
UNIT 16 THE ELDERLY

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16.1 INTRODUCTION

You would recall reading about meal planning during various stages of life, spanning right from the infancy till adulthood, including physiologically stressful period of pregnancy and lactation. This unit will focus on nutrition and ageing and will outline the current nutritional recommendations for healthy ageing. One of the fundamental and unavoidable facts of life is that our bodies change with age. They change from the way they look to the way they function. Externally, the hair greys, skin wrinkles, eyes and ears also go through their own degenerations. Internally, many physiological changes occur and practically all the tissues and organs decline in their function or efficiency over time. So let us in this unit study about the nutrient requirements and dietary pattern based on above mentioned changes. How does the body composition vary from that of an adult? What physiological changes take place? What modifications should be made so that all nutrient needs are sufficiently met? These are some issues highlighted in this unit. Let us proceed first and get to know who are the elderly.

Objectives

After studying this unit, you will be able to:

- comprehend the process of ageing and how it affects the human body,
- explain the importance of nutrition as a factor which modulates the biological process of ageing,
- describe the techniques for measuring body composition,
- list the common nutritional deficiencies among the elderly,
- comprehend the special nutritional needs of the elderly, and
- plan a balanced diet with an appropriate food selection for the older adults.

16.2 DEFINITION OF OLD AGE

The exact timing of the onset of the ageing process cannot be ascertained because the effect of age varies among different individuals. However, the chronological age is most often used by gerontologists to delineate the aged. In India, a *cut-off age of 60 years* is taken for classifying people as ‘old’ and is used for census purposes. Many nations follow the cut off age at 60 years while many developed countries and United Nations take the cut-off age at 65 years to designate the elderly.

Elderly represent the fastest growing segment of populations throughout the world. In India, socio-economic development along with better health facilities and a wider spread of medical care including primary health services have raised the life expectancy. The total number of persons above 60 years of age was 43.1 million in 1981, which has risen to 56.7 million in 1991. At present, the elderly constitute 7.7% of the total population i.e. approximately 76 million are projected to burgeon to about 150 million (12 percent) by the year 2025. The elderly population is a very heterogeneous group who has varying problems and needs. On classifying the elderly into 'young old' (i.e. 60 to 74 years) and 'old old' (i.e. 75 years plus), it was observed that 'young old' were increasing at a much faster pace (5.6%) till 2001 as compared to 'old' (1.2%) in India. Globally, maximal growth is recorded in the latter and not in the former category of elderly. Men outnumber women in young old age groups but the sex ratio is in favour of women in the higher old ages.

The Indian population projections reveal an impending burden of elderly care in the near future. Our health planners will have to give a greater attention to the preventive and health promotion. Measures for the elderly would help to improve their quality of life and reduce morbidity levels so that they live purposefully and independently within the community.

Let us now get to know about the various nutritional aspects related to the process of ageing.

16.3 NUTRITION AND AGEING

Ageing in human being is of a multifactorial origin and there is a programmed senescence (ageing) of the cells in the body. The genetic make-up of an individual is responsible for some degree of physical decline in the ageing process, but several environmental factors including diet, exercise, smoking, air pollution and occupational conditions also assume great importance.

Nutrition is increasingly being recognized as an important determinant, which modulates the biological process of ageing. Poor nutrient intakes and suboptimal diets have been implicated for many of the biological changes and increased risks for chronic diseases rather than the ageing process per se. Many of the chronic degenerative diseases of older persons such as cardiovascular disease, diabetes, obesity, osteoporosis and anaemias due to iron, folic acid and vitamin B₁₂ deficiency have preventable causes, including nutritional causes. Enhanced dietary intakes and more physically active life styles can help to prevent or control these conditions.

The nutritional status influences the age-related rate of functional decline in many organ systems in the body. Nutrition is also an important factor which affects the progressive changes in body composition associated with ageing, such as loss of bone and lean body mass (LBM).

Inadequate nutrition ranks as one of the major problems of old age. Various factors which may be responsible for the change in one's diet in old age include social isolation, living alone, limited income, lack of mobility, dental problems, diminished taste acuity, food faddism and presence of chronic diseases. Inappropriate dietary intake in old age can lead to various nutrient deficiencies and contribute to the development and enhanced progression of many degenerative diseases and disorders associated with ageing.

The nutritional deficiencies which have been identified in the group of elderly are of total calories, protein, vitamin A, vitamin C, iron and riboflavin. Folate deficiency in elderly not only produces anaemia but is also associated with dementia. Zinc deficiency has been associated with psychosis (a mental state in which thought and perception

are severely impaired) and anorexia. Potassium deficiency could cause confusion and apathy in elderly and irritability could result from magnesium deficiency. Chronic vitamin D deficiency can accelerate bone loss and precipitate osteoporosis, spinal compression fractures, hip and wrist fractures, especially in elderly women.

