
UNIT 21 FOOD AND NUTRITION

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21.1 INTRODUCTION

In the previous unit you have studied the limitations regarding availability and distribution of food in India. A large section of our population is under-nourished. Apart from not having enough to eat, their diet is generally deficient in certain components essential for health. An additional factor is the lack of awareness about proper nutrition. In this unit we will learn how we can improve our health by making the best use of the food available to us.

A dinner table with a variety of mouth-watering preparations appears far more tempting than a simple meal of rice, chapati, dal, vegetables and curds. Yet, the former may be inferior and incomplete from the point of view of what the body needs for survival, growth and activity. It may lack many important ingredients necessary to keep our body fit and healthy. Again some foods look different, but are similar in their nutritional value, e.g., milk, egg, meat, fish etc.

One may consume large quantities of food without getting proper nutrition, because it may lack one or more essential components. How can we find out whether a meal is complete or not? In this unit we will learn to classify nutrient groups of food, the amounts necessary for our body and how to get these from different foods available to us. We will also learn the concept of a balanced diet.

It is true that food choices of people are influenced by economic, social, educational and cultural factors, but nutritional awareness, i.e. learning to choose food wisely is also an important factor. You can possibly use the knowledge given in this unit, to modify your food habits and enlighten others about it. We often find that families with large income are poorly nourished and some families with small income are better nourished. This is because of a more intelligent use of money on the part of the low income groups to obtain proper nourishment. In addition, these simple concepts will enable you to realise the complexity of social problems related to availability of proper food for all our people. We will also discuss the problems of malnutrition and its magnitude.

Objectives

After studying this unit you should be able to :

- identify various nutrient groups in a given food,
- judge your daily intake of food and see whether it fulfils your nutritional needs,
- practise dietary habits which contribute to a healthy, attractive individual with an alert mind,
- compare food requirements of individuals according to age, sex, activity, body weight and climate,
- recognise the dangers of faulty food habits and food fads,
- list the diseases caused by malnutrition and deficiency of vitamins and minerals,
- realise the harm caused by adulterated food stuffs,

- recognise the importance of safeguarding food from spoilage and waste at home, and in stores and godowns.

In this unit, there are many tables. You are not expected to memorise them. They have been compiled for reference when necessary.

21.2 IMPORTANCE OF NUTRITION

We cannot live without food. Our hunger can be satisfied by any kind of meal, but to remain healthy and free of disease, our body requires certain kinds of food. The health of an individual is largely determined by the quality of food taken. Moreover, food makes a difference in our appearance, activity, behaviour, and in the quality of life.

Foods vary in their composition and no one type of food contains all we need, in the amounts that we need. A meal lacking in a particular requirement of our body for a prolonged period can result in disease, and even in death. Therefore, a knowledge of the food requirements of our body and various sources of obtaining them is essential. Studies carried out in many countries show that a good diet has promoted proper growth in children and has improved the general health of the people. A study of Japanese children has shown that an improved diet has increased the average height of children, from what it was a few decades ago.

A majority of the children of the developing countries of Asia, Africa and Latin America are generally poorly nourished. Some of them do not get enough to eat, while the diet of others is deficient in some foods that are essential for the body. So, we find a steady retardation in the physical and mental growth of these children and they suffer from various deficiency diseases.

The science of nutrition is a well developed discipline today. We know enough about what kind of nourishment is necessary for our child and adult population. The main problem is to make this information available to our people and to ensure that the food contains all the necessary ingredients. Of course, the foods must be available to the people.

21.3 NUTRIENT GROUPS AND THEIR FUNCTIONS

We should know that our body is made up of different chemical substances which are related to the food we take. Scientists have determined the chemical substances present in different foods and their role in the body. They call these substances “nutrients” and have classified them in different groups.

In order to get an idea about the nutrients of food, let us examine a familiar dish of peas and potato curry prepared in our homes. For preparing it, besides oil or ghee, onions, tomatoes and some spices are used. What these ingredients provide in terms of nutrients are listed below:










Ingredients	Class of Nutrients
1 Potatoes	Carbohydrates
2 Peas	Proteins and carbohydrates
3 Ghee/oil	Fats
4 Onions	Minerals
5 Tomatoes	Vitamins and minerals
6 Spices	Minerals
7 Water	Water

This dish is given as an example in order to illustrate how all the classes of nutrients required by our body can be included in our meal. These six classes of nutrients, namely, carbohydrates, proteins, fats, vitamins, minerals and water, must be included in our meals in correct proportion. This need can be fulfilled from a single dish or from a combination of dishes, prepared from a wide variety of food sources. If one of the ingredients of this recipe is deleted, we lose the corresponding nutrient. This is how we evaluate every food preparation.

You know that food habits vary from place to place all over India. Chapatis are the staple food in many parts of north India and rice is the staple food in south and east India. People in other countries also have their preferences in food. These habits are mostly due to the availability of a particular type of food stuff. Anyway, no particular food is absolutely necessary, because many alternatives to it can provide the same nutrients. Here, we must note that no single item of food contains exactly the same nutrients as any other single item.

Foods which have common nutrients can be put together as a Food Group. This provides us with a wide choice of alternate food items. Table 21.1 gives these food groups and their nutrient composition.

