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Review article

Changes during aging and their association with malnutrition

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ABSTRACT

The aging process involves changes in physiological, pathological, social, and psychological conditions of a person. Nutrition is an important element of health among the elderly, and it affects the whole process of aging. The prevalence of malnutrition is increasing in this population and is associated with a decline in functional status, impaired muscle function, decreased bone mass, immune dysfunction, anemia, reduced cognitive function, poor wound healing, delayed recovery from surgery, higher hospital readmission rates, and mortality. Due to changing socioeconomic environment, elderly people are often left alone to fend for themselves to maintain their health, which may interfere with the maintenance of a good nutritional status. Regular diagnosis of malnutrition among older patients increases the need for more education regarding nutritional status in older patients, and the purpose of this article is to provide information with an educational overview of essential nutritional aspect associated with changes in aging.

1. Introduction

As a population, older adults are more prone to age-related diseases, functional impairment, and physical inability that may interfere with the maintenance of a good nutritional status (Figure 1).[1] Aging refers to a multidimensional process in humans, the process of physical, psychological, and social changes.

The cutoff for old age cannot be defined exactly because the concept of old age does not have the same meaning in all societies. Government of India adopted the "National Policy on Older Persons" in January 1999. The policy defines "senior citizen" or "elderly" as a person who is 60 years of age or older; however, the age of senior citizen differs in various parts of the world.[2] According to the definition given by the National Policy on Older Person (Government of India), the elderly group is stratified on the basis of age (Table 1).[3]

Demographically, aging is the growth of the aged population (60 + years) in proportion to the total population over a period of time. A country is said to be aging if the proportion of people over 65 years of age reaches 7%.[4] The elderly population is the fastest growing segment throughout the world. In the next 30 years, there will be a rise in elderly population of up to 300% in Asia and Latin America (Table 2).[2,5]

The life expectancy at birth in developed countries is over 70 years. According to the global estimation, 605 million people are older than 65 years.[6] Aging of the world's population is the result of two factors: a decline in fertility and an increase in life expectancy.[7] There has been a decline in fertility rates in developing countries during the preceding 30 years and in developed countries throughout the 20th century.[7] In developed countries, the largest gain ever in life expectancy at birth occurred during the 20th century, averaging 71% for females and 66% for males.[7] Life expectancy at birth in developed countries now ranges from 76 years to 80 years.[7] Life expectancy has also increased in developing countries since 1950, although the amount of increase has varied. A higher life expectancy at birth for females compared with males is almost universal. Advances in medical science, improved health care, and improved standard of living have helped people to stay healthy and prolong their life. From the health perspective, the goal is to keep people alive and healthy as long as possible. Health education and health promotion play very important roles in maintaining good health, good mobility, and independent functional status in the elderly.[8]

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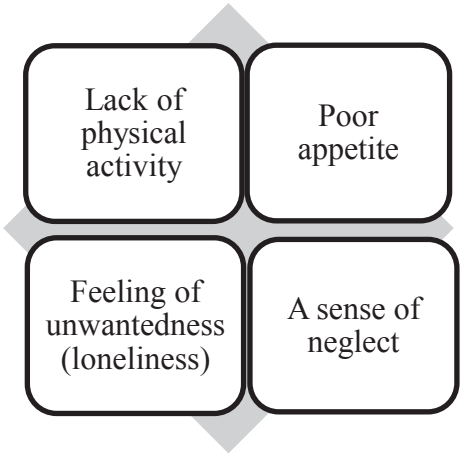

Figure 1. Age-related changes relevant to nutrition. *Note*. From "Human aging: usual and successful," by J.W. Rowe and R.L. Kahn, 1987, *Science*, *237*, p. 143–9. Copyright@ Science. Rowl and Kahn, 1987. Reprint with permission.

Table 1
Age stratification among the elderly.

60–69 y Old	70–79 y Old old	80 + y Oldest old
60–74 y Young old	75–84 y Middle old	85 + y Old old

Note. From "National Policy on Older Persons", by Ministry of Social Justice and Empowerment, Government of India, 1999. Copyright@ Government of India. Ministry of Social Justice and Empowerment, 1999. Reprint with permission.

Table 2
World trends in population growth of people aged 60 + years, 1980–2020 (in millions).