Nutrition has a strong influence on the immune system of the elderly. Ageing induces dysregulation of the immune system, mainly as a result of changes in cell mediated immunity. Undernutrition, among the aged population induces lower immune responses and consequently increases the risk of infection. Protein energy malnutrition and deficiency of a single micronutrient like zinc, selenium and vitamin B₆ also adversely affects the immune response. The diminished functioning of the immune system associated with ageing is also believed to have contributed to an increased incidence of not only infectious diseases but also degenerative diseases such as cancer in the elderly. There is an increasing evidence of immunologic enhancement followed by an intervention of nutrient supplements among the elderly, which may further help in health and reducing illness.

What are the physiological changes associated with ageing? How do these affect body's normal functioning? What role nutrition can have in sufficiently meeting the special requirements? Let us proceed and find out the answers to these questions in the following section.

16.4 PHYSIOLOGICAL CHANGES ASSOCIATED WITH AGEING

The physiological changes associated with ageing are described in this section. These changes include:

- *Changes associated with the gastrointestinal tract:* Many pathophysiological factors limit the adequacy of the dietary intake of elderly. Loss of natural dentition may occur due to tooth decay and gum disease. Loose painful teeth and ill-fitting dentures can result in mastication difficulty. Swallowing of food without proper mechanical chewing further leads to digestive problems. Certain other age-related changes include a decline in the sense of taste and smell which result in the lessening of appetite and reduction in the quantity of food consumed. The number of taste buds decreases with ageing which reduce sensitivity to taste and food may seem to be 'less appetizing' and have lost its 'natural taste'. Decreased secretion of saliva leads to dryness of mouth, thus making swallowing difficult. In the food passages, there is an increase in non-propulsive contraction which may lead to impaired absorption of nutrients. The incidence of gastric movement and gastric emptying diminishes progressively with age. Further, there is a decrease in the amount of acid and other digestive juices secreted by the digestive tract. Pancreatic enzyme secretion is not very much altered in old age. The food stays in stomach for longer period of time which gives a feeling of fullness and heaviness. Fat absorption is slightly impaired. In the small intestine, the blood flow is reduced by 40% and absorptive capacity by 30%. Carbohydrates and fat absorption decreases to a lesser extent with age and the protein absorption remains intact. The volume, acidity and pepsin content of the gastric juice is sometimes reduced. In turn, there is an interference with the absorption of calcium, iron, zinc and vitamin B₁₂.

The motility of large intestine and elasticity of the rectal wall decreases with advancing age due to decrease in muscle activity and constipation is likely to be a frequent complaint.

Fats may be poorly tolerated because they further retard gastric emptying. This happens as the pancreatic production of lipase (fat-digesting enzyme) is inadequate

for satisfactory hydrolysis and there may be a reduced production of bile due to chronic biliary impairment.

- *Changes associated with the cardiovascular and renal function:* The progressive accumulation of atheromatous plaques leads to narrowing of the lumen of blood vessels and loss of elasticity. There is a decline in the cardiac output, an increased resistance to the flow of blood and resultant reduced capacity to respond to extra work. As the rate of blood flow is reduced, the digestion, absorption and distribution of nutrients is retarded.

A reduced blood flow and smaller number of functioning nephrons lessens the glomerular filtration and tubular reabsorption so that the excretion of wastes and the return of nutrients to the circulation is less efficient.

- *Changes associated with the skeletal system:* Skeletal bone loss occurs with ageing and may have serious consequences among the elderly. With ageing, there is some thinning of bone tissues due to the loss of these minerals. In some elderly, there is an abnormal thinning of bone tissue and as a result, osteoporosis develops. Osteoporosis, as you would know, is *the condition in which the bones become weak and porous, prone to easy fractures*. It has been observed that old people, especially women, are vulnerable to osteoporosis.
- *Basal Metabolism Rate (BMR):* From age 25 years, the basal metabolism decreases by about 2 percent for each decade due to the increasing proportion of body fat and lesser muscle tension. Average decreases of 2.9 and 2.0 percent per decade, respectively, for men and women of normal weight (BMI of 18.5 to 25.0 kg/m²) have been calculated more recently (Food and Nutrition Board/Institute of Medicine, USA, 2002). You may recall reading about these changes associated with ageing earlier in Unit 2 as well. The decline in basal metabolism is less in persons who remain healthy and pursue vigorous activity in their later years. The ability to maintain normal body temperature is also lessened and hypothermia in the elderly can be especially dangerous.
- *Carbohydrate metabolism:* Glucose tolerance may be impaired to some extent. Usually, the fasting blood sugar is normal. The absorption of carbohydrate is not impaired, however, when a carbohydrate load is presented, as in the glucose tolerance test, the blood sugar remains elevated for a longer period of time as compared to the younger persons. Following exercise, the levels of blood lactic acid and pyruvic acid are often above normal limits.
- *Fat metabolism:* With increasing age, the blood cholesterol and blood triglyceride levels gradually increase. Certain factors like the kind and amount of fat and carbohydrate in the diet, the degree of overweight, the stresses of life may be responsible for the elevated levels.

Having gone through the discussion above, we hope you now have a clear idea about ageing and the physiological changes associated with ageing. Let us then check our understanding on the topic by answering the questions included in the check your progress exercise 1.

