

OCCUPATIONAL DISEASES

Occupational diseases are many and varied. They arise out of, or in the course of employment. The following is a short list of the important occupational diseases :

1. DISEASES DUE TO PHYSICAL AGENTS

Heat : Burns, heat cramps, heat exhaustion.

Cold : Frost bite, trench foot.

Light : Occupational cataract, etc.

Noise : Occupational deafness complete or partial.

Pressure : Air embolism, Caisson disease.

Electricity : Burns.

Radiation : Cancer, leukaemia.

Mechanical factors : Accidents, injuries

2. DUST DISEASES (PNEUMOCONIOSIS)

Coal dust : Anthracosis

Silica dust : Silicosis

Asbestos dust : Asbestosis

Cane fibre : Bagassosis

Cotton dust : Byssinosis

3. CHEMICAL EXPOSURES

Gases : Carbon monoxide, etc.

Solvents : e.g., benzene

Metals : e.g., lead, arsenic chromium, mercury, etc.

Organic : e.g., insecticides

4. BIOLOGICAL FACTORS

Anthrax, zoonoses, tuberculosis

5. OCCUPATIONAL CANCER
6. OCCUPATIONAL DERMATITIS

HEALTH PROBLEMS DUE TO INDUSTRIALIZATION

The presence of factories and industries in a community is not without adverse effects on the health of the people. The chief problems are :

(1) **Air pollution** : This is an important problem in all industrial areas. Toxic fumes, gases, smoke and dust are released into the atmosphere from factories. Such diseases as chronic bronchitis, and lung cancer are attributed to air pollution. It requires proper town planning and location of industries to eliminate this hazard, at least partially. (2) **Water pollution** : This is due to discharge of industrial wastes into water courses. Industrial wastes contain acids, alkalies and many toxic substances, injurious to health. Not only human health but also the aquatic life is threatened by water pollution. (3) **Soil pollution** : This can also occur, if there is no proper planning. (4) **Housing shortage** : It is well known that there is always an acute shortage of housing in industrial areas. This leads to mushroom growth of slums and sub-standard houses in industrial areas. (5) **Communicable diseases** : Tuberculosis, venereal diseases, food and water-borne infections are more frequent in industrial areas. (6) **Accidents** : Due to congestion and increased vehicular traffic, accidents are more likely to occur in industrial areas. (7) **Social problems** : Alcoholism, drug dependence, crime, violence, prostitution and delinquency are the usual social problems in all the industrial areas.

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temperature, washerman's hands and feet, low blood pressure, suppression of urine. In severe cases the patient may pass into coma because of dehydration. If death does not occur, the patient shows signs of gradual improvement.

However, in EL Tor cholera which is currently the predominant type of cholera, the diarrhoea may not be severe and there is a greater frequency of occurrence of mild and inapparent cases and the mortality is low. The features of classical cholera may not be evident.

THE CONTROL OF CHOLERA

It is now considered that the best way to control cholera is to develop and implement a national programme for the control of all diarrhoeal diseases because of the similarities in the epidemiology of cholera and other acute diarrhoeal diseases. The following steps constitute the control measures not only for cholera but also for all other diarrhoeal diseases:

1. Verification of the diagnosis

It is important to confirm the outbreak of cholera as quickly as possible by identifying vibrio cholera in the stools of the patient. Stool samples should be collected before a patient has been treated with antimicrobial drugs. The stool specimen should be collected with a No. 26 or No. 28 rubber catheter or by means of a rectal swab and transported in alkaline peptone water to the testing laboratory.

2. Notification

Cholera is a notifiable disease locally, nationally and internationally. The number of cases and deaths are to be reported daily and weekly till the area is declared free of cholera.

3. Early case finding

Cholera control is greatly facilitated

by the early detection of cases. Then only it will be possible to initiate treatment before patients go into shock.

4. Oral rehydration

The modern treatment of cholera is based on *oral rehydration*. The oral fluid contains:

Sodium chloride	3.5 g
Trisodium citrate, dihydrate	2.9 g
Potassium chloride	1.5 g
Glucose, anhydrous	13.5 g
Potable water	1 litre

Packets of "oral rehydration mixture" are freely available at all primary health centres, sub-centres and other medical centres. The contents of the packet are to be dissolved in one litre of drinking water.

The solution should be made fresh daily and used within 24 hours. It should not be boiled or otherwise sterilized.

If the WHO mixture of salts is not available, a simple mixture consisting of table salt (5 g) and sugar (20 g) dissolved in one litre of drinking water may be safely used until the proper mixture is obtained.

The guidelines for assessing the degree of dehydration are given in Table 2. Mild and moderately severe cases of cholera can be treated effectively by simple oral fluid alone. During the initial stages of therapy, adults can consume up to 750 ml per hour, and children up to 300 ml per hour.

The introduction of oral rehydration therapy has not only reduced the cost of treatment, but also made possible treatment of patients in their own homes by primary health workers or relatives of the patients.

SEVERE CASES

In severe dehydration (e.g., shock.

(6) *Salmonellosis* : Over 1600 serotypes are known, but only about 50 occur commonly. They are also associated with diarrhoea and dehydration. (7) *Others* : These include parasites such as giardia.

Mode of transmission

The above agents are transmitted by the **faecal-oral** route - this may be water-borne, food-borne or direct transmission such as through unwashed hands.

CONTROL MEASURES

The intervention measures comprise the following:

1. Oral rehydration therapy (ORT)

The oral rehydration therapy is a life saving measure to combat dehydration, regardless of the causative agent. It should be started forthwith (see under cholera, page 196).

2. Appropriate feeding

It is the usual practice in many families (due to ignorance) that the mother withholds all the feeds including breast milk when her child develops diarrhoea. This results in further dehydration and may eventually lead to the death of the child. The current view is that during episodes of diarrhoea, normal food intake should be promoted, including breast feeding. This will help the child to recover faster from acute diarrhoea.

3. Appropriate drugs

Unnecessary prescription of drugs (e.g., erythromycin, tetracycline, gentamycin, etc.) will do more harm than good in new-born infants. However, appropriate drugs should be considered only where the aetiological agent has been clearly identified.

4. Other strategies

There are other strategies that will

help prevent/or reduce diarrhoea. They include:

- improved water supply
- better personal and domestic hygiene (e.g., promotion of hand washing)
- breast feeding
- proper weaning practices
- use of latrines
- measles immunization
- vit. A supplementation.

5. Health education

This is essential for the ultimate control of diarrhoeal diseases.

FOOD POISONING

Definition

Food poisoning is an acute gastroenteritis caused by the ingestion of food or drink contaminated with either living bacteria or their toxins or chemical substances.

Types of food poisoning

- (a) **NON-BACTERIAL** : Caused by ingestion of chemical poisons such as arsenic.
- (b) **BACTERIAL** : Caused by the ingestion of living bacteria or their toxins. The following types of bacterial food poisoning are well-known.

Salmonella food poisoning

The bacterial organisms involved are commonly *Salmonella typhimurium* and *S. enteritidis*. Man gets the infection through contaminated foods, e.g., milk and milk products, custard, eggs and egg products. Once ingested, the organisms multiply in the intestine and cause illness in about 12 to 24 hours. The prominent symptoms are nausea, vomiting, abdominal pain and diarrhoea.

Degree of dehydration	Volume of fluid (per kg body weight)	Time of administration
Mild (patient thirsty, pulse normal, tongue moist)	50 ml/kg	Within 4 hours
Moderate (patient thirsty, pulse rapid and weak, eyes sunken, tongue dry)	100 ml/kg	Within 4 hours

coma, radial pulse absent), the best form of treatment is intravenous rehydration. If it is possible, start the patient on oral rehydration and send him to the nearest hospital or PHC. When the patient's condition improves, a change to the oral route should be made.

