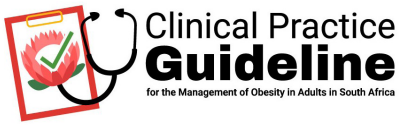
Assessment of people living with obesity



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KEY MESSAGES FOR HEALTHCARE PROVIDERS

- Obesity is a complex chronic disease in which abnormal or excess body fat (adiposity) impairs health, increases the risk of long-term medical complications, and reduces lifespan.
- Screening for people living with obesity (PLWO) should be performed regularly by measuring the body mass index (BMI) and waist circumference.
- The clinical assessment of PLWO should aim to establish the diagnosis and identify the causes and consequences of abnormal or excess adiposity on a person's physical, mental and functional health.
- Healthcare providers (HCPs) participating in the assessment of obesity should focus on establishing values and goals of treatment, identifying which resources and tools may be needed, and fostering self-efficacy with the patient in order to achieve long-term success.
- A non-judgemental, stigma-free environment is necessary for effective assessment of PLWO.

KEY MESSAGES FOR PEOPLE LIVING WITH OBESITY

- Obesity is a chronic disease characterised by the accumulation of excess body fat that can have a negative impact on your physical and mental health, as well as your overall quality of life.
- To guide you and your healthcare provider on the best obesity treatment options, a clinical evaluation is needed to determine how your weight affects your health and wellbeing. This may include both a mental health assessment and a physical examination.
- Weight bias and stigma are common in clinical settings and can be detrimental to helping you achieve your health goals. Healthcare providers should conduct their obesity assessment in a sensitive and non-judgemental way.

RECOMMENDATIONS

1. We suggest that HCPs involved in screening, assessing and managing PLWO use the '5As' framework to initiate the discussion by asking for their permission and assessing their readiness to initiate treatment (Level 4, Grade D, Consensus).
2. HCPs can measure height and weight and calculate BMI in all adults (Level 2a, Grade B),[1-9] and measure waist circumference in individuals with a BMI 25 - 35 kg/m^2 (Level 2b, Grade B).[10-13]
3. We suggest that a comprehensive history to identify root causes of weight gain as well as complications of obesity and potential barriers to treatment be included in the assessment (Level 4, Grade D).[14-16]
4. We recommend measurement of blood pressure in both arms, fasting glucose or glycated haemoglobin and lipid profile to determine cardiometabolic risk and, where appropriate, alanine transaminase to screen for metabolic dysfunction-associated steatotic liver disease in PLWO (Level 3, Grade D).[17,18]
5. We suggest that HCPs consider using the Edmonton Obesity Staging System to determine the severity of obesity and guide clinical decision-making (Level 4, Grade D).[19,20]

Introduction

Obesity is a chronic disease that requires a systematic and comprehensive diagnosis, assessment and treatment approach.[21] The objective assessment of PLWO is to gather information to confirm the diagnosis, determine related comorbidities due to excess body fat along with the severity of the disease, and identify causes of and contributors to weight gain (see the chapter 'The science of obesity'), and to guide appropriate management discussions in a non-biased and stigma-free clinical setting.[22] HCPs should initiate a discussion with PLWO about their values and goals for treatment, facilitate reflection, and encourage accountability and self-directed management to promote long-term improvements in health.[23]

This chapter provides an evidence-based approach to assessing PLWO in the primary care setting through a structured history, physical examination, and clinically appropriate laboratory testing. The authors also discuss clinical tools that allow for easy and efficient use in routine clinical practice.

Definition of obesity

Obesity is a complex chronic disease in which abnormal or excess body fat (adiposity) impairs health, increases the risk of long-term medical complications, and reduces lifespan.[23-25] It can no longer be regarded as a condition caused simply by an imbalance between energy in and energy out and, by implication, something that can be managed with mere willpower. Obesity has, in addition, traditionally been viewed as a risk factor for a wide range of other health issues. The Clinical Practice Guideline for the Management of Obesity in Adults in South Africa Committee, along with the Canadian Medical Association,[21,26] the Association for the Study of Obesity on the Island of Ireland,[27] Obesity Canada,[28] the American Medical Association,[29] the World Health Organization (WHO),[25] the World Obesity Federation (WOF) and others,[29-31] now acknowledge that obesity is a chronic disease in its own right, similar to type 2 diabetes (T2DM), hypertension and dyslipidaemia. A recent publication by the Lancet Diabetes and Endocrinology Commission[32] introduced new definitions of preclinical and clinical obesity, but does not cover the management of PLWO. The new definitions are also not formally included in any guideline and have not gained universal acceptance.

Initiating a discussion about obesity management

HCPs in primary care play an important role in the management of most chronic diseases. However, owing to the multitude of demands in primary care and lack of comfort and training, the assessment and management of PLWO are not easily undertaken. The initial approach, communication and attitude of the HCP during the assessment of PLWO is a significant determinant of their success.[33,34]

Many PLWO have experienced some form of weight bias in the primary care setting.[35,36] This is due in part to some HCPs' endorsement of negative attitudes and beliefs about PLWO, misinformation about causality, and perceptions that PLWO may be unmotivated and non-compliant. Many PLWO feel discriminated against and, as a result, will often avoid seeking treatment and delay preventive care.[37] This can affect their health status, their relationship with HCPs and their response to interventions,[38] which may lead to worsened outcomes including disordered eating, increased rates of depression, and lower rates of physical activity.[39,40]

We recommend that HCPs approach PLWO with empathy and sensitivity. In addition, it is important to acknowledge the complexity of the disease and the difficulty in sustaining behavioural change, as well as to avoid stereotypes and oversimplification of the disease.[41] A supportive environment with appropriate equipment (for example, appropriately sized blood pressure cuffs and gowns, armless chairs in waiting rooms, a private room for weigh-ins) and asking permission to weigh PLWO can help foster patient comfort and dignity. Stigmatisation of PLWO leads to worsened outcomes and promotes disordered eating, increased rates of depression and lower rates of physical activity. (See the chapter 'Reducing weight bias in obesity management, practice and policy'.)