Check Your Progress Exercise 1

- 1) Whom do you designate as the elderly in India?

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- 2) What are the nutritional deficiencies commonly found in elderly?
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- 3) Which factors could be responsible for loss of appetite in older persons?
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- 4) What are the changes which occur with ageing that may modify the digestion of food?
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- 5) Indicate if the following statements are true or false. Correct the false statements.
 - a) Two 70 year old men will exhibit identical biological ageing. (True/False)
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 - b) The aged individuals cannot serve as a valuable human resource. (True/False)
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 - c) We can overlook projections on the greying of Indian population and do not need to formulate health-care plans for the future. (True/False)
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 - d) Chronological and biological age do not run parallel together. (True/False)
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 - e) Nutrient deficiencies can lead to an enhanced progression of degenerative diseases associated with ageing. (True/False)
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Now, in the next section we shall focus on changing body composition and the techniques used for measuring body composition.

16.5 CHANGING BODY COMPOSITION AND TECHNIQUES FOR MEASURING BODY COMPOSITION

Changing body composition has been suggested as a pathway to explain age-related functional decline about which we studied earlier. There are various techniques by which we could measure the body composition. In this section, we shall focus on the changing body composition during ageing and what measures are available to measure the body composition.

16.5.1 Changing Body Composition

With ageing, a progressive decline in the water content and the lean body mass is accompanied by an increasing proportion of body fat. By 80 years, it is estimated that only half of the muscle cells remain. Specific functioning cells are replaced in part by non-specific fat and connective tissue.

The changes in connective tissue, which is so abundant in the human body, are of special significance. Collagen is one of the fibrous materials found in tendons, ligaments, skin and blood vessels. With ageing, the amount of collagen increases and it becomes more rigid, the skin loses its flexibility, the joints creak and the back becomes bent.

There is an average loss of 6.3% lean body mass for each decade of age and the same is compensated by an increase in the body fat and slight rise in body weight. The presence of chronic calorie deficiency also accelerates the loss of lean body mass.

Both longitudinal and cross-sectional studies throughout the world, indicate that height decreases with age. The average reduction in height during the total life span is about 2.9 cms in men and 4.9 cms in women, with approximately half the decrease being in sitting height. The reduction in sitting height is a result of vertebral compression, change in shape and height of vertebral discs, loss of muscle tone and postural changes.

A decline in weight has also been observed with advancing age, but the pattern of change is different from that of height and varies by sex. Weight loss in elderly is generally caused by a reduced lean body mass (LBM) and body fat due to metabolic and physical changes associated with ageing or presence of disease conditions. The body water content reduces with advancing age and this has been implicated as an important cause of decline in weight after 65 years.

The affluent populations in the Western countries show an increase in average weight both in men and women in the middle age. In men, this weight gain plateaus at around 65 years and then declines. Among women, however, the weight gain is greater and the plateau occurs about 10 years later than in men. The data on underprivileged populations is limited.

Cross-sectional studies also show a slow, progressive redistribution of fat in the elderly. The body fat relocates centrally and intra abdominally, while the subcutaneous fat on the limbs tend to decrease. An increase in abdominal circumference with age may also reflect shortening of trunk due to osteoporosis or other spinal deformities. As the length of the trunk decreases, the abdomen increases in girth.

16.5.2 Techniques for Measuring Body Composition

A number of techniques are used in the research laboratories to measure body composition. Some of these techniques are enumerated herewith.

- i) *Underwater weighing (densitometry)*: It applies the *Archimedean* principle of water displacement by the fully submerged individual. The specific gravity is determined by dividing the body weight by the body volume. Tables have been developed that show the percentage of body fat for a given specific gravity. A body specific gravity of 1.048 is equivalent to 25 percent body fat; a specific gravity of 1.002 is equal to a fat content of 49.3 percent.
- ii) *Multiple isotope dilution* (Total and extracellular body water): It is based on the principle that certain substances distribute themselves evenly within the specified fluid compartments. After time has been allowed for this distribution to take place, a blood sample can be analyzed for the concentration of the substance. Deuterium oxide, radioactive tritium oxide and antipyrine distribute evenly throughout all body compartments and are used to determine total body water. Inulin is distributed only in the extracellular fluid compartments and can be used to differentiate between the intracellular and extracellular compartments.
- iii) *Total body potassium*: It applies the concept that body cells contain a constant amount of potassium and that its measurement is therefore an indicator of lean body mass. The body potassium can be measured by injecting a radioisotope, K42, allowing time for its equilibration within the cells, and then withdrawing samples for analysis. Another technique involves the measurement of the naturally occurring K40 in the body with a low level whole body scintillation counter. Since K40 accounts for 0.012 percent of naturally-occurring potassium, the total body potassium can be calculated.
- iv) *Skinfold measurement*: The clinical use, skinfold measurements can be taken with the help of calipers. The calipers are applied at constant pressure at selected body sites to measure the fat fold thickness. The measurements at different sites can then be used to calculate the total body fat using mathematical equations. This is the only method that can be used in non laboratory situations for determining the amount of body fat. The triceps, biceps, subscapular, abdominal hip, pectoral and calf areas have been studied.

