Obesity Facts

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European Association for the Study of Obesity (EASO) position statement on the diagnosis and management of obesity in older adults

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Abstract
Obesity is increasingly prevalent among older adults and is a major contributor to cardiometabolic diseases, functional decline, frailty, and loss of independence. The intersection between population ageing and the obesity epidemic poses major public health and clinical challenges.
This European Association for the Study of Obesity (EASO) position statement represents an update of the EASO guideline from 2012, and provides a comprehensive overview of the epidemiology, pathophysiology, clinical consequences, and management of obesity in adults aged ≥65 years. It summarises current evidence and offers practical recommendations for diagnosis and treatment tailored to this age group.
To guide clinicians and researchers through this updated framework, the position statement highlights four central concepts that underpin obesity assessment and management in later life: 1) Obesity affects up to one third of older adults globally, with prevalence varying by sex and geography; 2) Ageing is associated with changes in body composition, hormonal milieu, and lifestyle factors (diet, physical inactivity, polypharmacy) that favour fat accumulation and sarcopenic obesity; 3) Body mass index alone is insufficient; assessment should include body composition analysis (including fat distribution and muscle mass), psychological status and functional performance; 4) A multimodal approach is recommended, including moderate energy restriction with adequate protein intake, structured multicomponent exercise, behavioural support, and, where appropriate, obesity management medications and/or metabolic bariatric surgery. The focus should be on preserving muscle mass, functional capacity, and quality of life, rather than weight loss alone.
Effective management of obesity in older adults should focus on individualized, multidisciplinary strategies that balance the benefits of weight reduction against the risks of sarcopenia, malnutrition, and loss of independence.

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1. Introduction

Obesity is now recognised as a chronic, relapsing, multifactorial disease characterised by excess adiposity and adipose tissue dysfunction, with widespread metabolic and clinical consequences [1]. As populations age, the absolute and proportional number of older adults living with obesity continues to rise, reshaping clinical needs and public health priorities. This dual trend is clinically relevant because obesity in later life intersects with age-related changes in body composition, multimorbidity, and medication use, amplifying risks for cardiometabolic disease, disability, and loss of independence.

Older adults show distinct pathophysiological features, most notably the combination of increased fat mass and remodelling of white and beige adipose tissue [2] with reduced muscle mass and strength, a condition often referred to as sarcopenic obesity [3]. This phenotype is associated with worse clinical outcomes than obesity or sarcopenia alone and highlights the limitations of body mass index (BMI) as a sole diagnostic criterion, supporting the need for complementary body-composition and functional assessments [4].

Management of obesity in older adults requires an individualised and goal-oriented approach. Nutritional strategies and multicomponent physical exercise form the foundation of care, with the selective addition of behavioural interventions, obesity management medication, or bariatric surgery when appropriate. Primary therapeutic goals should focus on preserving muscle mass, maintaining functional capacity, and improving quality of life rather than on weight reduction alone.

This European Association for the Study of Obesity (EASO) position statement will update the EASO guideline in older adults from 2012 [5]. It reviews the epidemiology and pathophysiology of obesity in older adults, discusses diagnostic approaches beyond BMI, and provides practical guidance on management tailored to this population.

2. General considerations on terminology

The term “older adults” (≥65 years) is preferred over labels such as “elderly”, “old” or “senior”, which reinforce stereotypes of frailty and dependence and are often used pejoratively (WHO, Global report on ageism, 2021). It is therefore essential to adopt respectful and empowering terminology, in line with person-first language principles. Interpersonal forms of ageism, such as “elderspeak” (overly simplistic or infantilizing language), further undermine dignity and contribute to negative perceptions of older adults [6,7].

Similarly, “persons with obesity” or “individuals living with obesity” is preferred over “obese persons” to reduce weight bias and discrimination in research and clinical practice [8]. Language should reflect that health, dignity and respectful care are fundamental rights for all, irrespective of body weight or age.

3. Prevalence and etiopathogenesis

Intersection of population ageing and rising obesity

- Population ageing, driven by increased longevity, reduced mortality and declining birth rates, is transforming demographic structures worldwide, with the proportion of adults aged 65 years and older progressively increasing. [9]. While in 1950, older people represented 5% of the world's population, this percentage is expected to increase to 16% by 2050 [10].
- In parallel, obesity prevalence has also been growing over the past decades and it is expected to increase in the next decades, making it an emerging determinant of morbidity and loss of independence in later life [11]. These converging trends pose significant challenges for healthcare systems, particularly for long-term care facilities, which must adapt infrastructures and workforce training to meet the complex needs of older adults with obesity [12].

Prevalence

- In 2022, based on BMI≥25 kg/m^2 the prevalence of overweight and obesity in Europe reached its highest levels among adults aged 65–74 years (64%), declining slightly to 58% among those aged 75 years and older [13].
- On a global scale, a meta-analysis including 44 studies and more than 45 million older adults estimated the prevalence of obesity at 25.3% (95% CI: 21.9–29) based on the World Health Organization definition (BMI ≥30 kg/m^2)[14]. The same analysis highlighted geographical differences: South America 40.4% (95% CI: 12.5–76.4), Europe 33.6% (95% CI: 24.1–44.5), Africa 32.5% (95% CI: 16.1–54.8), North America 27.3% (95% CI: 24.4–30.5), Oceania 20.8% (95% CI: 18.9–22.8), and Asia 14.6% (95% CI: 10.7–19.5) [14]. However, these estimates may underestimate obesity prevalence in Asian populations, where lower BMI cut-offs (≥25 or ≥28 kg/m^2) are recommended to account for a higher metabolic risk at lower body mass [15].
- In older adults aged ≥85 years (aged ≥85 years), prevalence estimates are lower but remain clinically relevant. In a Swedish longitudinal study including four cohorts assessed between 2000 and 2017, obesity

prevalence (BMI ≥ 30 kg/m^2) ranged from 6.6% to 10.2%, confirming that obesity persists even in the oldest age groups [16].

- Regarding sex differences, a study across 12 European countries found that among adults aged over 65 years, obesity prevalence was higher in women (17.3%) compared with men (15.2%) [17].

Biological factors

- Biological factors contributing to obesity in older adults include hormonal changes (insulin resistance,, changes in hormones that regulate appetite and fat storage), decreased muscle mass, and decreased basal metabolic rate. Genetic factors can influence the body's fat storage, fat metabolism, and appetite regulation through specific genes like those for leptin and the melanocortin 4 receptor (MC4R). These biological and genetic predispositions are exacerbated by environmental factors like reduced physical activity, which is often associated with aging [18].

Eating behaviours

- In Europe, as in other high-income regions, the obesity epidemic has been strongly influenced by widespread access to calorie-dense and nutrient-poor foods, coupled with increasingly sedentary lifestyles [19]. These dietary patterns remain a cornerstone of obesity risk in older adults.
- The affordability of energy-dense foods, despite their poor micronutrient profile, has further contributed to their dominance in the diet, particularly among vulnerable populations [19]. This imbalance favours weight gain while limiting overall nutritional adequacy. A similar nutrition transition is now evident in low- and middle-income countries, where shifts from traditional diets to processed, high-calorie products are becoming increasingly common [20].

Sedentarism and physical inactivity

- Parallel to these changes in diet, reductions in physically demanding occupations and the expansion of sedentary leisure activities such as screen time have exacerbated the imbalance between energy intake and expenditure [19,20].
- A positive association between obesity, physical inactivity, and sedentary behaviour in older adults has been demonstrated. Physical inactivity refers to not achieving recommended levels of moderate-to-vigorous physical activity, while sedentary behaviour is defined as low-energy activities (≤ 1.5 METs) performed while sitting or reclining; both have been linked to obesity in later life [21,22].

Polypharmacy

- Polypharmacy is common in older adults due to multimorbidity, and several widely used drug classes have been linked to weight gain. These include glucocorticoids, insulin and sulfonylureas, antipsychotics, antidepressants, and beta-blockers. The chronic use of such medications may aggravate age-related metabolic changes, thereby contributing to the development or persistence of obesity in later life [23,24].

Social, cultural, and economic determinants

- Psychological, functional, and social factors play a critical role in shaping eating behaviours in older adults. Depression, chewing or swallowing difficulties may lead to a preference for soft, calorie-dense, nutrient-poor foods that are easier to consume, thereby promoting weight gain despite a risk of qualitative malnutrition [25,26].
- Low income, high medication costs, loneliness, and eating alone have all been shown to negatively affect diet quality and energy balance, further contributing to unhealthy weight trajectories. Family structure and living situation (e.g., marital status, social isolation), as well as educational level, are key determinants of dietary choices and eating behaviour in community-dwelling older adults .

Key message. Population ageing and rising obesity prevalence are converging trends that substantially affect older adults. Obesity remains prevalent even in advanced age, reflecting multifactorial causes such as diet, sedentary behavior, psychological status and socioeconomic conditions in addition to biological and genetic factors, and poses major challenges for health systems.

4. Pathophysiology

Aging induces several physiological changes, with alterations in body composition being among the most prominent and clinically relevant [27].