The use of structured interview formats has been proposed to help facilitate discussions about obesity in primary care.[42,43] An adaptation of the '5As' template has been developed by Obesity Canada for use in clinical practice.[44] The main components of this framework include:

1. ASK for permission to discuss weight and explore readiness.
2. ASSESS obesity-related risks and root causes of and contributors to obesity.
3. ADVISE on health risks and treatment options.
4. AGREE on health outcomes and behavioural goals.
5. ASSIST in accessing appropriate resources and providers.[45,46]

Finally, when conducting an assessment of PLWO, and in order to achieve long-term success, it is important to assess the PLWO's readiness to change, intrinsic motivation, and values and goals when initiating a treatment plan. Personalising the approach, recognising PLWOs' strengths, and reframing misconceptions about obesity are important key processes that can have a positive impact on the PLWO's ability to make long-term changes.[15,25] (See the chapter 'Effective psychological and behavioural interventions in obesity management'.)

Screening for obesity

Before initiating screening or assessment of a PLWO, it is important to ask the PLWO's permission to discuss the topic and/or to conduct anthropometric measurements. Evaluation of anthropometric parameters is recommended as a practical screening tool to identify people with increased adiposity in whom more intensive assessments may be indicated. Moreover, performing regular anthropometric screening can identify people at risk of developing obesity, and the subsequent implementation of preventive measures can have a significant positive long-term effect on their health.[47,48] Many anthropometric parameters have been recommended in the screening and assessment of obesity; however, a calculated body mass index (BMI) and measured waist circumference (WC)[49] are the most widely used (Box 1), with some authors suggesting waist-to-height ratio (WtHR) as a useful measurement (Box 2).[50]

Traditionally, the BMI, calculated as weight in kilograms divided by height in metres squared (kg/m^2), has been used as a surrogate measure of body fat, and therefore as an objective parameter to define obesity, both in epidemiological and clinical studies.[12,51-54] Widely accepted classifications of obesity based on specific BMI cut-offs are presented in Table 1. Although the BMI is a simple, objective and reproducible measure, it has certain limitations that need to be recognised by HCPs:[42,43]

- BMI is not a direct measure of body fat, cardiovascular risk or health.
- BMI does not indicate body fat distribution.
- BMI does not account for muscle mass (it overestimates body fat in muscular individuals).
- BMI can underestimate body fat in people who have lost muscle mass (sarcopenic obesity [SO]).
- BMI is less accurate in certain populations (e.g. the elderly, people with physical disability, people less than 18 years of age and people with severe obesity, and during pregnancy and in cases of ascites or severe oedema).

Box 1. Measuring body mass index

- All anthropometric measurements should be conducted barefoot and in light clothing.
- Weight and height should be measured by trained professionals using standardised techniques and equipment and recorded to the nearest 0.1 kg and 1 cm.
- BMI should be calculated as weight (kg) divided by the square of the body height in metres (kg/m^2).

Box 2. Measuring waist circumference

- Remove clothing from the waistline.
- Stand with feet shoulder-width apart (25 - 30 cm) and a straight back.
- Palpate the abdomen to locate the inferior margin of the last rib at the level of the mid-axillary line.
- Palpate and identify the crest of the ileum in both sides. Use the area between the thumb and index finger to feel for the hip bone at the level of the mid-axillary line. This is the part of the hip bone at the side of the waist, not at the front of the body (Fig. 1).
- WC should be measured at the end of a normal expiration, midway between the inferior margin of the last rib and the crest of the ileum in a horizontal plane using a stretch-resistant tape that provides a constant 100 g tension, and should be recorded to the nearest 1 cm.
- Have the patient take two normal breaths, and on the exhale of the second breath tighten the tape measure so it is snug but not digging into the skin.

- Height plays a role in the relationship between adiposity and metabolic risk. Taller individuals are at greater risk than those of shorter stature.[55]

Importantly, BMI cutoffs can vary significantly between different ethnicities. Most Asian populations, which include China, Japan and Korea, have an increase in cardiovascular risk at a lower BMI compared with populations of European ancestry. Large epidemiological studies have shown that Asian populations may have increased adiposity and cardiometabolic risk at a lower BMI, and alternative cut-off points have been proposed for this patient population (Table 1).[56-61] In distinct populations such as the elderly, very muscular patients and those with extremely tall or short stature, the BMI can be misleading and needs to be interpreted with caution.[4]

Specific cut-offs for BMI in the black African population are still to be determined. A study in the South African (SA) black population reported an increase in cardiovascular risk in black African men at a BMI of 22 kg/m^2, whereas black African women's at-risk BMI approximates 28 kg/m^2.[62] There is a considerable need for further research in this area. Until a consensus is reached, the WHO cut-offs are used in the black SA population.

A BMI ≥30 kg/m^2 is associated with an increase in cardiovascular risk factors and all-cause mortality and should be used as a screening criterion to identify PLWO in the general population.[1,5] For most populations, the presence of overweight (BMI ≥25 kg/m^2, and ≥23 kg/m^2 in Asians) represents an increased risk and requires further evaluation of other anthropometric, haemodynamic and biochemical parameters.[5,63]

Given its simplicity, objectivity and reproducibility, the BMI continues to be an important measure in epidemiological and population-based surveillance studies. In a clinical setting, BMI at the recommended cut-offs should serve only as a simple screening measure.

Table 1. Recommended classification of BMI

Category	BMI (kg/m^2)
European and black African* ethnicity[51]	
Underweight	<18.5
Normal range	18.5 - 24.9
Overweight	25 - 29.9
Obesity Class 1	30 - 34.9
Obesity Class 2	35 - 39.9
Obesity Class 3	40 - 49.9
Obesity Class 4	50 - 59.9
Obesity Class 5	≥60
Asian† ethnicity[67]	
Underweight	<18.5
Normal range	18.5 - 22.9
Overweight – at risk	23 - 24.9
Obesity – moderate risk	25 - 29.9
Obesity – severe risk	≥30

BMI = body mass index.
*No specific BMI cut-offs have been determined for a black African population, so European cut-offs are used.
†Data from South, Southeast or East Asian populations. The ethnicity of the Asian population in South Africa is heterogenous and may not be fully represented here.

