III B.Sc Nutrition, FSM & Dietetics

NUTRITION THROUGH LIFE CYCLE

CNU52

UNIT-V

Nutrition allowances-Dietary guidelines-Nutrition and work efficiency modification of diet. Physiological changes in aging- Psycho and Social and economical factors affecting eating behaviors. Effect of aging on nutritional health.

NUTRITIONAL REQUIREMENTS

These are based on the physiological changes that take place during old age. The nutritional requirements change after the age of 30 years.

Energy

After the age of 35 the basal metabolic rate decreases due to reduced muscle mass and other metabolically active tissue mass. Also there is reduction in physical activity which affects the energy needs.

The Fig. 9.1 shows that the percentage of muscle tissue decreases and fat tissue increases as the age increases. Resting metabolic rate decreases approximately 15–20 per cent over the life span, primarily due to changes in body composition and reduction in physical activity.

Sarcopenia, an age related loss in skeletal muscle is the result of a decline in muscle strength. Sarcopenia contributes to changes in gait and balance and loss of physical function. Lean body mass declines approximately 2 to 3 per cent per decade. Body protein level in the healthy elderly is 30–40 per cent less than that in young adults. The average body fat percentage in males increases from about 15 per cent when young to 25 per cent.

The average body fat percentage in males increases from about 15 per cent when young to 25 per cent at the age of 60 years. This change in body fat is attributable to less intense physical activity and to an alteration in testosterone and growth hormone production that affects anabolism and lean tissue growth. Figure 9.1 shows percentage changes in body composition with age.

do not diminish.

Carbohydrate

An impaired glucose tolerance in the elderly can lead to hypoglycaemia, hyperglycaemia and type II diabetes mellitus. Insulin sensitivity can be enhanced by balanced energy intake, weight management and regular physical activity. Emphasis is placed on increasing the consumption of complex carbohydrates and controlling the intake of simple sugars. Whole grain cereals and pulses should be included in the diet.

It is necessary that at least 50 per cent of calories are derived from carbohydrates.

Since caloric requirements are reduced, carbohydrates intake is also reduced.

Protein

As people age there is a decrease in skeletal tissue mass. This results in decrease in store of protein provided by skeletal muscle and may be inadequate to meet the needs for protein synthesis. Hence the dietary protein intake is more important to meet essential needs.

A protein intake of 1.0 g per kilogram, the normal adult requirement, is safe during old age. Since caloric requirements are decreased without the corresponding decrease in protein, the food should be protein rich compared to normal adult food. To meet this adequate quantities of protein foods such as milk and curd can be included.

Due to decreased appetite and poor digestion, old people are likely to consume less protein. The serum albumin level is the most reliable indicator of protein nutriture. Deficiency of protein results in oedema, anaemia and lowered resistance to infection. Infection, altered gastrointestinal function and metabolic changes caused by chronic disease can reduce the efficiency of dietary nitrogen utilisation and increase nitrogen excretion.

Of the total caloric intake 11–12 per cent should be from protein.

Lipids

Epidemiological studies show that dementia and cardiovascular disease may share risk factors including high intakes of dietary total fat, high saturated fat, high ω-6 : ω-3 fatty acid ratio and low fish intake.

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

Minerals

Calcium needs during old age increases. Women over 50 years of age who are not receiving estrogens require more calcium as there is increased losses resulting in demineralisation of bone and osteoporosis. For women over fifty, 800 mg/day is recommended for the following reasons:

(*a*) Calcium is available only from a limited number of foods.

(*b*) To compensate age-related bone loss and to improve calcium balance.

(*c*) To decrease the prevalence of fractures and dental decay.

The physiology of calcium homeostasis in ageing men over 65 is similar to that of women with respect to the rate of bone loss. Calcium absorption efficiency decreases, vitamin D levels decline and hence men also require more calcium.

Milk is an important source of calcium for elderly as it is in the diet of the young. Wise provisions for calcium throughout life may go far in assuring an above average measure of health, an increase in vitality and perhaps in the lengthened prime of life. As caloric requirement decreases, total food consumption decreases, hence calcium supplements are essential.

The iron deficiency seen in the elderly is due to inadequate iron intake, blood loss due to chronic disease and/or reduced non-heame iron absorption secondary to achlorhydria of atrophic gastritis. Iron absorption per se does not appear to decline significantly with age. Vitamin C deficiency may also impair iron absorption.