- The excess of adipose tissue, represents one of the most common manifestation of these alterations, leading to obesity [28,29]. Beyond excess and /or dysfunctional adiposity, obesity is associated with a series of tissue-level modifications, including the redistribution of fat from subcutaneous and lower body fat depots to the visceral compartment and even to non-adipose tissues, such as skeletal muscle, myocardium, liver, and pancreas. Additionally, cellular changes involve adipocyte hypertrophy and hyperplasia, as well as a preferential differentiation of mesenchymal stem cells towards the adipogenic rather than the osteogenic lineage [30,31]. Obesity complications are mainly determined by 2 pathological processes, i.e., physical forces (fat mass disease) as well as endocrine and immune responses (sick fat disease) [32]. The impact of obesity on health extends beyond excess body weight itself, encompassing a wide range of clinical conditions, such as cardiovascular diseases (CVD), type 2 diabetes (T2DM), certain cancers, functional decline and reduced quality of life [8,33,34].
- Obesity is frequently accompanied by a progressive and generalised loss of muscle mass and function, a condition referred to as sarcopenia. Traditionally, described as a geriatric syndrome with a multifactorial aetiology and an age-related increase in prevalence [35,36], sarcopenia may also develop in individuals with obesity at any age [37]. This occurs because obesity can independently lead to muscle loss and function due to the negative impact of adipose tissue-dependent metabolic derangements, such as oxidative stress, inflammation, and insulin resistance, all of which negatively affect skeletal muscle mass and quality. When obesity and sarcopenia coexist, the resulting condition, termed sarcopenic obesity (SO), is associated with a synergistic worsening of clinical outcomes. Specifically, not only SO exacerbates functional impairment and weakens cardiorespiratory fitness but also increases the risk of dysmetabolic diseases and all-cause mortality compared to obesity or sarcopenia alone [38,39].
- With ageing, hormonal changes play a significant role in metabolic health. In women, menopause is characterised by an abrupt decline in estrogen, while in men, late-onset hypogonadism reflects the progressive reduction of testosterone levels. Ageing is also associated with decreased secretion of adrenal androgens and reduced growth hormone/IGF-1 (insulin-like growth factor 1) activity. Collectively, these endocrine changes contribute to increased adiposity, sarcopenia and a higher risk of metabolic complications, thereby influencing the pathogenesis of obesity in later life [40].
- In parallel, increasing evidence underlines a detrimental relationship between obesity and bone health. Age-related bone loss is a well-recognised phenomenon, particularly accelerated in women after menopause, leading to a higher risk of osteopenia and osteoporosis compared to men [27,41]. Obesity, particularly when associated with metabolic disorders, has been implicated in compromised bone quantity and quality, thereby further increasing the risk of osteoporosis and fragility fractures in older individuals [41,42].
- Increasing evidence also highlights a distinct clinical and functional condition characterized by the concurrent presence of osteoporosis, sarcopenia, and obesity, named osteosarcopenic obesity [43]. This triad results in compounded negative outcomes including impaired physical function, reduced mobility, increased risk of fall and fractures, and impaired quality of life [44], particularly among older adults, who are more frequently affected than those with any of the individual conditions alone [45].

Beyond the mere presence of excess adiposity, its distribution plays a crucial role in determining health outcomes. Fat can accumulate predominantly in subcutaneous depots or within the visceral compartment, with markedly different implications. Visceral adiposity, surrounding internal organs, is particularly detrimental as it is strongly associated with chronic low-grade inflammation, insulin resistance, adverse metabolic profiles, and an increased risk of bone fragility and fractures [46]. By contrast, subcutaneous fat appears to have a more neutral or even protective role in metabolic and skeletal health [47] [48].

Key message. Aging alters body composition through increased adiposity, muscle loss, and bone fragility, possibly leading to obesity, sarcopenia and osteoporosis, respectively. These conditions interact synergistically, and dysfunctional adipose tissue exacerbates cardiovascular and metabolic risk, functional decline, and skeletal deterioration.

5. Diagnosis beyond BMI

Limits of BMI

According to the World Health Organization (WHO), overweight and obesity are defined as abnormal or excessive fat accumulation that presents a risk to health [49]. A BMI ≥ 30 kg/m^2, regardless of age and sex remains the most widely used anthropometric measure to identify individuals with obesity; however, while its simplicity, accessibility, and low-cost make it suitable for epidemiological surveillance and preliminary screening, BMI has significant limitations, particularly evident at the individual level, which have raised concerns regarding its use as the sole criterion for the diagnosis of obesity [50]. Specifically:

- BMI is unable to discriminate between fat mass and fat-free mass. This lack of specificity often leads to misclassification of individuals, particularly those with reduced muscle mass and excess body fat (typical of SO), despite a normal BMI. As a result, BMI may fail to detect malnutrition, muscle depletion, and sarcopenia, particularly in older adults [50].
- BMI does not provide information regarding body fat distribution. In particular, indices of central adiposity, such as waist circumference, waist-to-height or waist-to-hip ratios [51], more accurately detect visceral fat accumulation, and have been consistently associated with insulin resistance, T2DM, CVD, and mortality, independently of BMI values [52].
- BMI cut-offs do not account for interindividual variability related to age, sex and ethnicity [1,53]. For instance, in older adults, BMI may mask significant muscle loss due to concomitant fat accumulation, limiting its reliability in the detection of conditions such as sarcopenia or SO [3]. Similarly, at equivalent BMI levels, Asian populations tend to exhibit higher body fat percentages compared to Caucasian populations, highlighting the need for population-specific BMI cut-off points for accurate risk assessment [54].
- The European Association for the Study of Obesity (EASO) recently introduced a new framework to define obesity that incorporates anthropometric measures beyond body mass index (BMI) and clinical comorbidities. In particular waist-to-height ratio was introduced, instead of waist circumference, in the diagnostic process due to its superiority as a cardiometabolic disease risk marker. Although the feasibility and reliability of height measurement in geriatric age can represent a problem, the new EASO framework may provide a more sensitive tool to diagnose obesity than the traditional BMI definition [1,55].

Body composition

To overcome the abovementioned limitations, the assessment of body composition provides distinct quantification of body compartments (for instance, fat mass, fat-free mass).

- Dual-energy X-ray absorptiometry (DXA) is widely regarded as the reference standard for both clinical practice and research. DXA enables accurate measurement of total and regional body composition, including visceral adipose tissue and appendicular skeletal muscle mass, while simultaneously assessing bone mineral density.
- Bioelectrical Impedance Analysis (BIA) represents a practical, non-invasive, and cost-effective alternative that estimates body composition [56] based on the electrical conductivity of different human tissues. Although less precise than DXA, BIA is widely used in clinical settings due to its accessibility and rapid assessment capabilities. Notably, the phase angle derived from BIA has emerged as a valuable biomarker of cellular health and nutritional status, showing strong associations with BMI and fat mass [56]. Low phase angle values have been consistently associated with malnutrition (under-nutrition), sarcopenia and frailty, and can predict disability and mortality in older adults [57]. Importantly, in individuals with obesity, phase angle values may be affected by alterations in tissue hydration [56,58], such as those caused by body fluid overload or oedema, which can complicate their interpretation [59].
- Advanced imaging modalities, such as Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) and Spectroscopy (MRS), offer unparalleled resolution for the quantification of visceral adipose tissue, intramuscular fat infiltration, and ectopic fat accumulation in organs. Despite their greater accuracy, the routine application of these methods is often constrained by factors such as cost, availability, and, in the case of CT, exposure to ionizing radiation. Nevertheless, in specific clinical or research contexts, these imaging techniques provide valuable insights into fat distribution and muscle quality that cannot be depicted by anthropometric measures or simpler body composition tools [60].
- In absence of universally accepted validated references for body composition in older adults, especially those aged >80 years, suggested cut-off values for excessive fat mass % are >43% and

>31% for Caucasian women and men; >41% and >29% for Asian women and men; >41% and >29% for African-American women and men [61], respectively.

- As for low muscle quantity, suggested cut-off points for appendicular skeletal muscle mass (ASM) are <15 kg and <20 kg for women and men, respectively. As for appendicular skeletal muscle mass / height^2 (ASMI) cut-points are <5.5 and <7.0 kg/m^2 for women and men, respectively [35]. Taking into account skeletal muscle mass / weight (SMM/W) suggested cut-off are <0.267 and <0.370 for women and men, respectively [62]. Finally, as for appendicular lean soft tissue adjusted to body weight (ALST/W) [63], [previously reported as appendicular lean mass / weight (ALM/W)], suggested cut-offs are <0.2347 for women and <0.2827 for men, respectively [64].

Functional status

While body composition assessment provides essential information on tissue distribution, evaluating the functional capacity of the musculoskeletal system represents an equally important dimension in determining overall health and the risk of adverse outcomes in older adults. In this population, obesity is consistently associated with poor functional performance, a higher prevalence of disability, and an increased risk of future functional decline [65]. Nevertheless, to date, no definite cut-off points for BMI, waist circumference or body fat percentage has been identified at which age-related functional status begins to decline.

