CHAPTER

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Preventive Strategies in Geriatric Care

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Introduction

In a developing country like India, the pendulum of population is now swinging towards elderly where the population of 60 years plus has crossed 8.8% mark.[1] No wonder the diseases of old age and chronic diseases[2,3] are on the rise. The socio-economic scenario is also changing[4] and elderly are becoming more and more health conscious as well as demanding. The number of old elderly is also increasing and it is coinciding with increased risks of cancer,[5] heart disease and functional impairment.[6]

In India,[7] the leading chronic diseases among the 65+ population are Hypertension, cataract, Osteoarthritis, Benign Prostate Hypertrophy, Depression, Dyspepsia, Constipation, coronary heart disease, COPD, Pneumonia, Hearing loss, diabetes mellitus. Controlling these conditions or postponement of their onset will result into a compressed morbidity and a healthy life expectancy.

Aging and Diseases

De novo ageing does not cause most of the diseases encountered in elderly population. Decline in immunity and diminution in physiological functioning of various organs and organ systems are responsible for many diseases in elderly. (Table 1 shows physiological alterations in function and resultant changes in organ specific defenses).

Variation in rates of chronic diseases in different communities shows that a substantial proportion of chronic diseases associated with ageing can be prevented or at least postponed. Above the age of 30 years, specific rates of cardiovascular diseases have halved in the USA[8] but doubled in Hungary and India.

Migration studies[9] show that the primary determinant of deterioration in physiological decline is usually environmental and not genetic. Japanese people have much lower cholesterol concentrations and lower coronary heart disease; however, Japanese migrants in the USA (following an American diet) have much higher cholesterol concentrations and rates of heart disease. In one study, Dutch women living in Antilles were found to have high bone mass and lower rates of fractures than Dutch Women of the same age in Holland. Thus, while the maximum life span is probably genetically determined, the likelihood of attaining that life span in good health is largely determined by environmental or lifestyle factors.

Health Promotion

The health promotion has to start from the time of conception itself rather than waiting till the old

age sets in. During fetal life,[10] maternal nutrition plays a critical role in programing basic metabolic processes and hence susceptibility to various conditions such as diabetes and cardiovascular diseases in later life. The pattern of fatty acid intake in infancy influences brain development and calcium intake and exercise influences bone mass, which later affect their decline pattern in the elderly. In later life, protection from infections or toxins to reduce the damage or to increase strength are important strategies.

During childhood and adolescence there lies the importance of vaccinations and inoculations. The role of diet and exercise of course is very important because the building of muscle mass and bones is at its peak in this age group.

During adolescence and adult age the role of healthy life style has a great preventive role which continues in old age as well. Now-a-days the role of life style in causing/precipitating/aggravating obesity, diabetes, coronary artery disease has been well established.

In old age the measures are different for men and women. For males the important things to be taken care of are Diabetes, Hypertension, Coronary Artery Disease, Prostate Cancer, Colorectal Carcinoma etc. while for females osteoporosis, Cervical cancer, Breast cancer etc. are special issues.

The above factors have great influence on elderly in seeking health promotions which are being provided by Government, Socio-political organisations, NGOs working for the cause of elderly, doctors and insurance workers.

The insurance companies[11] have covered the screening tests for many of the above diseases because their early detection and treatment saves not only the miseries of people but have financial implications also.

Health promotion measures are being taken at all three levels i.e., Primary, Secondary and Tertiary levels.

Primary prevention

In primary prevention, the emphasis has to be laid on vaccination, cigarette smoking/tobacco use cessation, diet, physical activities, socialisation and participation in community programs, living in a pollution free atmosphere and moderation in alcohol conjunction. Primary prevention of falls, accidental injuries and primary chemoprophylaxis with aspirin has lacked cost benefit evidence, still widely accepted.

Secondary prevention

For secondary prevention, there is role of pharmacological measures which has to be considered, as and where applicable.

Tertiary prevention

Tertiary prevention becomes a part of rehabilitation. Prevention of chronic diseases has more rewarding benefits. The chronic disease in which there is a role of non-pharmacological preventive measures or pharmacological prevention are Osteoporosis, Non-insulin dependent diabetes, syncope, falls & fractures, Sleep disturbances, Atherosclerosis, Hypertension, Coronary Artery Disease, COPD, Bronchial Asthma, Obesity, Cataract, Macular Degeneration, Breast Cancer, Colorectal Cancer, Kidney disease etc.