Mild anaemia affects the health of old people due to less efficient circulation of blood. Iron intake should be adequate to prevent anaemia. Iron requirement can be same as adult man, 30 mg. If there is anaemia, supplemental iron can be given. Consumption of liver once or twice a week is effective in combating such a tendency. Particular emphasis may be placed upon the inclusion of those green leafy vegetables which are good source of iron like mayalu, cauliflower greens and agathi and whole grain or enriched breads and to certain iron rich dry fruits, and use of iron fortified salt.

There is no evidence that moderate sodium restriction will delay or prevent the onset of cardiovascular disease. It is believed that great restriction of sodium should not be attempted except under the advice of a physician in the treatment of specific disease condition. Infact, moderate amounts of salt help to improve the palatability and thus the acceptability to the diet.

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

Vitamins

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

Stress, smoking and some medications can increase vitamin C requirement. The antioxidant vitamins, such as vitamin E, carotenoids and vitamin C have been promoted as agents that enhance the health of the elderly. Vitamin C may be protective against cataract at an intake level of between 150 and 250 mg per day which is possible to achieve from dietary sources alone. Vitamin E has also been found to be a potent nutrient for reducing the decline in cellular immunity that occur in the elderly. Changes in immune system can be overcome by taking 200 mg of vitamin E. Protection from DNA damage enhances the body's self defence mechanisms.

Requirements for the vitamin B_6 are increased in many elderly persons owing to atrophic gastritis which interferes with absorption. Alcoholic and liver dysfunction are additional risk factors for a deficiency of vitamin B_6. It has a significant role in immune function. Alcoholism is a risk factor for folate deficiency. Severe deficiency of folic acid in the elderly may result in anaemias and elevated serum homocysteine levels a risk factor for cardiac disease. Diets are often lacking in folate, so consumption of folate rich foods should be encouraged.

The usual causes of vitamin B_{12} deficiency are atrophic gastritis and bacterial overgrowth, which decrease absorption and can lead to pernicious anaemia.

Recent research has shown that increased serum levels of vitamins B_6, B_{12} and folate confer protection against elevated serum homocysteine, an independent risk factor for cardiovascular disease, depression and certain neurologic deficits.

A recent study found that patients with early stage Alzheimer's disease consumed less vitamin K. Consumption of green leafy vegetables may supply enough vitamin K during old age.

Supplementation with vitamins, carotenoids and polyunsaturated fatty acids provides protection against ultraviolet light. An increase in delayed type hypersensitivity skin responses after supplementation with nutrients has proven beneficial in elderly people. Supplementation may boost cell-mediated immunity.

All vitamin requirements remain the same as the adult requirement.

Water

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

Some elderly individuals may have a fading sense of thirst and may go for long periods without fluid. Others avoid liquid for fear of incontinence. Dehydration can result in mental confusion, headache and instability. Elderly should be advised to consume some fluid at regular intervals even if they are not thirsty.

Fibre

Fibre stimulates peristalsis. There is great enthusiasm to encourage the consumption of fibre containing food but any increase should be gradual otherwise bowel discomfort, distension and flatulence will result. While rough fibre, bran and mature vegetables are not advised for the aged, the fibre of tender vegetables, fruits will make easier the passage of the food mass down the intestinal tract.

Fibre also helps in reducing cholesterol which may reduce the incidence of atherosclerosis. Excess of fibre may reduce the absorption of iron and certain trace elements.

Diseases like diabetes, atherosclerosis, hypertension, cataract formation, Parkinson's disease and cancer and disability disorders like bone fractures, arthritis and strokes may affect nutrient requirements, intake, digestion, absorption, metabolism and excretion.

FOOD REQUIREMENTS

In nearly 60–65 years of one's life habits, especially those pertaining to diet usually get moulded by factors like heredity, health, family, education, occupation and numerous other socioeconomic and cultural factors. They are set in their ways and they cannot totally modify their whole pattern of eating.

The elderly prefer well cooked food in soft form or semisolid form. This may be due to the fact that elderly suffer from loss of teeth or wear dentures. Due to dental problems if the elderly are not able to eat common raw vegetables they can be used as grated vegetables or chutneys made with green leafy vegetables. Porridge can be prepared with unrefined cereals. Instead of chapathis, whole wheat rava upma can be given.