Table 21.1: Food Groups and Their Major Nutrients

Food Groups	Nutrients
<p data-bbox="208 306 382 333">Cereals and Millets</p> 	<p data-bbox="530 306 999 333">Carbohydrates, Proteins, Iron and Vitamins of B group</p>
<p data-bbox="208 472 382 499">Pulses and Legumes</p> 	<p data-bbox="523 472 991 499">Proteins, Carbohydrates, Iron and Vitamins of B group</p>
<p data-bbox="213 665 378 692">Nuts and Oilseeds</p> 	<p data-bbox="535 665 684 692">Fats and Proteins</p>
<p data-bbox="201 872 405 899">Milk and Milk products</p> 	<p data-bbox="530 872 768 899">Fats, Proteins and Vitamins</p>
<p data-bbox="201 1056 390 1083">Meats, Fish and Eggs</p> 	<p data-bbox="526 1056 772 1083">Proteins and some Vitamins</p>
<p data-bbox="223 1243 344 1270">Fats and Oils</p> 	<p data-bbox="535 1243 576 1270">Fats</p>
<p data-bbox="238 1450 303 1477">Sugars</p> 	<p data-bbox="526 1450 654 1477">Carbohydrates</p>
<p data-bbox="208 1632 364 1659">Roots and Tubers</p> 	<p data-bbox="526 1632 654 1659">Carbohydrates</p>
<p data-bbox="198 1815 390 1842">Vegetables and Fruits</p> 	<p data-bbox="515 1815 715 1842">Vitamins and Minerals</p>

Some foods have a great deal of one nutrient and very little or none at all of others. For example, oils and fats contain mostly fat, sugar is purely a carbohydrate. The six nutrients are present in various food stuffs in varying proportions. Depending upon the relative concentration of the nutrients contained, foods are classified as **protein-rich, carbohydrate-rich** or **vitamin-rich foods**. For good nutrition, we need to eat a combination of many different kinds of foods.

SAQ 1

List the food items you had for lunch today, and using Table 21.1 classify them into food groups and give their major nutrients. The first item has been worked out to give you an idea. Check whether all the nutrients were present in your lunch.

Food Items	Food Groups	Major Nutrients
1. Chapati	Cereals and Millets	Carbohydrates, Proteins, Iron and Vitamins of B Group
2. Rice
3
4
5
6
7

Note: While considering the nutrients of a cooked item, you must account for all the ingredients used in a recipe. For example, in finding the nutrients present in a biscuit, you should account for flour, milk, sugar, fat etc. used in making it.

Functions of Food

What do you think is the function of food?

Before you read on, write down the functions of food in the space below.

.....

.....

.....

The food we take performs the following functions :

- i) Food gives our body fuel to burn for warmth and energy. The energy is used to carry on both the internal and the external activities of the body. Examples of internal activities are : functioning of the brain, beating of the heart, breathing, digestion of food, excretory processes etc. They go on non-stop as long as we live. The external activities consist of all kinds of work, play and exercises.
- ii) Food is also necessary for growth and development, mainly in children. Food gives us material to build strong muscles and to produce blood. It is also used for continual repair of body tissues.
- iii) Food has a protective function also. It helps our body to fight infection and enables us to live to a ripe old age.

Let us now see, which of these functions of food are assigned to the nutrients we have listed earlier.

- i) **Carbohydrates and Fats** are the main energy source for the body. Carbohydrates are easily available and are the cheapest source of energy. Fats also serve as an “emergency energy store” in the body, to be used, for example, when enough food is not available due to fasting or starvation. Therefore, carbohydrates and fats are called **Energy Foods**.
- ii) **Proteins** are the raw material used for building muscles, skin, blood and bones. They repair the tissues which are constantly worn out. Therefore, we need to have proteins everyday and cannot live without them. Proteins can also serve as an energy source, if the energy need of the body is not met by carbohydrates and fats. They also help us to fight infection. Proteins are called **Body Building Foods**.

- iii) **Minerals and Vitamins** are not a source of energy but they are necessary in many of the steps involved in the release of energy in the cells. Thus, they help the body to make good use of food. They protect us from illness. Minerals, such as calcium, are the basic components of bones and teeth. Iron is a component of the red pigment of blood called haemoglobin. Minerals are important in transmission of nerve impulses and for muscle contraction and relaxation. Vitamins and minerals are called **Protective Foods**.
- iv) **Water** is a component of all body fluids such as blood, digestive juices, etc. Water accounts for about 50 to 70% of the body weight. It is essential for various metabolic activities. In fact, our body cannot utilise any substance, unless it is first turned into a form soluble in water. Digestion converts food into a soluble form, so that it is readily absorbed and is carried by the blood to the sites where it is needed. The waste products like urea are carried by the blood to the kidneys from where they are excreted. Water also plays a role in regulating the body temperature, through perspiration. The daily water requirement of the body depends on the climate, activity and the kind of food one takes.

SAQ 2

Give examples of various types of foods in the space indicated below :

Body building foods

.....

Energy giving foods

.....

Protective foods

.....

21.4 ESSENTIAL NUTRIENTS

Our body is a biochemical factory which can make many compounds for its needs. However, there are limits to this, and what our body cannot make has to be provided by a suitable choice of food. Such compounds are called essential nutrients. Each one of the nutrients has many components. For example, most proteins are composed of twelve to twenty different amino acids. Ten of them cannot be manufactured by the body and have to be supplied through diet. They are called essential amino acids. The remaining are non-essential amino acids, in the sense that they can be made in the body from any protein food we take. Similarly, a large number of vitamins and minerals and some fatty acids cannot be made in the body. So they must be included in the diet.

Plant Proteins vs Animal Proteins

Proteins can be obtained from a variety of sources, such as grains, pulses, nuts, milk, fish, meat, eggs, etc. But the nutritive quality and digestibility of these proteins is not equal. They are present in different amounts in different food stuffs and their quality and the ease with which they can be digested also differs with their source. Animal proteins have all the essential amino acids and are called complete or high-quality proteins. They also have much higher digestibility. Plant proteins lack one or more essential amino acids and are called incomplete proteins. Their digestibility is about 60%. Proteins, obtained from a variety of plant sources can together be made as good as a single animal protein, because what is missing in one plant protein may be compensated by another. For instance, in a meal of cereals and pulses plant the essential amino acids missing in cereals are found in pulses and vice versa. Surprisingly, we Indians have been eating a combination of chapati-dal, or rice-dal over the years, probably out of wisdom or experience, without any knowledge of the existence of amino acids.