Non-Pharmacological Measures

These measures hardly incur any expenditure in introducing them. They require only knowledge and motivation.

Diet

Kowald's[12] mathematical model supported the idea that calorie restriction prolongs life via reduction in the generation of free radicals. Xia E[13] observed that food restriction increased antioxidant levels in rats. Experiments in rats have shown that severe food restriction increases longevity in surviving rats. Anti-ageing and life prolonging effects of calorie restriction seem to stimulate various maintenance mechanisms and an increase in the life span of catalase, and dismutase genes lead to enhanced defences against oxidative damage.

Fruits and vegetables[14] may act through various mechanisms, like increasing folic acid to decrease homocysteine, increasing potassium and magnesium to decrease blood pressure besides providing antioxidants. High fruit and vegetable intakes have been most consistently associated with protection of cataract, macular degeneration, visual loss, respiratory diseases and cancers such as breast, stomach and colorectal. The discrepancy in benefits between isolated supplementation of antioxidants and fruit and vegetable consumption may be due to other phytonutrients or their synergistic effects. The role of lycopene (found in tomatoes) in protecting elderly male from cancer prostate has been quite promising.[15] Carrots have a role to play in preventing atherosclerosis and amla in promoting immunity.

Ageing may be associated with less efficient processing of essential nutrients-like poor ability to synthesise Vitamin D in the skin, a major source for Indians and poorer ability of the gut to absorb nutrients; requiring higher intakes of nutrients. A committee on medical aspects of food policy recommended higher intake of vitamins, minerals and fatty acids, which can be achieved by diets high in fruit, vegetables, complex carbohydrates and replacement of saturated fats with oils rich in unsaturated fats.

A diet rich in unsaturated fat is supposed to be the cause behind low atherosclerosis and high life expectancy in the Mediterranean region, and Japan.[16] High saturated fat diet has been associated with increased atherosclerosis. In a secondary prevention trial in the elderly, an advice to eat fatty fish twice a week reduced cardiovascular deaths by 30%. In another secondary prevention trial, replacing dairy and animal fats with Mediterranean diet reduced mortality by 70% after four years.

The addition of soybean (phytoestrogens) in the diet of elderly women in protecting them from osteoporosis has been very promising.[17]

Dietary sodium reduction in elderly results in a greater blood pressure fall than in younger subjects, however during summers in temperate zones where both sensible and insensible sweating is more; drastic reductions in salt intake often lead to a state of confusion and anuresis as a result of hyponatremia that ensues.

In hilly terrain iodized salts are preferred over the normal salts to help elderly to retain their normal thyroid function.

Exercise

Exercise can certainly be viewed as a source of primary prevention, and consistently has been noted to benefit the older adult. There is increasing evidence to suggest that habitual aerobic exercise, such as walking, cycling, circuit weight training, swimming, and jogging, can improve strength and aerobic capacity.[18,19]

Aerobic exercise is defined as physical activity that primarily stimulates mitochondrial oxidative metabolism. Aerobic exercise can also prevent and help manage diseases such as osteoporosis and fractures, coronary artery disease, and non insulin-dependent diabetes mellitus.[20] It can also decrease the risk of falling,[21] reduce physical disability,[22] improve sleep,[23] enhance mood and general well-being,[24] provide added physiologic reserve, and slow development of disability.[25]

It also has a protective effect in breast and colon cancers. Even moderate activities such as walking promote physical and mental well being besides their beneficial effect on diabetes, hypertension, obesity and cardiovascular diseases.

Exercise programs are important to improve balance. Flexibility exercises protect against falls, a major cause of morbidity in the elderly. Resistance exercises for legs increase walking speed and facilitate rising from a chair in the elderly. Upper body resistance exercises help in activities of daily living. In long term prospective studies, ongoing physical activity in those aged 60 to 84 years reduced mortality by 50% over

a follow-up period of 10 years. The British Cardiological Society recommends minimal use of special evaluation before starting exercise program as long as the workout begins at low levels and progresses slowly; however exercise stress test is recommended for anyone with hypertension or heart disease.

Social and Mental Activities[26]

Loneliness and brooding has a deleterious effect on cognitive functions and accelerates brain ageing. Involvement in social activities and the nature of mixing with others and sharing has a positive influence on the human attitude which provides elderly an emotional support.