If mastication and deglutition are problems, modification of food and beverage consistency may be indicated. The danger in dysphagia is that the person may choke on foods or beverages that are swallowed too rapidly. Aspiration pneumonia is the greatest risk in such cases.

For many elderly persons, swallowing difficulty occurs as a result of poor dentition, stroke, Alzheimer's disease or other dementias. Thin liquids (other than pure water taken alone in small sips) may need to be avoided. Thickening agents in food can be used.

Alteration in appetite may be due to ageing process affecting the centre in the brain for appetite. Physical, social and emotional problems may interfere with appetite.

There is a considerable difference in taste preference among the elderly which may be attributed to decline in taste perception as age advances. Elders usually do not prefer sweets, salty foods or fried foods.

Certain whole pulses may produce flatulence in the elderly. Hence such pulses should be avoided in the diet. Sulphur containing vegetables are avoided if they produce gas and discomfort in the elderly.

The general principles for planning a nutritious diet for the elderly are similar to those for younger adults. The most important guideline is to provide meals and snacks that are nutrient–dense, visually appealing, tasteful and of the appropriate consistency. Four or five smaller meals are often more acceptable than three substantial ones.

A summary of the dietary modifications required during old age and the reasons of it are given in Table 9.3.

Table 9.3 Modification of diet during old age

Dietary modification	*Reason*
Foods must be soft, easily chewable.	Problems of dentition, fallen teeth or dentures.
Foods should be easily digestible.	Decreased production of digestive enzymes.
Restricted fat in the diet, inclusion of PUFA.	Susceptible to heart disease.
Foods rich in fibre should be given.	To prevent constipation and reduce cholesterol level. Also to prevent colon cancer.
Coffee, tea and cola beverages should be restricted.	May result in insomnia due to over stimulation.
Foods rich in calcium like milk should be given.	To compensate the bone loss and reduce the incidence of osteoporosis.
Green leafy vegetables can be given liberally.	Source of nutrients like carotene, calcium, iron, riboflavin, folic acid and vitamin C, besides supplying fibre. Rich in antioxidants.
Foods of the elderly should consist of familiar foods. New foods are difficult to accept.	Unfamiliar or changes in the food pattern may lead to psychological problems like depression.
Clear soup at the beginning of meal.	Aids digestion.
Small and frequent meals instead of three heavy ones.	Favour more complete digestion and free from distress.
A glass of hot milk just before going to bed.	May induce sleep.
Heavy meal at noon and light evening meal.	Sleep is less likely to be disturbed.
Too many sweets with lot of fats and sugar should be avoided.	Too much of sugar may cause fermentation, discomfort due to indigestion and cause tooth ache and may increase cholesterol level. May lead to obesity.
Plenty of fluid.	To prevent constipation and dehydration.
Consumption of flax seed (40 g/d).	Decreases hot flushes in post menopausal women.

Dietary Guidelines

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

NUTRITION RELATED PROBLEMS OF OLD AGE

The elderly are at a risk of poor nutrition due to economic pressures, poor dentition, reduced mobility, depression, loneliness, ageing tissues and inadequate food consumption.

Osteoporosis

WHO identified osteoporosis as second only to cardiovascular disease as a leading health care problem.

Osteoporosis is a condition where there is loss of bone mineral density due to increase in osteoclast bone resorption activity and a concomitant decrease in osteoblast mediated bone formation. There is a generalized bone disease characterized by low bone density and micro architectural deterioration of bone tissue. It is primarily found in middle age and elderly women who had early menopause and had sedentary life. The early manifestations are an increased incidence of bone pains and of back pain in women. Its major symptom is an increased vulnerability to bone fractures. Post-menopausal women who consume around 800 mg of calcium with life time milk consumption can postpone the incidence of osteoporosis.