Remember, a mixed diet of various cereals, millets and pulses can fulfil the total nutritional requirements of vegetarians. Soyabean is the richest source of plant protein. In comparison to other legumes, it contains twice as much protein. Eggs are relatively a cheaper source of high-quality proteins when compared to meat. In India, a large percentage of people can afford only cereals which contain mostly carbohydrates. Protein foods are expensive, though even the prices of vegetables are going up. Scientists all over the world are trying to find ways and means of obtaining proteins from new sources. Methods of extracting proteins

from ordinarily uneatable green leaves, algae and other sources are underway. Proteins are complex substances and, unlike vitamins, cannot be manufactured in the laboratory at present. There may be a time in future when it will become possible.

We should also know that an excess of proteins should not be taken in a single day, because only a portion of it will be used in building and repair of the body and the rest will be burnt up to supply energy, or converted into fat. Since, proteins cannot be stored in the body, they are wasted. On an average, an adult requires one gram of protein per kilogram of body weight. The energy needs of the body are better fulfilled by carbohydrate foods.

Vitamins

You are, probably, familiar with the names of some of the vitamins. They can be obtained from plant and animal foods. Vitamins are required in small amounts and their prolonged deficiency in food results in various diseases. In order to correct this situation, sometimes vitamins have to be given as tonics or medicine. Vitamins are not a source of energy themselves but they help in the release of energy from carbohydrates, and fats. Therefore, food must contain required amounts of vitamins. There are various types of vitamins. A particular vitamin or a group of two or more vitamins, protect the health and assist in the work of a particular organ of our body. Each vitamin has a specific function and cannot substitute for another. Table 21.2 lists various vitamins, their sources and functions. Vitamin A is needed for healthy eyes, smooth skin and glossy hair. Many children go blind in our country because of vitamin A deficiency. This could be easily prevented, because foods containing vitamin A, like carrots and green vegetables, are easily available. You will notice that vitamins of the B group have many sub-groups. These have different functions but their source is more or less the same. Sometimes children or even adults complain of lack of appetite. They never seem to be hungry for meals. This is due to the deficiency of vitamin B group, which leads to undernutrition and retardation of growth.



Fig. 21.1: One year old Elmer MacCollum suffered from scurvy and there was no hope for his survival. His mother happened to feed him apple peel. On finding improvement in his health she kept feeding him vegetables and fruits. Thus by keen observation she found the antiscorvy diet. Interestingly, Elmer MacCollum grew to discover Vitamin A in 1913.

Table 21.2: Vitamins, their Functions, and Sources

Vitamins	Functions	Sources
Vitamin A	Enables us to see in the dim light Necessary for healthy eyes, smooth skin and glossy hair Required for normal bone formation	Butter, ghee, milk, egg-yolk Fatty fish Dark leafy vegetables Deep yellow vegetable, fruits
Vitamin B complex B ₁ , B ₂ , B ₃ , B ₆ , B ₁₂	Essential for the functioning of nerves, brain, heart and other vital organs, Required for normal growth and development Helps in preventing anaemia	Whole cereals Pulses, sprouted pulses Milk Egg Liver, brain, kidney
Vitamin C	Helps in rapid healing of wounds Facilitates absorption of iron Proper daily intake builds resistance to infections	Amla, guava, papaya Citrus fruits Green leafy vegetables
Vitamin D	Helps in the absorption of calcium and phosphorus in the intestine Required for the proper formation of bones	Egg, fish liver oil Chicken Butter, ghee Milk Exposure to sunlight
Vitamin E	Prevents vitamin A from destruction	Vegetable oils Cereals, cereal germ oil Nuts Legumes
Vitamin K	Prevents bleeding in wounds by clotting of the blood	Green leafy vegetables

Vitamin C is present in fresh fruits and vegetables, especially in citrus fruits and guava. It is essential for the health of the mucous membrane which lines our mouth, nose and inner organs. It helps in building resistance against infections like common cold. Vitamin D, which is present in eggs, milk, butter, etc., helps in proper formation of bones. Its deficiency leads to weak bones or physical deformities like bow legs in children. This is the only vitamin which our body can make in the skin, by the action of sunlight which is plenty in India and costs nothing. Vitamin D is also called "sunshine vitamin". Fig. 21.2 shows various foods rich in vitamin C.

We should know that vitamins B and C are water soluble. Therefore, they cannot be retained in the body and should be included in our daily meals. Other vitamins are not water soluble.

Their excess is stored in the body. An overdose of vitamins can also cause illness. They should be taken, as a tonic or medicine, only after consulting a doctor. It has recently been found that indiscriminate use of vitamin B complex and vitamin C leads to wide range of adverse effects on health, such as headache, irritability, insomnia, nausea, etc.

Vitamins are susceptible to destruction under certain conditions. Therefore, great care should be taken to retain them while cooking. For example, vitamin C and vitamins of B group, being water soluble, are washed off when we cut or wash the vegetables or fruit. Vitamin C gets destroyed in cooking at high temperature. Therefore, amla, green pepper, lemon and other citrus fruits which are rich sources of vitamin C, should be eaten raw, instead of being cooked. Vitamin B₂, which is present in milk, cereals and vegetables, etc., is destroyed by long exposure to sunlight.

