Diagnosis and Evaluation of Obesity

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PIN PAPDI Ilmu Penyakit Dalam
DEFINITION

“Obesity is defined as a chronic, relapsing, multifactorial, neurobehavioral disease, wherein an increase in body fat promotes adipose tissue dysfunction and abnormal fat mass physical forces, resulting in adverse metabolic, biomechanical, and psychosocial health consequences.”

*Obesity Medicine Association, 2017*
• **Adiposity-Based Chronic Disease (ABCD)** is a new diagnostic term for obesity that explicitly identifies a chronic disease, alludes to a precise pathophysiologic basis, and avoids the stigmata and confusion related to the term “obesity.”

• Key elements to further the care of patients using this new ABCD are:

  1. positioning lifestyle medicine in the promotion of overall health, not only as the first algorithmic step, but as the central action;
  2. standardizing protocols that comprehensively and durably address weight loss and management of adiposity-based complications;
  3. approaching patient care through contextualization to adapt evidence-based recommendations for different ethnicities, cultures, and socio-economics,
  4. developing evidence-based strategies for successful implementation, monitoring, and optimization of patient care over time.
Fig. 1. Translating adiposity and context into chronic disease burden

AACE/ACE, 2017
Definition...

• The term “adiposity” directly refers to adipocytes and adipose tissue, which can relate to quantity, distribution, and/or function of adipose tissue.

• The quantity of body fat mass can correlate with certain adverse clinical endpoints or adiposity-based complications but is inadequately reflected by BMI.

• The distribution of body fat also correlates with relevant pathophysiology such as insulin resistance and inflammation.

• The functional attributes of fat as well as involving other cytokine, hormonal, and humoral factors. Dysregulated secretion of these factors can affect multiple organ systems that correlate with adiposity-based complications.
Figure 2. Factors released by the adipocyte that can affect peripheral tissues. PAI, plasminogen activator inhibitor; TNF, tumor necrosis factor; RBP4, retinal binding protein 4.
ETIOLOGY OF OBESITY

- The causes of obesity remain elusive → a heterogeneous group of disorders.
- Role of gene versus environment.
- Specific genetic syndrome

*Obesity Medicine Association, 2017*
Role of gene versus environment

• Obesity is commonly seen in families, but Inheritance is usually not Mendelian, → difficult to distinguish the role of genes and environmental factors.
• Genes influence the susceptibility to obesity in response to specific diets and availability of nutrition.
• Environmental factors may contribute to the increasing obesity prevalence. Less well supported in humans are potential changes in gut flora with capacity to alter energy balance and a possible role for obesigenic viral infections.
Obesity as Multifactorial Disease

Mother
- Genetic inheritance

Father
- Epigenetic inheritance
- Familial/cultural/societal inheritance

Obesity and its complications
Other Specific Syndromes Associated with Obesity

• Cushing's Syndrome
  Obesity may be associated with excessive local reactivation of cortisol in fat.

• Hypothyroidism
  Much of the weight gain that occurs in hypothyroidism is due to myxedema.

• Insulinoma
  Patients with insulinoma often gain weight as a result of overeating to avoid hypoglycemic symptoms.

• Craniopharyngioma and Other Disorders Involving the Hypothalamus
SCREENING AND DIAGNOSIS

• Obesity is a state of excess adipose tissue mass.
• Three key anthropometric measurements → important to evaluate degree of obesity are:
  1. Weight
  2. Height
  3. Waist circumference (WC)
• Body mass index (BMI), which is calculated by:

$$\text{BMI (kg/m}^2\text{)} = \frac{\text{Weight (kg)}}{\text{Height}^2 \text{ (m}^2\text{)}}$$
Screening and Diagnosis..

