

---

## UNIT 8 NUTRITIONAL ASPECTS

---

### Structure

- 8.0 Objectives
- 8.1 Introduction
- 8.2 Scope and Importance
- 8.3 Need for Energy
- 8.4 Basal Energy Metabolism
- 8.5 Energy Value of Foods
- 8.6 Nutritive Value of Foods
- 8.7 Food Pyramid
- 8.8 Digestive Processes
  - Digestion of Carbohydrates
  - Digestion of Proteins
  - Digestion of Fat
- 8.9 Dietary Allowances, Standards and Balanced Diets for Different Age Groups: Children, Adults, Pregnant and Lactating Women, Old People
  - Dietary Allowances and Standards
  - Balanced Diets for Different Age Groups
- 8.10 Techniques for Assessment of Human Nutrition
- 8.11 Nutritional Labelling
- 8.12 Let Us Sum Up
- 8.13 Key Words
- 8.14 Answer to Check Your Progress Exercises
- 8.15 Some Useful Books

---

### 8.0 OBJECTIVES

---

After reading this unit, you should be able to:

- explain food, nutrition, nutrients, optimum nutrition, under nutrition, assessment of nutritional status;
- describe the role of different foods in our body;
- describe balanced diets; and
- state the importance of nutritional labelling.

---

### 8.1 INTRODUCTION

---

We need food for growth, development and to lead a healthy life. Since all foods are not of same nutritional quality, man's ability to meet his nutritional requirement depends upon the type and quantity of foodstuffs included in diet. It is not only the purchasing power of food but also the knowledge and awareness about nutritional needs at different stages of life, which is of paramount importance for maintaining nutritional health. We should consider the nutritive aspects of food from two broad points of view: first, what nutrients do foods contain and their requirement; and second, what are the relative stabilities of these nutrients and how are they affected by processing and handling. A brief description of general principles underlying the nutritional aspects is presented in the following sub-section.

## 8.2 SCOPE AND IMPORTANCE

We require more than 45 different nutrients throughout our life. Food materials ingested by our body are digested, absorbed and metabolized. A number of foodstuffs have to be selected to get all nutrients. Our health depends on the type and quantity of foodstuffs we choose in our diet. For sustaining healthy and vigorous life, diet should be planned according to the principles of nutrition.

Good nutrition is the fundamental basic requirement for health, functional efficiency and productivity. Good nutritional status is achieved not through drugs, tablets and pills but through a well and balanced diet. There is no known nutritional deficiency disorder that cannot be prevented by proper diet. Only the need is to provide adequate information to the common man as to how his nutritional needs can be fully met through judicious use of foods available at his own doorstep. The affluent sections need to be informed of the deleterious effects of dietary excesses and errors and how these can be avoided.

## 8.3 NEED FOR ENERGY

We need energy for work and different body functions. Whatever our age and sex, we need energy for three important functions of our body.

- a) Basal metabolism
- b) Physical activities
- c) Dietary thermogenesis

### a) Basal metabolism

The energy metabolism of a subject at complete physical and mental rest and having normal body temperature and in post absorptive state (i.e. 12 hours after the intake of last meal/ food) is known as basal metabolism.

### b) Physical activity

*Any movement of the body, or even a small part of it, expends energy. Greater the movement, higher the energy requirement. The actual amount of energy requirements of a person are determined by body weight, age, type and intensity of activity, and duration of activity.*

**Table 8.1: Effect of Body weight and type of physical activity on energy requirement (Kcal/day) of a moderately active person**

Body weight (kg)	Men			Women		
	Light activity	Moderate activity	Very active	Light activity	Moderate activity	Very active
50	2100	2300	2700	1800	2000	2330
55	2310	2530	2970	2000	2200	2600
60	2520	2760	3240	2160	2400	2830
65	2700	3000	3500	2340	2600	3055
70	2940	3220	3780	2520	2800	3290

### c) Dietary thermogenesis

Thermogenesis can be induced by diet, which is called as dietary thermogenesis, specific dynamic action or thermic effect of food. It is the amount of energy utilized by the body to digest, absorb, transport and store the nutrients. It is between 5-10% of the total energy intake. For example, it was found that in a fasting dog requiring 400 kcal, feeding of 100 g carbohydrates produces 425 Kcal, 44.4 g of fat produces 416 Kcal and 100 g of proteins produces 520 Kcal of heat. The extra heat produced is obtained by oxidation of tissue constituents and the animal will be in negative energy balance. This stimulating effect of carbohydrates, fats and proteins on energy metabolism is called specific dynamic action. The SDA of proteins is highest (about 30 %) while that of carbohydrates and fats is only 6% and 4% respectively.

---

## 8.4 BASAL ENERGY METABOLISM

---

Biochemical reactions (when body is at rest) are necessary to provide energy for maintenance of normal body temperature, breathing, heartbeat, muscle tone and other essential activities of cells and tissues. The basal metabolic rate is an expression of the amount of calories expended hourly in relation to the surface area of the body (calories/ meter<sup>2</sup>/ hour).

Basal metabolic rate (BMR) is influenced by following factors:

**Body surface area:** A person who is tall and has greater proportion of lean tissues normally requires more basal energy than a shorter person of same weight.

**Age:** Age affects BMR because it changes the lean body mass especially the amount of muscle. BMR is highest during first 2 years of life due to rapid growth and declines about 2 % per decade after 21 years of age.

**Gender:** In general BMR of women is lower (about 6-10 %) than men due to higher body fat and other factors.

Pregnancy produces a BMR 15-25 per cent above the normal. Lactation also increases BMR.