With increase in the age of an individual, there is a decline in calf, triceps and biceps skinfolds and an increase in abdomen : hip circumference ratio (AHR).

A high AHR indicates excess abdominal fat, which is due to relocation of body fat centrally and is associated with various chronic degenerative diseases like hypertension and hypertriglyceridemia.

Now take a break and recapitulate what you have learnt so far.

Check Your Progress Exercise 2

- 1) What are the major changes in body composition with ageing?

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- 2) Why does the height of an elderly person decrease with age?

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3) List the techniques for measuring body composition.

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4) What are the health implications of a high abdomen : hip ratio (AHR) in the elderly?

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So by now we hope you are well versed with the changes associated with ageing. Next, let us find out how these changes influence the nutrient needs of the elderly.

16.6 NUTRITIONAL REQUIREMENTS AND DIETARY MODIFICATIONS IN THE DIET OF THE ELDERLY

The nutritional status influences the age-related rate of functional decline in many organ systems. The progressive changes in body composition associated with ageing, such as loss of bone and lean body mass are affected to a great extent by the nutritional status of an individual. Moreover, the evidence is now undisputed that diet and nutrition are directly linked to many of the chronic diseases afflicting older adults. A consideration of recommended dietary allowances (RDAs) for older adults must recognize each of these aspects of the relationship between nutrition and ageing.

The nutritional requirements for elderly that are presently used, have to rely on extrapolation from data collected on younger people. A growing body of scientific literature provides ample evidence that nutrient requirements are altered for the ageing individuals and a need exists for redefining or RDAs. Further, the nutrient requirements may not be readily met through dietary intakes which are very often inadequate in older adults, therefore consumption of nutritional supplements may need to be endorsed.

The Basal Metabolic Rate (BMR) gradually decreases after the attainment of maturity due to a decrease in muscle mass tissues and physical activity. As per ICMR-NIN report on nutrient recommendations, 2020, for each year above 30 years, it is a thumb rule to subtract 10 calories/year for men and 7 calories year for women. Thus, after the age of 30, the requirement of energy decreases by 100 kcal and 70 kcal per decade for men and women, respectively. Requirements have been rounded off to 1700 kcal for men and 1500 kcal for women in Table 16.1. The daily nutrient recommended for elderly as given by the Indian Council of Medical Research (ICMR) National Institute of Nutrition (NIN) in Nutrient Requirements for Indians, 2020 is presented in the following Table 16.1.

Table 16.1: Daily Nutrient Recommendation for the Elderly in India

Nutrients		Energy (Kcal)*	Dietary Fibre (g)	Protein (g)	Vit A (µg)	Thiamine B ₁ (mg)	Riboflavin B ₂ (mg)	Niacin (mg)	Vit C (mg)	Vit B ₆ (mg)	Folate (µg)	Vit B ₁₂ (µg)	Vit D (IU)	Calcium (mg)	Magnesium (mg)	Iron (mg)	Zinc (mg)	Iodine (µg)
RDA (2020)																		
Men ≥60 Yrs	EAR	1700	-	42.9	460	1.2	1.6	-	65	1.6	250	2.0	400	800	370	11	14	95
	RDA	-	32	54.0	1000	1.4	2.0	12	80	1.9	300	2.2	800#	1200	440	19	17	150
Women ≥60 Yrs	EAR	1500	-	36.3	390	1.1	1.6	-	55	1.6	180	2.0	400	800	310	11	11	95
	RDA	-	25	45.7	840	1.4	1.9	9	65	1.9	200	2.2	800#	1200	370	19	13.2	150

*There is no RDA for energy. The EAR is equivalent to the estimated Energy Requirements (EER)

Adequate intake (AI)

According to ICMR 2020, energy requirements for older adults and the elderly should be calculated on the basis of PALs, just as they are calculated for younger adults. We have presented the energy requirements in Unit 2. We request you to review the recommendations of >60 years given in Table 2.11 once again to get a complete insight into the requirements.

Further, several clinical trials provide evidence of changing nutrient requirements with age. The metabolic demand for vitamin B₆ to maintain glucose tolerance and normal cognitive function in older adults is higher than the earlier assumption. Vitamin B₆ deficiency often associated with protein energy malnutrition and contributes to anaemia. Vitamin B₆ and vitamin E supplementation help to enhance the vigor of immune reactions which slow down with age. Vitamin B₁₂ deficiency can cause anaemia, neurological disorders and even dementia. The efficiency in absorption of vitamin B₁₂ and folic acid in the gut may be reduced with age owing to the decrease in secretion of hydrochloric acid in the stomach of many elderly people, atrophic gastritis, *Helicobacter pylori* infection, strict vegetarianism etc. Therefore, elder people should consume feeds fortified with vitamin B₁₂ or its supplements to meet their needs. The capacity of the skin to synthesize vitamin D from sunlight and also kidney's ability to convert vitamin D to its biologically active form, declines with ageing process.