• BMI is used since it provides an estimate of body fat and is related to risk of disease.
• BMI is recommended for use in clinical practice as a practical way to identify individuals who are overweight or obese.
• National Heart, Lung and Blood Institute (NHLBI) recommends that physicians also look at the following factors:
  ➢ Risk factors for diseases → hypertension and physical inactivity
  ➢ Waist circumference as a measure of abdominal adiposity

AAFP, 2013
CLASSIFICATION OF OVERWEIGHT AND OBESITY
by
Body Mass Index (BMI), Waist Circumference (WC), and Associated Disease Risk


**BASED on BMI (kg/m²) and OBESITY CLASS**

<table>
<thead>
<tr>
<th>WEIGHT CLASS, BMI, and OBESITY CLASS</th>
<th>BASED ON WC: INCREASED WC CAN BE A MARKER FOR INCREASED RISK EVEN PERSONS OF NORMAL WEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>INDONESIAN-BMI</td>
<td>MEN &lt; 102 cm WOMEN &lt; 88 cm</td>
</tr>
<tr>
<td>WESTERN-BMI</td>
<td>MEN ≥ 102 cm WOMEN ≥ 88 cm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>UNDERWEIGHT</th>
<th>NORMAL</th>
<th>OVERWEIGHT</th>
<th>OBESITY CLASS</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 18.5</td>
<td>18.5 – 22.9</td>
<td>23.0 – 24.9</td>
<td>25.0 – 34.9</td>
</tr>
<tr>
<td>NORMAL</td>
<td>18.5 – 22.9</td>
<td>23.0 – 24.9</td>
<td>25.0 – 29.9</td>
</tr>
<tr>
<td>OVERWEIGHT</td>
<td>18.5 – 22.9</td>
<td>23.0 – 24.9</td>
<td>25.0 – 29.9</td>
</tr>
<tr>
<td>OBESITY</td>
<td>18.5 – 22.9</td>
<td>23.0 – 24.9</td>
<td>25.0 – 29.9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WC (cm), Normal: MEN &lt; 90, WOMEN &lt; 80</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INCREASED</strong></td>
</tr>
<tr>
<td><strong>HIGH</strong></td>
</tr>
<tr>
<td><strong>VERY HIGH</strong></td>
</tr>
<tr>
<td><strong>EXTREMELY HIGH</strong></td>
</tr>
</tbody>
</table>

*) RISK for T2DM, HYPERTENSION, and CARDIOVASCULAR DISEASE

Seidell (2010): ① WC Alone Could Replace Both WHR and BMI as a Single Risk Factor for All-Cause Mortality
② WC and WHR seem to be Better Indicators of All-Cause Mortality than BMI
Waist circumference (WC)

- WC indicates abdominal obesity.
- Excess abdominal fat is a risk factor for developing heart disease and other obesity related diseases. WC is independently associated with higher risk for DM and cardiovascular diseases.
- Strictly, the WC is measured at a level midway between the lowest rib and the iliac crest.
**Ethnic Specific Values of Waist Circumference (IDF, 2005)**

<table>
<thead>
<tr>
<th>Country/Ethnic Group</th>
<th>Waist Circumference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europids</td>
<td>Male</td>
</tr>
<tr>
<td></td>
<td>Female</td>
</tr>
<tr>
<td>South Asians</td>
<td>Male</td>
</tr>
<tr>
<td></td>
<td>Female</td>
</tr>
<tr>
<td>Chinese</td>
<td>Male</td>
</tr>
<tr>
<td></td>
<td>Female</td>
</tr>
<tr>
<td>Japanese</td>
<td>Male</td>
</tr>
<tr>
<td></td>
<td>Female</td>
</tr>
<tr>
<td>North Americans</td>
<td>Male</td>
</tr>
<tr>
<td></td>
<td>Female</td>
</tr>
<tr>
<td>Ethnic South and Central Americans</td>
<td></td>
</tr>
<tr>
<td>Sub-Saharan Africans</td>
<td>Use South Asian recommendations until more specific data are available</td>
</tr>
<tr>
<td>Eastern Mediterranean and Middle East (Arab)</td>
<td>Use European data until more specific data are available</td>
</tr>
</tbody>
</table>
Metabolic Syndrome (MetS)

- MetS is a constellation of risk factors, including abdominal obesity, atherogenic dyslipidemia, elevated blood pressure and plasma glucose levels, that increase the risk of cardiovascular diseases.
- The predominant underlying risk factors are abdominal obesity and insulin resistance.
- Although many patients may be genetically susceptible, it rarely develops in the absence of obesity and physical inactivity.
- Consequently, the key emphasis in management is mitigation of modifiable risk factors, specifically obesity, physical inactivity, atherogenic diet, and smoking, through lifestyle changes.