**Sleep:** BMR during sleep is about 5-10 per cent less than in waking state.

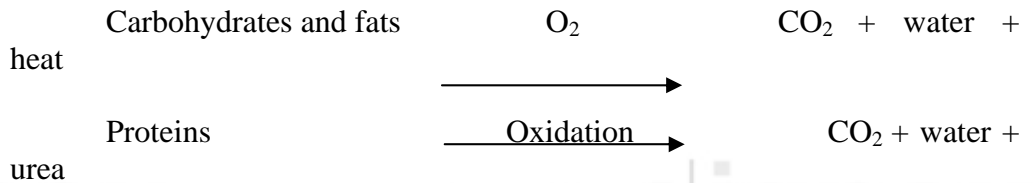
**Environmental temperature:** BMR increases when environmental temperature is low. At high temperature, BMR may decrease to lower heat production by the body.

**Recent exercise:** Following a period of exercise BMR remains elevated for some time.

**Health factors:** An elevation of body temperature above 98.6<sup>0</sup> F increases BMR by 7 per cent for each degree. Prolonged undernutrition, hypothyroidism, depression etc. tend to decrease BMR. Hyperthyroidism, anger, fear and other strong emotions increase BMR.

## 8.5 ENERGY VALUE OF FOODS

The energy yielding food factors are carbohydrates, proteins and fats. Vitamins and minerals do not provide energy, although they take part in liberating energy. Within the body, nutrients providing energy are oxidized in the cells with the help of catalysts. The process is one of continuous utilization of oxygen and production of CO<sub>2</sub>, water and heat:



The energy value of foods depends on the quantity of carbohydrates, fats and proteins present in them. This can be determined by oxidizing a known weight of food in an instrument called bomb calorimeter and measuring the heat produced. The energy value of foods can be expressed in terms of kilocalories (Kcal) or mega joules (MJ).

- One kilo calorie = 4.186 kilo joules
- 1000 kilo calorie = 4.186 × 10<sup>3</sup> kilo joules or 4.186 mega joules
- 1 Mega joule = 1000 kilo joules
- 1 Mega joule = 239 Kcal
- 1 Kilo calorie = 4.186 kilo joules

Addition of ghee or oil or butter to a food during preparation will increase the calorie content of that food. The average calorific value of pure carbohydrates, fats and proteins determined using the bomb calorimeter are:

1 g carbohydrates	4.1 Calorie
1 g fats	9.45 Calorie
1 g proteins	5.65 Calorie

The physiological energy value of carbohydrates, fats and proteins are 4,9,4 after making allowances for losses in digestion and metabolism.

### Check Your Progress Exercise 1

- Note:** a) Use the space below for your answer.  
b) Compare your answers with those given at the end of the unit.

1. What do you understand by nutrition? Write the importance of different nutrients in our body in brief.

.....

.....

.....

.....

.....

2. Why do we need energy? Explain.

3. Define basal energy metabolism. What do you understand by basal metabolic rate?

---

## 8.6 NUTRITIVE VALUE OF FOODS

---

Foods can be broadly classified into (i) cereals and millets (ii) legumes and pulses (iii) oilseeds and nuts (iv) vegetables (v) fruits (vi) fats and oil (vii) egg, meat, fish and other animal foods (viii) milk and milk products (ix) starchy and sugary foods and (x) spices and condiments.

### Cereal and millets

Cereals are the main source of energy in our diet. They contribute 70-80% of daily energy intake of majority of Indians. They also contribute significant quantities of proteins, calcium, and vitamin B complexes. Cereal proteins are deficient in an essential amino acid lysine. However, if supplemented with pulses rich in lysine, biological value of cereal products increases.

Cereals contain invisible fat that can meet more than 50 percent of our essential fatty acid requirement. Cereals are also fair source of calcium and iron. Ragi is rich in minerals especially calcium. Millets including ragi are rich in minerals and fibre. Millets are also rich in phytate and tannin, which bind minerals and hence interfere with their bioavailability. Cereals do not contain either vitamin C or vitamin A except that yellow maize and some varieties of sorghum contain small amounts of  $\beta$ -carotene.

### Legumes and pulses

Pulses are rich source of protein but do not contain vitamin C. They are a good source of B vitamins also. Germinated legumes are good source of vitamin C. Fermentation also improves the nutritive value particularly thiamin and niacin are enhanced. Legumes and pulses are also deficient in vitamin A, D, and B<sub>12</sub>.

Khesari dhal, consumed in some parts of the country may cause lathyrism if the consumption is more than 300 gm/day for 6 months.

**Table 8.2: Nutrients content of some commonly used cereals, legumes & nuts (values/ 100 g)**

Particulars	Calories (Kcal)	Protein (g)	Fat (g)	Fibre (g)	Calcium (mg)	Iron (mg)	Carotene (µg)
Bajra or pearl millet	360	11.6	5.0	1.2	0.05g	8.8	132
Barley	335	11.5	1.3	3.9	0.03g	3.7	10
Maize, dry	342	11.1	3.6	2.7	10	2.3	90
Rice (raw, milled)	345	6.8	0.5	0.2	10	0.7	-
Rice, puffed	325	7.5	0.1	0.3	23	6.6	-
Whole wheat flour	341	12.1	1.7	1.9	48	4.9	-
Wheat bread, white	245	7.8	0.7	0.2	11	1.1	-
Bengal gram, whole	360	17.1	5.3	3.9	202	4.6	189
Bengal gram dhal	372	20.8	5.6	1.2	56	5.3	129
Black gram dhal	347	24.0	1.4	0.9	154	3.8	38
Rajmah	346	22.9	1.3	4.8	260	5.1	-
Red gram dhal	335	22.3	1.7	1.5	73	2.7	32
Almond	655	20.8	58.9	1.7	230	5.09	0
Coconut dry	662	6.8	62.3	6.6	400	7.8	0
Gingelly seeds	563	18.3	43.3	2.9	1450	9.3	60
Groundnut	567	25.3	40.1	3.1	90	2.5	37

**Source:** Nutritive value of Indian Foods, 1991.

### **Nuts and oilseeds**

Nuts and oilseeds (except coconut) are rich in proteins containing about 18-40 per cent. Soybean is the richest source in proteins (containing about 40 per cent). They do not contain much carbohydrates but are rich in B-vitamins. Groundnuts are particularly rich in thiamin and niacin. Sesame seeds are rich in calcium.