The potential benefits of micro nutrients should also be taken into account when the nutrient allowances are defined for older adults. The increase in the status of vitamin B₆, B₁₂ and/or folate give protection against elevations in homocysteine – an independent risk factor for cardiovascular disease, depression and certain deficits of neuro-cognitive function. A good nutritional status of vitamin C, E and β -carotene (antioxidants) among healthy elderly have shown a reduced risk for cancer, cataracts and heart disease.

Moving further, fluid/water requirements are also higher in old age because of decreased thirst mechanisms. To maintain normal saliva flow rate, bowel movements, gastric functioning and emptying, metabolic, renal, cardiovascular functions and cognition, greater volume of fluids are recommended. Water requirements from various sources corresponding of energy requirements are given in Table 16.2 below:

Table 16.2 : Water requirement for elderly persons

Group	Body Weight (kg)	Energy Requirement (Kcal)	Total Water Requirement* (ml)	Water from Food* (ml)	Water from Beverages (ml)	Water Requirement from Beverages (ml/kg BW)
Man						
Sedentary	60	1883	2800	850	1950	33
Moderate	60	2216	3300	1000	2300	38
Woman						
Sedentary	55	1706	2550	750	1800	33
Moderate	55	2007	3000	900	2100	38

*Value are rounded off to the nearest 50. BW=Body Weight

Source: EAR and RDA, ICRM, NIN, 2020

Nutrients act as modulators of chronic disease risk. Therefore, it is more important for the elderly to consume a diet rich in antioxidant nutrients (vitamin A, C and E and, selenium), B vitamins (folate, vitamin B₆ and B₁₂) and minerals like calcium, to prevent chronic disease, rather than consuming just the amount of nutrients that are needed to prevent a deficiency state from occurring. Strong links which have been made between specific nutrients and particular chronic illnesses are presented in the Table 16.3.

Table 16.3: Interactions between specific nutrients and chronic illness

Chronic Disease	Nutrient
• Prevention of atherosclerotic cardiovascular disease and stroke • Amelioration of bone demineralization or osteoporosis • Prevention of atherosclerotic cardiovascular disease, certain site specific cancers • Prevention of age-related muscular degeneration	• B vitamins (folate, vitamin B₆ and vitamin B₁₂) • Calcium and vitamin D • Antioxidant nutrients vitamin C and E and selenium • Carotenoids, zeaxanthin and lutein

Having looked at the nutrient requirements, let us now learn about the dietary modifications recommended in the diet for the elderly.

Dietary modifications in the diet of the elderly

The various considerations to be kept in mind for providing nutritious meals to the elderly are highlighted herewith.

- Due to restriction in calories, nutrient dense foods should be included in the menu to meet the nutrient requirements.
- Small frequent meals, which are easy to prepare and digest, should be given.
- The taste acquisition and sensation of smell decline in later years, so that some of the pleasure derived from food is lost. It is, therefore, advisable that the meals should be made more attractive and appealing by including a variety of foods and colour combinations so as to encourage or motivate them to eat. Every effort should be made to make food palatable, without using spices in excess. Overuse and sprinkling of table salt over preparations while eating should be avoided by the elderly.
- Loss of teeth due to increased decay of teeth and gums is common in aged person. Fitting dentures may also make chewing difficult. A change in the texture and method of food preparation is recommended. Consequently, well cooked and soft meals must be included in the diet. Care must be taken to avoid too much of soft carbohydrate-rich foods and include foods that provide nutrients such as vitamins, proteins and minerals like calcium.
- There is decreased secretion of saliva, which makes swallowing difficult. Therefore, soups, vegetables with gravies, curds or raitas, dals should be included in the meals and very dry meals should be avoided.
- Gastric acidity decreases in a large percentage of old people. Peptic, tryptic, amylolytic and lipolytic activities of the digestive secretions are decreased. Reduced acid secretion and muscle weakness leads to delayed oesophageal emptying, poor tolerance to fat, distention, flatulence and constipation. A liberal intake of fibre and fluid (at least 8 glasses of water or non alcoholic caffeine free beverages) should be consumed by an elderly person to facilitate the digestion process. Roughage in the form of tender vegetables and fruits is beneficial against the problem of constipation.
- Protective foods (fruits/vegetables) must be included in the diet of elderly. Every effort must be made in order to incorporate these in the daily diet.
- Impaired absorption of iron and calcium may occur because of hypochlorhydria (decreased stomach acidity). This may lead to anaemia and may contribute to osteoporosis. Iron and calcium-rich food stuff should be included in the daily dietary intake.
- Elderly people also have to make a conscious effort of drinking water in order to remain well hydrated especially in warm climate. This happens because of a

reduced thirst mechanism with increase in age. This also helps to overcome the problem of constipation, which is a very common complaint during this age.