Table 2. Proposed waist circumference cut-off points to define increased abdominal adiposity[32,72-77]

Ethnicity/region	Men (cm)	Women (cm)
European		
Increased risk[76]	≥94	≥80
Significant risk[25,32]	≥102	≥88
Sub-Saharan Africa*[76]	≥94	≥80
South Asia (China, Malaysia, India)[76]	≥90	≥80
Japan[73]	≥85	≥90
China[74]	≥85	≥80

*There is no consensus on waist circumference cut-offs for black African (including black South African) populations, so European cut-offs are used.

The new proposed definitions of preclinical and clinical obesity continue to use BMI as an integral component of the diagnostic criteria, but the consensus is that another anthropometric measure such as WC or WtHR should be added in a clinical setting.[32]

Integration of both BMI and WC in clinical assessment may identify the higher-risk phenotype of PLWO better than either BMI or WC alone, particularly in individuals with a lower BMI.[64-66]

Regular assessment of BMI, WC and cardiometabolic risk factors can help identify people at increased risk of developing obesity. Regular assessment should also inform care and allow for increased vigilance in avoiding obesogenic medications (see Table 9) and for counselling on the avoidance of weight gain during high-risk periods such as pregnancy or forced sedentariness due to injury (see the chapter 'Prevention and harm reduction of obesity [clinical prevention]').

Waist circumference

Identifying which cut-off level to use for abdominal obesity is difficult. The purpose of a WC threshold is to identify individuals with an increased risk of metabolic complications.[64,66,68] Evidence from both cross-sectional and longitudinal data highlights that the thresholds vary between sexes and ethnic groups.[69-71] The WHO recognises two abdominal obesity measurements in European populations:[25]

- A WC of ≥94 cm in men and ≥80 cm in women indicates increased abdominal adiposity and an increased risk of cardiovascular disease.
- A WC of ≥102 cm in men and ≥88 cm in women indicates significant abdominal adiposity and an even greater risk of cardiovascular disease.

The Lancet Commission on Clinical Obesity, in its 2025 report, emphasises the use of WC as a key measure alongside BMI to assess obesity.[32] For populations of European descent, they define a WC ≥88 cm in women and ≥102 cm in men as measurements of body size in the assessment of excess body fat. Although there is value in international consensus, national health systems should adopt WC cut-offs appropriate to their population. For adults with a predominant South Asian, Southeast Asian or East Asian ethnicity, lower WC cut-offs have been recommended, as shown in Table 2.[72-74]

Owing to insufficient evidence, there are no specific WC cut-offs for black African populations. Accordingly, the International Diabetes Federation (IDF) Europid cut-points are recommended.[72] However, these may not be appropriate because for a given WC, black Africans have less visceral adipose tissue than their white European counterparts. Several SA studies have been undertaken to identify WC cut-points for risk (summarised in Table 3). Apart from one longitudinal study with incident T2DM as the outcome,[78] the remainder have been cross-sectional and relied on the metabolic syndrome (excluding WC) or glycated haemoglobin (HbA1c) as outcomes. Nonetheless, these studies have consistently shown that the European cut-points may not be appropriate for black South Africans, especially women. Compared with the IDF cut-points, the devised WC cut-points for SA women were higher (~90 cm), whereas those for men were lower (~90 cm). Based on these findings, there was a recommendation that the cut-points for men and women should be similar (~90 cm) for ease of implementation in resource-poor settings.[78-80] However, it is important to note that the cut-points may be dependent on the obesity prevalence of the region, with lower cut-points being observed in rural areas where the obesity prevalence is lower.[81,82]

The current recommended WC cut-offs for South Africans of Asian descent are those from South Asia, which are ≥90 cm for men and ≥80 cm for women. For the rest of the SA population, the WHO thresholds for Europeans (Table 2) can be used to screen for increased or significantly increased abdominal obesity and cardiovascular risk.

Despite its low-tech appeal and significant statistical association with cardiometabolic risk, there are important limitations to the routine use of WC measurement in the clinical setting:

- WC is not a direct measure of visceral fat.
- Considerable training and standardisation are required to ensure inter- and intra-reader reproducibility.
- WC is sensitive to abdominal distension due to food or fluid intake, bloating, ascites, pregnancy.
- Varying cut-offs are required for ethnic populations.
- WC is a less sensitive measure of visceral fat with increasing BMI.
- WC requires further body exposure and can be perceived as an intrusive measurement by some patients.

Waist-to-height ratio

The WtHR, calculated in centimetres, can be a valuable anthropometric indicator of central obesity and the accumulation of high-risk fat. By avoiding the ethnic, gender and age variations of WC measurements, it may be applied more generally.[50] A consensus statement from the European Association for the Study of Obesity (EASO) includes WtHR as a reliable marker of cardiometabolic risk at a cut-off of ≥0.5. A diagnosis of obesity is made if BMI is ≥30 kg/m^2 OR <30 kg/m^2 and ≥25 kg/m^2 PLUS a WtHR ≥0.5 in an individual with medical, mechanical or psychological complications.[90]

Integration of anthropometric measurements

BMI, WC and WtHR provide valuable and complementary information in the assessment of PLWO and the estimation of cardiometabolic risk. In PLWO with a BMI ≥40 kg/m^2, it is reasonable to assume that this measure alone can determine the presence of excess adiposity.[32] In people with an increased BMI, an increase in WC or