- Muscle strength should be considered the functional parameter of choice for obesity-related assessments. Although current evidence does not clearly favour a single functional test over others, sex- and age-specific reference values are recommended when interpreting functional assessments [3]. Among the most reliable and accessible indicators is handgrip strength (HGS), measured using a handheld dynamometer. Established as a core diagnostic criterion for sarcopenia by the European Working Group on Sarcopenia in Older People (EWGSOP2 [35]) and for sarcopenic obesity by the ESPEN-EASO Consensus Statement [3], HGS is a validated predictor of morbidity, hospitalization, and all-cause mortality [66,67]. HGS cut-off values for low muscle strength are <16 kg for women and <27 kg for men [35].
- Additional tests, such as the five-times-sit-to-stand test, evaluate lower limb strength and endurance by chair stand and have demonstrated predictive value for identifying individuals at risk of functional decline and falls [68]. Cut-off point for low chair stand is 15 s for both sexes [35].
- Gait speed, typically assessed over a short walking distance, serves as another reliable and easily implementable measure of physical performance. Reduced gait speed is associated with increased risk of frailty, falls, functional dependence, and mortality, making it a valuable tool for both clinical and epidemiological assessments [69]. Gait speed cut-off point for low performance is ≤0.8 m/s for both sexes [35].
- For a more comprehensive performance evaluation, tools like the Short Physical Performance Battery (SPPB) and the Timed Up and Go (TUG) test integrate multiple components of physical performance, including balance, strength, and mobility [35]. Cut-off point for low performance with SPPB is ≤8 point score and with 400 m walk TUG test is non-completion or ≥6 min for completion [35] for both sexes.

Psychological status

Psychological factors represent an essential, yet often underrecognized, component of comprehensive health assessment in adults with obesity [70]. Psychological well-being critically influences dietary behaviours, physical activity patterns, treatment adherence, and overall health outcomes. In individuals with obesity, body image dissatisfaction is highly prevalent and frequently associated with disordered eating behaviours, reduced quality of life, and poorer engagement in weight management interventions. Failure to identify and address these psychological disturbances may perpetuate maladaptive behaviours, contributing to the progression of obesity and its related complications [71].

- Psychological assessment in older adults with obesity should first include screening for eating behaviour disturbances. Commonly used tools such as the Sick Control One Fat Food (SCOFF) questionnaire [72] can help identify individuals at risk for eating disorders. Those who screen positive should undergo further evaluation using validated tools such as the Eating Disorder Examination questionnaire (EDEq), [73] which assesses core symptoms of disordered eating over the past 28 days. The Binge Eating Scale (BES) [74] explores cognitive, emotional, and behavioural aspects of binge episodes. It should be noted that these tools, although widely used in adult populations, have not been specifically validated in older adults.

- General psychological distress and mood disorders should also be assessed. While the Symptom Checklist-90 revised (SCL-90-r) [75] evaluates a wide range of psychopathological symptoms, including depression, anxiety, and somatization, it is not been fully validated in geriatric populations. Therefore, for older adults, it may be more appropriate to use the Geriatric Depression Scale (GDS), which is validated in this age group and provides a reliable measure of depressive symptoms [76].
- Weight stigma and internalized weight bias are significant psychosocial stressors that may represent critical factors in affecting the psychological well-being of people with obesity [77,78]. Notably, weight stigma has been associated with adverse outcomes, such as poor health-related quality of life and can negatively affect help-seeking behaviour, adherence to treatment, and clinical outcomes [79,80]. Tools such as the Weight Bias Internalization Scale (WBIS) [81], can assess the extent to which individuals attribute negative self-worth to their body weight. However, these instruments have not been specifically validated in older adults. Addressing internalized stigma and promoting a non-judgmental, patient-centred approach to care is essential to support therapeutic engagement and facilitate sustainable behaviour change.

Key message. BMI alone is insufficient for diagnosing obesity, particularly in older adults. Accurate assessment requires evaluating body composition, psychological and functional status (including visceral fat, muscle strength, gait, and weight-related distress) to enable accurate risk stratification and personalized management.

6. Clinical and functional consequences

Clinical Consequences

Obesity is associated with more than 200 medical complications and represents the fifth leading cause of death globally [82].

- *Cardiovascular disease (CVD).* Obesity in older adults is consistently associated with an increased risk of atherosclerotic cardiovascular disease (ASCVD), morbidity, and mortality, in line with evidence from large epidemiological cohorts [83,84]. However, recent analyses suggest that the relationship between body weight and cardiovascular outcomes in later life is complex. In a sample of adults aged 60–79 years, weight loss ≥5% was associated with higher predicted 10-year ASCVD risk, whereas weight gain showed no protective effect [85]. These findings highlight the importance of distinguishing intentional from unintentional weight change when assessing cardiovascular risk in this population [86,87]. Also, evidence from longitudinal studies indicates that elevated waist circumference is a significant predictor of cardiovascular events in older adults [88,89].
- *Type 2 diabetes (T2DM)* In older adults, excess weight and obesity are major contributors to T2DM and its complications, with risk increasing progressively with BMI; waist circumference, including its fluctuations over time, is strongly associated with diabetes risk [90–92].
- *Metabolic dysfunction-associated steatotic liver disease* (MASLD). The prevalence of MASLD is rising globally in parallel with population ageing. In a large-scale Korean cohort of more than 329,000 individuals aged ≥60 years, overweight and obesity emerged as the strongest predictors of both MASLD and progression to advanced fibrosis, independent of other cardiometabolic risk factors [93].
- *Respiratory complications.* Obstructive sleep apnoea syndrome (OSAS) is particularly common in older adults with obesity due to fat deposition in the upper airway and reduced muscle function. Prevalence is higher in men, but in postmenopausal women not receiving hormone replacement therapy it approaches that of men [94].
- *Renal diseases.* Obesity accelerates chronic kidney disease (CKD) in older adults by increasing risk factors like high blood pressure and T2DM, and by causing direct kidney damage through a process called glomerular hyperfiltration, which increases pressure on the kidneys [95].
- *Urinary incontinence.* Obesity is associated with urinary incontinence, likely through increased intra-abdominal pressure and pelvic floor dysfunction. Prevalence correlates positively with BMI and waist circumference in women, while a U-shaped association has been reported in older men [96].

- *Dementia.* The link between obesity and dementia is complex. Midlife obesity increases dementia risk 10–15 years later, but in late life this association weakens, while weight loss due to malnutrition or preclinical disease correlates with greater dementia risk [97].
- *Cancer.* Obesity is a recognised risk factor for several malignancies. Excess body weight has been causally associated with cancers of the endometrium, ovary, and postmenopausal breast in women, and with cancers of the oesophagus (adenocarcinoma), gastric cardia, colon and rectum, liver, gallbladder, pancreas, kidney, as well as meningioma and multiple myeloma in both sexes [98–100].

Functional consequences

- *Disability and falls*. In older adults, obesity is strongly associated with physical disability, with a consequent negative impact on quality of life [101]. Chronic pain is a major contributor, mediated by mechanical overload, low-grade inflammation and cardiometabolic complications such as peripheral neuropathy and claudication [102]. Functional limitations also translate into a higher risk of falls and recurrent falls, as confirmed by a meta-analysis of 31 studies [103].
- *Fractures and osteoarthritis.* The association between obesity and fracture risk is site-specific. While obesity appears protective against hip fractures, it increases the risk of humerus, leg, and ankle fractures [103]. Obesity is a major risk factor for osteoarthritis, especially in the knees, with risk increased 2.5- to 4.6-fold compared to normal weight. In addition to joint overload, low-grade inflammation, altered lipid metabolism and adipokines contribute to disease pathophysiology [104,105].

> **Key message.** In older adults, obesity remains a major determinant of morbidity, disability and mortality. Despite the debated "obesity paradox," consistent evidence links excess body fat with cardiovascular diseases, type 2 diabetes, MASLD, respiratory disorders, incontinence, dementia, cancer and functional decline, underscoring its multifactorial burden on ageing populations.

7. Management of obesity in older adults

The management of obesity is primarily based on individualized dietary protocols and structured physical exercise. In selected cases, these approaches may be integrated with pharmacological therapies, bariatric surgery, and formal behavioural interventions to improve long-term outcomes [1].

Nutritional approach

Nutritional strategies for obesity management in older adults must achieve a delicate balance between inducing fat mass reduction and preserving lean mass (and in particular skeletal muscle mass), functional capacity, and overall nutrient adequacy.

