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Review article

# Health consequences of obesity in the elderly

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ABSTRACT

The prevalence of obesity is increasing in all age groups. According to a 2001 census and the projection made by the United Nations (1996 revision), the elderly constitute 7.5% of the Indian population, and by all indications 21% of the Indian population will be 60 years and above by 2050. Medical science discoveries, improved lifestyle, and social conditions during the past few decades have increased the life span of man. Life expectancy at birth in developed countries is over 70 years. Questions have risen about the relation between obesity in old age and total or disease-specific mortality, the definition of obesity in the elderly, its clinical relevance, and about the need for its treatment. Information about changes in body composition and fat distribution among the elderly will help us better understand the relationships between obesity and morbidity in the elderly.

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## 1. Introduction

Ageing is a natural and inevitable process. Medical science discoveries, improved lifestyle, and social conditions during the past few decades have increased the life span of man. Life expectancy at birth in developed countries is over 70 years.[1–3] Global estimation indicates that there are 605 million people who are older than 65 years.[4] The elderly population is the fastest growing segment throughout the world. In the next 30 years, the elderly population will increase by up to 300% in Asia and Latin America.[5]

In India, the proportion of the population in the working age group, i.e., 15—59 years, and the retired age group of 60 years and above are both increasing, whereas the age group of 0—14 years is decreasing. The elderly population (≥60 years), which accounted for 6.7% of the total population in 1991, is expected to increase to more than 10% by the year 2021 (Fig. 1).[6]

Population aging or increased life expectancy is associated with the increase in the number of noncommunicable diseases—coronary heart disease, hypertension, type 2 diabetes mellitus (T2DM), osteoarthritis, cataract, urinary incontinence, and certain types of cancers.[7]

Obesity is considered one of the major causes of the onset and severity of noncommunicable diseases. It is a worldwide health problem at all stages of life in both developed and developing

countries. In the elderly, it contributes to the early onset of chronic morbidities and functional impairment, and leads to premature mortality.[8] There is a progressive decline in fat-free mass (FFM) after the age of 20—30 years. During the period of 20—70 years of age, up to 40% of FFM (primarily skeletal muscle) decreases, whereas fat mass increases.[9] Fat mass reaches maximum levels at 60—70 years of age and FFM at 20 years of age; both fat measures subsequently decline thereafter.[10] Therefore, both FFM and fat mass decrease during old age (>70 years).

Redistribution of body fat and FFM is associated with aging. In comparison to body fat or subcutaneous fat, there is a greater relative increase in intra-abdominal fat, and because of the loss of skeletal muscle there is greater decrease in peripheral than in central FFM.[11] In addition, insulin resistance among the elderly is associated with increased intramuscular and intrahepatic fat.[12]

## 2. Assessment of obesity among the elderly

Obesity is defined as "an unhealthy excess of body fat, which increases the risk of medical illness and premature mortality" (Fig. 2).[13] Body mass index (BMI) has been widely used and accepted as a method of classifying medical risk by weight status. In most clinical settings, an accurate measurement of body fat mass is difficult to obtain. BMI is calculated as body weight (in kg) divided by the square of height (in m). Data from the World Health Organization (WHO)[14] and the National Institutes of Health Heart, Lung, and Blood Institute[15] provide a measure of the relation between

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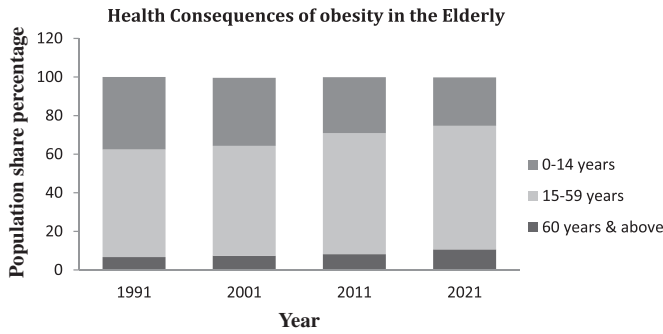E-mail addresses: shilpamarya@gmail.com, shilpaamarya@gmail.com (S. Amarya).

**Fig. 1.** Population age structure 1991−2021 in India.

height and weight and correlates results with percentage of body fat in young and middle-aged adults.