Table 3. Waist circumference cut-points in black South African populations

Reference	Cohort	Population	Outcome	Cut-point (cm), men	Cut-point (cm), women
Matsha *et al*., 2013[79]	Urban, Bellville South cohort	Mixed ancestry	Metabolic syndrome	90	90
Motala *et al*., 2011[80]	Rural Zulu cohort	Black African	Metabolic syndrome	86	92
Crowther and Norris, 2012[83]	Urban Birth-to-Twenty cohort of women	Black African	Metabolic syndrome	-	91.5
Peer *et al*., 2016[84]	Urban CRIBSA study	Black African	Metabolic syndrome	83.9	94
Goedecke *et al*., 2022[78]	Urban, middle-aged Soweto cohort	Black African	Incident T2DM	96.8	95.8
Nguyen *et al*., 2017[85]	Urban black African people living with HIV in Western Cape	Black African people living with HIV	Metabolic syndrome	87	92
Prinsloo *et al*., 2011[86]	SABPA study	Urban black African teachers	Metabolic syndrome	90	98
Sekgala *et al*., 2022[87]	SANHANES, male data	National survey (63% black African)	T2DM (HbA1c >6.5%)	89	-
Sekgala *et al*., 2024[88]	SANHANES, female data	National survey (66% black African)	T2DM (HbA1c >6.5%)	-	87
Castle *et al*., 2023[89]	Rural Vukuzazi study	Rural black African with a high prevalence of HIV (33.8%)	T2DM (HbA1c >6.5%)	72	81

CRIBSA = Cardiovascular Risk in Black South Africans; T2DM = type 2 diabetes mellitus; SABPA = Sympathetic Activity and Ambulatory Blood Pressure in Africans; SANHANES = South African National Health and Nutrition Examination Survey; HbA1c = glycated haemoglobin.

WtHR may imply intra-abdominal fat deposition and an increased risk of cardiometabolic disease.[90,91] These people may benefit from early intervention to treat and prevent obesity-related complications. In addition, measuring WC may not change management, but it can provide PLWO with valuable information regarding the efficacy of their treatment during their long-term follow-up. Some PLWO can see changes in adipose distribution before a significant change in body weight or BMI.

Assessing the impact of excess or abnormal adiposity on health

The association between a diagnosis of obesity and the development of related complications is strong but not always linear. Comparable levels of excess adiposity can result in varying degrees of health impact and impairment in quality of life among different individuals. While some patients with obesity may not initially present with elevated cardiometabolic risk markers, they may still face increased mortality risk,[92,93] and are more likely to experience other obesity-related conditions such as sleep apnoea, depression and musculoskeletal pain. A comprehensive obesity assessment, including use of the Edmonton Obesity Staging System (EOSS),[20,21] can provide a more accurate understanding of disease severity and help determine the appropriate intensity of treatment.

The Edmonton Obesity Staging System

Elements of the EOSS have been proposed to guide clinical decisions from the obesity assessment and at each BMI category.[20] Table 4 reviews the proposed clinical staging and its impact on management. The EOSS is a measure of the mental, metabolic and physical impact that obesity has had on people's health and uses these factors to determine their stage of obesity (from stage 0 to 4). In population studies, the EOSS has been shown to be a better predictor of all-cause mortality compared with BMI or WC measurements alone.[94]

Once the diagnosis has been established, the primary goal for the clinical assessment of PLWO should be to identify the possible causes and contributors leading to weight gain, determine the extent to which weight has affected the patient's health, and systematically look for barriers in their management.[95] Given that obesity is a complex and heterogeneous disease, this is often a daunting task for the HCP. Using a clinical tool such as the '4Ms' framework (Mental health, Mechanical, Metabolic, Monetary health/Milieu) can provide a practical approach for HCPs to explore major drivers, barriers and complications of obesity (Table 5).[96] It can be used to provide a structure to perform an efficient and complete obesity assessment, including the history, physical examination and clinically indicated investigations.

Patient-reported outcome measures[40]

Patient-reported outcome measures (PROMS) are tools that capture PLWOs' perspective on the effectiveness of interventions, and can include symptoms, function, and physical, mental and social health.[97] Until recently, there has been a lack of standardisation in the use of the measures in obesity assessment and treatment, although the 'Standardizing Quality of life measures in Obesity Treatment (S.Q.O.T.)' initiative has now identified eight domains considered important to measure: self-esteem, physical health/functioning, mental/psychological health, social health, eating, stigma, body image, and excess skin. In addition, other helpful patient-centred tools suggested are the Impact of Weight on Quality of Life-Lite (IWOOL-Lite), the International Consortium for Health Outcome Measurement (ICHOM) Set of Patient-Centered Outcome Measures,[98] BODY-Q, the 36-item Short Form Health Survey (SF-36), the Obesity related Problems scale (OP), and the Quality of Life for Obesity Surgery (QOLOS).[99]

Table 4. The Edmonton Obesity Staging System*

Stage	Description
0	No apparent obesity-related risk factors (e.g. blood pressure, serum lipids, fasting glucose, etc. within normal range), no physical symptoms, no psychopathology, no functional limitations and/or impairment of wellbeing
1	Presence of obesity-related subclinical risk factors (e.g. borderline hypertension, impaired fasting glucose, elevated liver enzymes, etc.), mild physical symptoms (e.g. dyspnoea on moderate exertion, occasional aches and pains, fatigue, etc.), mild psychopathology, mild functional limitations, and/or mild impairment of wellbeing
2	Presence of established obesity-related chronic disease (e.g. hypertension, type 2 diabetes, sleep apnoea, osteoarthritis, reflux disease, polycystic ovarian syndrome, anxiety disorder, etc.), moderate limitations in activities of daily living, and/or impairment of wellbeing
3	Established end-organ damage such as myocardial infarction, heart failure, diabetic complications, incapacitating osteoarthritis, significant psychopathology, significant functional limitations, and/or impairment of wellbeing
4	Severe (potentially end-stage) disabilities from obesity-related chronic diseases, severe disabling psychopathology, severe functional limitations, and/or severe impairment of wellbeing

*Adapted from Sharma AM, Kushner RF. A proposed clinical staging system for obesity. Int J Obes 2009;33(3):289-295.[20]

Table 5. Components of the '4Ms' framework for assessment of Mental, Mechanical, Metabolic and Monetary drivers, complications, and barriers to weight management in people living with obesity[96]