### **Fats and oils**

Fats and oils provide energy; vitamin A, E, D and K. Vegetable oils contain vitamin E and essential fatty acids (viz. linoleic and linolenic acids) except coconut and palm oils. Vegetable oils do not contain vitamin A and D except red-palm oil, which is exceptionally rich in carotene, a precursor of vitamin A.

**Table 8.3: Nutritive values of fats (per 100 g)**

Particulars	Moisture (%)	Fat (%)	Energy (Kcal)	Vitamin A (I.U.)	Vitamin E (mg)
Butter	14	86	774	700	2.4
Ghee	-	100	900	600	2.0
Vegetable oils and fats	-	100	900	-	8-140
Red palm oil	-	100	900	4000-10,000	10-15
Margarine#	14	86	774	700	10-50
Vanaspathi#	-	100	900	700	10-30

# Processed fat

**Vegetables**

Vegetables are termed as 'protective foods' due to their high vitamins and mineral content. These generally have high water content, low protein and energy and varying amount of dietary fibre. Vegetables can be broadly grouped into green leafy vegetables, roots and tubers, and other vegetables. Green leafy vegetables are good source of calcium, iron, carotene, dietary fibre, vitamin C and vitamin B-complexes except vitamin B<sub>12</sub>.

**Table 8.4: Nutritional compositions of green leafy vegetables**

Constituents	Range of values (per 100 g)
Moisture (g)	79-92
Energy (Kcal)	32-96
Carbohydrates (g)	4-14
Proteins (g)	109-607
Fat (g)	0.1-1.7
Calcium (mg)	30-500
Iron (mg)	0.8-16.0
Carotene (µg)	1200-7500
Vitamin C (mg)	48-200
Thiamin (mg)	0.05-0.16
Riboflavin (mg)	0.11-0.34
Nicotinic acid (mg)	0.4-1.8
Folic acid (mg)	10-30
Total dietary fibre (g)	2-6

Roots and tubers are rich in carbohydrates mainly starch and provide energy. In general, these are poor in proteins, vitamin and minerals but carrot and yellow flesh variety of sweet potato, and yellow yam are good sources of

carotene. Potato is a fair good source of protein and vitamin C. Tapioca and yam are rich in calcium. Other vegetables (brinjal, okra, beans, all gourds, pumpkin, etc) not only provide variety to the diet but also provide vitamin C, some minerals, and fibre and thus add bulk to the diet.

### Fruits

Fruits are prized for their vitamin and minerals content. Amla (600 mg/ 100g), guava (212 mg/ 100g) are rich source of vitamin C. Some fruits like banana and mango provide high calorie because of high sugar content. Eating fruits raw and fresh makes the vitamins and minerals present in them easily available to the body. Dried fruits like raisins, dates and apricots are good source of iron and calcium. Fruits also contain dietary fibre.

### Foods from animal origin

Milk is almost a complete and ideal food. Milk and milk products like paneer, curd, khoa, etc. are good source of proteins, calcium, riboflavin and vitamin B<sub>12</sub> but very poor in iron and vitamin C content. Milk does not contain vitamin E.

Eggs contain all nutrients except vitamin C and dietary fibre. Eggs contain proteins of very high biological value. Egg white contains about 12% proteins and some of B-vitamins but is devoid of fat and vitamin A. Egg yolk contains about 15% proteins, 3% fat, rich in vitamin A, iron, B-vitamins and vitamin D.

Flesh foods like meat, poultry and fish are rich in good quality proteins (18-22%) and vitamin B-complexes. Meat does not contain vitamin A, C and D. Fatty fish contain some vitamins A and D. Liver is rich in vitamin A and richest source of vitamin B<sub>12</sub>.

**Table 8.5: Nutritive value of some commonly used foods of animal origin (values/ 100 g)**

Particulars	Calories (Kcal)	Protein (g)	Fat (g)	Calcium (mg)	Iron (mg)	Carotene (µg)
Milk (cow's)	67	3.2	4.1	120	0.2	174
Curd (cow milk)	60	3.1	4.0	149	0.2	102
Egg (hen)	173	13.3	13.3	60	2.1	600
Mutton (muscle)	194	18.5	13.3	150	2.5	0
Pork (muscle)	114	18.7	4.4	30	2.2	0

### Other foods

Foods like sugar, jaggery, glucose, honey, custard powder, sago etc. mainly contain carbohydrates and provide energy.

Condiments and spices are accessory foods used for flavouring purposes to enhance the palatability of products. These are used in small amounts and their contribution to nutrient intake is very limited.



## 8.7 FOOD PYRAMID

The food pyramid is an outline to show the groups of foods that make a balanced diet. It is a general guideline that lets you choose a variety of foods from different food groups to get the various nutrients in right proportions. Its pyramid shape helps to explain which foods should be eaten more or less. The foods that make up the base of the pyramid i.e. widest part should provide the bulk of our diet. As you go up the pyramid, the amounts of different foods get smaller. Each of these food groups provide some, but not all, of the nutrients we need. Foods in one group can't replace those in another. No one-food group is more important than another - for good health, we need them all. The USDA has made some recommendation and provides a set of guidelines for healthy eating, represented in Figure 8.1.