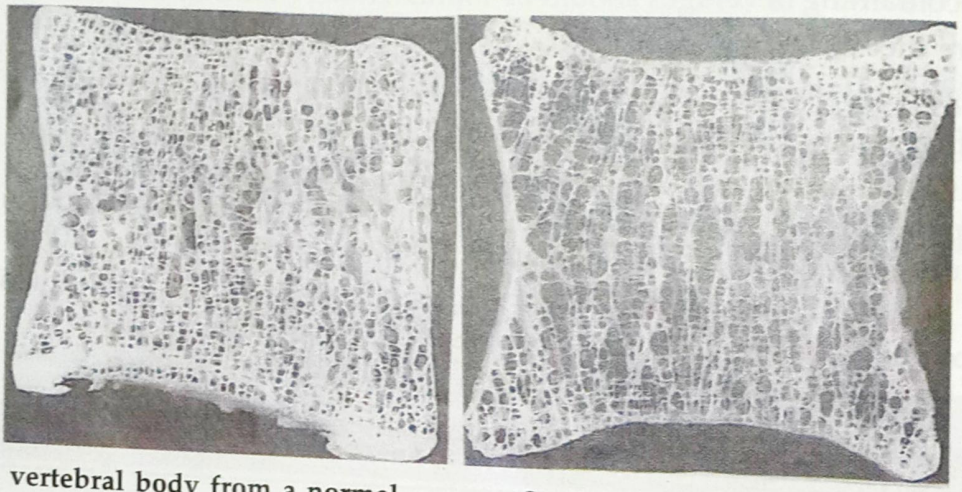
The age at which peak bone mass of population is 25–30 (NIN, 2006–2007). In young people in good health, the rate of calcium resorption equals that of bone formation. As people age, resorption begins to predominate over the bone formation, eventually resulting in osteoporosis. In osteoporosis the total amount of bone is reduced, but the remaining bone is of normal composition and quality.

Due to the reduction in number of cells, there is a decrease in thickness of the cortex, a thinning of the trabeculae and increased porosity of bone. As a result fractures occur with

greater frequency. Common fracture sites include the vertebrae, femur and radius and often these occur in spite of little or no trauma. The rate of femoral fractures alone doubles for each decade after the age of 50.

The cause of osteoporosis may be age related changes such as decreased estrogen production associated with menopause. The decline in circulating 17-beta–estradiol is the predominant factor in the accelerated bone loss that begins after the menopause and continues for 6 to 8 years. Decreased intestinal absorption of calcium and production of vitamin D, reduced physical activity and increased parathyroid hormone secretion may also cause osteoporosis. Inadequate protein intake may contribute to osteoporosis in the elderly. Men also suffer from osteoporosis.

Figure 9.2 shows height loss in post-menopausal woman with osteoporosis. The compact bone mass in the vertebrae is responsible for humped backs characteristic of many elderly people. Dissolution of the jaw bone is another frequent symptom of osteoporosis. It is a major contributing factor in periodontal disease, resulting in premature loss of teeth.



Section of a vertebral body from a normal individual showing the pattern of trabeculae

Section of a vertebral body from a patient with osteoporosis showing the thinning and loss of trabeculae compromising the mechanical strength of the bone

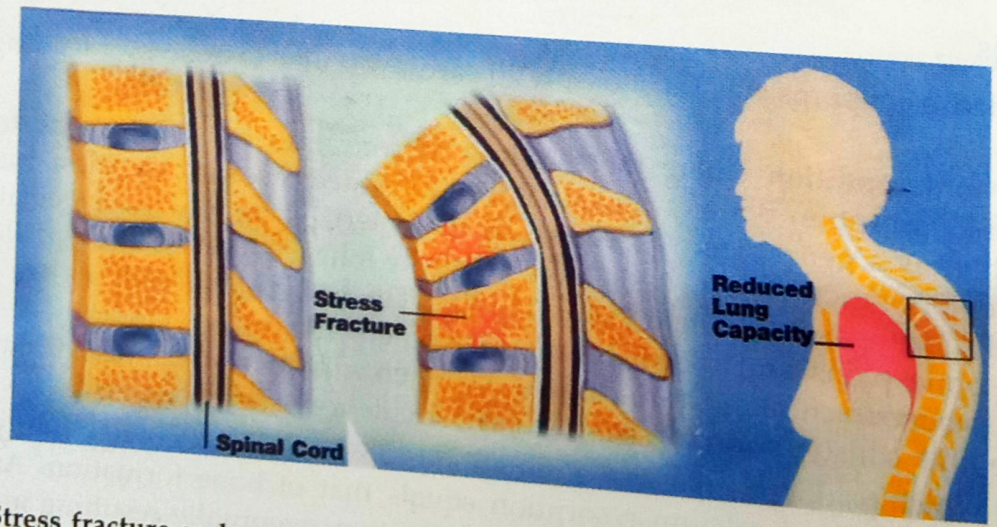


Fig. 9.2 Stress fracture and reduced lung capacity and decreased height are characteristics of osteoporosis. About 6" height is decreased after 30 years of menopause

Although ageing is one universal and unavoidable factor that brings a risk of osteoporosis many avoidable risk factors like sedentary life-style, emotional stress, inappropriate diet may contribute for osteoporosis. Low calcium intake and family history of osteoporosis are significant risk factors for low bone mass.