5. Antimicrobial treatment

Antibiotics cut short the duration of illness. They should be given as an adjunct to oral rehydration. Tetracycline is the antibiotic of choice. The adult dose of tetracycline is 500 mg every 6 hours for 3 days. Septran has also been recommended.

6. Disinfection

(1) **STOOL AND VOMIT**: Mix the stool or vomit with an equal quantity of 5 per cent cresol or lysol (prepared by mixing 225 ml of cresol or lysol in 4.5 litres of water); or 30 per cent bleaching powder solution. After 2 hours of disinfection the excreta may be disposed off by burying or in a sewer. If none is available, excreta should be disposed off by adding sufficient quantity of boiling water or by burning. Immerse the bedpan and other articles in cresol solution for 2 hours. (2) **CLOTHES**: These should be soaked in 2½ % per cent cresol solution for 30 minutes, and then washed with soap and water. Cheap and inexpensive clothing should be disposed of by burning. (3) **ROOM DISINFECTION**: The

floor and walls up to a height of 3 feet should be treated with 5 per cent cresol. (4) **HANDS**: Hands may be dipped in 1 per cent cresol and washed afterwards with soap and water. (5) **FEEDING AND COOKING VESSELS**: These may be disinfected by boiling them in water for 15 minutes and finally washing them with water and soda.

7. Sanitation measures

(1) **Water control**: The public water supplies should be adequately chlorinated containing free residual chlorine. Individual householders should resort to boiling or adding a chlorine solution such as calcium hypochlorite or sodium hypochlorite solution. (2) **Excreta disposal**: For the permanent control of cholera in endemic areas, there should be an arrangement for the proper sanitary disposal of human excreta, such as water seal type of latrines. (3) **Flies**: An attack should be made on the fly breeding places, by improving sanitation. (4) **Food sanitation**: The golden rule is to eat freshly cooked hot food. Cut fruits and vegetables which are likely to be eaten raw should be avoided. Sweets exposed to flies should be destroyed.

8. Vaccination

Parenteral vaccine

Cholera vaccine is the only specific preventive against cholera. One ml of

Staphylococcal food poisoning

Man gets infection from eating food contaminated by *staphylococci* derived from another man (e.g., from boils, nose and throat discharges or pyogenic infections) or animals (e.g., milk and milk products). The organism involved is *S. aureus* which produces a heat-stable enterotoxin. Subsequent heating may sterilize the food, but not destroy the toxin. The toxin acts on the intestine and produces nausea, vomiting, retching, abdominal cramps, diarrhoea and dehydration, after an incubation of 1 to 6 hours, usually 2-4 hours.

Botulism

This is caused by the exotoxin (which is a heat-labile neurotoxin) produced by *Clostridium botulinum* which occurs in soil, dust and intestinal tract of animals. Man gets the infection by eating food which has been contaminated. Foods involved usually are improperly canned or bottled vegetables and fish.

PREVENTION AND CONTROL

- (a) Ensure proper food sanitation, including personal hygiene.
- (b) Refrigeration - foods not eaten should be kept in cold storage. "Cook and eat the same day is the golden rule."
- (c) Canned foods - all canned food should be discarded if there is evidence of decomposition.
- (d) Foods must be protected against flies, rats, mice and dust, and
- (e) Food handlers - they should be free from infected wounds, boils, diarrhoea, dysentery and throat infection.

TYPHOID FEVER

(Enteric fever)

Definitio

Salmonella typhi. The disease is prolonged fever, toxic symptoms, constitutional disturbances. "enteric fever" includes both typhoid and paratyphoid fevers.

Geographic distribution

In the developed countries, with clean drinking water supplies and good environmental sanitation in general, typhoid fever is a rare disease. Typhoid fever is widely prevalent in the tropics. This is mainly due to poor drinking water, and lack of sanitation. According to official statistics, 1000 cases and 415 deaths were reported from enteric fever in India during 1970-71.

Epidemiological factors

- (1) **Agent** : *S. typhi* is responsible for 95 per cent of cases. *S. paratyphi* is responsible for about 5 per cent of cases.
- (2) **Source of infection** : Man and animal carriers of typhoid fever are the most important in transmission. They spread the disease for many years and go undetected.
- (3) **Infective material** : Faeces and urine of infected persons.
- (4) **Infective period** : As long as the bacteria are present in faeces and urine.
- (5) **Age** : The disease affects all age groups, but more common in children between 5 and 19 years.
- (6) **Immunity** : An attack of typhoid fever gives a fairly lasting immunity. Second attacks may occur after 10-20 years.
- (7) **Poor sanitation** : Lack of clean drinking water and safe water are the main factors in the spread of typhoid fever.

Nutrition may be defined as the science of food and its relationship to health. It is concerned primarily with the part played by *nutrients* in body growth, development and maintenance. The word *nutrient* or "food factor" is used for specific dietary constituents such as proteins, vitamins and minerals. *Dietetics* is the practical application of the principles of nutrition; it includes the planning of meals for the well and the sick. Good nutrition means "maintaining a nutritional status that enables us to grow well and enjoy good health".

Changing concepts

Through centuries, food has been recognized as important for human beings in health and disease. The history of man has been, to a large extent, a struggle to obtain food. Until the turn of the 19th century, the science of nutrition had a limited range. Protein, carbohydrate and fat had been recognized early in the 19th century as energy-yielding foods and much attention was paid to their metabolism and contribution to energy requirements. The discovery of vitamins at the turn of the 20th century "rediscovered" the science of nutrition. Between the two World Wars, research on protein gained momentum. By about 1950, all the vitamins and essential amino acids had been discovered. Nutrition gained recognition as a scientific discipline, with roots in physiology and biochemistry. In fact nutrition was regarded as a branch of physiology.

Great advances have been made during the past 50 years in knowledge of nutrition and in the practical application of that knowledge. Specific nutritional

diseases were identified and technologies developed to control them, as for example, protein energy malnutrition, endemic goitre, nutritional anaemia, nutritional blindness and diarrhoeal diseases.

RELATION OF NUTRITION TO HEALTH

Good nutrition is a basic component of health. The relation of nutrition to health may be seen from the following view points:

(1) Growth and development : Good nutrition is essential for the attainment of normal growth and development. Not only physical growth and development, but also the intellectual development, learning and behaviour are affected by malnutrition. Malnutrition during pregnancy may affect the foetus resulting in still-birth, premature birth and "small-for dates" babies. Malnutrition during early childhood delays physical and mental growth; such children are slow in passing their "milestones", and are slow learners in school. Good nutrition is also essential in adult life for the maintenance of optimum health and efficiency. In short, nutrition affects human health from birth till death.

(2) Specific deficiency : Malnutrition is directly responsible for certain specific nutritional deficiency diseases. The commonly reported ones in India are kwashiorkor, marasmus, blindness due to vitamin A deficiency, anaemia, beriberi, goitre, etc. Good nutrition therefore is essential for the prevention of specific nutritional deficiency diseases and promotion of health.

(3) Resistance to infection : Malnutrition predisposes to infections like tuberculosis. It also influences the course and out-come of many a clinical disorder.