In general, the following precautions should be taken while cooking, so as to retain maximum amounts of vitamins in the food.

- i) Use as little water as possible for washing and cooking.
- ii) Do not throw the water used for soaking or cooking rice, pulses vegetables, etc. It must either be used for cooking or consumed in some other way.
- iii) Vegetables should be washed before cutting, otherwise the vitamins will leak out from the cut vegetables into water and get washed away.
- iv) Vegetables should be cooked soon after cutting.
- v) Cook for the shortest possible period and serve it immediately.
- vi) Do not use baking soda because it destroys vitamin C.

Minerals

Our bones and teeth contain large amounts of calcium. An adult has a total of about 1 kg of calcium and a baby has about 30g in their bones. So, during the period of growth from a baby to an adult, a large amount of calcium has to be added to the bones. Therefore, doctors prescribe calcium tablets to children and pregnant women. Calcium is always present in the body in combination with another mineral, phosphorus. Milk and green leafy vegetables are a very good source of calcium. It is also required for proper working of muscles and for clotting of blood.

Another important mineral is iron which is required for making haemoglobin in the blood. Haemoglobin gives red colour to the blood. In comparison to 1 kg of calcium, the total amount of iron in the body is about 3 g. Iron is necessary for growing children and pregnant women. During the menstrual period, women lose iron and therefore, they need extra iron. Fig. 21.3 shows various food rich in iron.

About 17 different minerals are necessary for healthy functioning of our body, though their amount is insignificant in comparison to the bulk of food taken by us. Hence, these minerals are often referred to as "micronutrients". Some of these minerals are constituents of the body cells and the body fluids, and as such take part in chemical reactions in the cells. Have you heard of fluoride toothpastes? Fluorine is essential to produce strong teeth that resist decay. That is why the toothpastes containing fluorine are being promoted these days. But excess of fluorine also is harmful. Water of some districts in Andhra Pradesh and Punjab has excess of fluorine. Consumption of this water results in lustreless stained teeth and weakened enamel.

We all take common salt in every meal. It is essential for the proper working of the body. Common salt is a chloride of sodium. A minute amount of iodine is an important part of the hormone produced by thyroid gland in the neck. Its deficiency causes thyroid gland to swell, a condition known as goitre. Now iodised salt is available in the market which can provide us with iodine.

SAQ 3

a) Fill in the blanks :

- i) are those which our body can not synthesise.
- ii) Plant proteins in some amino acids.
- iii) is the richest source of plant
- iv) and are high quality proteins because they contain all the
- v) Excess of proteins taken in a day is converted into and

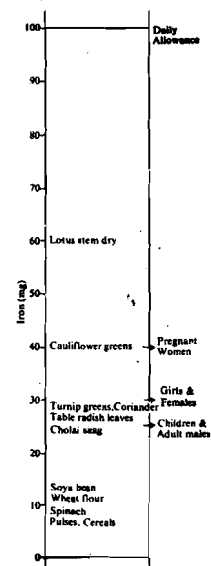


Fig 21.2: Vitamin C content per 100g of food stuff.

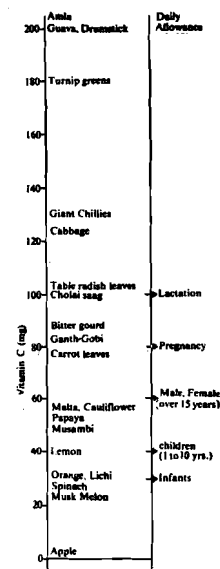


Fig. 21.3: Iron content in food stuff per 100 g graded on a 10 point scale.

- vi) Energy needs of body should be met by
 - vii) A mixed diet of, and provides as good a protein as meat.
- b) Match the vitamins and minerals given in column 1 with their functions listed in column 2 of the following table :

Vitamins and Minerals	Functions
a) Vitamin B	i) Builds resistance to infection
b) Vitamin A	ii) Necessary for the formation of haemoglobin of the blood
c) Vitamin D	iii) Its absence may cause bow legs
d) Vitamin K	iv) For building strong bones and teeth
e) Vitamin C	v) Helps us to have healthy eyes, smooth skin and shiny hair
f) Calcium	vi) It prevents bleeding
g) Iron	vii) Important for proper functioning of nerves and brain
h) Iodine	viii) Prevents swelling of thyroid gland.

21.5 FOOD AS FUEL FOR THE BODY MACHINE

We mentioned earlier that the body requires food for internal as well as external activities and for growth. Another way of looking at this is that the body requires energy for both its internal and external activities. In this sense, the body can be compared with a machine and food is the fuel which is required to run the body. Energy is produced in the body from food by a process called metabolism which is comparable to combustion or burning of a fuel. Oxygen is used up in this 'combustion' and carbon dioxide is produced. If the body does not get at least a minimum of energy, it will not be able to carry on its normal internal functions or undertake external work.

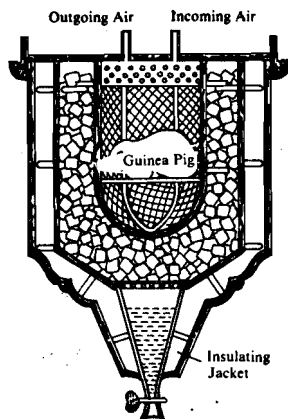


Fig 21.4: A key Nutritional Experiment. In 1783 Antoine Lavoisier and Pierre de Laplace showed that body "burns" food much as a fire does. In the experiment shown above they measured heat output (as the amount of melted ice) and carbon dioxide produced by Guinea pig, and found them in the same proportion as produced by the burning of charcoal.