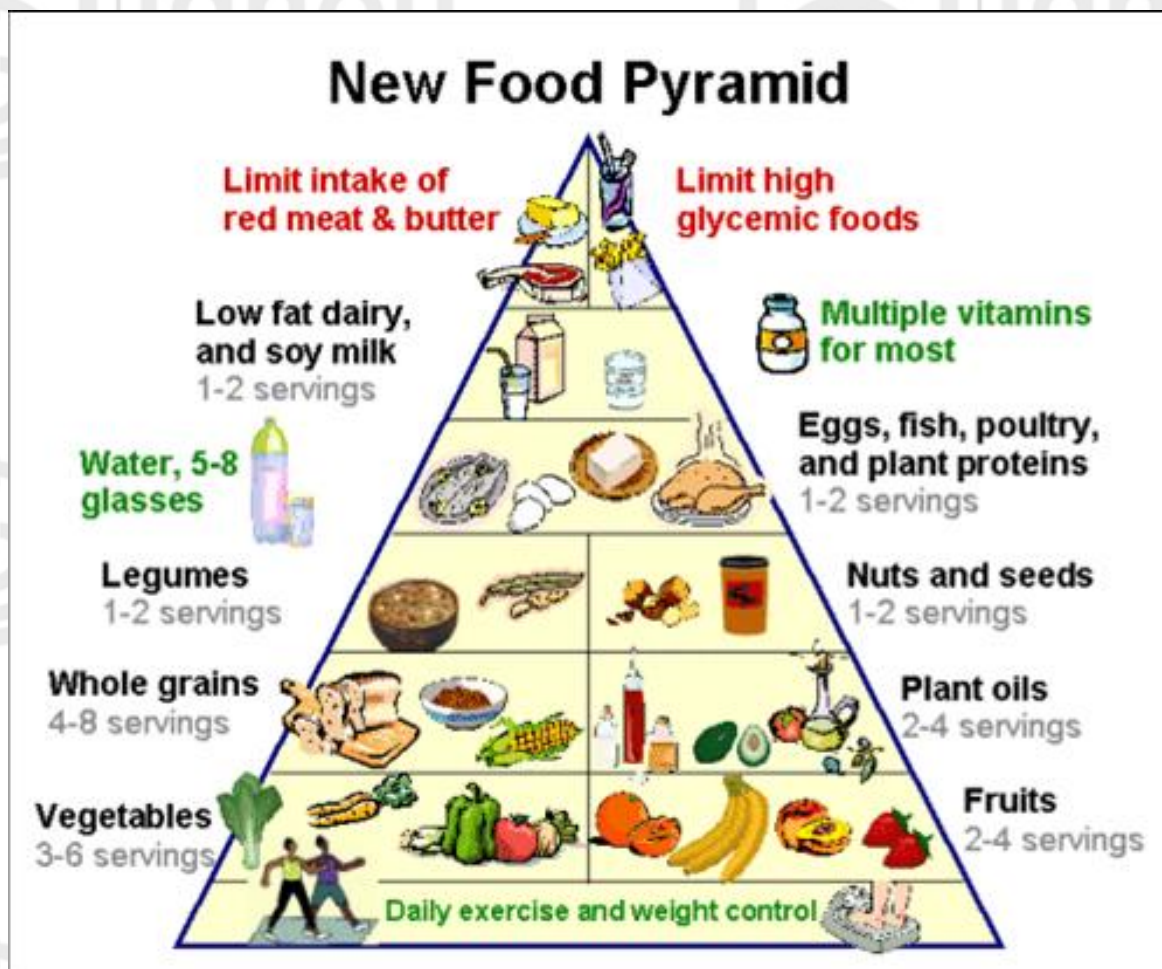


Figure 8.1: Food pyramid

New guidelines emphasise more as weight control, whole grains, plant oils, vegetables & fruits and less on consumption of red meat, butter and refined foods such as white rice, white bread, pasta, etc.

## 8.8 DIGESTIVE PROCESS

Food do not get absorbed into the body as such except only a few substances namely water, simple sugars and some of mineral salts and vitamins. The

principal component of food namely carbohydrates, fats and proteins undergo digestion.

### 8.8.1 Digestion of Carbohydrates

Digestion of cooked starch by salivary amylase begins in the mouth. This continues in the stomach for 10-15 minutes, till the food get mixed with gastric juice and action of amylase ceases due to high acidity.

A greater part of starch and glycogen present in food is digested by pancreatic amylase in small intestine.

• Starch and glycogen	Pancreatic amylase	Maltose + Isomaltose
• Sucrose	Sucrase	Glucose + Fructose
• Maltose	Maltase	2 molecules of glucose
• Lactose	Lactase	Glucose + Galactose
• Isomaltose glucose	Isomaltase	2 molecules of

The resulting monosaccharides viz. glucose, fructose, galactose are absorbed in small intestine. Cellulose, hemicellulose, pectin etc. are not digested and excreted as such.

### 8.8.2 Digestion of Proteins

Hydrolysis of proteins is accomplished by proteases secreted in gastric juice, pancreatic juice and in the small intestine.

**Gastric digestion:** The proteolytic enzyme present in gastric juice is pepsin. Since food remains in stomach for short time, pepsin hydrolyses dietary proteins mainly into a mixture of polypeptides.