- Caloric restriction remains the cornerstone of body weight reduction; however, overly restrictive regiments may induce or exacerbate sarcopenia, micronutrient deficiencies, and frailty. Consequently, moderate energy restriction, typically around 500 kcal/day below estimated requirements, is recommended, in combination with adequate protein intake to mitigate loss of skeletal muscle mass, and appropriate essential micronutrients intake.
- Protein intake is particularly critical in aging [106], given the decline in protein synthesis associated with anabolic resistance [107]. High-quality proteins rich in essential amino acids, especially leucine (a branched-chain amino with a central role in stimulating muscle protein synthesis) are strongly recommended [108]. Current recommendations indicate a minimum daily protein intake of 1.0-1.2 g/kg of body weight for older adults to maintain muscle mass and function [108] as almost is in line with the finding in a systematic review and meta-analysis among older adults showing that a protein intake above 1 g/kg retained
- More lean mass compared to intakes less than 1 g/kg [109]. In this regard it seems that avoiding low protein intake and in addition to advice about protein rich foods, protein enrich diary product or protein supplements may be considered.
- In individuals with impaired renal function higher intakes (> 1.2 g/kg) should be avoided [110]. To avoid excessive protein intake, consensus and position papers (e.g. the ones from ESPEN and EASO) have supported protein intakes above 1 g/kg adjusted body weight (ABW)·day (ABW= ideal body weight + 25% excess body weight) [111,112]. Moreover, protein consumption should be timed at each of the three main meals (≥ 25 g per meal) to counteract age-related changes in digestion, gastric emptying, splanchnic extraction, and peripheral utilization, all of which influence the anabolic response [113]. Even if evidence

regarding the differential effects of plant-based versus animal-based protein sources on fat mass regulation remains inconclusive [114], animal-derived proteins appear more effective in stimulating muscle protein synthesis in older adults [115].
- The adequacy of specific micronutrients should be ensured (possibly also through supplementation), as deficiencies can impair muscle health and metabolic function. Particular focus should be given to vitamin D, involved in protein synthesis and strength, magnesium (low levels are associated with insulin resistance), and vitamins B6, B12, and selenium, which have been associated with functional decline in older populations [116]. According to the Nordic Nutrition Recommendation 2023 [117], the recommended intake of vitamin D is 20 mcg/day in older adults [117]. Vitamin D and calcium is of importance for bone health. While recommended level of calcium can be achieved with daily intakes of dairy products (i.e. cheese, milk and yoghurt), supplements may be needed to achieve the recommended level of vitamin D.

Physical exercise

Physical exercise represents a fundamental component in the management of obesity in older adults, particularly due to the combined effect of aging and excess adiposity, which reduce functional capacity even in absence of comorbidities. In SO, structural muscle alterations lead to a progressive loss of muscle strength and performance, compromising independence and limits the ability to perform activities of daily living [118]. At the same time, obesity exacerbates low-grade systemic inflammation and cardiometabolic risk, ultimately contributing to shorter life expectancy [119].

Physical exercise counteracts these detrimental processes by improving metabolic health [120], enhancing functional independence [120], and inducing favourable changes in body composition, including reductions in visceral and ectopic fat [121]. Specifically:

- Multicomponent training combining flexibility, balance, aerobic, and resistance training is strongly advised [1].
- Aerobic training of 150 to 200 min/week at moderate intensity reduces body weight, total fat, visceral fat, intra-hepatic fat, and improves in blood pressure [122].
- Resistance training at moderate-to-high intensity attenuates lean mass loss during weight loss, preserves bone mineral density and limits bone turnover [121,122].
- Exercise training of any type (aerobic, resistance, and combined aerobic or resistance) or high-intensity interval training (after thorough assessment of cardio-vascular risk and under supervision) improves insulin sensitivity and increases cardiorespiratory fitness [122].
- Aerobic, resistance or combined training improves psychological well-being and overall quality of life [116,122].
- Balance training is particularly beneficial for older persons with obesity, as it improves physical function, reduces frailty, increases muscle strength, and lowers the risk of falls [123,124]. It also led to reduced fear of falling, and increased confidence in performing activity of daily living [125].
- Exercise programs tailored to individual capacities, following the FITT principle which considers frequency, intensity, time and type, act synergistically with dietary protocols to promote weight loss, prevent weight regain, and reduce obesity-related complications [1,121].
- In severe obesity or in the presence of significant functional limitations, exercise and diet alone may be not sufficient; in such cases, pharmacological or surgical treatments can support weight reduction and improve exercise tolerance. There is no fixed upper age limit for bariatric surgery. The decision should be based on individual patient health and physiological status rather than chronological age alone, although epidemiological data show that risk factors increase with age [126].

Behavioural therapies

- Evidence on behavioural change techniques (BCTs) in older adults with obesity is limited. Strategies such as education, motivational interviewing, self-monitoring, goal setting and personalised feedback have been tested, but data on their effectiveness in this age group remain scarce [127]. Interventions should consider age-related challenges, including cognitive status, social isolation, depression, disease burden and dependency, which can hinder adherence [123,128].

- Behavioural therapy should prioritise realistic, health-oriented goals, focusing on improving comorbidities and quality of life rather than weight loss alone. Sustained support, regular follow-up and family or social involvement improve adherence, while relapse prevention strategies are crucial for long-term success. Older adults are more likely to engage in behaviour change when it is linked to health and functional outcomes, rather than appearance or social influences [129].

Obesity management medications

Recent progress in obesity pharmacotherapy, particularly with the advent of second-generation agents, has been described as a paradigm shift in the medical management of obesity [24].

- To date, The Electronic Medicines Compendium notes that evidence on the use of these therapies in individuals aged 75 years and older is scarce.
- Three incretin mimetics (IMs) are currently approved for obesity pharmacotherapy: liraglutide and semaglutide, both GLP-1 receptor agonists, and tirzepatide, a dual GIP/GLP-1 receptor agonist. They act by enhancing satiety, delaying gastric emptying and reducing energy intake, with tirzepatide providing additional metabolic effects concerning incremental glucose-lowering effects [130,131].
- Gastrointestinal adverse events are frequent during therapy with GLP-1 receptor agonists and dual agonists, primarily related to delayed gastric emptying and central appetite modulation [132]]. In older adults, together with sensory impairment [133], heightened gastrointestinal sensitivity, characterised by increased pyloric activity and elevated postprandial gut hormones (CCK, GLP-1), may amplify these effects and contribute to the "anorexia of aging," a common condition after 75 years associated with reduced food intake and malnutrition risk [134].
- IMs induce clinically meaningful weight loss; however, a considerable share of this reduction originates from lean mass. In older adults, this raises particular concern as it may precipitate or worsen sarcopenic obesity. Weight-loss interventions with incretin-based therapies should therefore be coupled with strategies aimed at preserving muscle mass, such as adequate protein intake and resistance exercise [134,135].
- For other classes of drugs (already approved and in use, being tested or being marketed) data relating to use in older adults (in particular over the age of 75 years) are very scarce [24]. While little is known about drug-drug interactions and the effect on bone and muscle, older adults are more likely to experience adverse events of obesity management medications, and/or a higher rate of treatment discontinuation. Given this uncertainty, a tailored, individualized approach to prescribing obesity pharmacotherapy for older people is required, with careful consideration of potential risks and benefits followed by close medical supervision [136]. From this point of view it may be useful to refer to the Framework on the Pharmacological Treatment of Obesity proposed by EASO [137,138].

Metabolic bariatric surgery

- Age per se is not an absolute contraindication to bariatric surgery.
- In the past, most international guidelines on metabolic bariatric surgery (MBS) focused on patients aged 18–60 years [139,140]. More recently, the clinical practice guidelines of the European Association for Endoscopic Surgery (EAES), the American Society for Metabolic and Bariatric Surgery (ASMBS) and the International Federation for the Surgery of Obesity and Metabolic Disorders (IFSO) have removed upper age limits, recommending surgery for patients considered fit and without contraindications to laparoscopy, regardless of chronological age [141,142].
- No randomized trial has directly compared surgery with non-surgical interventions in older adults, making it impossible to define a reliable balance of benefits and risks or to issue strong age-specific recommendations [143].
- Several observational studies have investigated weight loss outcomes following MBS in individuals aged ≥65 years, demonstrating clinically meaningful reductions in body weight, although the magnitude of benefit appears in some analyses to be lower than that observed in younger cohorts [143]. Weight loss generally begins early after surgery and is maintained for 2–3 years, while robust long-term data are still lacking.

- Older patients show higher odds of in-hospital mortality after bariatric surgery compared with younger adults and are at increased risk of respiratory, infectious, and renal complications, as well as longer hospital stays [144]. In addition, bone health may be adversely affected after surgery due to nutrient malabsorption and accelerated bone loss [145].

8. Conclusions

Key message. Management of obesity in older adults should be personalized, prioritizing the preservation of muscle mass, functional capacity, and quality of life. Moderate caloric restriction combined with adequate protein intake, multicomponent exercise, and behavioral support are the cornerstones of treatment. Obesity management medications, and metabolic bariatric surgery may be considered in selected patients, with attention to age-related risks, adverse effects, and long-term adherence.

Obesity in older adults is a growing public health challenge, driven by population ageing and rising obesity prevalence worldwide. Its diagnosis requires approaches that go beyond BMI, incorporating body composition and functional assessment. Management should aim for moderate weight loss when indicated, with strategies focused on maintaining lean mass, improving comorbidities, and supporting independence. Nutritional therapy, multicomponent exercise, behavioural support, and, where appropriate, pharmacotherapy or metabolic surgery can be combined to optimise outcomes.