Treatment: Oestrogen therapy in post-menopausal women has been shown to slow the rate of bone loss although it does not stimulate new bone formation. It is much more effective as a preventive measure begun immediately after menopause than as a treatment of osteoporosis that has already developed. In the longer term, oestrogen treatment, results in increased parathyroid hormone and 1,25 $(OH)_2$ D synthesis, which may explain the observed improvement in the intestinal absorption and renal reabsorption of calcium.

Teriparatide, a synthetic form of parathyroid hormone is the newest therapy which actually stimulates new bone formation. Vitamin D supplementation in older individuals in stable health is associated with a 20 per cent reduction in the risk of falls. Patients who are diagnosed with osteoporosis and who comply with treatment are less likely to have fractures. Bisphosphonates slow bone resorption without lowering bone formation, increasing bone density.

The most effective preventive measures are, ensuring additional calcium intake of about 200 mg/d with a total intake of 800 mg/d. This is to cover at least 30 mg/d extra obligatory loss of calcium in the urine.

It is logical for old people to take a diet with ample calcium that is to drink 2–3 glasses of milk regularly. Some old people have a markedly reduced capacity to absorb calcium from the gut and in such patients therapeutic doses of calcium salt might be of benefit. Adequate protein along with calcium also helps in the formation of bone tissue.

Plant-based estrogens or phytoestrogens are used as adjunctive therapy for alleviating the symptoms of menopause. Phytoestrogens are nonsteroidal estrogens of dietary origin. Phytoestrogens in soya (isoflavones) may reduce the incidence of hot flushes, one symptom of menopause. Soya isoflavones may also protect women against osteoporosis by the action of genistein, which has an effect similar to estrogen. It stimulates osteoblasts, the bone-forming cells.

It is sensible to encourage all old people and especially those with radiological evidence of osteoporosis, to be as physically active as possible. The more they are on their feet, less is the risk of pathological fractures of the femur and spine.

Prevention of osteoporosis can be achieved by adopting a life style that involves regular exercise and avoiding the avoidable risk factors.

Weight bearing exercise may help increase Bone Mineral Density by imposing stresses through repetitive impact loading. Resistance training (weight lifting, squeezing a tennis ball, streching exercises, sit ups, trunk extensions, aerobic exercise) may help by exposing bone to varying loads and rates of strain. Improved muscle strength may enhance coordination and balance and protect against falls and fractures. Although an exercise regimen that includes both weight-bearing and resistance-training routines has a greater impact on BMD, even a simple weight-bearing programme performed at moderate intensity may be beneficial.

Exercise combined with adequate calcium and vitamin D intake may have a modest effect on slowing the decrease in bone mineral density in post menopausal women. Milk and sardines are good sources of vitamin D.

Indian Scenario: The life expectancy of both men and women is increasing in India. However, this increased longevity is associated with increased burden of age-related morbidities including osteoporosis.

Studies conducted by NIN (2007), in low socio-economic group shows that osteoporotic hip fractures occur at least 10–15 years earlier in Indians (57–62 years) compared that to reported from the Western region (75 years). However, populations from the high income group in India do not show this early age of fractures. A few studies from India suggest that osteopenia and osteoporosis may occur at a relatively younger age in the Indian population. However, prevalence of fractures of the spine and forearm goes undetected in India because they are usually treated as out-patient cases. Studies reporting the bone density values of the Indian population involving large sample size are however not available. This is important because Indians from low income group subsist on diets that have inadequate calcium coupled with low calories, proteins and micronutrients. In addition, they have low body weights and women attain menopause at an earlier age than their Western counterparts. It is possible that these women are at a risk of osteoporosis and fractures at an early age.

In the near future, developing countries like India may expect the occurrence of hip fractures in epidemic proportions. Osteoporotic fractures, especially hip fractures are associated with considerable morbidity and mortality and increasing high economic and social costs.