Dietary protein  $\xrightarrow{\text{Pepsin}}$  Polypeptides

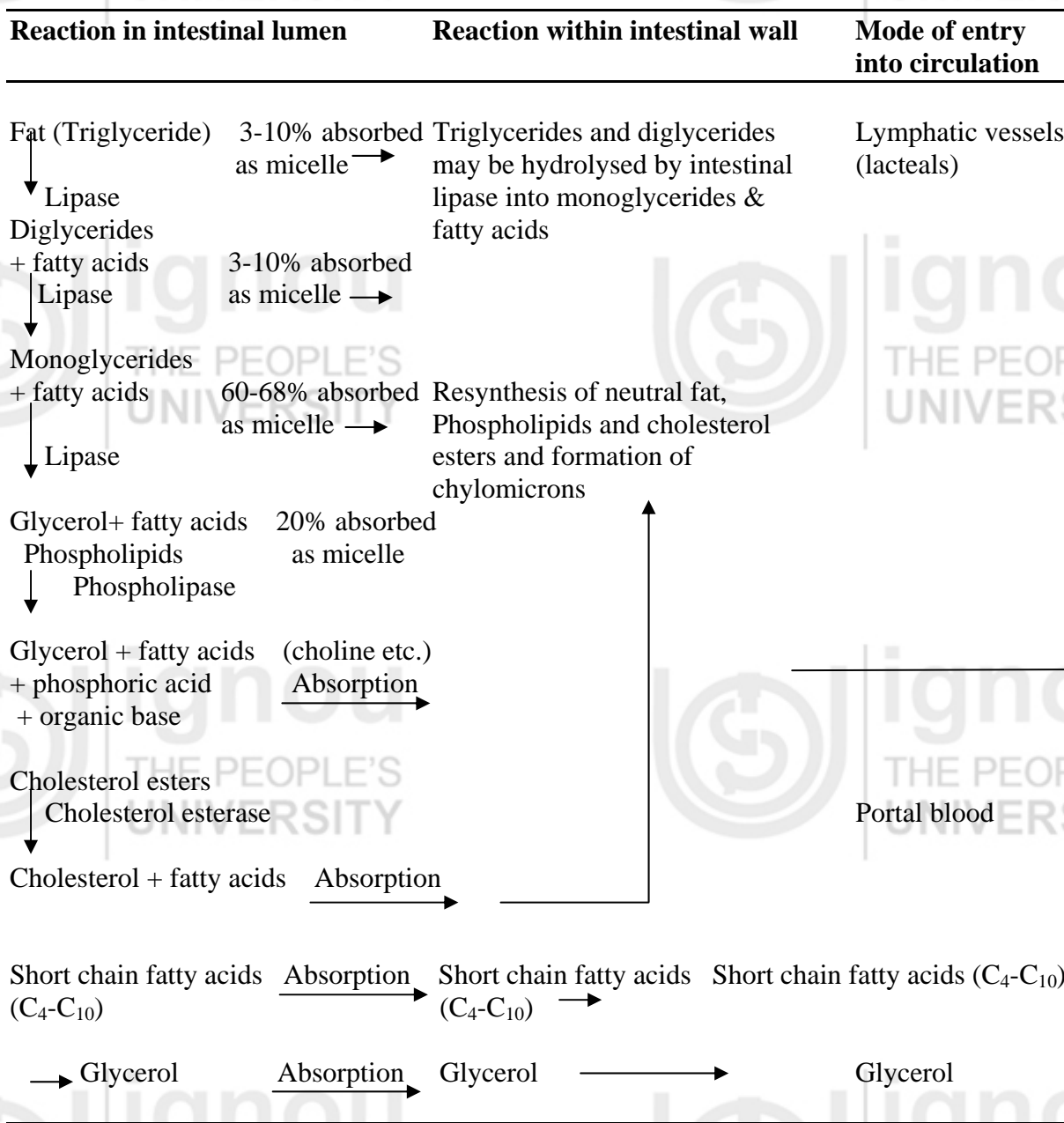
**Digestion in small intestine:** The main digestion of polypeptides produced in stomach takes place in small intestines. The proteases involved in digestion are trypsin, chymotrypsin and carboxypeptidase secreted in pancreatic juice and amino peptidases present in intestinal mucosa.

• Protein and Polypeptides acids	Trypsin and Chymotrypsin	Peptide + amino
• Peptides	Carboxy peptidase	Amino acids
• Peptides	Amino peptidases	Amino acids
• Dipeptides	Dipeptidase	Amino acids
• Tripeptides	Tripeptidases	Amino acids

The resulting amino acids are absorbed in small intestine.

### 8.8.3 Digestion of Fat

Almost all fats present in our meal are triglycerides. Only a small fraction of dietary fat consists of cholesterol esters and phospholipids. Fats are primarily hydrolyzed in the small intestine. In stomach gastric lipase brings about some hydrolysis of finely divided fats only such as egg yolk and cream. Brief description of digestion and absorption of fat is given below.



**Check Your Progress Exercise 2**

- Note:** a) Use the space below for your answer.  
 b) Compare your answers with those given at the end of the unit.

1. What are different foods? Write the importance of fruits and vegetables.

.....

.....

.....

.....

2. Define food pyramid. What is the importance of food pyramid in food selection for the diet?

ignou  
THE PEOPLE'S  
UNIVERSITY

ignou  
THE PEOPLE'S  
UNIVERSITY

3. Explain the term 'digestion'. Write the different enzymes, which are important for digestion of carbohydrates, proteins and fats.

ignou  
THE PEOPLE'S  
UNIVERSITY

ignou  
THE PEOPLE'S  
UNIVERSITY

---

## **8.9 DIETARY ALLOWANCES, STANDARDS AND BALANCED DIETS FOR DIFFERENT AGE GROUPS: CHILDREN, ADULTS, PREGNANT AND LACTATING WOMEN, OLD PEOPLE**

---

### **8.9.1 Dietary Allowances and Standards**

Dietary allowances are measures of nutritional need in terms of specific amount of nutrients that a person should receive every day to achieve full growth and development potential. The Nutrition Advisory Committee of Indian Council of Medical Research (1989) recommended the dietary allowances of different nutrients, which are presented in Table 1.11. Reference man is between 20-39 years of age, weighs 60 kg, free from diseases and physically fit for active work. Reference woman is between 20-39 years, weighs 50 kg and healthy.

### **8.9.2 Balanced Diets for Different Age Groups**

A balanced diet is one which includes a variety of foods in such quantities and proportion that the need for nutrients is adequately met to promote and maintain the health. Food requirement will differ according to age, sex, physical activity, and physiological state viz. pregnancy, lactation etc.

Balanced diets for different age groups, sex, moderate activity and physiological state are given in Table 8.6 to 8.10. These diets are formulated using food exchange system suggested by Gopalan et al. (1991) and recommended dietary allowances of nutrients for Indians (I.C.M.R, 1989).

ignou  
THE PEOPLE'S  
UNIVERSITY

ignou  
THE PEOPLE'S  
UNIVERSITY

The food stuffs given in these tables should be considered as raw food items that represent a food group, for example, cereals may include wheat, bread, rice, puffed rice, maize etc. depending upon the dietary habits of individual/family.