Special attention must be given to risks specific to this age group, including sarcopenia, bone loss, polypharmacy, and the potential adverse effects of weight-loss interventions. This EASO position statement calls for a person-centred, evidence-based, and stigma-free approach to the diagnosis and management of obesity in older adults, as well as further research to define optimal treatment targets and improve outcomes in this vulnerable but heterogeneous population.

Conflict of Interest Statement

Luca Busetto declares personal fees as advisory board member and/or speaker by Amgen, Boehringer Ingelheim, Bruno Farmaceutici, Lilly, Novo Nordisk, Pfizer, Pronokal, Recordati, Regeneron, Rhythm, Roche.

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Author Contributions

LMD: conceptualization, writing, review, and editing; ODV: investigation, writing, and editing; MM: investigation, writing, and editing; JLB, RB, EB, LB, AC, DD, LF, TH, BM, SM, EP, PS, MS, EW, VDY: review and editing.

References

1 Busetto L, Dicker D, Frühbeck G, Halford JCG, Sbraccia P, Yumuk V, et al. A new framework for the diagnosis, staging and management of obesity in adults. Nat Med. 2024 Sept;30(9):2395–9.

2 Wang G, Song A, Wang QA. Adipose tissue ageing: implications for metabolic health and lifespan. Nat Rev Endocrinol. 2025 Oct;21(10):623–37.

3 Donini LM, Busetto L, Bischoff SC, Cederholm T, Ballesteros-Pomar MD, Batsis JA, et al. Definition and Diagnostic Criteria for Sarcopenic Obesity: ESPEN and EASO Consensus Statement. Obes Facts. 2022 Feb;15(3):321–35.

4 Prado CM, Batsis JA, Donini LM, Gonzalez MC, Siervo M. Sarcopenic obesity in older adults: a clinical overview. Nat Rev Endocrinol. 2024 May;20(5):261–77.

5 Mathus-Vliegen EMH, Obesity Management Task Force of the European Association for the Study of Obesity. Prevalence, pathophysiology, health consequences and treatment options of obesity in the elderly: a guideline. Obes Facts. 2012;5(3):460–83.

6 Murphy E, Fallon A, Dukelow T, O'Neill D. Don't call me elderly: a review of medical journals' use of ageist literature. Eur Geriatr Med. 2022 Aug;13(4):1007–9.

7 World Health Organization. Global report on ageism. Geneva, Switzerland: World Health Organization. 2021Available from: https://www.who.int/publications/i/item/globalreport-on-ageism

8 Durrer Schutz D, Busetto L, Dicker D, Farpour-Lambert N, Pryke R, Toplak H, et al. European Practical and Patient-Centred Guidelines for Adult Obesity Management in Primary Care. Obesity Facts. 2019 Jan;12(1):40–66.

9 Gianfredi V, Nucci D, Pennisi F, Maggi S, Veronese N, Soysal P. Aging, longevity, and healthy aging: the public health approach. Aging Clin Exp Res. 2025 Apr;37(1):125.

10 GBD 2019 Fracture Collaborators. Global, regional, and national burden of bone fractures in 204 countries and territories, 1990-2019: a systematic analysis from the Global Burden of Disease Study 2019. Lancet Healthy Longev. 2021 Sept;2(9):e580–92.

11 Boutari C, Mantzoros CS. A 2022 update on the epidemiology of obesity and a call to action: as its twin COVID-19 pandemic appears to be receding, the obesity and dysmetabolism pandemic continues to rage on. Metabolism. 2022 Aug;133:155217.

12 GBD 2021 Adolescent BMI Collaborators. Global, regional, and national prevalence of child and adolescent overweight and obesity, 1990-2021, with forecasts to 2050: a forecasting study for the Global Burden of Disease Study 2021. Lancet. 2025 Mar;405(10481):785–812.

13 Luxembourg: European Commission. Overweight and obesity - BMI statistics. 2022Available from: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Overweight_and_obesity_-_BMI_statistics

14 Khaleghi AA, Salari N, Darvishi N, Bokaee S, Jafari S, Hemmati M, et al. Global prevalence of obesity in the older adults: A meta-analysis. Public Health Pract (Oxf). 2025 June;9:100585.

15 WHO Expert Consultation. Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. Lancet. 2004 Jan;363(9403):157–63.

16 Burman M, Hörnsten C, Öhlin J, Olofsson B, Nordström P, Gustafson Y. Prevalence of Obesity and Malnutrition in Four Cohorts of Very Old Adults, 2000-2017. J Nutr Health Aging. 2022;26(7):706–13.

17 Stival C, Lugo A, Odone A, van den Brandt PA, Fernandez E, Tigova O, et al. Prevalence and Correlates of Overweight and Obesity in 12 European Countries in 2017-2018. Obes Facts. 2022;15(5):655–65.

18 Jura M, Kozak LP. Obesity and related consequences to ageing. Age (Dordr). 2016 Feb;38(1):23.

19 Malenfant JH, Batsis JA. Obesity in the geriatric population - a global health perspective. J Glob Health Rep. 2019;3:e2019045.

20 Popkin BM, Ng SW. The nutrition transition to a stage of high obesity and noncommunicable disease prevalence dominated by ultra-processed foods is not inevitable. Obes Rev. 2022 Jan;23(1):e13366.

21 Silveira EA, Mendonça CR, Delpino FM, Elias Souza GV, Pereira de Souza Rosa L, de Oliveira C, et al. Sedentary behavior, physical inactivity, abdominal obesity and obesity in adults and older adults: A systematic review and meta-analysis. Clin Nutr ESPEN. 2022 Aug;50:63–73.

22 Tremblay MS, Aubert S, Barnes JD, Saunders TJ, Carson V, Latimer-Cheung AE, et al. Sedentary Behavior Research Network (SBRN) - Terminology Consensus Project process and outcome. Int J Behav Nutr Phys Act. 2017 June;14(1):75.

23 Stanford FC, Cena H, Biino G, Umoren O, Jimenez M, Freeman MP, et al. The association between weight-promoting medication use and weight gain in postmenopausal women: findings from the Women's Health Initiative. Menopause. 2020 Oct;27(10):1117–25.

24 Boyle LD, Akbas F, Yazıcı D, McGowan BM, Yumuk V. Pharmacotherapy for older people with obesity. Eur J Intern Med. 2024 Dec;130:33–7.
25 Bozkurt ME, Erdogan T, Catikkas NM, Ozkok S, Kilic C, Bahat G, et al. Undernutrition in obese older adults by fat percentage. Aging Clin Exp Res. 2024 Jan;36(1):3.
26 Yannakoulia M, Mamalaki E, Anastasiou CA, Mourtzi N, Lambrinoudaki I, Scarmeas N. Eating habits and behaviors of older people: Where are we now and where should we go? Maturitas. 2018 Aug;114:14–21.
27 Migliaccio S, Greco EA, Aversa A, Lenzi A. Age-associated (cardio)metabolic diseases and cross-talk between adipose tissue and skeleton: endocrine aspects. Hormone Molecular Biology and Clinical Investigation. 2014 Oct;20(1):25–38.
28 Frühbeck G, Busetto L, Dicker D, Yumuk V, Goossens GH, Hebebrand J, et al. The ABCD of Obesity: An EASO Position Statement on a Diagnostic Term with Clinical and Scientific Implications. Obesity Facts. 2019 Mar;12(2):131–6.
29 Gadde KM, Martin CK, Berthoud H-R, Heymsfield SB. Obesity: Pathophysiology and Management. J Am Coll Cardiol. 2018 Jan;71(1):69–84.
30 Ahn H, Kim DW, Ko Y, Ha J, Shin YB, Lee J, et al. Updated systematic review and meta-analysis on diagnostic issues and the prognostic impact of myosteatosis: A new paradigm beyond sarcopenia. Ageing Research Reviews. 2021 Sept;70:101398.
31 Wang L, Valencak TG, Shan T. Fat infiltration in skeletal muscle: Influential triggers and regulatory mechanism. iScience. 2024 Feb;27(3):109221.
32 Frühbeck G, Busetto L, Dicker D, Yumuk V, Goossens GH, Hebebrand J, et al. The ABCD of Obesity: An EASO Position Statement on a Diagnostic Term with Clinical and Scientific Implications. Obes Facts. 2019;12(2):131–6.
33 Donini LM, Busetto L, Bauer JM, Bischoff S, Boirie Y, Cederholm T, et al. Critical appraisal of definitions and diagnostic criteria for sarcopenic obesity based on a systematic review. Clinical Nutrition. 2020 Aug;39(8):2368–88.
34 Hassapidou M, Vlassopoulos A, Kalliostra M, Govers E, Mulrooney H, Ells L, et al. European Association for the Study of Obesity Position Statement on Medical Nutrition Therapy for the Management of Overweight and Obesity in Adults Developed in Collaboration with the European Federation of the Associations of Dietitians. Obes Facts. 2023;16(1):11–28.
35 Cruz-Jentoft AJ, Bahat G, Bauer J, Boirie Y, Bruyère O, Cederholm T, et al. Sarcopenia: revised European consensus on definition and diagnosis. Age and Ageing. 2019 Jan;48(1):16–31.
36 Cruz-Jentoft AJ, Baeyens JP, Bauer JM, Boirie Y, Cederholm T, Landi F, et al. Sarcopenia: European consensus on definition and diagnosis: Report of the European Working Group on Sarcopenia in Older People. Age and Ageing. 2010 July;39(4):412–23.
37 Poggiogalle E, Migliaccio S, Lenzi A, Donini LM. Treatment of body composition changes in obese and overweight older adults: insight into the phenotype of sarcopenic obesity. Endocrine. 2014 Dec;47(3):699–716.
38 Donini LM, Busetto L, Bischoff SC, Cederholm T, Ballesteros-Pomar MD, Batsis JA, et al. Definition and Diagnostic Criteria for Sarcopenic Obesity: ESPEN and EASO Consensus Statement. Obes Facts. 2022;15(3):321–35.
39 Gortan Cappellari G, Guillet C, Poggiogalle E, Ballesteros Pomar MD, Batsis JA, Boirie Y, et al. Sarcopenic obesity research perspectives outlined by the sarcopenic obesity global leadership initiative (SOGLI) – Proceedings from the SOGLI consortium meeting in Rome November 2022. Clinical Nutrition. 2023 May;42(5):687–99.
40 Pataky MW, Young WF, Nair KS. Hormonal and Metabolic Changes of Aging and the Influence of Lifestyle Modifications. Mayo Clin Proc. 2021 Mar;96(3):788–814.
41 Corrao G, Biffi A, Porcu G, Ronco R, Adami G, Alvaro R, et al. Executive summary: Italian guidelines for diagnosis, risk stratification, and care continuity of fragility fractures 2021. Front Endocrinol. 2023 Apr;14:1137671.
42 Migliaccio S, Mocini E, Minnetti M, Donini LM. Sarcopenic obesity and the impact on bone health. Current Opinion in Clinical Nutrition & Metabolic Care. 2024 May;27(3):252–5.
43 Ilich JZ, Kelly OJ, Inglis JE, Panton LB, Duque G, Ormsbee MJ. Interrelationship among muscle, fat, and bone: Connecting the dots on cellular, hormonal, and whole body levels. Ageing Research Reviews. 2014 May;15:51–60.