Mental	Mechanical	Metabolic	Monetary
Cognition	Sleep apnoea	Type 2 diabetes	Education
Depression	Osteoarthritis	Dyslipidaemia	Employment
Attention deficit	Chronic pain	Hypertension	Income
Addiction	Reflux disease	Gout	Disability
Psychosis	Incontinence	Fatty liver	Insurance
Eating disorder	Thrombosis	Gallstones	Benefits
Trauma	Intertrigo	Polycystic ovary syndrome	Bariatric supplies
Insomnia	Plantar fasciitis	Cancer	Weight loss programmes

Components of an obesity-centred history

An obesity-centred history should include all parts of a routine clinical interview, such as past medical and surgical history, medications, allergies and social and family history. However, an emphasis should be placed on screening for underlying root causes of, contributors to and consequences of obesity (Table 6). Key elements of a history include screening for sleep disorders; physical, sexual and psychological abuse; description of eating patterns; physical activity and screen time; internalised weight bias; mood and anxiety disorders; and substance abuse and addiction.[14,16] A thorough history of medications should screen for weight-promoting medications. Consider alternative options where possible. The most common weight-promoting medications are outlined in Table 9. The HCP conducting the assessment should also identify and document the person's values and goals around treatment and foster insight to help with long-term coping and self-management skills.[15,25] Table 6 reviews some key components that are specific to an obesity-focused interview. The table highlights some key processes of a personalised obesity assessment in primary care; these have been shown to have a positive impact on the individual's ability to foster everyday change and facilitate improvements in their physical, mental and social health.[14,25]

Components of an obesity-centred physical examination

An obesity-centred physical examination should be focused on determining the obesity phenotype, causes of and contributors to weight gain, and treatment barriers for all patients. The key components of an obesity-centred physical exam are outlined in Table 7. Routine anthropometric measurements should include height, weight, BMI (Box 1) and WC (Box 2; Fig.). Blood pressure should be measured with an appropriately sized cuff according to the patient's arm circumference. If a large upper arm size is prohibitive, systolic blood pressure can be measured in the forearm, selecting the cuff size (small cuff [20.0 - 26.0 cm], standard cuff [25.4 - 40.6 cm and 25.0 - 34.0 cm] and large cuff [>32.0 cm]) according to the individual's forearm circumference. For cuff installation in the forearm, position the distal edge of the cuff about 6 cm proximal to the styloid process of the ulna.[100,101] Neck circumference and airway patency are also helpful to estimate the risk of sleep apnoea. In addition to a routine cardiorespiratory examination, a head, neck and gastrointestinal examination should be performed along with a general skin examination to rule out common skin findings (see Table 7). A joint and gait examination is also recommended to assess barriers in mobility. A cursory endocrine examination includes palpating for an enlarged thyroid gland and screening for signs of Cushing's syndrome and polycystic ovarian syndrome. If present, these signs should prompt further biochemical screening.

Investigations to assess obesity

Diagnostic testing is commonly ordered during the initial assessment of PLWO to identify metabolic problems and to tailor therapy. There is no single blood test or diagnostic evaluation that is indicated for all PLWO. The specific evaluations performed should be based on the presenting symptoms, the person's risk factors and the index of suspicion. Table 8 lists some blood and diagnostic tests for HCPs to consider when assessing a PLWO. Screening for metabolic syndrome with HbA1c or fasting blood sugar, total cholesterol, serum triglycerides and high-density lipoprotein is recommended in most PLWO.[102] PLWO who are at high risk of metabolic dysfunction-associated steatotic liver disease (MASLD), including those living with T2DM or metabolic syndrome, should be screened

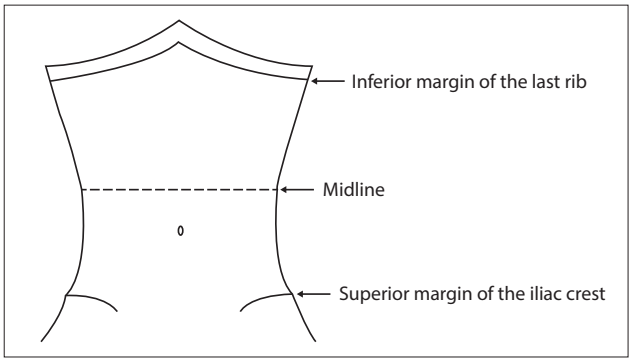

Fig. 1. Measurement of waist circumference.

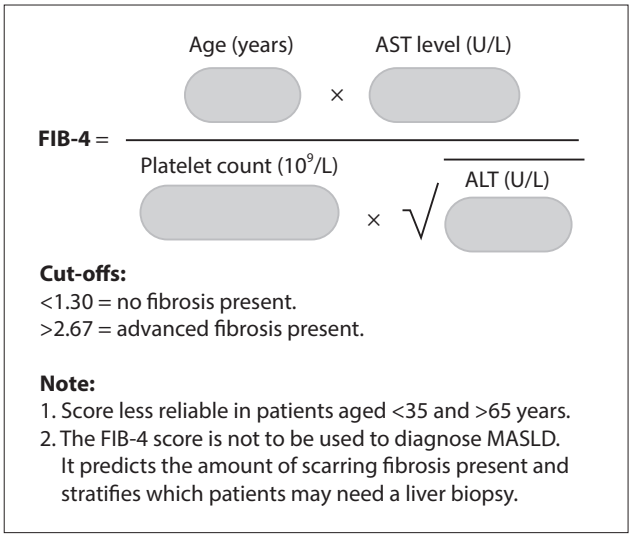

Fig. 2. The FIB-4 score.[104] (FIB-4 = Fibrosis-4; AST = aspartate aminotransferase; ALT = alanine aminotransferase; MASLD = metabolic dysfunction-associated steatotic liver disease.)

with alanine aminotransferase and aspartate aminotransferase levels and an abdominal ultrasound scan. A referral to gastroenterology/hepatology may be appropriate in PLWO with persistently elevated liver enzymes (greater than two times the upper limit of normal over 6 months) and/or high Fibrosis-4 (FIB-4) scores (Fig. 2). The gold standard to diagnose MASLD is a liver biopsy.[103]

In patients aged over 65 years, a FIB-4 cut-off of >2.0 should be used. FIB-4 has low accuracy in those under age 35, so secondary assessment should be considered in individuals in this age group with increased metabolic risk.