Mother's milk is the best food for newborns and infants up to 6 months of age. Afterwards, supplementary foods along with milk, is necessary. Strained fruit juices and soups, mashed banana, papaya, sago porridge, rice porridge, soft boiled egg yolk, mashed and well cooked khitcheri etc. may form the supplementary foods for the infants.

**Table 8.6: Balanced diets for children (1-9 years old)**

Food stuffs (g/caput/day)	1-3 years		4-6 years		7-9 years	
	Veg.	Non-veg.	Veg.	Non-veg.	Veg.	Non-veg.
Cereals	120	120	200	200	250	250
Pulses	20	20	40	40	50	50
Green leafy vegetables	50	50	50	50	50	50
Other vegetables	30	30	50	50	75	75
Fruits	50	50	50	50	100	100
Milk*	400	300	400	300	400	300
Fats and oils	20	20	20	20	25	30
Sugar and jaggery	20	20	40	40	30	30
Eggs or meat	-	50	-	50	-	50
<b>Approximate nutrients</b>						
Carbohydrates	158	153	256	251	334	284
Proteins	34	36	47	49	53	57
Total fats	46	46	46	46	41	56
Energy (kcal)	1258	1228	1689	1659	1933	1946

\*Buffalo milk. If cow milk is to be taken, increase the amount by one and half times

**Table 8.7: Balanced diet for boys**

Food stuffs (g/caput/day)	10-12 years		13-15 years		16-18 years	
	Veg.	Non-veg.	Veg.	Non-veg.	Veg.	Non-veg.
Cereals	300	300	350	350	390	390
Pulses	50	50	50	50	60	60
Green leafy vegetables	75	75	100	100	100	100
Other vegetables	75	75	100	100	100	100
Fruits	100	100	50	50	50	50
Milk	400	300	400	300	400	300
Fats and oils	30	30	30	30	30	30
Sugar and jaggery	40	40	25	25	30	30
Groundnut	25	25	25	25	25	25
Eggs or meat	-	60	-	60	-	60
<b>Approximate nutrients</b>						
Carbohydrates	394	345	381	376	423	367
Proteins	58	63	71	75	77	83
Total fats	43	57	66	67	66	86
Energy (kcal)	2189	2182	2451	2437	2640	2635

**Table 8.8: Balanced diets for girls**

Food stuffs (g/caput/day)	10-12 years		13-18 years	
	Veg.	Non-veg.	Veg.	Non-veg.
Cereals	250	250	250	250
Pulses	50	50	50	50
Green leafy vegetables	75	75	150	150
Other vegetables	50	50	100	100
Fruits	100	100	50	50
Milk	400	300	400	300
Fats and oils	30	30	25	25
Sugar and jaggery	30	30	25	25
Groundnut	25	25	25	25
Eggs or meat	-	60	-	60
<b>Approximate nutrients</b>				
Carbohydrates	298	293	303	299
Proteins	54	28	61	64
Total fats	56	57	51	62
Energy (kcal)	1972	1959	2083	2070

Table 8.9: Balanced diet for adult man &amp; woman (moderate worker)

Food stuffs (g/caput/day)	Man		Woman			
	Veg.	Non-veg.	Veg.	Non-veg.	Pregnancy*	Lactation*
Cereals	490	490	350	350	-	25
Pulses	60	50	50	40	25	25
Green leafy vegetables	100	100	150	150	50	-
Other vegetables	100	100	100	100	-	-
Fruits	100	100	100	100	50	50
Milk	300	200	300	200	200	200
Fats and oils	40	40	30	30	-	10
Sugar and jaggery	40	40	25	25	-	10
Eggs or meat	-	90	-	90	-	-
<b>Approximate nutrients</b>						
Carbohydrates	507	496	377	366	38	60
Proteins	76	82	60	65	14.5	17
Total fats	59	65	49	55	13	23
Energy (kcal)	2871	2858	2228	2215	357	554

\* additional allowances (in addition to normal diet) during pregnancy/ lactation

Table 8.10: Balanced diet for an aged person (60-70 years)

Food stuffs (g/caput/day)	Man		Woman	
	Veg.	Non-veg.	Veg.	Non-veg.
Cereals	325	325	225	225
Pulses	50	50	50	50
Green leafy vegetables	100	100	100	100
Other vegetables	150	150	150	150
Fruits	200	200	200	200
Milk	300	200	300	200
Fats and oils	20	20	20	20
Sugar and jaggery	20	20	20	20
Eggs	-	50	-	50
Meat	-	30	-	30
<b>Approximate nutrients</b>				
Carbohydrates	363	358	283	278
Proteins	58	63	48	53
Total fats	40	42	40	42
Energy* (kcal)	2084	2087	1744	1747

\*Due to reduced basal Metabolic Activities, energy requirement in this age group is reduced by 20 per cent