2. Classification by chemical composition

- 1) Proteins
- 2) Fats
- 3) Carbohydrates
- 4) Vitamins
- 5) Minerals

3. Classification by predominant function

- 1) *Body-building foods*, e.g., milk, meat, poultry, fish, eggs, pulses, groundnuts, etc.
- 2) *Energy-giving foods*, e.g., cereals, sugars, roots and tubers, fats and oils.
- 3) *Protective foods*, e.g., vegetables, fruits, milk.

4. Classification by nutritive value

- 1) Cereals and millets
- 2) Pulses (legumes)
- 3) Vegetables
- 4) Nuts and oilseeds
- 5) Fruits
- 6) Animal foods
- 7) Fats and oils
- 8) Sugar and jaggery
- 9) Condiments and spices
- 10) Miscellaneous foods.

NUTRIENTS

Nutrients are organic and inorganic complexes contained in food. There are about 50 different nutrients which are normally supplied through the foods we eat. Each nutrient has specific functions in the body. Most natural foods contain more than one nutrient. These may be divided into :

(i) *Macronutrients* : These are proteins, fats and carbohydrates which are often called "proximate principles" because they form the main bulk of food. In the Indian dietary, they contribute to

the total energy intake in the following proportions:

Proteins	...	7 to 15 per cent
Fats	...	10 to 30 per cent
Carbohydrates	...	65 to 80 per cent

(ii) *Micronutrients* : These are vitamins and minerals. They are called micronutrients because they are required in small amounts which may vary from a fraction of a milligram to several grams.

A short review of basic facts about these nutrients is given below.

PROTEINS

The word "protein" means that which is of first importance. Indeed they are of the greatest importance in human nutrition. Proteins are composed of carbon, hydrogen, oxygen, nitrogen and sulphur in varying amounts. Some proteins also contain phosphorus and iron and occasionally other elements. Proteins differ from carbohydrates and fat in the respect that they contain nitrogen. Proteins are made up of simpler substances, called *amino acids*. These are the building blocks of protein.

Some 24 amino acids are stated to be needed by the human body, out of which nine are called "essential". The essential amino acids are: (1) Isoleucine (2) leucine (3) lysine (4) methionine (5) phenylalanine (6) threonine (7) tryptophan; and (8) valine, and (9) histidine. These are called "essential" because the body cannot synthesize them in sufficient quantity, and therefore they must be obtained from the food we eat.

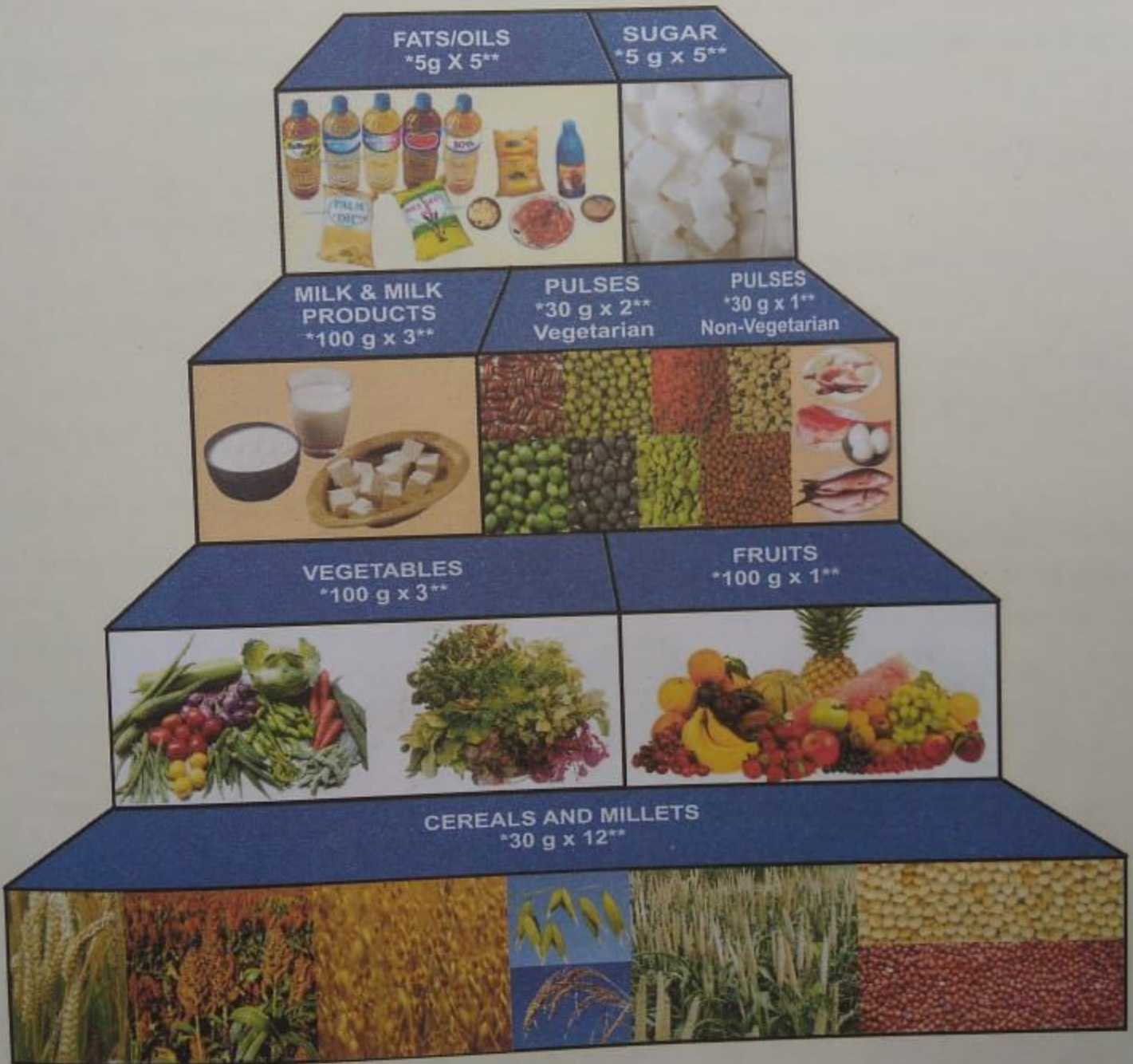
Functions

Proteins are needed by the body :-

- (1) *For growth and development*: They furnish the building material, i.e. the amino acids from which the body proteins are synthesized.

Figure 3

BALANCED DIET FOR ADULT MAN (SEDENTARY)



* Portion Size.

** No. of Portions

Elderly man: Reduce 3 portions of cereals and millets and add an extra serving of fruit

to two or three large meals in a day. Large meals are more difficult to digest, and also increase your tendency to put on weight (especially if you make dinner your heaviest meal of the day!). Actually, you should have a hearty breakfast to get you going for the day, followed by a good lunch, a snack with your evening tea, and a light dinner. Try to leave a gap of at least two hours between dinner and going to sleep at night.

FOOD PYRAMID

A food guide pyramid is a pyramid-shaped visual guide of food groups, divided into sections to show the recommended intake for each food group. It enables the individual to get the information about what s/he should eat and in how much quantity at a glance. Information related to quantity can be in terms of the number of servings of each food group in a day, or in relative terms like adequately, sparingly, moderately, and abundantly. Recommendations under the dietary guidelines of a country are used to formulate such pyramids. The most widely known food pyramid was introduced by the United States Department of Agriculture (USDA) in 1992, which consisted of four horizontal levels depicting four food groups. This was updated in 2005 and turned into a pyramid with vertical divisions representing food groups, and was referred to as the 'MyPyramid'.