AAFP, 2013
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>To be identified as Mets</td>
<td>Any three or more of the following five components</td>
<td>Central obesity plus any two other factors</td>
<td>Any three or more of the following five components</td>
</tr>
<tr>
<td>Waist circumference</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>&gt;102 cm</td>
<td>≥90 cm for Chinese men</td>
<td>≥90 cm for Asian men</td>
</tr>
<tr>
<td>Women</td>
<td>&gt;88 cm</td>
<td>≥80 cm for Chinese women</td>
<td>≥80 cm for Asian women</td>
</tr>
<tr>
<td>TG</td>
<td>≥1.70 mmol/L (150 mg/dL)</td>
<td>≥1.70 mmol/L (150 mg/dL) mg/dL or specific treatment for this lipid abnormality</td>
<td>≥1.70 mmol/L (150 mg/dL) or drug treatment for elevated TG</td>
</tr>
<tr>
<td>HDL-C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>&lt;1.03 mmol/L (40 mg/dL)</td>
<td>&lt;1.03 mmol/L (40 mg/dL) in males or specific treatment for this lipid abnormality</td>
<td>&lt;1.03 mmol/L (40 mg/dL) in men or drug treatment for reduced HDL-C</td>
</tr>
<tr>
<td>Women</td>
<td>&lt;1.30 mmol/L (50 mg/dL)</td>
<td>&lt;1.30 mmol/L (50 mg/dL) in women, or specific treatment for this lipid abnormality</td>
<td>&lt;1.30 mmol/L (50 mg/dL) in women or drug treatment for reduced HDL-C</td>
</tr>
<tr>
<td>Blood pressure</td>
<td>≥130/85 mm Hg</td>
<td>SBP ≥130 or DBP ≥85 mm Hg, or treatment of previously diagnosed hypertension</td>
<td>≥130 mm Hg SBP or ≥85 mm Hg DBP or on antihypertensive drug treatment in a patient with a history of hypertension</td>
</tr>
<tr>
<td>Fasting glucose</td>
<td>≥6.1 mmol/L (110 mg/dL)</td>
<td>≥5.6 mmol/L (100 mg/dL), or previously diagnosed type 2 diabetes</td>
<td>≥5.6 mmol/L (100 mg/dL) or drug treatment for elevated glucose</td>
</tr>
</tbody>
</table>

doi:10.1371/journal.pone.0091578.t001
EVALUATION

1. Focused obesity related history
2. Physical examination to determine the degree and type of obesity
3. Comorbid condition
4. Fitness level
5. The patient’s readiness to adopt lifestyle change
1. Focused obesity related history

- What factors contribute to the patient’s obesity?
- How is the obesity affecting the patient’s health?
- What is the patient’s level of risk from obesity?
- What are the patient’s goal and expectations?
- What kind of help does the patient need?
Medications That Promote Weight Gain

Assessment of the obese patient should include a complete medication history. Many agents, including beta blockers, corticosteroids, diabetes drugs, and psychoactive drugs, are known to cause weight gain. Most of these medications cause weight gain by increasing appetite. Prescribing these medications may be unavoidable, but patients should be told that weight gain is a side effect and encouraged to take steps to prevent it (e.g., increase physical activity).

<table>
<thead>
<tr>
<th>Anticonvulsants</th>
<th>Antihypertensives</th>
<th>Antipsychotics</th>
<th>Corticosteroids</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valproic acid</td>
<td>Clonidine</td>
<td>Chlorpromazine</td>
<td>Psychotropics</td>
</tr>
<tr>
<td>Carbamazepine</td>
<td>Guanabenz</td>
<td>Thiothixene</td>
<td>Lithium</td>
</tr>
<tr>
<td><strong>Antidepressants</strong></td>
<td><strong>Methyldopa</strong></td>
<td><strong>Haloperidol</strong></td>
<td><strong>Sulfonylureas</strong></td>
</tr>
<tr>
<td>Amitriptyline</td>
<td>Prazosin</td>
<td>Olanzapine</td>
<td>Glipizide</td>
</tr>
<tr>
<td>Imipramine</td>
<td>Terazosin</td>
<td>Clozapine</td>
<td>Glyburide</td>
</tr>
<tr>
<td>Phenelzine</td>
<td>Propranolol</td>
<td>Risperidone</td>
<td></td>
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<tr>
<td></td>
<td>Nisoldipine</td>
<td>Quetiapine</td>
<td></td>
</tr>
</tbody>
</table>

