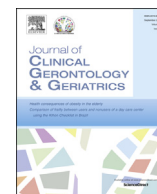


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Review article

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 Institute¹⁵ provide a measure of the relation between

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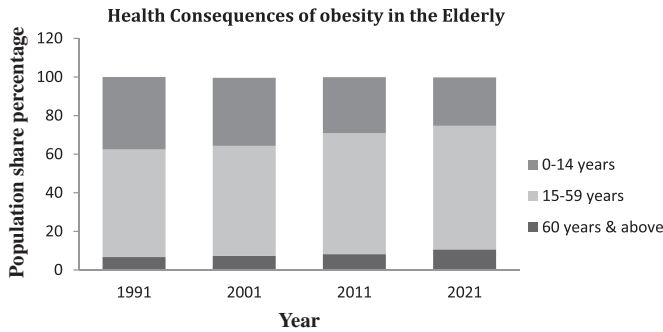


Fig. 1. Population age structure 1991–2021 in India.

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 ≥ 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

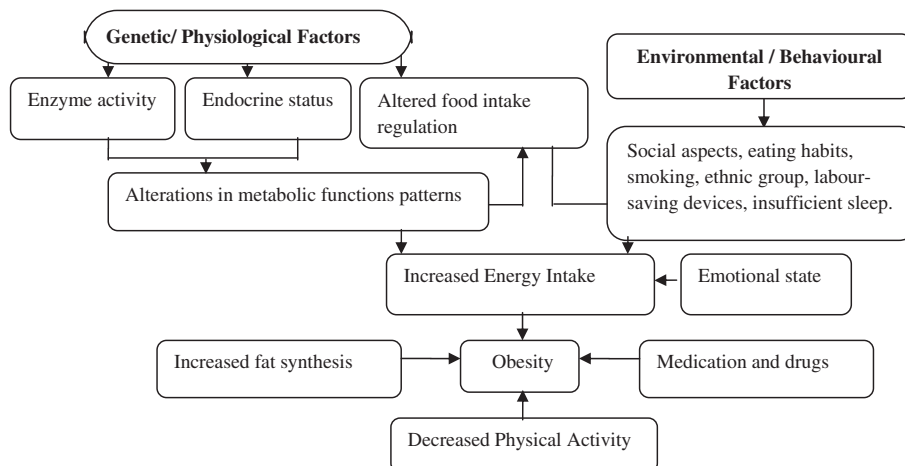


Fig. 2. Possible causes of obesity.

Table 1
Effect of ageing on major components of total energy expenditure (TEE).

Components of TEE	Decrease in component (%) of TEE
Resting metabolic rate	70
Thermic effect of food	10
Physical activity	20

syndrome because of multiple age-related physiologic mechanisms, and components of the metabolic syndrome (excess abdominal fat, insulin-resistant glucose metabolism, dyslipidemia, and high blood pressure) are all prevalent in older populations. The prevalence of the metabolic syndrome increases with age. There is a rise after the 3rd decade, reaching a peak in men 50–70 years of age and in women 60–80 years of age.³² Rise in abdominal fat mass in both men and women aged 70–79 years indicates metabolic syndrome.³³

7. Diabetes

According to the Expert Committee on the Diagnosis and Classification of Diabetes and Classification of Diabetes Mellitus (1997),³⁴ after 30 years of age fasting plasma glucose increases by 1–2 mg/dL and postprandial glucose increases by 10–20 mg/dL.³⁵ The prevalence of T2DM is 31.7% in India according to a 2010 report, and it is expected to reach 79.4% by the year 2030.³⁶

8. Hypertension

About 30–50% of the elderly aged 65 years and above are affected by hypertension.³⁷ Even in old age, obesity and high blood pressure remain correlated. WC is an independent predictor of hypertension, and in some studies it was a better predictor of hypertension compared to BMI.³⁸

9. Arthritis

Obesity and arthritis tend to go together. The prevalence in adults has been reported to vary from 0.5% to 3.8% in women and from 0.15% to 1.37% in men, with peak incidence in old age.³⁹ If strain is sustained for a long time in the elderly, it may also lead to osteoarthritis of weight-bearing joints.³⁹ Arthritis is one big cause of physical immobility in older adults, resulting in reduced energy expenditure and high risk of weight gain.⁴⁰

10. Cardiovascular disease

In recent years, the incidence of coronary artery diseases (CADs) has shown an increasing trend in India.⁴¹ The risk of developing CAD in the Indian population is much higher than that in other countries.^{42,43} Moreover, CAD is the major cause of disability, thus limiting the activity and eroding the quality of life of millions of elderly people each year. Generally, cardiometabolic obesity-related complications are linked to central adiposity, and many reports show that other than WC obesity is quantified in terms of BMI alone, which may potentially mask the association of abdominal fat and cardiovascular disease to events. Various studies suggest that obesity can raise the risk of cardiovascular disease in older adults. Data from longitudinal population studies⁴⁴ suggest that obesity increases the risk of cardiovascular disease in older men, but not necessarily in older women. Increased BMI in older men was associated with an increase in new cases of coronary heart

disease, fatal and nonfatal infarction, and cardiovascular disease mortality during 12–15 years of subsequent observation. However, no increased cardiovascular disease risk was observed in obese older women in some, but not all, studies.