My Pyramid (Figure 15.2a) depicted six food groups in bands of differing widths, suggesting the proportional contribution of each food group to a healthy diet. Grains were shown in orange, vegetables in green, fruit in red, milk in blue, all in wide bands, indicating that the intake of these groups should be encouraged; oils in yellow comprised the slimmest band, and meat and beans in purple were also in a slim band, indicating that these foods had to be consumed in smaller quantities. The wide base was indicative of the liberal consumption of nutrient dense foods, while the narrow top represents restricted foods such as sugar, fat and salt-rich processed foods. The need for being physically active was represented by a person climbing steps on the pyramid.

In 2011, the pyramid concept was changed to a plate portioning out the different food groups. It was felt that the pyramid concept was poorly understood by the general public, and that a plate was more symbolic in indicating the serving size of each food group. The icon known as 'MyPlate' is shown in Figure 15.2b. MyPlate is part of a larger communications initiative based on the 2010 Dietary Guidelines for Americans to help consumers make better food choices. MyPlate illustrates the five food groups using a familiar mealtime visual, a place setting.

Many other countries and organisations have also published food pyramids. These have been presented in Chapter 16. Most of the pyramids are accompanied by advice to abstain from / limit alcohol intake, and to say no to smoking/use of tobacco. Most also talk about the importance of being physically active / exercising regularly. The common message across the board seems to be—eating a variety, eating in moderation, and balancing the food groups will promote good health.

Figure 15.2a: Visual Food Guides Promoted by USDA

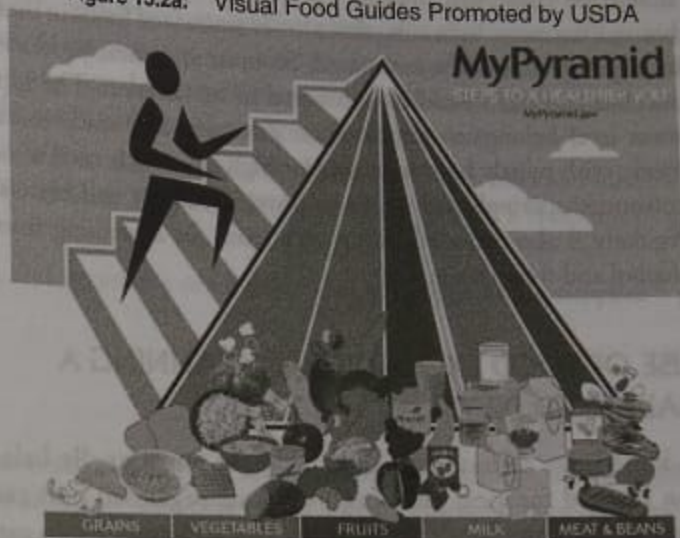
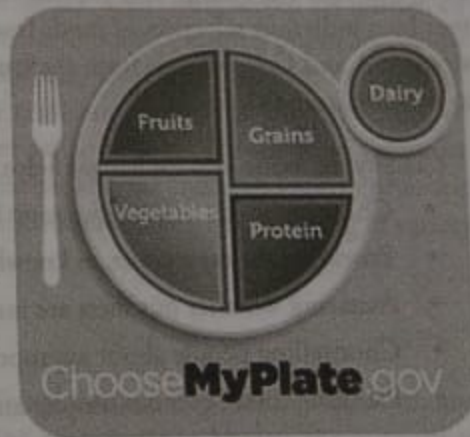


Figure 15.2b



My Plate - United States

Source: USDA's Center for Nutrition Policy and Promotion; <http://www.fns.usda.gov/>

Vegetables have been split into two categories—A and B—according to their carbohydrate content. Vegetables in the A category have only 3.5 g carbohydrate in one exchange of approximately 100 g. Vegetables in the B category have double the amount of carbohydrate, that is, 7 g.

Fruit exchange includes all fruits, and one exchange of approximately 100 g provides 10 g carbohydrate. A lower weight of the high-sugar fruits will provide the same amount of carbohydrate, for example, only 40 g of banana will give 10 g carbohydrate, whereas in a fruit of high water content like musk melon, 285 g will provide the same amount of carbohydrate.

Cereals include a group of foods that are rich in starch. It includes grains like wheat, rice and maize, millets like *bajra* and *jowar*, as well as roots and tubers like potatoes, sweet potatoes, etc., and products made chiefly from cereal grains, like bread, biscuits, pasta, and cakes. About 20 g of a cereal grain will provide 70 kcal and 15 g carbohydrate, while 30 g of bread or 65 g of potato would provide the same amount of energy and carbohydrate.

Fat exchange includes the visible fat like butter, ghee and cooking oil, and the invisible fat-rich nuts and oilseeds. One exchange of fat provides 5 g fat and approximately 45 kcal. This would be provided by about a teaspoon (5 g) of visible fat, or 8–13 g of a nut/oilseed.

Sugar exchange includes table sugar, jaggery, jam, and sugarcane or its juice. One exchange of 5 g supplies 5 g of carbohydrate and 20 kcal.

NEED FOR MEAL PLANNING

Giving due thought to planning meals not only makes it simpler to cook and serve meals which the whole family will relish, but also ensures that the nutritional needs of all family members will be adequately met. Planning helps if you want to spend within the budget. It also helps you to save time and energy. Once the menu has been planned for the day—or broadly, for a week—pre-preparation work required for cooking and serving the meals can be worked out in advance; for instance, the need to prepare a salad dressing in advance for the salad being served for dinner, or the need to sort, clean and boil spinach beforehand for the *palak paneer* planned for lunch. Soaking pulses and beans like *rajma*, *lobia* and soyabean the night before helps to cook them faster, and also saves time and fuel. In addition, a thought can be given to how vegetables that were not fully used in one meal can be used for the next meal, or how leftover boiled rice can be used to create another dish, like curd rice or tamarind rice. This helps to minimise wastage. If we do not plan the quantities of the different types of foods to be cooked, we end up cooking either too little or too much. While planning, you can give better thought to making the meals attractive by bringing in variety in taste, texture and colour.

Steps in Meal Planning

The first step in meal planning (Figure 15.4) is to consider the individual's age, sex and physical activity level, and see the Recommended Dietary Allowance (RDA) for the person. The RDA represents the level of the nutrient to be consumed daily to meet all the requirements of most individuals in a given population. In fact, the nutrient requirements of about 98 per cent of the population are covered. Once you know how much energy and protein needs to be given to an individual, a food plan is worked out, which details the number of exchanges from each food group that should be included in a day's diet to meet the energy and protein requirements.

Next, depending on the age group and lifestyle of the individual, the number and timing of meals are worked out. Usually, it is recommended that smaller and more frequent meals be consumed. A 4–5 meal pattern fits most work/school schedules. Besides the three main meals of breakfast, lunch and dinner, 1–3 small meals of snacks can be introduced between breakfast and lunch (mid-morning), and then between lunch and dinner (tea-time). A time gap of 2–4 hours can be given between the different meals.