Adapted from Kolasa KM, Collier DN, Cable K. Weight loss strategies that really work. J Fam Pract. 2010;59(7):378-385.
2. Physical and laboratory examination

• Measure weight and height (from which BMI is calculated), WC, blood pressure (appropriate size cuff).
• Assess the presence and impact of obesity-related diseases (diabetes, hypertension, dyslipidaemia; cardiovascular, respiratory and joint diseases; non-alcoholic fatty liver disease (NAFLD), sleep disorders etc.
• Look for the presence of acanthosis nigricans as a sign of insulin resistance.
Laboratory Examinations

- Fasting blood glucose
- Serum lipid profile (total, HDL and LDL cholesterol, triglycerides)
- Uric acid
- Thyroid function (thyroid-stimulating hormone (TSH) level)
- Liver function (hepatic enzymes)
- Cardiovascular assessment, if indicated {RBP}
- Endocrine evaluation if Cushing’s syndrome or hypothalamic disease suspected
- Liver investigation (ultrasound, biopsy) if abnormal liver function tests suggest NAFLD or other liver pathology
- Sleep laboratory investigation for sleep apnoea.
Body Composition Analysis

- Development of devices and equipment to more accurately measure body fat, including dual energy X-ray absorptiometry (DEXA), air-displacement plethysmography (BodPod), bioimpedance analysis (BIA) and body scanning procedures – replacing the cumbersome underwater weighing –, it has become possible to more easily classify individuals according to the degree of body fat, independently of BMI.

- This approach has also drawn attention to the function of non-adipose tissue – that is, fat-free mass (FFM) or lean mass – and the contribution made by FFM to physiological functioning, pathology and well-being.

- Assessment of body composition is not essential for the management of obesity in routine clinical practice.
Dual energy X-ray absorptiometry (DEXA)
Anthropometric Component of the Medical Diagnosis of Obesity

Screening (R3, R7) → Annual BMI

Diagnosis (R4, R5, R6, R7, R8, R29)

- BMI ≥ 25 kg/m²
- BMI ≥ 23 kg/m² for some ethnicities

Clinical Component of Diagnosis R29

1. **Clinical Interpretation of BMI (R4):** Assure elevated BMI is indicative of excess adiposity by assessing: age, gender, muscularity, hydration status, edema, third space fluid collection, large tumors, sarcopenia
2. **Waist circumference if BMI < 35 (R6, R8):** Adds information pertaining to cardiometabolic disease risk; use gender and ethnicity-specific cut-off values
3. **Can consider body composition technologies (R5):** E.g., bioelectrical impedance, air/water displacement plethysmography, or dual-energy x-ray absorptiometry scan

**Abbreviation:** BMI = body mass index.
3. Physical Fitness

- These observations highlight the importance of taking an exercise history during examination as well as emphasizing physical activity as a treatment approach.
4. Comorbid Conditions

- The evaluation of comorbid conditions should be based on presentation of symptoms, risk factors and index of suspicion.
- All patients should have lipid panel and blood glucose measurement along with blood pressure determination.
Obesity and comorbidities

- Pulmonary disease
  - Abnormal function
  - Obstructive sleep apnea
  - Hypoventilation syndrome

- Nonalcoholic fatty liver disease
  - Steatosis
  - Steatohepatitis
  - Cirrhosis

- Gall bladder disease

- Gynaecologic abnormalities
  - Abnormal menses
  - Infertility
  - Polycystic ovarian syndrome

- Osteoarthritis

- Skin

- Idiopathic intracranial hypertension

- Stroke

- Cataracts

- Coronary heart disease
  - Diabetes
  - Dyslipidaemia
  - Hypertension

- Severe pancreatitis

- Cancer
  - Breast, uterus, cervix, colon, oesophagus, pancreas, kidney, prostate

- Phlebitis
  - Venous stasis

- Gout
Assessment include patient’s motivation and support, stressful life events, physiciantric status, time availability and constraints and appropriateness of goals and expectations.