**Table 8.11: Recommended dietary allowances for Indians**

Group	Particulars	Body wt. (kg.)	Energy kcal/d	Protein g/d	Fat g/d	Ca mg/d	Iron mg/d	Vit.A µg/d	Thiamin mg/d	Riboflavin mg/d	Niacin mg/d	Pyridoxin mg/d	Vit.C mg/d	Folic acid mg/d	Vit.B mg/d
Man*	SW	60	2425	60	20	400	28	600	1.2	1.4	16	2.0	40	100	1
	MW	60	2875	60	20	400	28	600	1.4	1.6	18	2.0	40	100	1
	HW	60	3800	60	20	400	28	600	1.6	1.9	21	2.0	40	100	1
Woman*	SW	50	1875	50	20	400	30	600	0.9	1.1	12	2.0	40	100	1
	MW	50	2225	50	20	400	30	600	1.1	1.3	14	2.0	40	100	1
	HW	50	2925	50	20	400	30	600	1.2	1.5	16	2.0	40	100	1
	Pregnancy		+300	+15	30	100	38	600	+0.2	+0.2	+2	2.5	40	400	1
	Lactation														
	0-6 months		+550	+25	45	1000	30	950	+0.3	+0.3	+4	2.5	80	150	1.5
	6-12months		+400	+18	45	1000	30	950	+0.2	+0.2	+3	2.5	80	150	1.5
Infants	0-6 months	5.4	108/kg	2.05 kg	-	500	-	-	55µg/kg	65µg/kg	710	0.1	25	25	0.2
	6-12months	8.6	98/kg	1.65/kg	-	500	-	350	50µg/kg	60µg/kg	µg/kg 650 µg/kg	0.4	25	25	0.2
Children	1-3 years	12.2	1240	22	25	400	12	400	0.6	0.7	8	0.9	40	30	0.2
	4-6 years	19.0	1690	30	25	400	18	400	0.9	1.0	11	0.9	40	40	1.0
	7-9 years	26.9	1950	41	25	400	26	600	1.0	1.2	13	1.6	40	60	
Boys	10-12 years	35.4	2190	54	22	600	35	600	1.1	1.3	15	1.6	40	70	0.2-1.0
Girls	10-12 years	31.5	1970	57	22	600	19	600	1.0	1.2	13	1.6	40	70	0.2-1.0
Boys	13-15 years	47.8	2450	70	22	600	41	60	1.2	1.5	16	2.0	40	100	0.2-1.0
Girls	13-15 years	46.7	2060	65	22	600	28	600	1.0	1.2	14	2.0	40	100	0.2-1.0
Boys	16-18 years	57.1	2640	78	22	500	50	600	1.3	1.6	17	2.0	40	100	0.2-1.0
Girls	16-18 years	49.9	2060	63	22	500	30	600	1.0	1.2	14	2.0	40	100	0.2-1.0

\* Reference man/ woman

## 8.10 TECHNIQUES FOR ASSESSMENT OF HUMAN NUTRITION

The nutritional status of an individual is influenced by food intake both in terms of quantity and quality and also by physical health of the person. The main objective of nutritional assessment is to obtain precise information on prevalence and geographical distribution of nutritional problems of a given community and identifying the individuals or groups of people 'at risk' or in a greatest need of nutritional assistance.

The assessment of nutritional status involves various techniques viz. clinical examination, anthropometry, biochemical evaluation, assessment of dietary intake, vital and health statistics, ecological studies.

### Clinical Assessment of Nutritional Status

There are a number of physical signs, some specific and many non-specific known to be associated with states of malnutrition. Clinical signs, which are useful in assessment of nutritional status are: moon face, angular stomatitis, xerosis of conjunctiva, Bitot's spots, magenta tongue, etc. However, malnutrition cannot be quantified on the basis of clinical signs and many deficiencies are unaccompanied by physical signs.

### Anthropometric Measurements

Anthropometric measurements such as height, weight, skin fold thickness and arm circumference are valuable indicators of human nutrition. In young children, additional measurements such as head and chest circumference are good indicators.



### **Laboratory and Biochemical assessment**

Haemoglobin estimation is, most common laboratory test carried out to assess the prevalence of anaemia. Stools are examined for intestinal parasites. Urine is examined to assess the presence of albumin and sugar, etc.

Biochemical tests are applied to measure nutrient concentration in body fluids (e.g. serum iron, serum albumin, etc.) or detection of abnormal amounts of metabolites in urine (e.g. urinary creatinine, etc.) or measurement of enzymes in which the vitamin is a known co-factor (as in riboflavin deficiency) to assess malnutrition in its preclinical stages.

### **Radiological and Biophysical Assessment**

Radiological examination may help in diagnosis of rickets, osteomalacia, infantile scurvy, beriberi, fluorosis, and protein-calorie malnutrition.

A large number of tests have been devised to assess dark adaptations of the eye, nerve accommodation, physical performance, muscle co-ordination etc., in different deficiency states to assess the degree of alteration in physiological function.

### **Assessment of Dietary Intake**

Assessment of food consumption involves dietary surveys, which may be household inquiries, or individual food consumption surveys. A diet survey may be carried out by one of the methods viz. weighment of raw foods, weighment of cooked foods, oral questionnaire method to get information about dietary intake patterns; specific food consumed and estimated nutrient intakes.

### **Vital Statistics**

An analysis of vital statistics – mortality (infant mortality rate, rate of low birth weight babies etc.) and morbidity data (hospital data or data from community health and morbidity surveys) particularly protein energy malnutrition, anaemia, xerophthalmia and other vitamin deficiencies, endemic goiter, diarrhoea, measles and parasitic infestations can be of value in providing additional information contributing to nutritional status of the community.

### **Ecological Studies**

Malnutrition is the end result of many interacting ecological factors. A study of ecological factors comprises of food balance sheet, socio-economic factors (family size, occupation, income, education, customs, cultural influences etc.), health and educational services (primary health care services, feeding and immunization programme), and conditional influences (e.g., parasitic, bacterial and viral infections etc.).

---

## **8.11 NUTRITIONAL LABELLING**

---

Labelling for nutrition information has been mandatory for (i) any food to which a nutrient has been added – enrichment, fortification, or restoration and (ii) any food for which a claim is made for nutritional properties either on the label or in advertising. All food for special dietary use require labelling. At

present most nutrition labelling is voluntary, but many manufacturers have adopted it for their products.

Reasons for nutrition labelling:

- The main reason for nutrition labelling is to make the consumer aware about the nutritional properties of the product.
- Labelling also leads food processors to be constantly aware of the nutritive values of foods that they produce.
- Labelling will help persons who require modified diets to select those foods appropriate for their needs.