The total number of exchanges of each food group is then distributed judiciously between the different meals. Each major meal should include foods from the three basic food groups—energy giving, body building and protective

- Use traditional **spices and condiments** liberally in preparing dishes. Ginger, garlic, *haldi*, red and green chilli, cloves, black pepper, etc., have many phytochemicals in them, which are beneficial to our health. Salt is the only seasoning that you have to add sparingly. Limit spices, especially chillies, for younger children.
- To make sure you are getting all **vitamins and minerals** in your diet, eat a variety of foods, especially fruits and vegetables. You have to make a special effort to include foods rich in three nutrients—**vitamins A and C, and iron**. These nutrients are not present in sufficient quantities in many foods. Vitamin A can be obtained from green leafy vegetables, yellow and orange vegetables, and fruits like, carrot, pumpkin, *paya*, mango, etc., and also from egg yolk, full cream milk and liver. Vitamin C is present in all fruits of the citrus family (like *mausmi*, orange, lemon, etc.), cabbage, capsicum, guava, strawberries, *amla*, sprouted pulses, etc.
- Iron is more readily absorbed from non-vegetarian foods like meat, egg and liver. Vegetarians should include an array of green leafy vegetables in their diet, like *methi*, *chulai*, *sarson ka saag*, *bathua dhania*, and *puđina*. Spinach also has some iron, but it is not a rich source. In addition, iron can be obtained from cereals like whole wheat, *bajra* and *ragi*, and from pulses, especially soyabean, *channa*, lentils. Among other vegetables and fruits that are rich in iron are lotus stem, watermelon, *seethaphal*, pineapple, apricot, beans, and green plantain. Most nuts are also rich in iron. We get most of the B group vitamins and other minerals in sufficient quantity from cereals, pulses, milk, and meat if we meet our daily calorie and protein requirement.
- In the end, the golden rule to good health and ideal nutritional status is **Moderation**. A nutritionally balanced diet will furnish appropriate amounts of all nutrients. It will avoid an excess of calories, fat, sugar, and salt, which are associated with an increased risk of diet-related diseases.

Factors Affecting Meal Planning

While planning meals, you need to keep several points in mind. The most important consideration, of course, is that the nutrient requirements of all members of the family have to be met. Meals have to be balanced in their nutritional content by including foods from all three basic food groups. Several factors must be considered before meal timings, the number of meals to be served, and the menu of different meals are decided. Generally, people like variety in colour, texture, taste, and flavour in their meals. Satiety is also an important factor in determining both the menu and the portion sizes. Let us discuss some of these factors in detail.

1. **Family Composition:** The first thing to be looked at is the composition of the family. What is the **age** of the different family members? Are there elderly people, children, pregnant women, and/or nursing mothers in the family? These groups would need special attention in planning. The menu decided upon should be suitable for all members. The elderly in the family generally prefer easily digestible, simple food that has been prepared traditionally. Children may, however, prefer a varied cuisine, and want to eat foods that are popular with their peer group. The person in charge of planning will have to balance each meal with dishes that all family members like. Nutrient needs also vary according to age. When the body is growing rapidly, as in infancy and adolescence, the requirement for all nutrients goes up drastically. Energy, protein, vitamin, and mineral needs increase steadily as the child reaches adulthood. After that, however, there is a gradual decline, particularly in energy needs, as the body ages. Part of the change in body needs is related to changes in body composition, as the individual moves from one stage of his lifecycle to the next. The requirement of nutrients also varies with **sex**, as the body size and composition of males and females is different, especially after the age of 10. Sometimes males and females may also have different food choices. It is important to keep the **number of family members** who will be consuming each meal in mind, in order to decide on the quantity of food to be cooked. If the food cooked is too little, family members may not be able to satisfy their hunger. On the other hand, too much food cooked at each meal will leave you with a lot of leftovers, leading to food wastage.

Besides availability, climate or weather conditions may also affect food choices. In cold weather, the consumption of hot beverages like tea and coffee, and high energy foods like nuts and oilseeds, in the form of roasted peanuts and jaggery brittles (*chikki*, *rewri*, *gazak*), go up. In summers, the consumption of cooling beverages like cold drinks, buttermilk, juices, ice lollies, ice creams, and foods with high water content, like watermelon, muskmelon, cucumber, etc., increases. Many traditional families believe very strongly in the concept of hot and cold foods, which alters their food selection depending on the weather and season.

5. **Availability of food:** The geographical location of the city/town or village where the family lives determines the availability of foods in a particular area. People living in remote areas, which are not well-connected to other towns, can select only those foods that are locally grown. However, with improved processing, preserving techniques, and with better infrastructure and transport facilities now available, a variety of foods are now available to the consumer all round the year, even in towns far away from the place where the food has been produced. But if the area has no big grocery stores or supermarkets, the variety of processed and convenience foods available will be less. The availability of food in a region can also be restricted because of calamities like floods, droughts and war.

6. **Socio-cultural factors, religion and family traditions:** Cultural influences on the choice of foods eaten by a family are very strong. Cooking styles, the ingredients used, and even recipes vary by region. Within a **region**, recipes for commonly eaten foods vary from family to family. Every family will have their own special seasoning for dishes. That is why the same dish will taste different when you eat it at your own home, and then at your friend's place. Coastal states use a lot of coconut in their cooking and also consume a lot of seafood. Traditionally, Bengalis use mustard oil in their cooking, people in Kerala like to use coconut oil, while unrefined groundnut oil is popular in Andhra Pradesh. Some families are very traditional about their way of cooking, while others have adapted their cooking and become more cosmopolitan, drawing cooking styles from various **cultural backgrounds**.

Customs and beliefs concerning foods that should or should not be eaten have present in every group of people. These include religious beliefs, beliefs concerning the health properties of food, and the emotional responses to food. These beliefs are generally deep-rooted and difficult to change. **Religion** plays a significant role in food choices. Certain religions expect followers to shun particular foods. A lot of people do not consume non-vegetarian foods out of religious considerations. Others practice vegetarianism on particular days of the week. Cultural or religious **taboos** also demand that certain foods be avoided, these usually being specific to certain days of the week, or certain physiological states like pregnancy or lactation. There is no harm in following these restrictions as long as these do not affect our nutritional status or health.

Special occasions, whether religious or otherwise, demand special menus. The special thing about celebrating festivals is the particular foods made especially for the occasion, for example, the special dishes of *Navratras* and *Janamashanti*, the *modak ladoos* of *Ganesh Chaturthi*, the special *Pongal* rice for the Tamil new year, *biryani* for Eid, and many more. Special foods are cooked on other celebratory occasions as well, for instance on weddings and birthdays. Even the simplest celebration is incomplete without food.

7. **Likes and dislikes:** This is perhaps the most important reason why you choose to eat a particular kind of food. Personal likes and dislikes generally govern the type of food that people select. Many factors determine an individual's or a family's food choices. Age, physiological status, lifestyle, culture, religion, economic status, and availability (as already discussed) will affect food choices. People also like meals that are both satiating and appetising. In addition, the following factors will also influence what families would like to eat:

Food fads usually refer to diets that do not follow common nutritional guidelines. A food fad may lead to undue reliance on, or avoidance of, a particular foodstuff. Fads are common in toddlers, adolescents, in people under stress, or those trying to lose weight. Fads usually spike in popularity at a particular point in time. They are like popular trends in foods. An example of a fad diet is that of eating only white-coloured foods for a week.

- **Knowledge and attitudes towards foods.** Good health is a growing focus for some families. A good education helps family members to make full use of their opportunities and resources to improve their diets. For example, even low-income group families can improve the quality of their diets by sprouting pulses, and growing and consuming green leafy vegetables at home. Knowledge also helps them to overcome prejudices and wrong beliefs. However, it is simply not enough to have nutrition knowledge in order to make wise food choices. Attitudes also need to undergo a change before families can change their dietary habits.
- **Safety considerations.** Safety is one very important consideration when families make food choices. For instance, the belief that street food is unhygienic will make people prefer home-cooked meals. Most of us avoid uncooked foods like salads or milk-based products when we eat out, especially in summers. Fear of novel foods or fear of allergies can also make people reject a large variety of foods, especially seafood. People who are conscious of eating too many food additives will select fewer processed food items.
- **Nutrition information and misinformation:** Advertising can both help and hinder the process of making the right food choices. Mass media can be very powerful in influencing food choices. Nutrition information on food labels and the health claims made can become important influencers. Sometimes companies mislead consumers by making false or irrelevant claims; for instance, claiming that a particular brand of vegetable oil is 'cholesterol-free' may increase its sale. However, one must remember that all vegetable oils are actually free of cholesterol.