BMI and waist circumference (WC) are adopted based on the WHO classification for assessment of obesity. However, the BMI classification suggested by WHO is not considered suitable for Indians and Asians.[16] Indians have more body fat than the standard BMI.[17] Indian Reworks Obesity Guideline (2004)[17] suggested that BMI should be reduced for Indians. Hence, BMI (WHO Asia-Pacific classification) is an appropriate measure for Asians in an assessment of obesity. Age-related changes in body composition occurs in old age (i.e., decreases in FFM and increases in fat mass), and compression of vertebral bodies and kyphosis (posterior convex angulation of the spine) result in loss of height. The major drawback of BMI is that it does not differentiate between body fat and FFM and so, changes in body composition tend to underestimate fatness, whereas the loss of height would tend to overestimate fatness at any given BMI. Alternative methods of estimating height, such as knee height or arm span, have been suggested. This may provide more reliable estimates of BMI, although these approaches have not been adequately validated.[18,19]

## 3. Pathogenesis

Table 1 shows that aging is associated with a decrease in all major components of total energy expenditure (TEE).[20] Older men show 20% less thermic effect as compared to younger men.[21] The relation between energy intake and expenditure is an important determinant of body fat mass. Therefore, the increase in total fat mass that occurs with aging must be attributable to an increase in energy intake, a decrease in energy expenditure, or both. Physical activity decreases with increasing age, and it has been estimated that decreased physical activity accounts for about one-half of the decrease in TEE that occurs with aging.[22] Therefore, it is likely that a decrease in TEE is an important contributor to the gradual increase in body fat with advancing age.

There is an association between aging and decreased growth hormone secretion. Hormonal changes can enhance the accumulation of fat, the reduction of FFM, and energy balance. The decline in growth hormone and testosterone production with increasing age decreases FFM and increases fat mass. Thyroid hormone-induced oxidative bursts are blunted with aging.[23] Moreover, resistance to leptin could result in a decreased ability to down-regulate appetite.[24]

## 4. Obesity and functional capacity

Obesity has more functional implications as compared to lean in the older population. Obesity can exacerbate age-related decline in physical function. Activities of daily living, particularly mobility, is markedly diminished in the overweight and obese.[25,26] BMI is inversely related to measured physical performance in older persons; a 3-unit increase in BMI is associated with a 1-point decrease in physical performance test scores.[27] In addition, excess body fat mass and a BMI of $\geq 30$ in older individuals are associated with physical dysfunction and are predictive of a decline in functional status and future disability.[28]

## 5. Obesity and associated chronic disorders

Obesity causes serious health complications resulting in morbidity. The prevalence of several medical complications, such as diabetes, hypertension, arthritis, cardiovascular disease, urinary incontinence, and various types of cancers, is associated with obesity in advancing age.[29]

## 6. Metabolic syndrome

Metabolic syndrome and T2DM (formerly noninsulin-dependent diabetes mellitus or adult-onset diabetes) is the strongest disease associated with overweight and obesity.[30] According to the National Institutes of Health (2005),[31] the elderly are at an increased risk of developing intra-abdominal obesity and metabolic
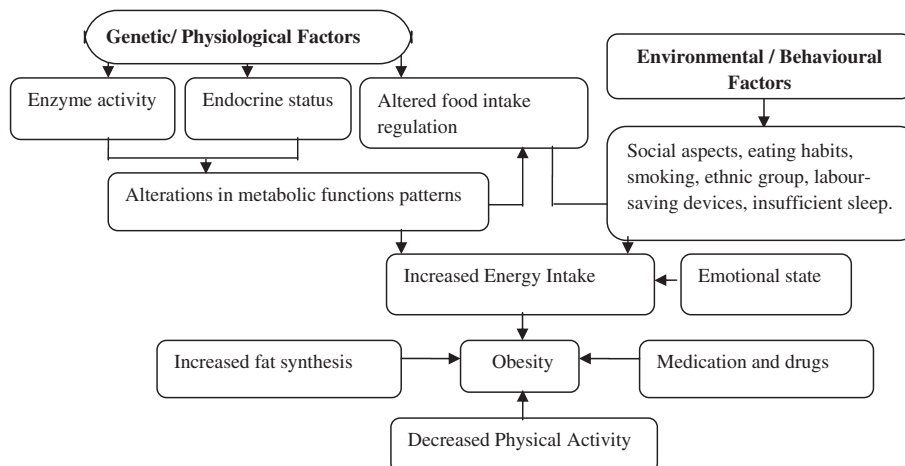


**Fig. 2.** Possible causes of obesity.