Obesity

Some of the elderly are obese because their consumption of calories has not decreased though there is steady decrease in calorie requirement. Decreasing basal metabolic rate and sedentary life style may be contributing factors. Obese are susceptible to degenerative diseases and mortality rate may be higher. Maintaining weight promotes healthier ageing and prolongs life span.

Neurological Dysfunction

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

Epidemiologic findings suggest that high-calorie diets and folic acid deficiency increase the risk for Alzheimer's disease and Parkinson disease.

Women who walk or exercise regularly are less likely to experience the memory loss and other declines in mental function that can come with ageing.

Anaemia

Anaemia in old age is an independent risk factor for decline in physical performance. Anaemia, characterised by feelings of fatigue, anxiety, lack of energy and sleeplessness is a common result of inadequate iron. Anaemia also decreases myocardial function and can lead to heart failure. Iron inadequacy can be caused by low dietary intake, impaired absorption possibly resulting from lack of haem iron or vitamin C or blood loss. A majority of the anaemia in old age is due to underlying diseases such as cancer and infectious diseases or due to malnutrition. Treatment may involve using iron supplements together with a diet providing iron sources of high bio availability and vitamin C to enhance absorption.

Pernicious anaemia is seen chiefly in middle ages and elderly persons (women aged between 45–65) Plasma vitamin B_{12} is below 160 ng/l while plasma folate is usually normal. Hydroxy cobalamin should be given in a dosage of 1,000 mcg. The diet should include animal foods like liver, egg yolk, shrimps and curd.

Malnutrition

The important causes of malnutrition during old age are, poverty, inability to move around easily, cumulative effects of chronic diseases necessitating multiple medications, social isolation and lack of knowledge for adequate preparation of meals. The studies conducted by NIN showed that the average daily intake of majority of nutrients such as calcium, iron, vitamin A, thiamine, riboflavin and vitamin C were below the recommended levels as evidenced by the low levels of consumption of protective foods. Malnutrition is common among old people who are institutionalised.

According to the studies conducted by NIN (2004) the prevalence of Chronic Energy Deficiency is significantly higher among the elderly than their adult counterpart. With increasing age there is decrease in consumption of food and nutrients. There is a need to develop and implement appropriate programmes to improve the health and nutrition in particular, among the elderly population of India.

Constipation

It is the infrequent passage of stools which are most often attributed to prolonged rectosigmoid transit. Reduced elasticity of intestinal wall muscles affecting peristaltic movement, fewer meals, low fluid and fibre intake and depression can result in drier or harder than normal stool. Generally, it is uncomfortable and elimination can be difficult and painful. Common symptoms of constipation include bloating, sluggishness, a feeling of "fullness" in the rectum and a general sense of "feeling out of sorts".

The stools become hard and dry because the stool moves too slowly through the colon. The natural contractions or rhythms of the colon might be disturbed due to loss of tone, stress, medication, illness, resisting the urge to defecate, pain from haemorrhoids or tissues, lack of exercise, a low fibre diet or not drinking enough fluids. It may even be caused by overuse of stimulant laxatives or enemas. In the elderly it may be related to inadequate energy intake, fewer meals per day, depression and sedentary life-style.

Constipation can be prevented by eating regular meals, drinking plenty of fluids and doing exercise daily. One should respond to the urge to move bowels and avoid straining. And by adding fibre to the diet, constipation can be prevented.

Immunity

The responsiveness of the human immune system has been shown to decrease with age. The clinical implications of immunosenescence include a poor response to vaccination, progressive loss in the ability to recognise foreign antigens, increased autoantibodies and increased susceptibility to infections and chronic disease.

The deficiency of a number of nutrients have been linked to immune function notably vitamin A, vitamin C and zinc, vitamin B_6, iron, copper and selenium. Lower than recommended intakes of selenium and ω-3 fatty acids and higher than recommended intakes of vitamin A may influence overall immune function in elderly persons.

DEGENERATIVE DISEASES

Blood pressure continues to increase in women older than 80 years of age but declines substantially in older men. Serum cholesterol levels in men tend to peak at 60 years of age, but total cholesterol levels as well as the low-density lipo protein fraction continue to rise in women until the age of 70 years. Correction of hypertension and hyperlipidaemia have been shown to reduce cardiovascular morbidity and mortality in the elderly.

Renal function and glomerular filtration rate can diminish as much as 60 per cent between the ages of 30 and 80 years.