Early experiences with food shape later choices. Hence parents, and the family as a whole, have an immense responsibility in teaching their children how to make the correct food choices.

SUMMARY

- A balanced diet is one that includes foods from all food groups during the day. The quantities and proportions of these foods need to be such that they fulfil the daily requirements for all the nutrients we need. In addition, the nutrients should be in such amounts that a little bit can be stored in the body to take care of days when food intake is insufficient.
- Foods can be grouped into categories according to the type of food, or the nutrients that foods supply. The basic food group classification is based on the physiological role played by the foods of each group in our bodies, that is, energy giving foods, body building foods, and protective or regulatory foods.
- The Indian Council of Medical Research (ICMR) classifies foods into five groups—cereals, pulses, milk and meat, vegetables and fruits, and fats and sugars. Classifying foods into groups helps dietitians and healthcare professionals in several ways.
- A food guide pyramid is a pyramid-shaped visual guide of food groups, divided into sections to show the recommended intake for each food group.
- A knowledge of food exchanges helps in nutritionally balancing meals. Foods are organised into exchange groups based on their carbohydrate, fat and protein content. Foods listed in any one exchange group can be used interchangeably.
- Planning meals in advance helps to ensure that the nutritional needs of all members are being fulfilled. There is also a lot of saving on time for food preparation and less waste.

2. **Occupation and Lifestyle:** The occupation of different members of the family will determine their lifestyle, and how much time they have for meal preparation and consumption. It also majorly determines the timing and number of meals, and how elaborate the menu is for each meal. Working women, for instance, would not have the time to prepare elaborate meals, and would end up using more of convenience foods unless they have additional manpower in the form of domestic help to help with cooking. Some family members eat all their meals at home; work considerations may demand that some others eat at least one meal outside the home; while some others, like school and college-going children and office-goers, may carry a packed meal from home.

Occupation also determines how much **income** comes into the house, and consequently how much money is available for purchasing food.

3. **Food Cost:** The greater the household income, the more the money available for purchasing food items. It has been observed that with an increase in income, there is an increase in the quantity and variety of food purchased by the family. Also, the quality of food selected is directly proportional to the income. For example, those with a limited family income will choose low-cost food groups like cereals to supply most of their caloric or nutrient requirements. They will use smaller quantities of the meat and milk group, and from the fruit-vegetable group, they will select the less expensive items. Less expensive meat cuts, seasonal vegetables, poor quality vegetables left over after market time, and cheap, locally grown fruits will probably be selected by those with a limited income. In contrast, when money is not a problem, the family selects a greater variety of food, selects good quality foods, exotic foods and processed foods, and tends to eat out more often. The cost of food is often equated with status. The rich will tend to select the more expensive foods, especially when entertaining.

Families can manage their budgets better by keeping a few points in mind. The first step is to make a budget according to the amount of money kept aside for food expenses. They then need to do a few exercises, like:

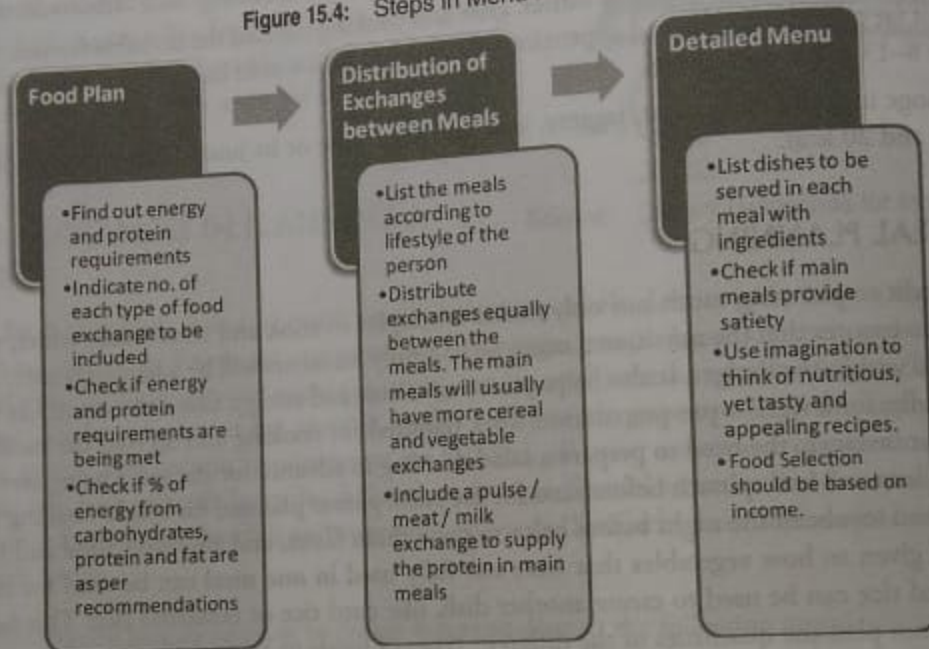
- Identifying shops and retail outlets that sell the food items at subsidised rates. Cereal grains like wheat and rice and edible oil are available from government fair price shops (ration shops) at very low rates. Besides this, there are *Kendriya bhandars* and other government-run outlets that will sell food products at very reasonable rates.
- Buying non-perishable foods in bulk sometimes helps to bring down prices, but one must be careful to never buy perishable food in bulk, as some of it will rot before you get a chance to eat it.
- Identifying the cheapest vegetables and fruits of the season. Buying seasonal foods is usually cheaper.
- Cooking just enough food that can be finished by the family members is important; otherwise, there are a lot of leftovers. Wastage of leftovers can be reduced by incorporating leftover foods in other recipes, for example, leftover rice can be turned into fried rice, lemon rice, or curd rice. Leftover dals can be used to make stuffed *parathas* or *rotis*.
- Maintaining kitchen gardens (even if vegetables can only be grown in pots) or keeping poultry (where space permits) provides a ready source of nutrient-rich foods at home.

4. **Climate or Weather Conditions:** The climate of a place determines the kinds of foods grown in and around that area. If the climate is generally cold and the place snow-laden for a good part of the year, the kind of foods that can be grown at home or in fields are very limited. The same problem applies to hot and dry climate areas. The availability of foods like fruits and vegetables is most affected by season. Seasonal foods are more easily available, of better nutritional quality, and cheaper. However, in big cities, because of the provision of cold storage facilities and food processing plants, fruits and vegetables may be available throughout the year. Canning and processing of fruits and vegetables reduces wastage from the spoilage of surplus crops, and at the same time, makes nutrient-dense foods available throughout the year. Frozen peas and other vegetables, tomato puree, canned mangoes, pineapples, cherries, and the pulp of different fruits and vegetables are now available off the shelf.

foods. This means cereal, along with pulse/milk/meat and vegetables/fruits. Even the smaller meals should be made nutrient-dense, as for most age and physiological groups, the reason for splitting the day's diet into so many meals is that they are not able to eat too much at a single meal. Healthy options of dishes for each meal have been discussed in subsequent chapters, along with diets for each age group. As a rule, individuals of all age groups should consume fried or very salty or sweet snacks only occasionally.