Smoking and tobacco consumption[27,28]

Chewing of tambul and tobacco (In Paan, Gutka) and smoking (Cigarette, Beedi, chillum, hookah etc) both in active and passive manners have deleterious effect on health. Smoking cessation is advocated at all stages. This has a role in heralding the progress of COPD, increased susceptibility to infections, decreasing risk of lung and GI cancers(Oral, Esophageal and Stomach) cardio-vascular diseases, peptic ulcer and irritable bowel syndrome.

Environmental Pollution[29]

Pollution adversely affect COPD, Bronchial Asthma, hearing and cardiovascular Diseases. Any type of pollution whether smoke, suspended particles, fumes or noise has bad effect on the health and accelerate the progress of diseases mentioned above.

Yoga

Studies have shown beneficial effect of yoga on sleep, cognitive functions, cardio-vascular diseases specially Hypertension, Respiratory Diseases, Obesity, Arthritis etc.

Pharmacological Measures

Atherosclerosis, Coronary Artery Disease, Hypertension, Obesity, Hyper lipidemia, Osteoporosis, Fracture healing, Cognitive Functions, Immune functions have been shown to be influenced by the pharmacological measures. (Table 2)

Antioxidants

Evidence is accumulating that most degenerative diseases that affect the elderly, like atherosclerosis, some cancers, inflammatory joint diseases, asthma, diabetes, senile dementia and degenerative eye diseases (for example, cataract, macular degeneration) have their origin in deleterious free radical reactions. Free radical involvement in chronic diseases of the elderly has prompted interventions to postpone or prevent these diseases.

Antioxidants (free radical scavengers) levels decrease with ageing. Oxidative stress assessed by six parameters (TBARS, Vit E, selenium, erythrocyte SOD, glutathione peroxidase in red cells/plasma) was found to be higher in the elderly population and was suggested as a biological marker of ageing. Antioxidant supplementation in the elderly may enhance defence against free radical damage.

In the Cambridge heart antioxidant[30] study, patients with coronary artery disease receiving Vit E had significant reduction in death from cardiovascular cause or non fatal myocardial infarction. An observational study of 34, 486 post-menopausal women over 70 years showed that women taking higher dietary Vit E had significantly reduced risk of coronary heart disease. Hodis[31] demonstrated reduced coronary atherosclerosis by serial coronary angiography in patients taking antioxidant vitamins.

The implication of free radicals as a major contributing factor in Alzheimer's dementia, vascular dementia and Parkinson's disease is increasingly evident. Amyloid interacts with endothelial cells to produce an excess of superoxide radicals, with attendant alterations in endothelial structure and brain functions.

In a two-year randomised placebo controlled trial, 2000 IU of Vit E given to patients with moderate Alzheimer's disease[32] delayed by 50%,

the combined end points of death, admission to an institution, inability to perform the activities of daily living, or severe dementia.

Immune system boosters

The functional capacity of the immune system declines with involution of the thymus gland and deterioration of stem cells, leading to increased incidence of infection, cancer and other immunity mediated diseases in the elderly.

Trials in healthy elderly given Vit E supplements[33] showed a significant improvement in the indices of immune response mediated by T cells. Clinical trials have found that antioxidant supplementation with Vit C, E and A can significantly improve activation of cells involved in tumor immunity. Supplementation with Vit A decreases morbidity and mortality in measles. A randomised placebo controlled clinical trial found that selenium may protect against all cancers.

Vaccination

WHO recommends the use of following vaccines in Elderly.

1. Tetanus Toxoid

   Although Tetanus has diminished dramatically since the tetanus toxoid vaccine was first introduced, the disease has not disappeared. However, in principle the health burden for tetanus is totally preventable through universal immunization even though potential exposure to bacteria will always be present in the environment. Tetanus toxoid vaccination produces long term immunity with few doses, few adverse reactions and remains one of the most effective biologicals available. It is important for the vaccinator to ensure that the vaccine be given in the arm and not in the buttocks.