44 Di Vincenzo O, Piciocchi C, Muzzioli L, Poggiogalle E, Frigerio F, Minnetti M, et al. Osteosarcopenic obesity: A systematic review and a call for consensus on definitions and diagnostic criteria. Clin Nutr. 2025 June;51:146–60.
45 Ilich JZ, Pokimica B, Ristić-Medić D, Petrović S, Arsić A, Vasiljević N, et al. Osteosarcopenic adiposity (OSA) phenotype and its connection with cardiometabolic disorders: Is there a cause-and-effect? Ageing Research Reviews. 2024 July;98:102326.
46 Chait A, den Hartigh LJ. Adipose Tissue Distribution, Inflammation and Its Metabolic Consequences, Including Diabetes and Cardiovascular Disease. Front Cardiovasc Med. 2020 Feb;7:22.
47 Perna S, Spadaccini D, Nichetti M, Avanzato I, Faliva MA, Rondanelli M. Osteosarcopenic Visceral Obesity and Osteosarcopenic Subcutaneous Obesity, Two New Phenotypes of Sarcopenia: Prevalence, Metabolic Profile, and Risk Factors. Journal of Aging Research. 2018;2018:1–8.
48 Donini LM, Pinto A, Giusti AM, Lenzi A, Poggiogalle E. Obesity or BMI Paradox? Beneath the Tip of the Iceberg. Front Nutr. 2020 May;7:53.
49 Obesity [Internet]. World Health OrganizationAvailable from: https://www.who.int/health-topics/obesity
50 Busetto L, Dicker D, Frühbeck G, Halford JCG, Sbraccia P, Yumuk V, et al. A new framework for the diagnosis, staging and management of obesity in adults. Nat Med. 2024 Sept;30(9):2395–9.
51 Correia F, Oliveira BMPM, Poínhos R, Sorokina A, Afonso C, Franchini B, et al. BMI, waist-to-height ratio and body fat mass in older adults: results from the Pronutrisenior project. Proceedings of the Nutrition Society. 2020 Jan;79(OCE2):E222.
52 Sweatt K, Garvey WT, Martins C. Strengths and Limitations of BMI in the Diagnosis of Obesity: What is the Path Forward? Curr Obes Rep. 2024 July;13(3):584–95.
53 Neeland IJ, Poirier P, Després J-P. Cardiovascular and Metabolic Heterogeneity of Obesity: Clinical Challenges and Implications for Management. Circulation. 2018 Mar;137(13):1391–406.
54 Rohatgi A, Anand SS, Gadgil M, Gujral UP, Jain SS, Javed Z, et al. South Asians and cardiometabolic health: A framework for comprehensive care for the individual, community, and population - An American society for preventive cardiology clinical practice statement. Am J Prev Cardiol. 2025 June;22:101000.
55 Dicker D, Karpati T, Promislow S, Reges O. Implications of the European Association for the Study of Obesity's New Framework Definition of Obesity: Prevalence and Association With All-Cause Mortality. Ann Intern Med. 2025 Aug;178(8):1065–72.
56 Di Vincenzo O, Marra M, Antognozzi V, Sammarco R, Ballarin G, Cioffi I, et al. Comparison of bioelectrical impedance analysis–derived phase angle in individuals with different weight status. Nutrition. 2023 Apr;108:111960.
57 Norman K, Herpich C, Müller-Werdan U. Role of phase angle in older adults with focus on the geriatric syndromes sarcopenia and frailty. Rev Endocr Metab Disord. 2023 June;24(3):429–37.
58 Di Vincenzo O, Marra M, Sacco AM, Pasanisi F, Scalfi L. Bioelectrical impedance (BIA)-derived phase angle in adults with obesity: A systematic review. Clinical Nutrition. 2021 Sept;40(9):5238–48.
59 Denneman N, Hessels L, Broens B, Gjaltema J, Stapel SN, Stohlmann J, et al. Fluid balance and phase angle as assessed by bioelectrical impedance analysis in critically ill patients: a multicenter prospective cohort study. Eur J Clin Nutr. 2020 Oct;74(10):1410–9.
60 Shah UA, Ballinger TJ, Bhandari R, Dieli-Conwright CM, Guertin KA, Hibler EA, et al. Imaging modalities for measuring body composition in patients with cancer: opportunities and challenges. J Natl Cancer Inst Monogr. 2023 May;2023(61):56–67.
61 Gallagher D, Heymsfield SB, Heo M, Jebb SA, Murgatroyd PR, Sakamoto Y. Healthy percentage body fat ranges: an approach for developing guidelines based on body mass index. Am J Clin Nutr. 2000 Sept;72(3):694–701.
62 Janssen I, Heymsfield SB, Ross R. Low relative skeletal muscle mass (sarcopenia) in older persons is associated with functional impairment and physical disability. J Am Geriatr Soc. 2002 May;50(5):889–96.
63 Prado CM, Gonzalez MC, Norman K, Barazzoni R, Cederholm T, Compher C, et al. Methodological standards for body composition-an expert-endorsed guide for research and clinical applications: levels, models, and terminology. Am J Clin Nutr. 2025 Aug;122(2):384–91.
64 Poggiogalle E, Lubrano C, Sergi G, Coin A, Gnessi L, Mariani S, et al. Sarcopenic Obesity and Metabolic Syndrome in Adult Caucasian Subjects. J Nutr Health Aging. 2016;20(9):958–63.
65 Jensen GL, Hsiao PY. Obesity in older adults: relationship to functional limitation. Curr Opin Clin Nutr Metab Care. 2010 Jan;13(1):46–51.