The last step is to plan the detailed menu for the day. Food selection from each group should be according to the likes and dislikes of the individual. Choose healthier options from each group, as discussed earlier and in Box 15.2. The meal should provide satiety (proteins, fats and fibre-rich meals provide greater satiety value) and variety in taste and flavour, colour and texture. Many other factors need to be kept in mind, which we will now discuss.

Figure 15.4: Steps in Menu Planning

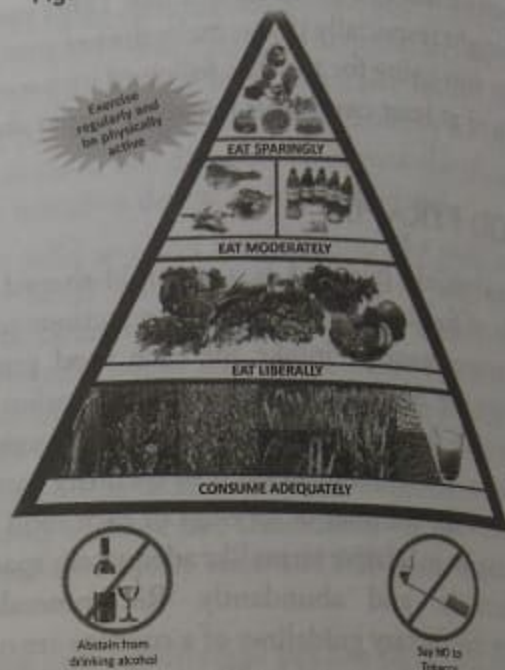


Box 15.2: Points to Remember While Planning Nutritionally Adequate Meals

- **Cereals** are a staple, which means that we include these in all our meals.
- To ensure good quality protein, combine cereals with **pulses, milk or milk products, meat or egg**. You can choose between a pulse, milk or meat product to provide sufficient protein in a meal. Overloading protein in a meal will actually have no extra benefit, as excess protein is broken down and excreted from the body!
- Always include **vegetables or fruits** in all your meals to add a dose of vitamins and minerals, because these actually help your body to utilise other nutrients better.
- Use **fats and sugars** to make your food more palatable, but be a miser while adding these to your dishes. Choose low fat foods like double toned or skim milk and its products, leaner cuts of meat, chicken without its skin, and fish. Walnuts, almonds and pistachios are healthier than cashewnuts. Also choose roasted nuts over fried and salted ones. Avoid foods rich in saturated fat, trans fat and cholesterol, as these increase the risk of heart disease.
- Eat a lot of **fibre** by including whole grain cereals and pulses in the daily menu, along with vegetables and fruits. So choose whole wheat flour (*atta*) bread and biscuits, rather than those made from *maida*. Soluble fibre in cereals, legumes, fruits, and vegetables also protects you from diabetes and heart disease by lowering your blood sugar and cholesterol.

The National Institute of Nutrition in India has also made a food pyramid, which was revised in 2010. The pyramid consists of four horizontal bands (Figure 15.3). As the base of the pyramid is the largest, cereals, which make up the largest proportion in an Indian diet, have been positioned here. This band also includes pulses and milk, which need to be consumed adequately in a healthy diet. The next band is for vegetables and fruits, which should be consumed liberally. As you go upwards, the bands become narrower, indicating that a lower amount of foods in these food groups should be consumed. So meat and meat products, and fats and oils should be consumed in moderation. The top-most level belongs to calorie-dense processed and ready-to-eat foods, with mostly high sugar and/or high fat, which need to be consumed sparingly. Advice to be physically active and exercise regularly is also included, along with icons for abstaining from alcohol and tobacco use.

Figure 15.3: Indian Food Pyramid



Source: Dietary Guidelines for Indians, NIN 2011.

USE OF FOOD EXCHANGES IN PLANNING A BALANCED DIET

A knowledge of food exchanges helps in nutritionally balancing meals. Let us learn how a food exchange list can be used for meal planning. Foods are organised into exchange groups, based on their carbohydrate, fat and protein content. Foods listed in any one exchange group can be used interchangeably. A specified weight of any food in one group can be substituted for another, and it will provide approximately the same nutritive value. Provided that the energy and protein requirements are fulfilled, all other nutrient requirements are likely to be met by a judicious selection of foods from the different exchanges. Special attention needs to be paid to selecting vitamin A and C-rich foods from the fruit and vegetable exchange. Similarly, a conscious effort needs to be made to include iron-rich foods.

Classifying foods into exchanges helps us to design balanced diets in the following ways:

- Choosing foods from each group helps to include all the nutrients we require in our meals.
- Providing variety in taste, as knowledge of food groups enables us to choose alternatives from the same group.
- Assessing whether our diets are nutritionally adequate.
- Counselling people about appropriate diet choices.
- Planning diets becomes simpler and quick.
- Improving flexibility in our planning.

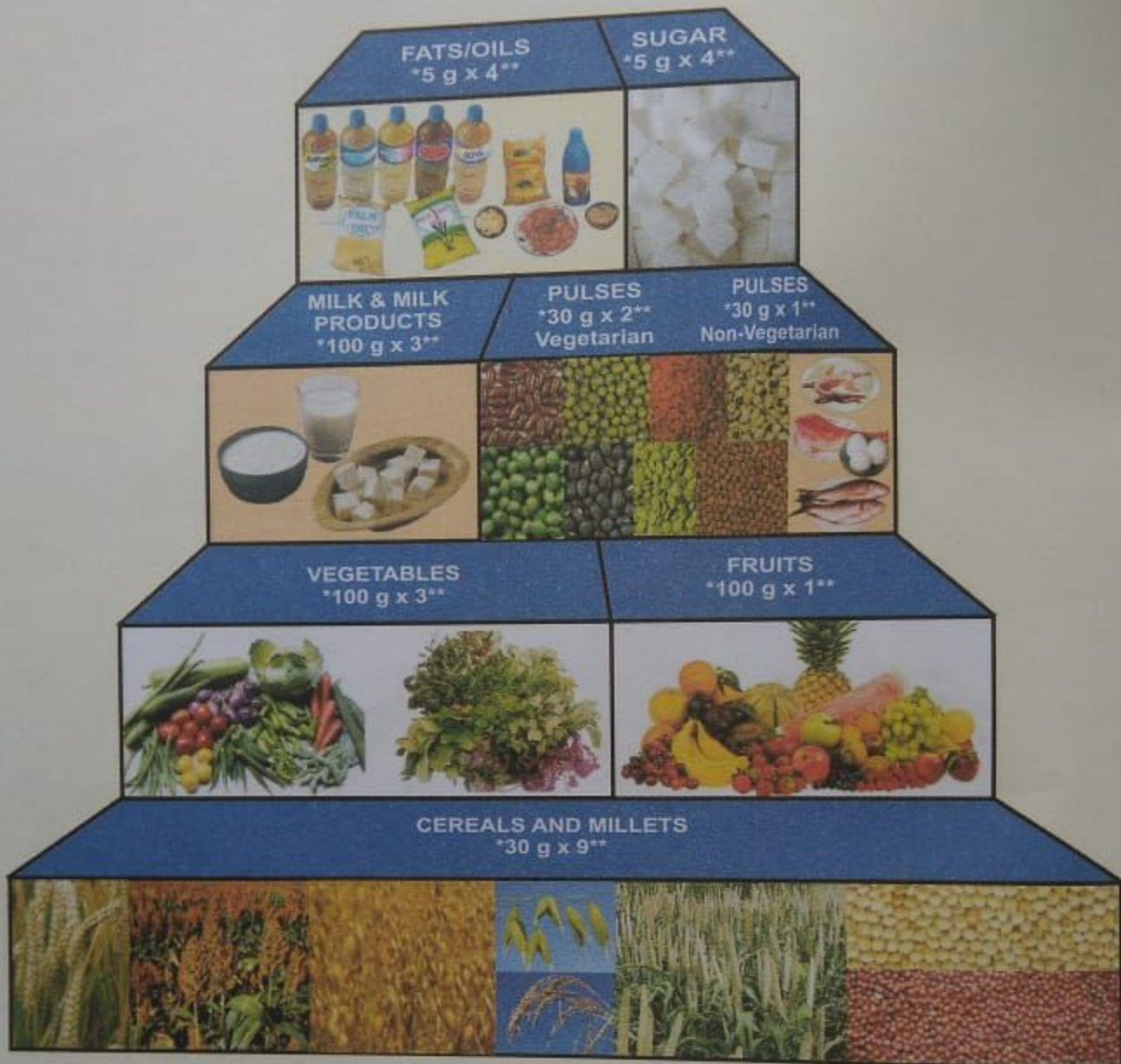
The main features of the different exchanges are discussed here. The detailed exchange list used at Lady Irwin College, University of Delhi, and illustrated steps showing how to use the exchange list in planning a day's menu are given in Appendix 3.