However, a major difference between a machine and the human body is that the latter is composed of the same fuel which it uses to provide energy. A machine cannot use itself as fuel to run. But our body can. Thus, during fast the body can burn its own fats to get energy, resulting in loss of weight. If a body is supplied with more energy than is required to run it, it is stored in the body in the form of fat for future use.

Energy requirements of the body are measured in terms of "calories" or kilo-calories (1000 calories), usually written as Calories, with a capital C. For example, a tea spoon of sugar (5 gm), when burnt, produces 20 Calories of heat. Scientists have studied energy requirements of infants, girls, boys and adults of different ages and weights to find out how many Calories they use in doing different things. You would be curious to know how much food is required to keep our body healthy and active. In order to calculate this, we need to know :

- i) energy value of different nutrients and
- ii) factors influencing the energy requirement of an individual.

Energy provided by different nutrients is given below and may be compared with petrol.

Carbohydrates	4.0 kcal/g
Proteins	4.0 "
Fats	9.0 "
Petrol	10.0 "

The energy and nutritive value of Indian foods is published by the Indian Council of Medical Research. In Table 21.3 we have listed some common food stuffs and their energy and protein content.

Table 21.3 : Energy and Protein Contents of Some Common Foods

Food stuffs	Energy (Cal/100g)	Proteins (g)
Cereals	340	10-13
Pulses and Legumes	345	20-25
Soyabean	430	43
Milk-Buffalo	120	4.3
Cow	70	3.2
Skimmed	30	2.5
Paneer	264	18.3
Cheese	348	24.1
Butter	730	—
Vegetable oils & Fats	900	—
Egg	170	13.3
Sugar	390	—
Peanuts	570	25.3
Coconut (dry)	660	6.8
Almond	655	20.8
Banana	116	1.2
Guava	50	0.9
Mango	74	0.6
Orange	48	0.7
Spinach	26	2.0
Potatoes	95	1.6
Meat	200	18.5
Fish	100	14.9

Let us now find out what determines the energy required by a person in a day. The energy requirement of an individual depends mainly upon:

- i) internal or basic processes of the body which is also called Basal Metabolic Rate (BMR) and
- ii) physical activity.

Greater part of the energy is spent for internal activities or for Basal Metabolism, which is influenced by various factors like surface area of the body, sex, age, sleep, body temperature, level of hormones, etc. For example, the BMR for different persons and states is as follows:

Tall thin person > Short thin person,

Muscular person > Short fat person,

Infant > Adolescent

Male > Female

Awake > Sleep

Young person > Old person

During fever > Normal health

Cold climate > Hot climate

Physical activities depend upon the kind of work done by an individual, whether it is light, moderate, or heavy work. The requirement for physical activities is generally lower than BMR, except in case of persons engaged in very hard physical work like stone-cutting, running, etc. You must have noticed that after hard physical work we feel very hungry and eat a lot more food than when we are sitting idle. The table below lists sedentary, light, moderate and vigorous activities and expenditure of energy in Cal/hr.

Table 21.4: Approximate Energy Needs for Various Kinds of Activities

Light work 150 Cal/hr	Moderate work 150-250 Cal/hr	Hard work 250-350 Cal/hr	Strenuous work 350 Cal/hr
Reading	Mopping	Cycling	Hard labour
Writing	Scrubbing floor	Playing games	Playing tennis, football, hockey,
Typing	Washing clothes	Sawing wood	Running fast cycling,
Dish washing	Polishing		Fast swimming
Ironing	Gardening		
Sitting	Carpentry		
Serving	Walking		
Talking			

The average total energy need of a moderately active person is often taken to be 2000 Calories per day.

21.6 BALANCED DIET

In the previous sections, we have dealt with quality and quantity of food. Both of these should be balanced in a diet. A balanced diet is a combination of various foods which can fulfil energy needs of a person and can provide proteins, vitamins and minerals in proper quantity and proportion required to keep him healthy. Figure 21.5 shows the percentage of Calories derived from different food stuffs in a balanced diet. Table 21.5 provides the composition of a balanced diet for various age groups.

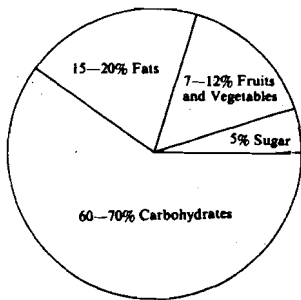


Fig. 21.5: Division of Calories among Food Stuffs in a Balanced Diet according to Nutrient requirement.

Table 21.5 : Balanced Diet for Various Age Groups

Food Item	Adult (Moderate work)		— Pre-school children						
	Male	Female	Additional Allowance	preg-nant		Lactating		Girls	Boys
				1-3	4-6	10-12	13-18	13-18	
Mixed cereals	475	350	50	100	150	200	320	350	430-450
Pulses and Legumes	80	70		10	50	60	70	70	70
Green leafy vegetables	125	125	25	25	50	75	100	150	100
Other vegetables	75	75			30	50	75	75	75
Roots and Tubers	100	75						75	100
Fruits	30	30			50	50	50	30	30
Milk	200	200	125	125	300	250	250	250	250
Fats and Oils	40	35		15	20	25	35	35	45
Sugar and Jaggery	40	30	10	20	30	40	50	30	40
Total Calories	2800	2200	2200	2200	1200	1500	2100	2200	2500-3000
			+300	+700					



Fig 21.6

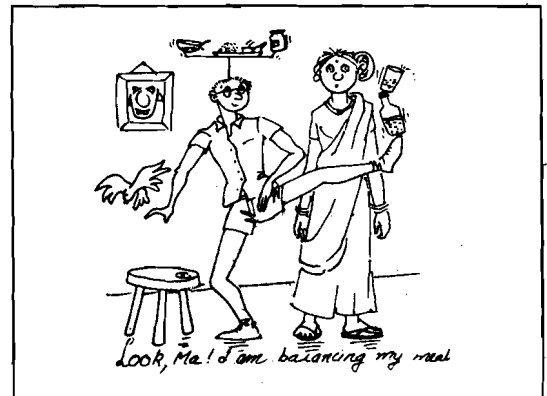


Fig 21.7

Obesity

Generally, fat people think that their overweight is due to their constitution and/or heredity. It could be true in some cases. But have you ever come across a fat labourer, coolie, athlete, or mountaineer? Although, they eat a lot more than obese people, they do not gain weight. Why? Because they use up the calories in physical activities. When the intake of calories is more than what is needed, the excess is deposited in the form of fat on the body and the person gradually becomes over-weight. Right weight and active habits are good for health.