Evaluation of coronary artery disease

Large prospective studies have documented obesity as being an independent predictor of coronary artery disease.[105] This relationship was stronger in younger individuals. Susceptibility to obesity-related cardiovascular complications is not only mediated by overall body fat mass, but is largely dependent upon individual differences in regional body fat distribution.[91,106] Large cohort studies using imaging techniques have identified excess abdominal visceral adipose tissue as a strong predictor in the development of cardiovascular disease over time, independently of total body fat mass.[107] Numerous non-invasive tests can diagnose atherosclerosis or myocardial ischaemia, or both. The correct choice depends on local expertise, the relative strengths and weaknesses of each modality and individual patient characteristics, as well as the pretest likelihood of coronary artery disease.

Table 6. Recommended key components of an obesity-centred medical history[27]

Interview component	Details	Implication/significance/recommended actions
Medical	Medical history Surgical history Medications	
Weight history	Document age of onset of obesity and major weight trajectories over time Previous weight loss attempts and response to interventions (including behavioural interventions, medications, endoscopic and surgical interventions) Highest and lowest weight Major life event(s) associated with weight change Current phase of weight (e.g. gaining, losing, stable)	Can help to understand patient's weight journey, success/failures of past attempts, and causes of weight gain/loss in the past, childhood v. adult obesity Can help to establish realistic expectations Can help to prevent future weight gain and target behavioural and psychological treatment Can help to make appropriate goals (e.g. weight stabilisation if currently gaining weight) Key processes: Show compassion Real listening (paraphrase and summarise to ensure that you understand and validate the patient's thoughts) Help patients make sense of their story (find root causes, foster insight, find patterns/triggers, identify values/goals, reflect on timeline to acknowledge impact on life in context of weight)
Nutrition	Current eating patterns, nutrient intake, medical conditions that may require a specialist diet Food environment (access, preparation facilities and skills, budget/food security, social eating) Nutritional requirements (protein, energy, micronutrients) Appetite e.g. TFEQ Relationship with food Assess nutrition literacy	Is there concern of physiological hunger, emotional eating, mindless eating, knowledge Consider referral to registered dietitian See chapter 'Medical nutrition therapy in obesity management' for more details on the use of nutrition care process for detailed nutrition assessment
Physical activity	Current physical activity, including time spent in sedentary activities Limitations/barriers to activity (e.g. pain, time, motivation, past experience, cardiorespiratory or neurological impairment, obesity-related lymphoedema-like swelling) Mobility aid requirement Identify social limiting factors restricting access to increasing physical activity Falls history assessment Number of days a week outside of the home Activity of daily living assessment BODY-Q	Help patient to make self-directed activity goals if helpful to the individual Address limitations independently (e.g. pain management and appropriate referral for joint pain, etc.) See chapter 'Physical activity in obesity management' Key processes: Recognise strengths Shift beliefs Reframe misconceptions Help establish whole-person value goals and functional outcomes, instead of weight-based goals
Depression and anxiety screening	Screen for depression and anxiety Determine overall quality of life, e.g. IWQOL, SF-36, Dartmouth COOP Assessment/European Quality of Life Questionnaire Visual Analogue Scale (EQVAS)	Consider referral to psychiatry/psychology
Other mental health issues/drivers	Screen for attention deficit hyperactivity disorder, post-traumatic stress disorder, chronic grief Screen for eating disorders, e.g. using BES, ESS and EDI, QEWP-5, EDE-Q or clinical interviews (EDE-Q, NESHI, SCID-1, SIAB, BODY-Q) Psychological impact of previous weight journey	Consider referral to psychiatry/psychology Review challenges with body image, self-esteem See chapter 'Effective psychological and behavioural interventions in obesity management'
Addiction/dependency	Smoking status Alcohol intake Use of cannabinoids and other psychoactive substances, current or previous substance abuse Excessive use of caffeine-containing beverages (e.g. sugar-sweetened beverages)	Consider referral to psychiatry/psychology See chapter 'Effective psychological and behavioural interventions in obesity management'

...continued

Table 6. (continued) Recommended key components of an obesity-centred medical history[27]

Interview component	Details	Implication/significance/recommended actions
Abuse	Screen for previous and current forms of physical, psychological and sexual abuse	Unresolved history of abuse and current abuse can be a barrier to obesity management and can have an impact on food behaviours and relationship with food Interdisciplinary approach may be required
Sleep history	Number of hours of sleep per night, sleeping pattern (bed time/rise time, sleep quality) and barriers to initiation/ maintenance Use of pharmacological sleeping aids	If night eating is identified, consider using NEQ Poor sleep quality and quantity can be a barrier to obesity
	Sleep apnoea-hypopnoea screening (e.g. STOP-Bang Questionnaire, Epworth Sleepiness Scale)	If positive screening (STOP-Bang >4), consider referral for a sleep study
Medication history	Review medications that can have a significant impact on weight	See Table 9 Key processes: Make sense of the story Help establish root causes
Social history Family history	Age, sex, ethnicity, marital status, occupation/work schedule: number of hours per week, night shift work, commute time/mode	Eating behaviours in shift workers may require additional consideration when deciding on therapeutic options
	Income support, medical coverage, access to exercise facilities	Evaluate patient's access to food options, nutritional education, cooking skills Consider involving a social worker/counsellor in cases where income, medication coverage and resource access may be limited
	Level of functional independence	In patients with decreased independence, consider involving caregivers and decision makers Consider referral to an occupational therapist +/- medical social worker
	History of first-degree relative with overweight/obesity or related complications	Can help determine patients' risk of obesity or related complications
	Overweight and obesity in other household members	Group interventions are more challenging but more likely to be feasible and sustainable in patients exposed to environments where obesity is highly prevalent
Other mental health issues/drivers	Past experience Motivation Confidence Expectations	See chapter 'Effective psychological and behavioural interventions in obesity management' Key processes: Recognise strengths Shift beliefs (help manage expectations, focus on the whole health of the patient) Co-construct a new story (context integration, prioritising goals) Orientate values and plan actions (help establish direction) Foster reflection (insight, motivation, accountability) Help internalise core messages (help establish coping skills)