2. Pneumococcal Vaccine

   Ever since ACIP guidelines have recommended the use of Pneumococcal Polysaccharide Vaccine in a vast group of people from various age groups and clinical conditions, this has been accepted as a preventive measure against invasive Pneumococcal disease.[34]

   This is a highly purified capsular polysaccharide from 23 most prevalent strep pneumoniae including the six sero types that most frequently cause drug resistant Pneumococcal infections as reported from USA. Pneumococcal disease being globally present in the form of sinusitis, otitis media, bronchitis, pneumonia, bacteremia and meningitis has been reported by various workers in India.[35,36] The disease gains further importance because the Pneumococcus developing drug resistance.[37-38] Further more, because of the large number of people suffering from diseases like COPD, Diabetes Mellitus Congestive failure, CLD, CRF, Malignancies, HIV and a number of people being immuno-deficient and on steroid therapy are also prone to get Pneumococcal infections.[34] Chronic smokers are yet another vulnerable group. PPV produces effective antibody levels by the third week following vaccination, by 0.5 ml of PPV given IM/subcutaneous; the levels of which decline after 5-10 years. However in elderly above the age of 60 years the decline may be faster necessitating re-vaccination.

3. Influenza Vaccine

   In influenza epidemics most deaths occur in the elderly. The influenza vaccine has a lower efficacy in the elderly than the young, but is still around 60-70%. It causes substantial reduction in mortality and cardio respiratory morbidity and has been found to be cost effective. Hence annual immunization is recommended in USA but for India this is possible only in a select group who can afford the vaccine. The vaccine must be given yearly because antibody response is short lived and because of the yearly antigenic variation in circulating strains of influenza. The most recent circulating virus strains are selected for the vaccine. Two doses are given 4-8 weeks apart for primary immunizations.

Newer vaccines such as subunit (hemagglutinin) vaccine, live (recombinant) vaccine and cold adapted strains vaccine are in the development stage.

Hormonal Intervention

Human Growth Hormone replacement in Growth Hormone deficit elderly has shown beneficial results in lipid profile as well as abdominal obesity.[39]

Testosterone supplementation in andropausal men has shown beneficial results in cognitive functions, onset of alzhemier disease, osteoporosis, metabolism besides improving erectile dysfunctions.[40]

Melatonin supplementations prevent age-related diseases and prolong the lifespan and improve the quality of life of elderly people.[41]

Estrogen or estrogen and progesterone replacement therapy within the first 5 years of menopause offers protection against osteoporosis in women. It also has a primary preventive role against cardiovascular events in postmenopausal women as seen in the Nurses Health Study. Estrogen alone or several combinations of estrogen and progestin improved the coronary risk profile of subjects in the postmenopausal Estrogen/progestin intervention (PEPI) trial. However, the benefit fell with long term treatment due to increased risk of breast cancer. Raloxifene, a selective estrogen receptor modulator has a promising estrogen-like action on the skeletal and cardiovascular system without any evidence of increased incidence of endometrial or breast cancer.

Non-Steroidal Anti-inflammatory Drugs

The benefit of aspirin is due to its antiplatelet as well as anti-inflammatory action. Giving aspirin shortly after ischemic stroke has been associated with reduction in recurrent stroke and death.

The United States Physician Health Study and British Doctors Trial have used aspirin for primary prevention of myocardial infarction. In the US study, 22000 male US physicians, aged between 40 and 84 years, received 162.5 mg aspirin daily and had 44% relative reduction in acute MI (0.4% to 0.2% per year) in physicians above 50 years age. But the British study, involving 5000 doctors aged 50-78 years receiving 500 mg aspirin daily, showed no difference. There was a slight increase in hemorrhagic stroke and GI hemorrhage in both studies.

Aspirin should be considered in a dose of 162.5 mg /day in persons over 50 years and those with poorly controlled risk factors like diabetes, smoking and hypercholesterolemia if there are no contraindications.

Antibiotics

Common chronic infections have been implicated in the causation of atherosclerosis. Evidence for *C pneumoniae* is quite strong. Treatment with antibiotics has been shown to be beneficial in secondary prevention. Larger trials are needed to substantiate benefits in primary or secondary prevention.

Lipid lowering drugs

Lowering of hypercholesterolemia by statins has lowered the incidence of fatal and non-fatal MI by 30-35% in primary as well as secondary prevention trials. This also reduces the incidence of coronary revascularization procedures and stroke. It improves quality of life for the elderly. In the Indian context, agents lowering triglycerides and raising HDL may be of more benefit.

Miscellaneous

Even in normotensive Diabetics, the addition of Ramipril showed reno-protective effect as documented in HOPE[42] study.

Laser therapies in diabetic retinopathy have helped in prevention of blindness.

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