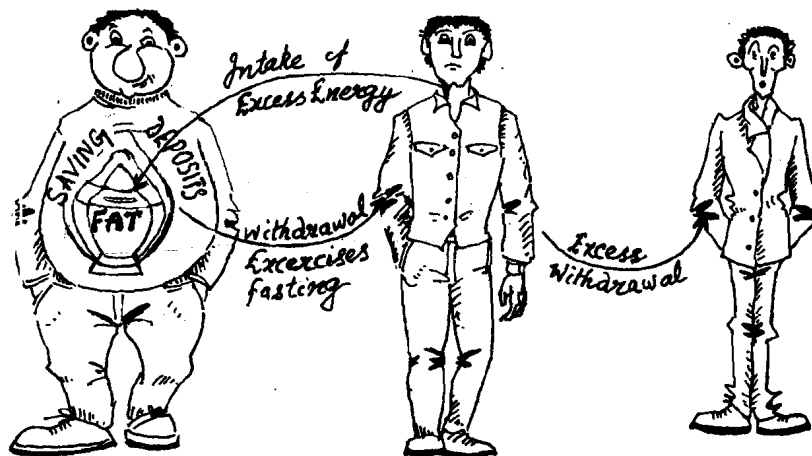


Fig 21.8

Dietary Requirement during Fever and Infection

During fever, there is a break down of tissue proteins, and water and salts are lost. The BMR increases with the rise of every degree of temperature. What kind of diet is desirable under such circumstances?

With an increase of BMR and break down of tissue proteins, a diet rich in proteins and calories is desirable. Patients should be given easily digestible foods such as milk, eggs, custard, pudding, fruit juices, etc. Glucose and sugar can fulfil immediate energy demands.

During fever, fats like butter, ghee and vegetable oils should be avoided, but once the fever has gone they should be included in the diet, because they are a rich source of energy.

Now that you have learnt so much about food, you must be feeling hungry. Have a break and treat yourself with a snack you fancy, and then attempt the following SAQ.

SAQ 4

a) Strike off the wrong word(s) from those given within the brackets.

- i) Twenty grams of fat provides energy equivalent to (20g/45g/70g) of carbohydrates.
- ii) Children require (low energy/high energy) and (low protein/high protein) diet.
- iii) A young person needs (more/less) energy than an old person.
- iv) A person becomes obese because of (heredity/constitution/excessive intake of energy/high BMR).

b) A meal consists of the following items. Calculate its energy contents; use the data given in Table 21.3.

2 Chapatis (25g each)
1 Plate rice (50g)
2 Servings dal (25g)
1 Serving spinach (50g)
1 Serving potatoes (90g)
1 Mango (150g)
1 Table spoon of fat (10g)

21.7 FOOD FADS

You may have picked up the idea from your family or friends that certain combinations of food can be dangerous for your health. For example, fish and milk or radish and milk taken together are dangerous because they result in a skin disease called leucoderma or white patches on the skin. Milk should not be taken immediately after eating curd or with fruits because it will curdle in the stomach. In fact, there is no scientific basis for such beliefs. Do you know what happens to milk in the stomach? Our stomach contains gastric juices which curdle milk before it is digested.

Some people also recommend certain food combinations to cure some illnesses. Such suggestions may come from well-meaning friends, but they may not be safe to practise because the diet may lack in some essential food nutrients. At such times we should take the diet prescribed by a physician.

21.8 FOOD ALLERGIES

Food allergies are different from food fads. Certain foods seem to have strange reactions on some people. Probably, you have come across a person who got skin rashes everytime he ate eggs. Certain substances in food cause "allergy" to some people. Allergy is the scientific name given to a disturbance which arises when a person is sensitive to a substance. Some people are allergic to pollen, others are allergic to skin-contact with some materials. Allergy to medicines is also common. In fact, before giving a penicillin injection, doctors first test whether the patient is allergic to it. Foods which cause allergies are, fish, eggs, milk and milk products. Substances that cause allergy are protein in nature.

Food allergies are manifested in the form of skin rashes, skin eruption called eczema, asthma, frequent sneezing, one-sided severe headache called migraine, vomiting, diarrhoea, etc.

21.9 ADULTERATION OF FOOD

We live in a society where some times foods and even medicines are sold in an adulterated form by mixing it with other materials, which are neither food nor medicine. For example, pure ghee may be adulterated with dalda or cooking oils may be mixed with cheaper oils or mineral oils. They are also flavoured with chemicals. Pulses may be sold with stones and wheat flour may contain chalk powder. Similarly, ground spices, tea and coffee are also adulterated. Commonest example is adulteration of milk with water, sometimes unclean water! All these are practised by traders to gain more profit. Out of greed, traders fail to realise that these acts are injurious to the health of the people. For example, adulteration of mustard oil with argemone oil results in paralysis. Bengal gram dal is mixed with Khesari dal which causes lathyrism, a crippling disease characterised by paralysis of the legs. Turmeric is often adulterated with a poisonous substance called "metanil yellow" which can cause cancer.