This may be due to certain chronic conditions which reduce the number of nephrons and reduce blood flow. This makes the elderly person less able to respond to changes in fluid status and to challenges to the acid base balance. Geriatric nephropathy may be result of chronic protein over nutrition.

Oxidative stress promotes the process of ageing. Lowered red cell activity of glutathione peroxidase was observed in the elderly. Such decrease might be a precursor to oxygen mediated damage to the tissue and incidence of degenerative tissue. Diseases like diabetes, atherosclerosis, hypertension, cataract formation, Parkinson's disease, Alzheimer's disease and cancer that occur during old age may be related to low intake of antioxidants.

With ageing there is decrease in glucose tolerance. Vitamin C which is an antioxidant plays an important role in preventing complications of diabetes. Free radicals are implicated in the cause of atherosclerosis. Studies have shown that vitamin E retards the development of coronary artery disease.

Cataract is the opacification of the eye lens, which interferes with the transmission of light on the retina. The UV radiation may damage the cells like lens protein by generating reactive oxygen species. Antioxidants prevent susceptibility of lens protein to UV radiation. Studies have shown that people with low serum carotenoid levels had more chances of developing cataracts than those with normal levels. Cataract can be prevented by making the diet rich in β-carotene, riboflavin and ascorbic acid. Consumption of β-carotene may reduce the risk of macular degeneration. Studies have also shown that elders who take sufficient ω-3 fatty acids have better visual acuity.

The incidence of cancer increases progressively with age. Persons with high antioxidant intake are less likely to develop certain cancers.

Dietary factors may interact with disease-causing or predisposing genes in molecular cascades that either promote or prevent the degeneration of neurons. Epidemiologic findings suggest that high-calorie diets and folic acid deficiency increase the risk for Alzheimer disease and Parkinson disease. High homocysteine levels have been implicated as one of the causes of Alzheimer's disease.

Supplementing with vitamin B_6, vitamin B_{12} and folic acid are helpful. Lipoic acid and coenzyme Q and herbs like ginkgo tea may be useful to the patients. Reducing calorie intake has also been found to be of much help.

Eating a Mediterranean diet which emphasises fruits, vegetables and olive oil includes little red meat is associated with a lower risk for Alzeimer's disease. Individuals who have higher levels of fatty acid docosahexaenoic acid (DHA) in their blood may have a lower risk of developing dementia and Alzheimer's disease. The dietary modifications may be helpful most with cognitive impairment rather than advanced dementia. Keeping the patient mentally active by encouraging reading, making them to solve puzzles is important. Reciting slokas and singing may also be helpful to the patient.

Resistance to disease declines in the elderly. Changes in immune system can be overcome by taking 200 mg of vitamin E. Protection from DNA damage is believed to enhance the body's self defence mechanisms.

Damage to the collagen fibrous network underlying the skin by free radicals can result in sagging of the tissue, appearance of fine lines and wrinkles and discolouration of the pigment. This can be slowed down through nutrition or antioxidants.

The elderly are more prone to diseases due to lowered synthesis of antioxidants in the body, reduced food intake, physical activity and resistance to infection. The elderly need more calcium, iron, zinc, vitamin A and antioxidants to prevent age related diseases. Present evidence shows that 600 g/day of antioxidants rich in fruits and vegetables should be taken by the elderly persons.

Stress

People who are stressed over long periods tend to look haggered and it is commonly thought that psychological stress leads to premature ageing and the earlier onset of diseases of the ageing. Stress is known to affect physical health, act as a risk factor for heart disease and lead to poorer immunity against infection. Psychological stress is linked to oxidative damage to DNA and other cellular components.

The intake of antioxidants such as some vitamins and micronutrients and certain plant products such as greens, tomatoes, carrot or red wine has been shown to retard age-related biological effects as well. Research shows that eating more ω-3 fatty acids and fewer ω-6 fatty acids may help reduce stress and inflammation in the body.

It is a challenge to prevent physiological ageing getting converted into pathological ageing with chronic disease.

EXERCISE AND OLD AGE

Studies have proved that those who walk or exercise regularly are less likely to experience memory loss and other declines in mental function that can come with ageing. Weight bearing activities enhance bone and muscle mass. Aerobic exercise increases lung capacity. Exercise is an integral part of maintaining healthy life. It helps to regulate body weight. The risk of degenerative disease is considerably decreased by regular exercise.