66 Lu Y, Li G, Ferrari P, Freisling H, Qiao Y, Wu L, et al. Associations of handgrip strength with morbidity and all-cause mortality of cardiometabolic multimorbidity. BMC Med. 2022 June;20:191.
67 Hwang S-H, Lee DH, Min J, Jeon JY. Handgrip Strength as a Predictor of All-Cause Mortality in Patients With Chronic Kidney Disease Undergoing Dialysis: A Meta-Analysis of Prospective Cohort Studies. J Ren Nutr. 2019 Nov;29(6):471–9.
68 Buatois S, Perret-Guillaume C, Gueguen R, Miget P, Vançon G, Perrin P, et al. A simple clinical scale to stratify risk of recurrent falls in community-dwelling adults aged 65 years and older. Phys Ther. 2010 Apr;90(4):550–60.
69 Bortone I, Sardone R, Lampignano L, Castellana F, Zupo R, Lozupone M, et al. How gait influences frailty models and health-related outcomes in clinical-based and population-based studies: a systematic review. J Cachexia Sarcopenia Muscle. 2021 Apr;12(2):274–97.
70 Atlantis E, Baker M. Obesity effects on depression: systematic review of epidemiological studies. Int J Obes (Lond). 2008 June;32(6):881–91.
71 Pearl RL, Puhl RM. Weight bias internalization and health: a systematic review. Obes Rev. 2018 Aug;19(8):1141–63.
72 Morgan JF, Reid F, Lacey JH. The SCOFF questionnaire: assessment of a new screening tool for eating disorders. BMJ. 1999 Dec;319(7223):1467–8.
73 Fairburn CG, Beglin SJ. Assessment of eating disorders: interview or self-report questionnaire? Int J Eat Disord. 1994 Dec;16(4):363–70.
74 Gormally J, Black S, Daston S, Rardin D. The assessment of binge eating severity among obese persons. Addict Behav. 1982;7(1):47–55.
75 Derogatis LR, Savitz KL. The SCL-90-R, Brief Symptom Inventory, and Matching Clinical Rating Scales. 2nd ed. In M. E. Maruish- Lawrence Erlbaum Associates Publishers; 1999.
76 Yesavage JA, Brink TL, Rose TL, Lum O, Huang V, Adey M, et al. Development and validation of a geriatric depression screening scale: a preliminary report. J Psychiatr Res. 1982 1983;17(1):37–49.
77 Puhl RM, Heuer CA. The stigma of obesity: a review and update. Obesity (Silver Spring). 2009 May;17(5):941–64.
78 Schaumberg K, Anderson DA, Anderson LM, Reilly EE, Gorrell S. Dietary restraint: what's the harm? A review of the relationship between dietary restraint, weight trajectory and the development of eating pathology. Clin Obes. 2016 Apr;6(2):89–100.
79 D'Amico M, Mocini E, Frigerio F, Lombardo C, Donini LM, Cerolini S. The weight of stigma: pressures for a healthy weight from health professionals can predict binge eating symptoms through the mediation of internalised weight stigma. J Eat Disord. 2025 May;13(1):95.
80 Zagaria A, Cerolini S, Mocini E, Lombardo C. The relationship between internalized weight stigma and physical and mental health-related quality of life in a large sample of women: a structural equation modeling analysis. Eat Weight Disord. 2023 June;28(1):52.
81 Durso LE, Latner JD. Understanding self-directed stigma: development of the weight bias internalization scale. Obesity (Silver Spring). 2008 Nov;16 Suppl 2:S80-86.
82 Blüher M. Obesity: global epidemiology and pathogenesis. Nat Rev Endocrinol. 2019 May;15(5):288–98.
83 Moazzeni SS, Hizomi Arani R, Deravi N, Hasheminia M, Khalili D, Azizi F, et al. Weight change and risk of cardiovascular disease among adults with type 2 diabetes: more than 14 years of follow-up in the Tehran Lipid and Glucose Study. Cardiovasc Diabetol. 2021 July;20(1):141.
84 Murayama H, Liang J, Shaw BA, Botoseneanu A, Kobayashi E, Fukaya T, et al. Short-, Medium-, and Long-term Weight Changes and All-Cause Mortality in Old Age: Findings From the National Survey of the Japanese Elderly. J Gerontol A Biol Sci Med Sci. 2021 Oct;76(11):2039–46.
85 Peng Y, Li H, Liao F, Lu J, Yang W, Tan L, et al. Association between weight change and the predicted 10-year risk for atherosclerosis cardiovascular disease among U.S. older adults: data from National Health and Nutrition Examination Survey 1999-2018. Front Public Health. 2023;11:1183200.
86 Alibhai SMH, Greenwood C, Payette H. An approach to the management of unintentional weight loss in elderly people. CMAJ. 2005 Mar;172(6):773–80.
87 Brown RE, Kuk JL. Consequences of obesity and weight loss: a devil's advocate position. Obes Rev. 2015 Jan;16(1):77–87.

88 Visscher TL, Seidell JC, Molarius A, van der Kuip D, Hofman A, Witteman JC. A comparison of body mass index, waist-hip ratio and waist circumference as predictors of all-cause mortality among the elderly: the Rotterdam study. Int J Obes Relat Metab Disord. 2001 Nov;25(11):1730–5.
89 Dey DK, Lissner L. Obesity in 70-year-old subjects as a risk factor for 15-year coronary heart disease incidence. Obes Res. 2003 July;11(7):817–27.
90 Gray N, Picone G, Sloan F, Yashkin A. Relation between BMI and diabetes mellitus and its complications among US older adults. South Med J. 2015 Jan;108(1):29–36.
91 Bai K, Chen X, Song R, Shi W, Shi S. Association of body mass index and waist circumference with type 2 diabetes mellitus in older adults: a cross-sectional study. BMC Geriatr. 2022 June;22(1):489.
92 Wu L, Liu H, Cui Z, Hou F, Gong X, Zhang Y, et al. Fluctuations in waist circumference increase diabetes risk: a 4-year cohort study in 61,587 older adults. Nutr Metab (Lond). 2021 Nov;18(1):99.
93 Kim K, Lee Y, Lee JS, Kim MN, Kim BK, Kim SU, et al. Incidence of metabolic dysfunction-associated steatotic liver disease and advanced fibrosis and impact of overweight/obesity in elderly population: a nationwide cohort study. J Gastroenterol Hepatol. 2024 Dec;39(12):2845–52.
94 Jehan S, Zizi F, Pandi-Perumal SR, Wall S, Auguste E, Myers AK, et al. Obstructive Sleep Apnea and Obesity: Implications for Public Health. Sleep Med Disord. 2017;1(4):00019.
95 Hojs R, Ekart R, Bevc S, Vodošek Hojs N. Chronic Kidney Disease and Obesity. Nephron. 2023;147(11):660–4.
96 Chen X, Jiang S, Yao Y. Association between obesity and urinary incontinence in older adults from multiple nationwide longitudinal cohorts. Commun Med (Lond). 2023 Oct;3(1):142.
97 Wong Zhang DE, Tran V, Vinh A, Dinh QN, Drummond GR, Sobey CG, et al. Pathophysiological Links Between Obesity and Dementia. Neuromolecular Med. 2023 Dec;25(4):451–6.
98 Pati S, Irfan W, Jameel A, Ahmed S, Shahid RK. Obesity and Cancer: A Current Overview of Epidemiology, Pathogenesis, Outcomes, and Management. Cancers (Basel). 2023 Jan;15(2):485.
99 Reeves GK, Pirie K, Beral V, Green J, Spencer E, Bull D, et al. Cancer incidence and mortality in relation to body mass index in the Million Women Study: cohort study. BMJ. 2007 Dec;335(7630):1134.
100 Lauby-Secretan B, Scoccianti C, Loomis D, Grosse Y, Bianchini F, Straif K, et al. Body Fatness and Cancer--Viewpoint of the IARC Working Group. N Engl J Med. 2016 Aug;375(8):794–8.
101 Houston DK, Ding J, Nicklas BJ, Harris TB, Lee JS, Nevitt MC, et al. Overweight and obesity over the adult life course and incident mobility limitation in older adults: the health, aging and body composition study. Am J Epidemiol. 2009 Apr;169(8):927–36.
102 McCarthy LH, Bigal ME, Katz M, Derby C, Lipton RB. Chronic pain and obesity in elderly people: results from the Einstein aging study. J Am Geriatr Soc. 2009 Jan;57(1):115–9.
103 Neri SGR, Oliveira JS, Amabile DB, Lima RM, Tiedemann A. Does Obesity Increase the Risk and Severity of Falls in People Aged 60 Years and Older? A Systematic Review and Meta-analysis of Observational Studies. J Gerontol A Biol Sci Med Sci. 2020 Apr;75(5):952–60.
104 Cui A, Li H, Wang D, Zhong J, Chen Y, Lu H. Global, regional prevalence, incidence and risk factors of knee osteoarthritis in population-based studies. EClinicalMedicine. 2020 Dec;29–30:100587.
105 Zheng H, Chen C. Body mass index and risk of knee osteoarthritis: systematic review and meta-analysis of prospective studies. BMJ Open. 2015 Dec;5(12):e007568.
106 Poggiogalle E, Fontana M, Giusti AM, Pinto A, Iannucci G, Lenzi A, et al. Amino Acids and Hypertension in Adults. Nutrients. 2019 June;11(7):1459.
107 Volkert D, Beck AM, Cederholm T, Cruz-Jentoft A, Goisser S, Hooper L, et al. ESPEN guideline on clinical nutrition and hydration in geriatrics. Clinical Nutrition. 2019 Feb;38(1):10–47.
108 Deutz NEP, Bauer JM, Barazzoni R, Biolo G, Boirie Y, Bosy-Westphal A, et al. Protein intake and exercise for optimal muscle function with aging: Recommendations from the ESPEN Expert Group. Clin Nutr. 2014 Dec;33(6):929–36.
109 Kim JE, O'Connor LE, Sands LP, Slebodnik MB, Campbell WW. Effects of dietary protein intake on body composition changes after weight loss in older adults: a systematic review and meta-analysis. Nutr Rev. 2016 Mar;74(3):210–24.
110 Ikizler TA, Burrowes JD, Byham-Gray LD, Campbell KL, Carrero J-J, Chan W, et al. KDOQI Clinical Practice Guideline for Nutrition in CKD: 2020 Update. American Journal of Kidney Diseases. 2020 Sept;76(3, Supplement 1):S1–107.