- The energy intake should be sufficient to maintain normal weight without leading to obesity or weight loss. Undernutrition is undesirable and obesity may predispose an elderly person to diabetes, coronary heart disease, gout and other degenerative disorders.
- Small meals at frequent intervals should be consumed. Fats, oils, refined cereals and sweets should be consumed by the elderly. Dietary fat, if poorly tolerated may be reduced .
- Elderly need more calcium, iron, zinc, antioxidant nutrients (β -carotene, vitamin E and C) to prevent age-related diseases. Inadequate diets of the elderly may need to be supplemented with pharmaceutical nutritional supplements.
- The likes, dislikes and food preferences of the elderly should be considered while meal planning.
- Among elderly who suffer from chronic diseases like diabetes, hypertension or heart disease, further dietary modifications may be required.
- Alcohol consumption and cigarette smoking should be avoided.

We will continue with this topic in the next section, where guidelines for planning balanced diets for the elderly have been presented. However, before we move on to Section 16.7, we suggest you recapitulate your knowledge related to the nutrient requirements of the elderly by answering the check your progress exercise 3.

Check Your Progress Exercise 3

- 1) Why does the energy requirements decrease with an increase in age?

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- 2) What role do antioxidant nutrients play in maintaining the health of the elderly?

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- 3) Why should dry meals be avoided for the elderly?

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- 4) Why do elderly people have to consciously make an effort of drinking water?

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16.7 GUIDELINES FOR PLANNING BALANCED DIETS FOR ELDERLY

The key element in planning diets for the elderly should be nutrient-based dietary guidelines, in order to reduce the burden of chronic disease afflicting this group by nutritional means. The adults over 70 years may also consume less food than younger people primarily because of decrease in energy expenditure and also distinctly different metabolic processes. It is important to emphasize the following for old people:

- 1) Foods that are nutrient dense in vitamins and minerals. For example, whole grain and enriched or possibly fortified bread should be preferred to refined grain products for provision of adequate amounts of B vitamins. This is especially important since cereals and bread comprise the bulk of the diet of elderly people, many of whom are at risk for malnutrition.
- 2) In the fruit and vegetable category, deeply coloured ones should be chosen for provision of folate and antioxidant nutrients.
- 3) With in the milk and milk products (curd, paneer, cheese) group, emphasis should be placed on low fat dairy products for the provision of adequate amounts of calcium and vitamin D.
- 4) From the protein rich group of meat, poultry, fish, beans, eggs and nuts groups, variety should be the key principle to follow with individual choices being made according to availability, affordability, chewability, individual preference and ease of preparation.
- 5) Foods high in dietary fiber should be stressed and fluid intakes of elderly people should be emphasized since thirst sensation is decreased in older people.

Based on the dietary guidelines for Indians published by ICMR (1998), sample balanced diets for elderly man and woman are given in Tables 16.4 and 16.5, respectively. However, these are only examples. Amounts in individual food groups may vary to constitute a balanced diet, depending on the requirements given in Table 16.1. You may have noticed that the requirements for energy are substantially reduced in new ICMR, 2020 recommendations.

Table 16.4: Balanced diet for an elderly man

Food Groups	Years			
	60-69		70 and above	
	Amount (gms)	Household Measure	Amount (gms)	Household Measure
Cereals	265	8 chapatis	225	7 chapatis
Pulses*	60	2 katori (medium)	40	2 katori (medium)
Milk (ml)	400	2 cups	400	2 cups
Roots and tubers	100	1 katori (medium)	100	1 katori (medium)
Green leafy vegetables	100	1 katori (medium)	100	1 katori (medium)
Other vegetables	200	2 katori (medium)	150	1½ katori (medium)
Fruits	200	2 medium	200	2 medium
Sugar	20	4t	20	4t
Fats/ oils (visible)	20	4t	20	4t

- 30 g or 1 katori of pulse may be exchanged with 50 g of eggs or one portion of chicken/ fish for non-vegetarians.
- t-teaspoon; This diet provides around 1950 kcal/day and 1735 kcal/day for 60-69 years and 70 and above respectively.

Table 16.5: Balanced diet for an elderly woman

Food Groups	Years			
	60-69		70 and above	
	Amount (gms)	Household Measure	Amount (gms)	Household Measure
Cereals	180	6 chapatis	150	5 chapatis
Pulses*	40	1 1/3 katori (medium)	30	1 katori (medium)
Milk (ml)	500	2 cups + 1 katori curd	450	2 1/4 cups
Roots and tubers	100	1 katori (medium)	50	1/2 katori (medium)
Green leafy vegetables	100	1 katori (medium)	100	1/2 katori (medium)
Other vegetables	100	1 katori (medium)	100	1 katori (medium)
Fruits	200	2 medium	200	2 medium
Sugar	20	4t	20	4t
Fats/ oils (visible)	20	4t	20	4t

*30 g or 1 katori of pulse may be exchanged with 50 g of eggs or one portion of chicken/fish for non-vegetarians.

t-teaspoon; this diet provides approximately 1630 kcal/day and 1420 kcal/day for 60-69 years and 70 and above respectively.