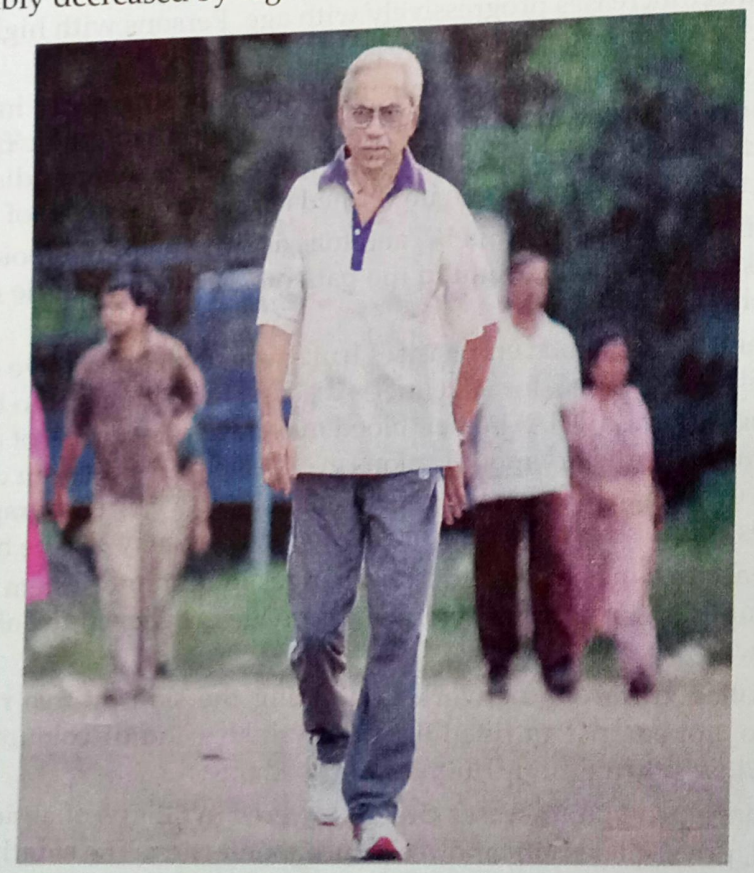


Fig. 9.4 Walkers perform better in tests of mental agility

Beyond the effect on BMD, exercise has many additional benefits in post menopausal women. A number of studies have shown that regular exercise can

- improve psychological health
- increase muscle mass, strength and endurance
- reduce musculoskeletal complaints
- prevent chronic disease
- decrease the risk of falls through improved agility and balance
- promote functional independence

Exercise is an integral part of maintaining healthy life.

DRUGS AND OLD AGE

The aged constitute only 10 per cent of the total population but they consume about 25 per cent of drugs prescribed because of increased health problems in old age.

At any age there is a risk of harmful drug or drug nutrient interactions, but elderly persons seem to have more than their share. Several things contribute to this increased risk among the elderly.

- They are likely to take more drugs for longer periods to control chronic diseases.
- The elderly are at increased risk owing to pathophysiologic changes related to ageing, endocrine dysfunction and the common ingestion of restricted diets.
- Illness, mental confusion or lack of drug information may increase errors in self-care.
- Nutrients can affect drug action by altering the digestion, absorption, distribution metabolism and/or excretion of the drug. Drugs may exhibit their effects on nutritional status through several avenues effects on food intake, alteration of nutrient absorption, and alteration in nutrient excretion.
- Because the rate of drug metabolism and detoxification in the liver is much slower in older people, drugs remain in the body longer to exert their influence on the metabolism of nutrients.

One of the greatest concerns of older adults, is becoming dependent on others and being unable to live independently. All efforts should focus on offsetting declines in functional status and promoting independence and successful ageing.

Suggested recipes during old age

Recipe	Reason
Pongal, idli, idiappam	Cereal pulse combination easily chewable and digested.
Tomato soup, rasam	Good appetiser, low calorific value aid in digestion.
Amaranth dal	Greens good sources of vitamins, minerals and fibre.
Buttermilk, fruit juices	As they are light old people may feel comfortable.
Banana	Prevents constipation.
Skimmed milk powder	High in protein and low in fat. The requirement of protein, remains the same where is calorie intake is reduced.
Warm milk	Induces sleep.