	1980	1990	2000	2010	2020
World	381.2	484.7	608.7	754.2	1011.6
Developed countries	173.3	203.6	234.6	232.4	308.2
Developing countries	207.9	281.8	374.1	491.8	703.4
China	78.6	101.2	131.7	167.9	238.9
India	44.6	60.2	81.4	107	149.7

Note. From "United Nations' world demographic estimates and projection.". Copyright@ United Nations. United Nations Department of Economic and Social Affairs, Population Division, 2013. Reprint with permission.

2. Age-related changes relevant to nutrition

Nutritional needs change throughout life. Especially for the elderly, these changes may be related to the normal aging process, medical conditions, or life style. Over the past decades, the importance of nutritional status in the elderly has increasingly been recognized in a variety of morbid conditions such as cancer, heart disease, and dementia.[9,10] Nutrition is an important determinant of health in elderly patients.[11] Nutritional status assessment is essential for preventing or maintaining various chronic and acute disease, and even for healing. As people age, various changes occur in the body, which may or may not affect the nutritional status of an individual. A common problem related to aging is loss of bone density, which can increase the risk for osteoporosis. Sarcopenia is the other age-related change. The loss of lean muscle mass can lead to a gain in body fat. Muscle loss is seen even in healthy people, which implies that metabolic changes occur during aging, making it a universal phenomenon. It may be more noticeable by loss of strength, functional decline, and poor endurance. This loss also leads to reduced total body water content.[12]

Various other changes occur throughout the digestive system. There is a decrease in gastric acid secretion, which can limit the absorption of iron and vitamin B_{12}. Saliva production decreases, leading to slower peristalsis and constipation. Appetite and thirst dysregulation also occurs. Sensory changes affect the appetite in many ways. Vision loss makes cooking, and even eating, more difficult. Diminished senses of taste and smell make the food less appealing. These changes typically alter eating habits and reduce nutrient availability and absorption, which can lead to nutritional deficiencies and various health problems.

Malnutrition is both a cause and a consequence of ill health.[13] It can be of various types: undernutrition, overnutrition, or specific nutrient-related deficiencies. Malnutrition in older patients is regularly underdiagnosed,[14] and hence more education regarding nutritional status is needed among older patients. Malnutrition in older adults can lead to various health problems, including a weak immune system, that increases the risk of infections; poor wound healing; and muscle weakness, which can lead to falls and fractures. In addition, malnutrition can lead to further disinterest in eating or lack of appetite, making the problem worse.[15]

Many elderly patients have an increased risk for malnutrition compared with other adult populations. It has been estimated that between 2% and 16% of community-dwelling elderly people are nutritionally deficient in protein and calories.[16] If mineral and vitamin deficiencies are included in this estimate, malnutrition in persons over the age of 65 years may be as high as 35%.[17] Malnutrition in older adults is associated with various health concerns. Malnutrition leads to a weak immune system, increasing the risk of infections, poor wound healing, and muscle weakness, which further leads to falls and fractures.

The problem gets worse as malnutrition can lead to further disinterest in eating or a lack of appetite. Older adults who are seriously ill, and those who have dementia or have lost weight are especially vulnerable to the effects of poor nutrition.[18] Although there is no uniformly accepted definition of malnutrition in the elderly, some common indicators include too little food or a diet lacking in nutrients. In reality, though, malnutrition is often caused by a combination of physical, social, and psychological factors, for example, health concerns, restricted diets, limited income, reduced social contact, depression, and alcoholism. The number for hospitalized seniors is also high. Studies on hospitalized older patients suggest that 20–65% of these patients suffer from nutritional deficiencies,[19] and the prevalence of malnutrition in long-term care facilities is estimated to be between 30% and 60%.[20] A careful nutritional assessment and nutritional education are necessary for successful diagnosis of malnutrition in the elderly, and for the development of appropriate and comprehensive treatment plans.

3. Physiological changes

3.1. Body mass and composition

Aging causes various changes in body composition, which have important consequences on health and physical functions. There is a progressive decrease in lean body mass and an increase in body fat.[21] Decreased physical activity accounts for the increased body fat, and this may lead to decreased energy intake with aging.[22] These changes in body composition, including those in fat distribution, may be associated with changes in various physiological functions that affect metabolism, nutrient intake, physical activity, and risk for chronic diseases.[23] There is also an alteration in bone density that results from a decrease in mineral content, which occurs with aging.[24] Severe osteoporosis may cause the bones in the legs to bow under the weight of the body. This bowing, together with changes of the spine, makes measurement of height unreliable