Food advertising agencies also mislead people by making false claims about their products. A close guard against such propaganda is also necessary. What can be done to stop such practices? Government should enforce strict rules against adulteration of food items, and give exemplary punishment to the guilty. The consumer can also form consumer welfare society through which they can give expression to their grievances and also build public pressure against such practices. In USA such societies are very powerful and they closely monitor various products in the market.

21.10 MALNUTRITION AND ILL HEALTH

In section 21.6 we have learnt about balanced diet. Now, we will turn our attention to the health problems resulting from inadequate nutrition.

Are you familiar with the term malnutrition? Malnutrition means either lack of sufficient food or imbalance of nutrients in the diet, resulting in the impairment of health. Protein-

calorie deficiency and the resulting malnutrition are prevalent in India and in other developing nations of Asia, Africa and Latin America.

What are the causes of malnutrition in India?

Some of the causes are as follows :

- 1 Poverty
- 2 Large population
- 3 Inadequate production and inequitable distribution of food

Can you add some more to this list?

Well, lack of education, ignorance and faulty food habits also contribute to malnutrition.

As you know, population and poverty are distributed unevenly on this planet. Affluent countries like USA, Canada, USSR, Australia, etc. have smaller populations and higher standards of living than developing countries in Asia, Africa and Latin America which have 70% of the world population and a lower standard of living. Approximately, three quarters of the under-nourished people of the world live in the Indian subcontinent.

India is the second most populated country in the world. It is estimated that by 2000 A.D., the population may increase up to 1000 million. Rising population increases the total demand of food. The Planning Commission has estimated that 48% of rural population and 41% of the urban population in 1977-78 were below the poverty line, that is, they were unable to obtain a balanced diet of appropriate calorie value. So you see a large percentage of our people are under-nourished. According to the latest estimates, the percentage under the poverty line has decreased to about 39% but in the meantime, population has also increased. So the total number of such persons, men, women and children, runs up to a good 300 million people! Our production of food has to be increased but actual availability depends on the buying power, which means people should have money to buy a proper meal, which means in turn, more employment and better wages. This is an uphill task and requires considerable economic changes in the country.

At the social level, we should not waste food. We often find that in large festive gatherings, whether of affluent or of poor people, substantial amounts of food are thrown away. We should also avoid eating excess of food either in terms of protein or calories.

Let us continue with our discussion on the problem of malnutrition in India. The inadequacy of food results in nutritional deficiencies and reduces the intake of one or more nutrients. This results in poor health, increased susceptibility to disease and in reduction of the life span. Money spent on treatment of ill health and disease could possibly have improved nutrition to avoid disease!

Diseases due to Protein-Calorie malnutrition

The developing countries of the world today are faced with diseases due to Protein-Calorie malnutrition. The most affected group are the little babies and children of the poor and uneducated class, which constitute a majority of our population.

Two severe diseases due to deficiency of proteins and protein-calorie are **Kwashiorkar** and **Marasmus**, respectively. Millions of children die annually and millions more go through a miserable life. They retard the child's physical growth and weaken its natural immunity to various infections. In extreme cases, children are mentally retarded and they never reach maturity and thus become a burden to the family and the nation.

Kwashiorkar

This disease was first recognised in 1935, in African children and it is named from two words of an African dialect, meaning first and second, i.e. sickness that strikes the first child, when he is soon displaced at his mother's breast by the second born.

Why do babies lose weight during weaning? On weaning, a child requires more than twice as much protein in relation to body weight as do adults. In spite of the nutritional status of the mothers, breast milk provides enough nutrition in quality and quantity for babies up to 6 months, and it is free of infection. For proper growth, children, after six months, require supplementary food which is not available due to some of the following reasons :

- 1 Increased financial burden, if the next child is born.
- 2 Because of ignorance, the best food is usually given to men who are supposed to be bread winners; children and women eat whatever is left.
- 3 Babies prefer breast milk, they are fussy about taste, and refuse new items included in the diet.
- 4 As most Indians can afford only vegetarian diet, it, therefore, becomes very difficult to provide sufficient proteins to a child, unless the food is consumed in large quantities.

Due to meagre energy food and protein intake, the child gradually loses appetite and often develops weaning diarrhoea. It is generally believed that diarrhoea is due to teething. This is incorrect. In fact, diarrhoea during teething is due to infection. Because of sensation in the gums, babies like to chew hard things and also pick up whatever is lying on the floor. Thus, they get infection from dirt or from chewing unwashed vegetables, fruits, etc. This, often, misleads the mother, who further restricts the diet mainly to carbohydrate gruels. Thus, the child is deprived of the much needed protein diet.



Fig. 21.9: Marasmus: Severe wasting of muscle and loss of subcutaneous fat is due to deficiency of calories and proteins. The child looks like a living skeleton.

