
10. Adult woman suffering from diabetes mellitus
11. Adult man suffering from kidney diseases
12. Adult woman suffering from Atherosclerosis

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GLOSSARY

Acidosis	அமிலத்தேக்கம்
Amenorrhea	மாதவிலக்கின்மை
Anal fissures	மலவாய் வெடிப்பு
Anencephaly	பெரு மூளையில் குறைவளர்ச்சி
Ascites	நீர்க் கோவை
Urinary Bladder	சிறுநீர்ப்பை
Bland diet	காரம், வாசனை, மசாலா அற்ற உணவு
Body Mass Index	உடல் நிறை அலகு
Bone mineralization	எலும்பு கனிமமாதல்
Bradycardia	குறை இருதய துடிப்பு
Caesarean delivery	அறுவை சிகிச்சையின் மூலம் பிரசவித்தல்
Carcinoma	புற்றுநோய்
Carcinogen	புற்றுநோய்க் காரணி
Carcinoma of pancreas	கணையத்தின் புற்றுநோய்
Celiac disease	கோதுமைப் புரத ஒவ்வாமை
Cerebrovascular stroke	பெருமூளை இரத்தக்குழாய்கள் பக்கவாதம்
Cholecystitis	பித்தப்பை அழற்சி
Chronic pancreatitis	நாள்பட்ட கணைய அழற்சி
Cognitive functions	புலனுணர்வு செயல்பாடுகள்
Constipation	மலச்சிக்கல்
Convulsions	வலிப்பு
CT Scan	கதிரியக்க துழாவற்படம்
Dietitian	உணவு நிபுணர்
Diuretics	சிறு நீர்ப்பெருக்கிகள்
Fatty liver	கொழுப்பு படிந்த கல்லீரல்
Foetus	கருக்குழவி
Food fads	உணவு பழக்க வழக்கங்கள்
Hemorrhoids	இரத்தக்கட்டு
Nephritis	சிறுநீரக அழற்சி

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Hyperglycaemia	இரத்தத்தில் கூடுதல் சர்க்கரை
Hyperpyrexia	அளவுக்கதிகமான காய்ச்சல்
Hypocalcaemia	இரத்தத்தில் கால்சியம் பற்றாக்குறை
Hepatomegaly	கல்லீரல் வீக்கம்
Hypoplasia	குறை வளர்ச்சி
Infectious disease	தொற்று நோய்
Ischemic heart disease	குருதி ஓட்டக் குறை இருதய நோய்
Ketosis	இரத்தத்தில் கீட்டோன் செறிவு நிலை
Laxatives	மலமிளக்கிகள்
Lipogenesis	கொழுப்பு ஆக்கல்
Malaise	உடல் சோர்வு
Meal Pattern	உணவுமுறை
Myalgia	தசை வலி
Necrosis	திசு நசிவு
Neuropathy	நரம்பு மண்டல நோய்
Obesity	உடல் பருமன்
Omega 3 fatty acids	கொழுப்பு அமிலங்கள்
Physiological stress	உடலியல் அழுத்தம்
Phytonutrients	தாவர ஊட்டச்சத்துக்கள்
Plaque	கொள்ளை நோய்
Pneumonia	நுரையீரல் அழற்சி
Pyrexia	காய்ச்சல்
Renal colic	சிறுநீரக வலி
Renin	சிறுநீரக ரெனின்
Retinopathy	விழித்திரை நோய்
Routine hospital diets	வழக்கமான மருத்துவமனை உணவு
Therapeutic diet	சிகிச்சை உணவு
Toxaemia	குருதி நஞ்சூட்டுதல்
Urethra	சிறுநீர் வடிகுழாய்
Zoonosis	விலங்கு பரிவர்த்தன நோய்கள்
Dental caries	பற் சிதைவு

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List of Authors and Reviewers

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Authors

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Assistant Professor,
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