11. Pulmonary abnormalities

Obesity, particularly abdominal obesity, is associated with pulmonary function abnormalities, obesity-hypoventilation syndrome, and obstructive sleep apnea.⁴⁵ In a 5-year prospective study, older heavier men had the greatest increase in the respiratory disturbance index, which is the number of apneas and hypopneas divided by the estimated hours of sleep.⁴⁶ Increased weight on the chest wall decreases respiratory compliance, increases the work of breathing, and restricts ventilation. Older obese men may be particularly predisposed to developing weight-related sleep apnea.

12. Cancer

WHO states that overweight and obesity are the most important known avoidable causes of cancer after tobacco.⁴⁷ The incidence of cancer increases with age, and more than 12–23% of all cancers occur after the age of 65 years.^{48,49} Although more than 25% of cancers are diagnosed in people over 60 years of age, this group is less extensively investigated and probably receives less appropriate treatment. Obesity is associated with an increased risk of several types of cancer (i.e., breast, colon, gallbladder, pancreas, renal, bladder, uterine, cervical, and prostate cancers). A pooled analysis of eight cohort studies of more than 300,000 women has shown that postmenopausal women with BMI ≥ 28 kg/m² have a 26% increase in the risk of breast cancer compared with those with BMI < 21 kg/m².⁵⁰

13. Urinary incontinence

This is a common and distressing problem for the elderly. The prevalence ranged from 5% to 25% in men and from 7%⁵¹ to 42%⁵² in women. Obesity contributes to the increase in prevalence of urinary incontinence in older persons, and the increase in urinary incontinence is directly associated with increased BMI.⁵³

14. Cataracts

India accounts for 20% of the global burden of blindness, with cataracts being the principal cause.⁵⁴ Studies based on population reports show that Indians have a higher prevalence of cataracts than Western populations.⁵⁵ Visual impairment associated with cataract affects nearly 20% of persons aged ≥ 65 years.⁵⁶ Various studies done on the elderly (60 years and above) indicate that overweight and obesity are associated with an increased prevalence of cataracts and cataract surgery.⁵⁷

15. Guidelines for treatment

With a brief overview of the health challenges faced by the elderly population in India, the following strategies may be explored: improving the quality of life of the geriatric population and improving physical function. In fact, quality of life may be the most important goal of therapy in older adults. Among the elderly, therapeutic approaches focus on preventing loss of muscle and bone mass that occurs with weight loss in older persons. The current therapeutic tools available for weight management in older persons are described in the following subsections.

15.1. Pharmacologic agents

Because elderly patients are mostly on various medications for other diseases, pharmacologic agents used for the treatment of obesity can cause additional burdens. Orlistat, a saturated derivative of lipostatin, is the only licensed antiobesity medication.⁵⁸ The gastrointestinal tract does not absorb this medicine. Rather, it binds to intestinal lipases and thus prevents 30% of dietary fat absorption.⁵⁹ Orlistat helps to reduce 8–10% of weight in 1 year. Its adverse profile is restricted to gastrointestinal effects such as steatorrhea (which occurs if high-fat meals >20 g fat are consumed).⁶⁰ There is no reason to suppose that its effectiveness or safety would be any different in elderly patients.⁶¹

Sibutramine is another medication. It has recently been withdrawn in most countries (including the United States and Europe) because in older adults clinical trial is very high mainly elderly with active CHD, who fell outside its license. This is a centrally acting, monoamine reuptake inhibitor, blocking the reuptake of both serotonin and noradrenaline, thus leading to increased satiation.⁶²

15.2. Bariatric surgery

Bariatric surgery is the most effective weight-loss therapy for obesity. Although there are no age guidelines provided, the majority of patients who undergo bariatric surgery are 60 years or older.⁶³ Criteria for bariatric surgery are defined as having a BMI of 40 or 35–40 kg/m² with other significant diseases (e.g., sleep apnea, T2DM, high blood pressure) that could be improved by weight loss. This option requires that the individual must: (1) have failed to achieve the desired results with all appropriate nonsurgical procedures to achieve clinically beneficial weight loss for at least 6 months; (2) be generally fit for anesthesia and surgery; and (3) commit to the need for long-term follow-up.⁶³

16. Concluding remarks

Obesity is a common but increasing problem in the elderly. The number of obese people is increasing because of the increased total number of older persons and increase in the percentage of obese elderly. Its prevalence is lower in extreme old age, but this is likely to increase in the future. Obesity has important functional implications in older men and women because of the decline in physical activity and energy expenditure, which causes frailty or sarcopenic obesity. Among the elderly, many medical consequences particularly of obesity are problematic (e.g., T2DM, arthritis, cardiovascular disease, metabolic syndrome, urinary incontinence, and depression). Chronic inflammation and endocrine changes contribute to the changes in metabolism and body composition that accompany aging. The focus of treatment should be on a reduction of intra-abdominal fat initially with modest, conventional diet restriction, and preservation of muscle mass and strength through physical activity. Therefore, it is particularly important to consider weight-loss therapy to improve physical function in obese older people, in addition to possibly preventing or improving the medical complications associated with obesity, which is the major goal of weight-loss therapy in obese young adults. In addition, the therapeutic approaches must consider the potential adverse effects of weight loss on muscle and bone masses.

Conflicts of interest

No potential conflicts of interest were disclosed.

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