TFEQ = Three Factor Eating Questionnaire; IWQOL = Impact of Weight on Quality of Life; SF-36 = 36-Item Short Form Survey; BES = Binge Eating Scale; ESS = Emotional Easting Scale; EDI = Eating Disorder Inventory; QEWP-5 = Questionnaire on Eating and Weight Patterns-5; EDE-Q = Eating Disorder Examination Questionnaire; NESHI = Night Eating Syndrome History Inventory; SCID-1 = Structured Clinical Interview for DSM-IV Axis Disorders; SIAB = Structured Interview for Anorexia and Bulimia; HCP = healthcare provider; NEQ = Night Eating Questionnaire.

Electrocardiogram

Obesity has the potential to affect the ECG in several ways, including displacement of the heart by elevating the diaphragm in the supine position, increasing the cardiac workload, and increasing the distance between the heart and the recording electrodes. Besides low QRS voltage and leftward trend in the axis, other alterations frequently seen are nonspecific flattening of the T waves in the inferolateral leads (attributed to the horizontal displacement of the heart) and voltage criteria for left atrial abnormality. An increased incidence of false-positive criteria for inferior myocardial infarction in PLWO

Table 7. Key components of an obesity-centred physical examination

Vital signs: Blood pressure (appropriately sized cuff), heart rate

Anthropometric measurements: Weight, height, waist circumference, BMI

Head and neck

- Neck circumference
- Thyroid examination
- Cushing's features (moon facies, prominent supraclavicular and dorsocervical fat pad, violacious striae, thin skin)
- Polycystic ovary syndrome features (acanthosis nigricans, hirsutism, acne)

Cardiorespiratory

- Heart rate and rhythm
- Signs of heart failure (added heart sounds, pedal oedema, pulmonary crackles)

Gastrointestinal

- Liver span
- Umbilical or incisional hernias
- Screening for stigmata of chronic liver disease (encephalopathy, ascites, jaundice, palmar erythema)

Musculoskeletal

- Osteoarthritis (Heberden's/Bouchard's nodes, weight-bearing joints)
- Gout
- Gait examination

Skin

- Candidiasis, intertrigo, tinea, skin tags, psoriasis, acanthosis nigricans
- Nutritional deficiencies (pallor of conjunctiva, palmar crease rubor, atrophic glossitis, neuropathy)[112]
- Abdominal striae (violaceous striae wider than 1 cm)

Lower limbs

- Lymphoedema (non-painful, pitting oedema, typically arms/legs)
- Lipoedema (often painful fat deposition, non-pitting oedema, typically in arms and legs with sparing of the hands and feet)
- Venous insufficiency, ulcers, stasis, thrombophlebitis

BMI = body mass index.

Table 8. Laboratory and diagnostic tests to consider in the assessment of people living with obesity

Consider for most patients

- Full blood count and platelets
- HbA1c
- Electrolytes and renal function tests (creatinine, eGFR)
- Total cholesterol, HDL and LDL cholesterol, triglycerides
- ALT, AST
- Age-appropriate cancer screening

Consider only if clinically indicated

- Thyroid-stimulating hormone/thyroid function tests
- Uric acid
- Assessment of iron (TIBC, % saturation, serum ferritin, serum iron)
- Vitamins B_{12} and D levels
- Urinalysis
- Urine for micro-proteinuria

Women living with obesity and symptoms of polycystic ovary syndrome

- LH, FSH, total testosterone, DHEAS, prolactin and 17-hydroxyprogesterone levels

HbA1c = glycated haemoglobin; eGFR = estimated glomerular filtration rate; HDL = high-density lipoprotein; LDL = low-density lipoprotein; ALT = alanine aminotransferase; AST = aspartate aminotransferase; TIBC = total iron binding capacity; LH = luteinising hormone; FSH = follicle-stimulating hormone; DHEAS = dehydroepiandrosterone.

due to the elevation of the diaphragm has been reported.[108] Left ventricular hypertrophy is probably underdiagnosed based on the usual ECG criteria in individuals with greater than Class 2 obesity. Since baseline ECG may be influenced by obesity (false positive for inferior myocardial infarction, microvoltage, nonspecific ST-T changes) and PLWO may have impaired maximal exercise testing capacity (dyspnoea, mechanical limitations, left ventricular diastolic dysfunction), other modalities may be of interest in the evaluation of coronary artery disease in this population. Indeed, owing to impaired exercise tolerance because of mechanical and physiological limitations related to stress testing in patients at very high BMIs, a perfusion scan may be used instead of exercise testing for evaluating the presence of ischaemic heart disease.[109-111]

Evaluation of other conditions associated with obesity

Women living with obesity and symptoms of polycystic ovary syndrome should be screened for luteinising hormone, follicle-stimulating