Regulations for nutrition labelling established by the Food and Drug Administration (FDA) are presented in Figure 8.2.

NUTRITION INFORMATION (PER SERVING) SERVING SIZE = 8 OZ.	
SERVINGS PER CONTAINER = 1	
CALORIES.....560	FAT (PERCENT OF CALORIES 53%).....33 GM
PROTEIN .....23 GM	POLYUNSATURATED*...2 GM
CARBOHYDRATE .....43 GM	SATURATED .....9 GM
	CHOLESTEROL* (20 MG/100 GM).....40 GM
	SODIUM (365 MG/ 100 GM) .....830 MG
PERCENTAGE OF U.S. RECOMMENDED DAILY ALLOWANCES (U.S. RDA)	
PROTEIN .....35	RIBOFLAVIN .....15
VITAMIN A .....35	NIACIN .....25
VITAMIN C (ASCORBIC ACID).....10	CALCIUM.....2
THIAMIN (VITAMIN B <sub>1</sub> ) ..... 15	IRON .....25
*Information on fat and cholesterol content is provided for individuals who, on the advice of a physician, are modifying their total dietary intake of fat and cholesterol	

Figure 8.2: The nutrition label format (U.S. FDA)



### Check Your Progress Exercise 3

- Note:** a) Use the space below for your answer.  
b) Compare your answers with those given at the end of the unit.

1. What do you understand by dietary allowances? Write the requirements of fruits and vegetables in our daily diet.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

2. List the various techniques involves in assessment of nutritional status. What are various anthropometric measurements?

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

3. Nutritional labelling helps the consumer in products selection. Justify.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

---

### 8.12 LET US SUM UP



Food is essential for our health and vitality. It is the food that provides us nourishment to perform various voluntary and involuntary functions of our body and prevents from deficiency diseases. Purchasing power of food and nutritional knowledge and awareness about nutritional need are the most important factors that affect the dietary consumption and nutritional health of a person and of any community.

It is the food pyramid which is a good guide in choosing a variety of foods from different food groups to get the required nutrients. Nutritional labelling also makes us aware about nutritional properties of purchased products.

---

### 8.13 KEY WORDS

**Absorption** : Transfer of nutrients across cell membranes; following digestion, nutrients are transferred from the intestinal lumen across the mucosa and into the blood and lymph circulation.

- Digestion** : Hydrolysis of foods in the digestive tract to simpler substances so that they can be used by the body.
- Health** : State of complete physical, mental and social well being and not just absence of disease.
- Kilo Calorie** : Kilo Calorie is the quantity of heat required to raise the temperature of 1 kg of water through 1°C.
- Metabolism** : Physical and chemical changes occurring within the organism; includes synthesis of biological materials and breakdown of substances to yield energy.
- Enzyme** : An organic compound which can be protein or RNA produced by living tissue to accelerate certain specific metabolic reactions, viz. hydrolases, oxidases, peptidases and others.
- Cholesterol** : The commonest member of sterol group; synthesized by body and is essential for its functions.

---

 **8.14 ANSWER TO CHECK YOUR PROGRESS EXERCISES**

---

**Check Your Progress Exercise 1**

Your answer should include the following points:

1. We need nourishment to perform various voluntary and involuntary body functions.

The nutrients; carbohydrates, proteins, fats, vitamins and mineral are required by body to provide energy, development of body tissue, bones, teeth etc. See Sub-sec. 8.1, 8.2 and 8.5.

2. Basal metabolism

Physical activities

Dietary thermogenesis. See Sub-sec. 8.

3. Some of the energy is required at rest.

Basal metabolic rate is the amount of calories required in the state of complete rest.

Basal metabolic rate is influenced by body surface area, gender, age, health factors, sleep etc. See Sub-sec. 8.4

**Check Your Progress Exercise 2**

Your answer should include the following points:

1. Broadly foods can be classified in to ten different groups. Fruits and vegetables are termed as protective foods. Fruits and vegetables provide vitamins and minerals. See sub-sec. 8.6.
2. Food pyramid shows the food groups. Food pyramid helps in selecting balanced amount of foods. See sub-sec. 8.7
3. Hydrolysis of food is essential for absorption of different nutrients. Amylase, proteases, lipase etc. are enzymes essential for digestion of food. See sub-sec. 8.10.

**Check Your Progress Exercise 3**

Your answer should include the following points:

1. Dietary allowances are measures of nutrients that we need to take daily.  
An amount of 100 g of each of fruits, green leafy vegetables and other fruits can fulfil our daily requirements. See sub-sec. 8.9.2. and Tables 8.1 to 8.5.
2. Clinical examination, anthropometry, biochemical evaluation, assessment of dietary intake, vital and health statistics, ecological studies are techniques for nutritional assessment.  
Important anthropometric measures are height, weight, skin fold thickness, arm circumference, head and chest circumference. See sub-sec. 8.10.
- 3) Nutritional labelling is helpful in selecting nutritious products from variety of available products.  
FDA has established regulations for nutrition labelling. See sub-sec. 8.11

---

**8.15 SOME USEFUL BOOKS**

---

1. Gopalan, C. and Shastri, Rama, Balasubramanian, S.C. (2002) Nutritive Value of Indian Foods, National Institute of Nutrition, ICMR, Hyderabad, India.
2. Mridula, D. and Bisht, B.S. (2000) Food Facts and Diets, Central Institute of Post Harvest Engineering and Technology, Ludhiana, India.
3. Mudambi, S.R. and Rajagopal, M.V. (1982) Fundamental of Foods & Nutrition (Third Edition), Willey Eastern Limited, New Delhi.
4. Swaminathan, M. (1991) Advanced Text Book on Food and Nutrition Volume I, Bangalore Printing and Publishing Company, Bangalore.
5. Swaminathan, M. (1991) Advanced Text Book on Food and Nutrition Volume II, Bangalore Printing and Publishing Company, Bangalore.