Milk exchange provides 150 kcal and 8 g protein per 250 ml (a medium glass) of toned/standardised milk. It includes all types of milk—full cream or buffalo's milk, toned or cow's milk, skim milk, milk powder, and products made from milk, like curd, *paneer*, cheese, etc. The amounts of each of these foods that would supply 8 g proteins have been worked out to exchange with one cup of milk.

Meat and Pulse exchange provides 7 g of protein. Meat (40g is one exchange of meat or egg) provides 80 kcal. Lean meat, like chicken and fish (30g is one exchange), provides 35 kcal, while pulse (30 g is one exchange) provides 100 kcal per exchange. About 15 g of soyabean make one pulse exchange because of the high protein content.

Figure 4

BALANCED DIET FOR ADULT WOMAN (SEDENTARY)



* Portion Size.

** No. of Portions


Extra Portions:

Pregnant women : Fat/Oil-2, Milk-2, Fruit-1, Green Leafy Vegetables-1/2.

Lactating women : Cereals-1, Pulses-2, Fat/Oil-2, Milk-2, Fruit-1, Green Leafy Vegetables-1/2

Between 6-12 months of lactation, diet intake should be gradually brought back to normal.

Elderly women : Fruit-1, reduce cereals and millets-2.



potassium, calcium, phosphorus, magnesium and sulphur, while zinc, copper, selenium, molybdenum, fluorine, cobalt, chromium and iodine are micro minerals. They are required for maintenance and integrity of skin, hair, nails, blood and soft tissues. They also govern nerve cell transmission, acid/base and fluid balance, enzyme and hormone activity as well as the blood-clotting processes. Approximate calorific value of nuts, salads and fruits are given in annexure 1.

What is a balanced diet?

A balanced diet is one which provides all the nutrients in required amounts and proper proportions. It can easily be achieved through a blend of the four basic food groups. The quantities of foods needed to meet the nutrient requirements vary with age, gender, physiological status and physical activity. A balanced diet should provide around 50-60% of total calories from carbohydrates, preferably from complex carbohydrates, about 10-15% from proteins and 20-30% from both visible and invisible fat.

In addition, a balanced diet should provide other non-nutrients such as dietary fibre, antioxidants and phytochemicals which bestow positive health benefits. Antioxidants such as vitamins C and E, beta-carotene, riboflavin and selenium protect the human body from free radical damage. Other phytochemicals such as polyphenols, flavones, etc., also afford protection against oxidant damage. Spices like turmeric, ginger, garlic, cumin and cloves are rich in antioxidants. Balanced Diet for Adults - Sedentary/Moderate/Heavy Activity is given in annexure 2 and figures 3 & 4. Also, sample menu plans for sedentary adult man and woman are given in annexure 2a and 2b respectively.

What are food groups ?

Foods are conventionally grouped as :

1. Cereals, millets and pulses
2. Vegetables and fruits
3. Milk and milk products, egg, meat and fish
4. Oils & fats and nuts & oilseeds

However, foods may also be classified according to their functions (Table 4).

What are nutrient requirements and recommended dietary allowances (RDA)?

Requirements are the quantities of nutrients that healthy individuals must obtain. The recommended dietary allowances

Infection, in turn, may aggravate malnutrition by affecting the food intake, absorption and metabolism.

(4) Mortality and morbidity : The indirect effects of malnutrition on the community are even more striking - a high general death rate, high infant mortality rate, high sickness rate, and a lower expectation of life. Over-nutrition, which is another form of malnutrition is responsible for obesity, diabetes, hypertension, cardiovascular and renal disease, disorders of the liver and gall bladder. More recent reports suggest that diet perhaps plays an important role in certain types of gastro-intestinal cancers. It is now quite well accepted that diet and certain diseases are inter-related.

Functions of food

The main functions of food are:-

- (1) Provision of energy
- (2) Body building and repair
- (3) Maintenance and regulation of tissue functions.

On the basis of the above functions foods have been classified as :

- (1) *Energy-yielding foods:* These are foods rich in carbohydrate and fat, e.g., rice, wheat, potatoes, sugar, fats and oils.
- (2) *Body building foods:* These are foods rich in protein, e.g., milk, eggs, meat, liver, fish, pulses, oilseed cakes.
- (3) *Protective foods:* These are foods rich in vitamins, minerals and proteins, e.g., milk, green leafy vegetables. Protective foods are so called because they protect the body against infection, disease, and ill-health. It may be mentioned that diets in India are generally poor in protective foods.

A balanced diet must contain foods from the above three groups.

Constituents of food

The dietary constituents of food are shown in Fig. 1

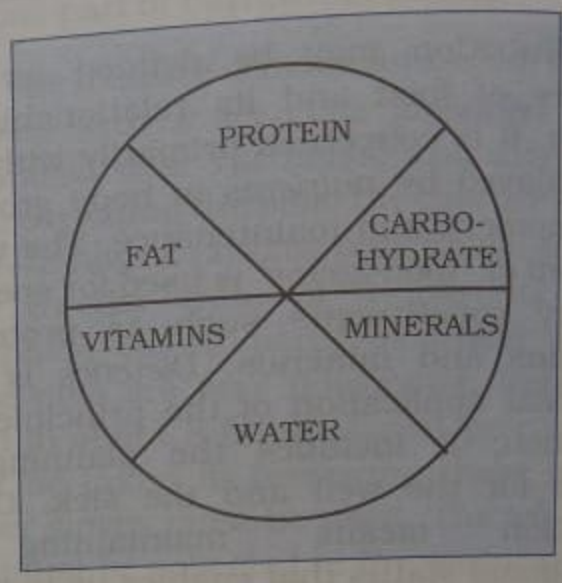


FIG. 1
Dietary constituents of food

Proteins, fats and carbohydrates are called "proximate principles" or energy yielding foods. Together with water, they form the bulk of food. The human body has the following approximate composition :

TABLE 1
Composition of human body

Constituents	Per cent
Water	63
Protein	17
Fat	12
Minerals	7
Carbohydrates	1

CLASSIFICATION OF FOODS

There are many ways of classifying foods:

- 1. *Classification by origin*
 - 1) Foods of animal origin
 - 2) Foods of vegetable origin