A food guide pyramid which illustrates the food groups and numbers of recommended serving of each per day for a healthy elderly person is given in Figure 16.1.

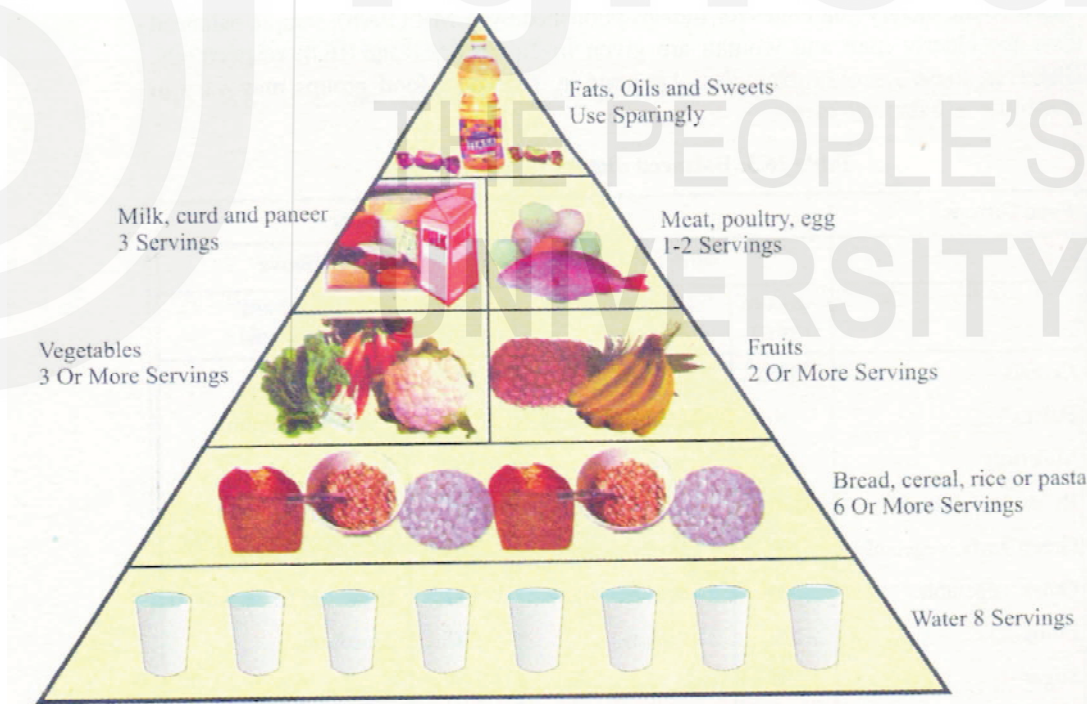


Figure 16.1: Eating right from bottom to top

The foundation of the pyramid suggests eight 225 ml glasses of water or other non-alcoholic caffeine-free beverages. The pyramid also calls for 6 to 11 servings of cereals, 3 to 5 servings of dark green, orange, red or yellow vegetables, 2 to 4 fruits, 1-2 of high protein food (fish, poultry, eggs, nuts), two or three of low-fat dairy foods. Fats, oils and sweets, at the tip of the pyramid should be consumed sparingly. A supplement 'flag' at the peak of the pyramid indicates those nutrients which are most likely to be inadequately supplied in the diets of the elderly and can be compensated, through the use of pharmaceutical nutritional supplements. The elderly need more

calcium, iron, zinc, antioxidant nutrients (β -carotene, vitamin E and C) to prevent age-related diseases.

Nutritional shortcomings are common among the elderly, most often due to poor choice of foods i.e. they may be consuming least nutritious choices in each food group. Consumption of refined cereals like white bread and 'naan' etc., instead of whole wheat flour chapati and fruit juice instead of whole fruit deprives the elderly person of the essential and vital nutrients and fibre. Elderly also tend to eat fewer servings of the recommended foods groups which leads to inadequacy of not only the total calories but also of several micronutrients. Certain culinary practices like overcooking of vegetables to make them soft, washing after cutting and discarding excess of water in which they were cooked, further leads to leaching of nutrients.

Some handy tips for feeding elderly with chewing difficulty are highlighted next.

Tips for elders with chewing difficulty

Elders, without teeth cannot chew their foods, hence they start taking only liquid or semi-solid food. Thus, the quantity of nutritious food consumed reduced. Elderly people without teeth should have artificial dentures. Some of the following suggestions may help the elderly with chewing difficulty.

- Chop, grind or mechanically blend foods that are hard to chew
- Milk as a beverage
- Paneer (cottage cheese)
- Eggs - soft cooked or scrambled
- Tender meat or poultry, finely minced or ground, soft-cooked fish
- Soft raw fruits like banana, papaya, mango, cooked apples or pears, fruit juices or pineapple, lime or orange
- Soft cooked vegetables, chopped or mashed
- Raw vegetables such as tomatoes can be eaten if finely chopped and the skin removed, soups can be given
- Cooked rice, suji, kheer, upma, poha or vermicelli
- Plain bread or toast with hot or cold milk
- Desserts: ice-creams, puddings, jellies, halwas

Check Your Progress Exercise 4

- 1) List the guidelines for planning a balanced diet for the elderly.