Table 9. Medications that may contribute to weight gain*

Category	Class	Name
Antihyperglycaemics	Insulins	Insulin
	Thiazolidinedione	Pioglitazone
	Sulphonylureas	Gliclazide MR†[118,119]
		Glimepiride
		Gliclazide
Antidepressants[120]	Tricyclics	Amitriptyline
		Doxepin
		Imipramine
		Clomipramine
		Dothiepin
		Mirtazapine
	SSRIs: varied weight effects within the class, especially related to duration of treatment	Paroxetine
		Citalopram
		Escitalopram
	Lithium	Lithium
Antipsychotics[121, 122]		Sulpiride
		Clozapine
		Chlorpromazine
		Fluphenazine
		Risperidone
		Olanzapine
		Quetiapine
		Zuclopenthixol
		Clothiapine (unclear)
Anticonvulsants		Valproic acid
		Carbamazepine
		Gabapentin
Antiretrovirals	Rapidly evolving field[114]	
Corticosteroids	Oral steroids	Prednisone
		Prednisolone
		Cortisone
	Inhaled steroids	Ciclesonide
		Fluticasone
Hormone replacement therapy	Oestrogens	
	Progestogens	
Contraceptives	Depot-medroxyprogesterone acetate	
Antihistamines		Diphenhydramine
		Promethazine
Beta-blockers/antihypertensives		Propranolol
		Metoprolol
		Atenolol
		Clonidine

SSRIs = selective serotonin reuptake inhibitors.
*Note: The information in this table lists medications associated with increased risk for weight gain. However, as with all medication side-effects, there is significant individual variability with weight responses to medications, and some people may experience unexpected weight gain or weight loss that is atypical for a medication.
†Gliclazide MR is the sulphonylurea of choice according to the Society of Endocrinology, Metabolism and Diabetes of South Africa 2017 guidelines for the management of type 2 diabetes.[119]

hormone, total testosterone, dehydroepiandrosterone, prolactin, thyroid-stimulating hormone and 17-hydroxyprogesterone levels. Other endocrinopathies, including thyroid dysfunction, Cushing's syndrome or acromegaly, are not routinely recommended unless clinically warranted. We encourage age-appropriate cancer screening for PLWO, as they are at an increased risk and often have poor outcomes owing to lower rates of routine screening and delays in seeking treatment.

Screening for chronic kidney disease has always been controversial to some extent owing to inability to treat beyond controlling blood pressure as well as difficulty in proving cost-effectiveness. However, morbid obesity has recently been added as a condition where screening is advocated owing to the quicker decline in kidney function and risk of progression to end-stage kidney disease. Treating obesity has been shown to improve overall kidney function.[113]

The advancement and availability of antiretroviral treatment (ART) have improved the life expectancy of people living with HIV (PLWH) to near normal. However, PLWH are presenting with obesity after treatment initiation. This is especially the case in black African people, in women, and when treatment is started in the setting of advanced disease. The pathophysiological mechanisms are currently unclear, as are the long-term impact and cardiovascular consequences.[114] At present the priority would be studies to clarify the mechanisms of and approach to this significant problem. Focus should remain on: (*i*)

identifying ART regimens that are less obesogenic – this is a rapidly evolving field; (*ii*) promoting an overall healthy lifestyle; and (*iii*) consideration of specific treatments for PLWO (medication and/or surgery). Guidelines for HIV treatment are updated by the Southern African HIV Clinicians Society.[115]

Can one have a high BMI and be healthy?

This remains controversial. Attempts have been made to define the concept of health in the setting of obesity.[32] In epidemiological studies, the relationship between body fat (or BMI as a surrogate) and health impacts follows a U-shaped curve with health risks progressively increasing at both the lower and higher ends of the BMI spectrum.[116] Cardiovascular disease risk increases with increasing BMI, even in the absence of metabolic abnormalities.[117] In addition to metabolic complications (often with variable and inconsistent definitions used), mechanical and mental health impact needs to be considered. Finally, it should be noted that 'health' is often an illusion of limited testing – not an actual absence of disease processes.

Sarcopenic obesity

SO is defined as the coexistence of obesity, characterised by high body fat percentage, and sarcopenia, defined as low skeletal muscle mass accompanied by diminished muscle function.[123] This unique clinical condition poses a higher risk for metabolic diseases and functional impairments than either condition alone, owing to the synergistic effects of fat accumulation and muscle loss.

In 2022, the EASO and the European Society for Clinical Nutrition and Metabolism released a joint consensus statement on the definition and diagnostic criteria for SO for use in clinical settings.[124] They recommend three steps:

- **Screening.** Based on the concomitant presence of an elevated BMI/WC (using WHO cut-points) and surrogate indicators of sarcopenia (e.g. clinical symptoms, risk factors [including age >70 years, chronic/acute disease diagnosis and history of falls, fatigue or weakness]) and/or validated questionnaires (e.g. SARC-F [strength, assistance with walking, rising from a chair, climbing stairs, and falls] in older subjects).
- **Diagnosis.** Based on altered skeletal muscle function (using hand-grip strength or chair stand tests) and altered body composition of increased fat mass plus reduced muscle mass (assessed using appendicular lean mass adjusted to body weight by dual-energy X-ray absorption or skeletal muscle mass adjusted by weight by bioelectrical impedance analysis).
- **Staging.** To establish the severity of SO, consider the absence (Stage 1) or presence (Stage 2) of at least one complication attributable to altered body composition and skeletal muscle functional parameters (e.g. metabolic diseases, disability, cardiovascular and respiratory diseases).

Conclusion

Obesity is a complex chronic disease requiring a structured, compassionate and individualised approach to assessment. The Guideline Committee emphasises the use of validated frameworks – the 5As (Ask, Assess, Advise, Agree, Assist) to guide patient-centred discussions, and the 4Ms (Mental, Mechanical, Metabolic, Milieu/Monetary) to evaluate the multifaceted impact of excess adiposity. Initial screening involves anthropometric measures: BMI, a widely used but imperfect indicator of body fat, and WC, a better predictor of visceral fat and cardiometabolic risk. Limitations of the BMI include its inability to distinguish between fat and muscle or to capture fat distribution. Combining BMI with WC or WtHR improves risk stratification. Ethnic-specific cut-offs are crucial, especially in black African and Asian populations. A comprehensive assessment should also include a physical and mental health history, lifestyle factors and laboratory tests. The EOSS provides clinical staging beyond BMI, predicting health risks more effectively. A non-judgemental, stigma-free environment is essential to foster trust and engagement. Ultimately, the goal is to identify drivers and complications of obesity, tailor interventions, and support long-term, patient-directed care.

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