111 Kirk B, Cawthon PM, Arai H, Ávila-Funes JA, Barazzoni R, Bhasin S, et al. The Conceptual Definition of Sarcopenia: Delphi Consensus from the Global Leadership Initiative in Sarcopenia (GLIS). Age Ageing. 2024 Mar;53(3):afae052.
112 Barazzoni R, Bischoff SC, Boirie Y, Busetto L, Cederholm T, Dicker D, et al. Sarcopenic obesity: Time to meet the challenge. Clin Nutr. 2018 Dec;37(6 Pt A):1787–93.
113 Neri MC, d'Alba L. Nutrition and Healthy Aging: Prevention and Treatment of Gastrointestinal Diseases. Nutrients. 2021 Nov;13(12):4337.
114 Gilbert J-A, Bendsen NT, Tremblay A, Astrup A. Effect of proteins from different sources on body composition. Nutr Metab Cardiovasc Dis. 2011 Sept;21 Suppl 2:B16-31.
115 Gorissen SHM, Witard OC. Characterising the muscle anabolic potential of dairy, meat and plant-based protein sources in older adults. Proc Nutr Soc. 2018 Feb;77(1):20–31.
116 Battista F, Bettini S, Verde L, Busetto L, Barrea L, Muscogiuri G. Diet and physical exercise in elderly people with obesity: The state of the art. Eur J Intern Med. 2024 Dec;130:9–18.
117 NORDIC NUTRITION RECOMMENDATIONS. 2023Available from: https://pub.norden.org/nord2023-003/
118 Batsis JA, Villareal DT. Sarcopenic obesity in older adults: aetiology, epidemiology and treatment strategies. Nat Rev Endocrinol. 2018 Sept;14(9):513–37.
119 Battineni G, Sagaro GG, Chintalapudi N, Amenta F, Tomassoni D, Tayebati SK. Impact of Obesity-Induced Inflammation on Cardiovascular Diseases (CVD). Int J Mol Sci. 2021 Apr;22(9):4798.
120 Moretti A, Tomaino F, Paoletta M, Liguori S, Migliaccio S, Rondanelli M, et al. Physical exercise for primary sarcopenia: an expert opinion. Front Rehabil Sci. 2025;6:1538336.
121 Bellicha A, van Baak MA, Battista F, Beaulieu K, Blundell JE, Busetto L, et al. Effect of exercise training on weight loss, body composition changes, and weight maintenance in adults with overweight or obesity: An overview of 12 systematic reviews and 149 studies. Obes Rev. 2021 July;22(Suppl 4):e13256.
122 Oppert J-M, Bellicha A, van Baak MA, Battista F, Beaulieu K, Blundell JE, et al. Exercise training in the management of overweight and obesity in adults: Synthesis of the evidence and recommendations from the European Association for the Study of Obesity Physical Activity Working Group. Obes Rev. 2021 July;22 Suppl 4(Suppl 4):e13273.
123 Mathus-Vliegen EMH. Obesity and the elderly. J Clin Gastroenterol. 2012 Aug;46(7):533–44.
124 Kim Y, Vakula MN, Waller B, Bressel E. A systematic review and meta-analysis comparing the effect of aquatic and land exercise on dynamic balance in older adults. BMC Geriatr. 2020 Aug;20(1):302.
125 Papalia GF, Papalia R, Diaz Balzani LA, Torre G, Zampogna B, Vasta S, et al. The Effects of Physical Exercise on Balance and Prevention of Falls in Older People: A Systematic Review and Meta-Analysis. J Clin Med. 2020 Aug;9(8):2595.
126 Salminen P, Kow L, Aminian A, Kaplan LM, Nimeri A, Prager G, et al. IFSO Consensus on Definitions and Clinical Practice Guidelines for Obesity Management-an International Delphi Study. Obes Surg. 2024 Jan;34(1):30–42.
127 Koca M, Dobbie LJ, Ciudin A, Halil M. Behaviour therapy for obesity in older adults. Eur J Intern Med. 2024 Dec;130:3–8.
128 Dassen FCM, Houben K, Allom V, Jansen A. Self-regulation and obesity: the role of executive function and delay discounting in the prediction of weight loss. J Behav Med. 2018 Dec;41(6):806–18.
129 Žižka O, Haluzík M, Jude EB. Pharmacological Treatment of Obesity in Older Adults. Drugs Aging. 2024 Nov;41(11):881–96.
130 Caruso I, Cignarelli A, Sorice GP, Perrini S, Giorgino F. Incretin-based therapies for the treatment of obesity-related diseases. NPJ Metab Health Dis. 2024 Nov;2(1):31.
131 Henney AE, Wilding JPH, Alam U, Cuthbertson DJ. Obesity pharmacotherapy in older adults: a narrative review of evidence. Int J Obes (Lond). 2025 Mar;49(3):369–80.
132 Sodhi M, Rezaeianzadeh R, Kezouh A, Etminan M. Risk of Gastrointestinal Adverse Events Associated With Glucagon-Like Peptide-1 Receptor Agonists for Weight Loss. JAMA. 2023 Nov;330(18):1795–7.
133 Toffanello ED, Inelmen EM, Imoscopi A, Perissinotto E, Coin A, Miotto F, et al. Taste loss in hospitalized multimorbid elderly subjects. Clin Interv Aging. 2013;8:167–74.
134 Minnetti M, Barazzoni R, Batsis JA, Busetto L, Yumuk VD, Poggiogalle E, et al. The integration of lifestyle modification advice and diet and physical exercise interventions: cornerstones in the management of obesity with incretin mimetics. Obesity Facts. 2025

135 Prado CM, Phillips SM, Gonzalez MC, Heymsfield SB. Muscle matters: the effects of medically induced weight loss on skeletal muscle. Lancet Diabetes Endocrinol. 2024 Nov;12(11):785–7.
136 McGowan B, Ciudin A, Baker JL, Busetto L, Dicker D, Frühbeck G, et al. A systematic review and meta-analysis of the efficacy and safety of pharmacological treatments for obesity in adults. Nat Med. 2025 Oct;31(10):3317–29.
137 McGowan B, Ciudin A, Baker JL, Busetto L, Dicker D, Frühbeck G, et al. Development of the European Association for the Study of Obesity (EASO) Grade-Based Framework on the Pharmacological Treatment of Obesity: Design and Methodological Aspects. Obes Facts. 2025 July;1–9.
138 McGowan B, Ciudin A, Baker JL, Busetto L, Dicker D, Frühbeck G, et al. Framework for the pharmacological treatment of obesity and its complications from the European Association for the Study of Obesity (EASO). Nat Med. 2025 Oct;31(10):3229–32.
139 Fried M, Yumuk V, Oppert JM, Scopinaro N, Torres A, Weiner R, et al. Interdisciplinary European guidelines on metabolic and bariatric surgery. Obes Surg. 2014 Jan;24(1):42–55.
140 Yumuk V, Tsigos C, Fried M, Schindler K, Busetto L, Micic D, et al. European Guidelines for Obesity Management in Adults. Obes Facts. 2015;8(6):402–24.
141 Di Lorenzo N, Antoniou SA, Batterham RL, Busetto L, Godoroja D, Iossa A, et al. Clinical practice guidelines of the European Association for Endoscopic Surgery (EAES) on bariatric surgery: update 2020 endorsed by IFSO-EC, EASO and ESPCOP. Surg Endosc. 2020 June;34(6):2332–58.
142 Eisenberg D, Shikora SA, Aarts E, Aminian A, Angrisani L, Cohen RV, et al. 2022 American Society for Metabolic and Bariatric Surgery (ASMBS) and International Federation for the Surgery of Obesity and Metabolic Disorders (IFSO): Indications for Metabolic and Bariatric Surgery. Surg Obes Relat Dis. 2022 Dec;18(12):1345–56.
143 Çalık Başaran N, Marcoviciu D, Dicker D. Metabolic Bariatric surgery in People with Obesity aged ≥65 Years. Eur J Intern Med. 2024 Dec;130:19–32.
144 Mabeza RM, Mao Y, Maynard K, Lee C, Benharash P, Yetasook A. Bariatric surgery outcomes in geriatric patients: a contemporary, nationwide analysis. Surg Obes Relat Dis. 2022 Aug;18(8):1005–11.
145 Sayadi Shahraki M, Mahmoudieh M, Kalidari B, Melali H, Mousavi M, Ghourban Abadi MR, et al. Bone Health after Bariatric Surgery: Consequences, Prevention, and Treatment. Adv Biomed Res. 2022;11:92.