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- 2) Plan a one day's sample menu for an elderly man with chewing difficulty?

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3) Why should fats and sweets be restricted in the diets of elderly people?

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4) Why should an elderly person consume 'whole wheat chapati' instead of 'bread'?

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16.8 LET US SUM UP

In this unit, we learnt about the nutritional needs of the elderly, and in doing so we have also focused on many other aspects such as who do we define as elderly, what is an ageing process and the impact of nutritional status on the health of older adults. We, then saw what are the age-related changes in body composition and the various techniques for measuring the same. We studied about physiological changes in the body systems and based on these nutritional requirements of the older adults. The guidelines for planning balanced nutrient dense diets for them were also outlined. There are special considerations to be kept in mind while planning menus for them and these have been pointed out.

16.9 GLOSSARY

Ageing	: the process of gradual and progressing changes which take place over the entire adult life span.
Chronological age	: a person's age stated in hours, days, weeks, months, or years and months since birth.
Collagen	: a protein that forms white fibres of the bones cartilage, connective tissues and tendons.
Constipation	: a condition characterized by difficulty in passing stools.
Dementia	: chronic loss of mental capacity; involve progressive deterioration of thinking, memory, behaviour, personality and motor function.
Gerontologist	: a person who studies old age.
Hypochlorhydria	: decreased secretion of hydrochloric acid in the stomach.
Osteoporosis	: spotty clarifying of bones that fracture spontaneously.
Psychosis	: a disease of the mind especially a functional; mental disorder affecting the ability to function normally.

Roughage	: dietary fibre present in coarse food stuffs like whole cereals, pulses, raw fruits and vegetables.
Senescence	: the stage of growing old.
Taste buds	: small organs of taste on the tongue, which help to detect different tastes or flavours.
Texture	: refers to structure, appearance, consistency of foods or food items.

16.10 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress Exercise 1

- 1) A cut off age of 60 years is taken for classifying people as 'elderly' in India and is used for census purposes.
- 2) Some common nutrient deficiencies identified in the group of elderly are of total calories, protein, vitamin A, vitamin C, folate, iron and riboflavin.
- 3) A decline in the taste acuity and also the sense of smell can reduce the pleasure that an elderly person derives from food and could lead to loss of appetite.
- 4) Gastrointestinal changes which occur with ageing include a decrease in the incidence of gastric movements and gastric emptying. The motility of large intestine also decreases along with elasticity of rectal wall leading to constipation. The absorptive capacity of small intestine reduces by 30%. There may be impaired absorption of iron, calcium, zinc and B₁₂ because of decrease in volume, acidity, and pepsin content of gastric juice. The pancreatic production of lipase may also be inadequate for the digestion of fats, hence they are poorly tolerated by older adults.
- 5)
 - a) False. One 70 years old man will differ in biological age as compared to the other man of the same age. Several environmental and genetic factors affect the ageing process of an individual.
 - b) False. Aged individuals have a potential to serve as a valuable human resource. Healthy ageing individuals can be productive and purposeful for the community.
 - c) False. Preventive health care should form an important part of the health care plans for the elderly, considering their rising numbers.
 - d) True
 - e) True

Check Your Progress Exercise 2

- 1) There is a decline in water content and lean body mass and an increase in the proportion of body fat.
- 2) There is vertebral compression, change in shape and height of vertebral discs and loss of muscle tone which contribute to the decrease in height with increase in age.
- 3) The techniques for measuring body composition are: (i) Under water weighing (densitometry), (ii) Multiple isotope dilution and (iii) Total body potassium.
- 4) High abdomen: hip ratio predisposes an individual to chronic degenerative diseases like hypertension and hypertriglyceridemia.

Check Your Progress Exercise 3

- 1) The energy requirements decrease because the basal metabolic rate decreases owing to declining lean body mass and lessened physical activity with an increase in age.
- 2) The antioxidant nutrients (vitamin A and C) play an important part in preventing chronic degenerative diseases like cancer, cataracts and heart disease in elderly.
- 3) The secretion of saliva in the mouth decreases with an increase in age which makes swallowing difficult. There can also be chewing problems due to loss of teeth, therefore, very dry meals should be avoided.
- 4) The thirst mechanism is reduced in elderly, therefore, to remain well hydrated, the elderly people have to make a conscious effort of drinking water.

Check Your Progress Exercise 4

- 1) Look at section 16.7 and answer on your own.
- 2) Look up the tips given in section 16.7 and answer on your own.
- 3) Excessive use of fats is not tolerated well by the elderly and also it can cause obesity or raise the levels of fat in the blood and predispose them to chronic disease. Excessive sweets also contribute to additional empty calories which may lead to obesity which may lead to obesity or hyperglycemia in diabetics.
- 4) Whole wheat chapati has higher fibre content and B vitamins while bread is made from refined wheat flour and is not as nutritious.