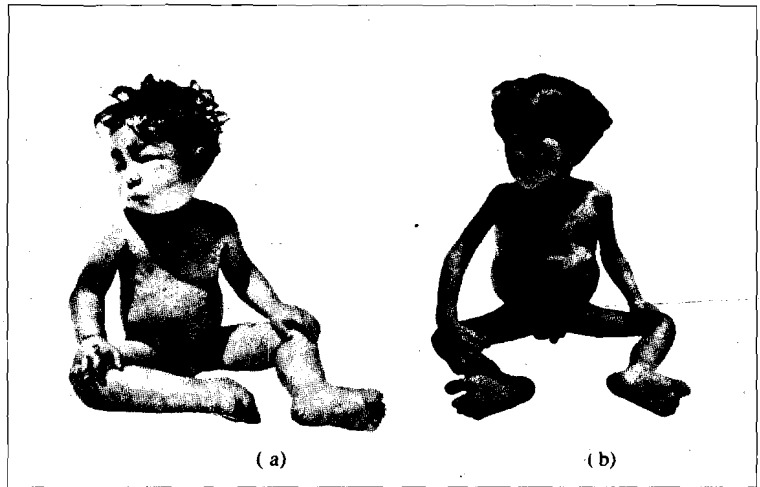


Fig 21.10: Kwashiorkor: (a) The severe deficiency of proteins is characterised by pot belly and oedema (b) on feeding high proteins oedema disappears but underlying malnutrition becomes apparent.

Marasmus

This is caused due to the severe deficiency of both proteins and calories in the diet. Nutritional surveys among pre-school (1 to 5 years) children show that more than 90% of children of lower economic groups do not get required calories per day. Therefore, such children become victims of marasmus. This is manifested by severe retardation in growth, loss of muscles and subcutaneous fat.

Deficiency due to iron and vitamin A causes anaemia and eye lesions respectively. There are other diseases prevalent mainly among low income groups due to deficiency of other vitamins and minerals. Some of the diseases can be cured by making certain foods available to the people. Figs. 21.9 to 21.13 show deficiency symptoms of some of the diseases.

So we conclude that to curb malnutrition, our country needs to produce and distribute sufficient food to meet the basic energy (calorie) requirements of our vast population. And once this need is fulfilled, ways of supplementing the food with proteins, vitamins and minerals can be worked out to improve its quality.



Fig 21.11: Rickets: Deficiency of Vitamin D results in rickets in children. Weekend bones curve laterally. These early deformities of bones persist throughout life.



Fig. 21.12: Pellagra: Deficiency of Vitamin B₃ causes Pellagra characterised by typical thickening and spotting of the skin.



Fig. 21.13: Goitre: Deficiency of iodine causes enlargement of thyroid gland. Disease is common in Rajasthan and Himalayan territories.

21.11 SUMMARY

In this unit we have tried to explain that the nutritive quality of a diet greatly determines the health of an individual. We have provided you with the knowledge about the type of nutrition necessary for us at various stages of our life. Due to insufficient food and its inequitable distribution, the energy demand of most of our people is not fulfilled. The problem of malnutrition continues and severe deficiency diseases are prevalent in our country. Thus, you have learnt that :

- food consists of 6 classes of nutrients : carbohydrates, proteins, fats, vitamins, minerals and water.
- the bulk of the food we eat provides us with energy. It is used for growth, development and maintenance of our body. A small but essential part of the food we consume is vitamins and minerals. This helps in regulating the processes of our body and protecting our body from infection.
- food stuffs containing the same type of nutrients are put together into a food group. According to the functions performed in the body, the nutrients are also classified as energy foods (i.e. carbohydrates and fats), body-building foods (i.e. proteins) and protective foods (i.e. vitamins and minerals).
- energy value of food is expressed in calories. The calorie requirements depend on age, sex, type of activity, climate, etc.
- adulterated foods, and sometimes food fads, may affect our health adversely. Also, some people may be allergic to certain protein foods.
- millions of children of the world suffer from diseases such as kwashiorkor and marasmus which are caused due to protein-calorie malnutrition.

21.12 TERMINAL QUESTIONS

1) Write down the nutrients of the food items listed below.

Food Items	Nutrients
a) Roasted gram	
b) Peanuts	
c) Biscuit	
d) Boiled Egg	
e) Bread Pakora	
f) Orange	
g) Campa Cola	
h) Potato chips	

- 2) In comparison with an average adult what type(s) of extra foods would you recommend for the following categories of people?

Categories of people	Types of food
Athlete	Body building foods Energy foods
b) Labourer	
c) Pregnant mother	
d) Infants	
e) Children	

- 3) Arrange in increasing order the energy needs of the people of same weight involved in various activities.

Cycling, coolie type work, washing clothes, typing

- 4) We have listed some diseases in column 1; write down the corresponding deficiencies in column 2.

Diseases	Deficiency
a) Night blindness	
b) Goitre	
c) Kwashiorkor	
d) Marasmus	
f) Rickets	
g) Anaemia	

21.13 ANSWERS

Self Assessment Questions

- 2) Body building foods—milk and milk products, egg, meat, fish, pulses, legumes, soyabean, etc.
Energy giving foods—Cereals, millets, fats and oil, sugar, honey, jaggery, potatoes
Protective foods—green leafy vegetables, deep yellow vegetables, fruits, etc.
- 3) a) i) Essential nutrients ii) lack, essential iii) soyabean, proteins iv) milk, fish, eggs and meats, essential amino acids v) energy and fat vi) carbohydrates vii) cereals, millets, pulses.
b) a) vii b) v c) iii d) vi e) i f) iv g) ii h) viii
- 4) a) (i) 45 g (ii) high energy, high protein (iii) more (iv) excessive intake of energy
b) 812 Cal.

Terminal Questions

- 1) a) Carbohydrates, Proteins b) Carbohydrates, Fats, Proteins c) Carbohydrates, Fats d) Proteins, Fats, Vitamins e) Carbohydrates, Fats f) Vitamin C g) Carbohydrates h) Carbohydrates, Fats.
- 2) b) energy foods c) Body building foods, Protective foods, Calcium and Iron d) Body building foods, Calcium e) Body building foods, Energy foods, Calcium
- 3) typing < washing clothes < cycling < coolie type work
- 4) a) Vitamin A b) Iodine c) Protein d) Calories e) Calcium and Vitamin D f) Iron.