Readiness can be viewed as the balancing of 2 opposing forces:
1. Motivation ➔ patient’s desire to change
2. Resistance ➔ patient’s resistance to change
Algorithm for the assessment and stepwise management of overweight and obese adults. *BMI and WC cut-off points are different for some ethnic groups*

1. **Determine degree of overweight and obesity**
   - Measure height (cm) and weight (kg) and calculate BMI (kg/m²)
   - Measure waist circumference (WC) cm

2. **If BMI ≥ 25 kg/m²* or WC ≥ 94 cm for men* or WC ≥ 80 cm for women***

3. **Assess**
   - Presenting symptoms and underlying causes
   - Co-morbidities and health risks
   - Weight loss history
   - Lifestyle (nutrition and physical activity)
   - Eating behaviour
   - Depression and mood disorders
   - Chronic psychological stress
   - Potential of weight loss to improve health
   - Motivation to change
   - Barriers to weight loss

4. **Set goals and propose realistic, individualised and sustainable lifestyle changes at the long term**
   - **Weight loss goal**
     - 5–15% of body weight or 0.5–1.0 kg/week

5. **Considering referring to obesity specialist services or Collaborating Centres for Obesity Management (COMs)**
   - If the person has complex disease states or needs that can not be managed in primary or secondary care
   - If the underlying causes of obesity need to be assessed
   - If conventional treatment has failed
   - If specialist interventions such as VLCD is needed
   - If bariatric/metabolic surgery is needed
European Guidelines for Obesity Management in Adults, 2015

Lifestyle (nutrition and physical activity)
- Eating behaviour
- Depression and mood disorders
- Chronic psychological stress
- Potential of weight loss to improve health
- Motivation to change
- Barriers to weight loss

Set goals and propose realistic, individualised and sustainable lifestyle changes at the long term
Weight loss goal
5–15% of body weight or 0.5–1.0 kg/week

Management
Nutrition
- Reduce energy intake by 500–1,000 kcal/day
Physical activity
- Initially at least 150 min/week moderate aerobic exercise combined with 1–3 sessions/week resistance exercise
Cognitive behaviour therapy
Pharmacotherapy
- BMI ≥ 30 kg/m² or BMI ≥ 27 kg/m² with co-morbidities
- Adjunct to lifestyle modification
Bariatric/metabolic surgery
- BMI ≥ 40 kg/m² or BMI between 35.0–39.9 kg/m² + co-morbidities or BMI between 30.0-34.9 kg/m² with type 2 diabetes on individual basis. Consider if other weight loss attempts fail; requires lifelong medical monitoring
- Prevention and treatment of co-morbidities

Considering referring to obesity specialist services or Collaborating Centres for Obesity Management (COMs)
- If the person has complex disease states or needs that cannot be managed in primary or secondary care
- If the underlying causes of obesity need to be assessed
- If conventional treatment has failed
- If specialist interventions such as VLCD is needed
- If bariatric/metabolic surgery is needed

Weight loss goal is achieved

Assess effect on co-morbidities, weight maintenance and weight regain
- Regular monitoring of weight, BMI and WC
- Reinforce lifestyle modification
- Address other risk factors

European Guidelines for Obesity Management in Adults, 2015
EVALUATION

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### SUMMARY

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<thead>
<tr>
<th>Assess</th>
<th>Severity of obesity with calculated BMI, waist circumference, and comorbidities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advise</td>
<td>Diagnosis of overweight, obese, or severe obesity</td>
</tr>
<tr>
<td></td>
<td>Caloric deficit needed for weight loss</td>
</tr>
<tr>
<td>Agree</td>
<td>If patient is not ready, discuss at another visit</td>
</tr>
<tr>
<td></td>
<td>If patient is motivated and ready to change, develop treatment plan</td>
</tr>
<tr>
<td>Assist</td>
<td>Provide a diet plan, physical activity guide, and behavior-modification guide</td>
</tr>
<tr>
<td></td>
<td>Provide Web resources based on patient interest and need</td>
</tr>
<tr>
<td>Arrange</td>
<td>Follow-up appointments to meet patient needs</td>
</tr>
<tr>
<td></td>
<td>Referral to registered dietitian and/or behavioral specialist for individual counseling/monitoring or weight-management class</td>
</tr>
<tr>
<td></td>
<td>Referral to surgical program</td>
</tr>
<tr>
<td></td>
<td>Maintenance counseling to prevent relapse or weight regain</td>
</tr>
</tbody>
</table>
Thank You