Obesity
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434 Medicine Team

MED 434 ICINE

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Objectives:

- **Definition**
- **Pathogenesis of obesity**
- **Factors predisposing to obesity**
- **Complications of obesity**
- **Assessment and screening of obesity**
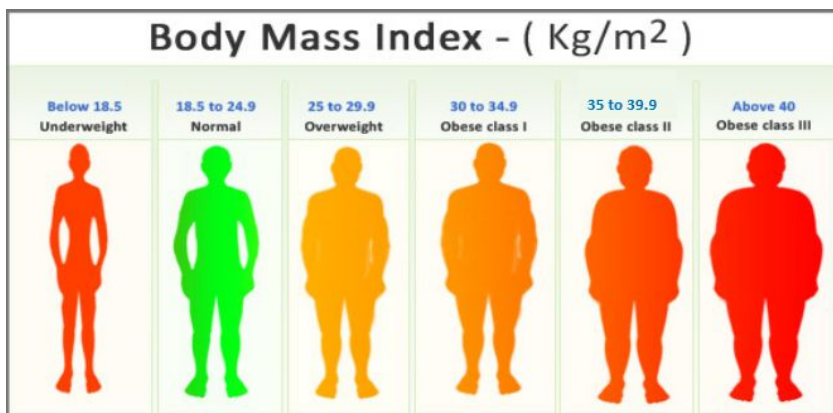- **Management of obesity**

Editing file

Definition of obesity

✓ Obesity means excess accumulation of fat in the body **20% or more** over an individual's ideal body weight

✓ Once it develops it is difficult to 'cure' and usually persists throughout life

How to diagnose obesity
Obesity is usually diagnosed on the basis of calculation of

❖ **Body mass index [BMI] Calculation (kg/m2) (more important):**

Weight (Kg)

Height squared (meters)

IMPORTANT
Obesity Classification-BMI

➢ **according to classification of obesity and looking at the risk factor you decided which to start the medical therapy or send the patient to surgery**

❖ **Measurement of waist-hip ratio**

Waist circumference

Hip circumference
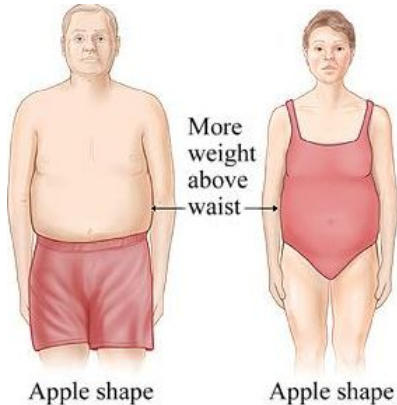
Waist circumference of ≥40 in in men and ≥35 in in women is considered elevated and corresponds with an increased cardiometabolic risk.

What your Waist-to-Hip Ratio Means

WOMEN	HEALTH RISK	BODY SHAPE
0.80 or below	Low	Pear
0.81 to 0.85	Moderate	Avocado
0.85+	High	Apple
MEN	HEALTH RISK	BODY SHAPE
0.95 or below	Low	Pear
0.96 to 1.0	Moderate	Avocado
1.0+	High	Apple

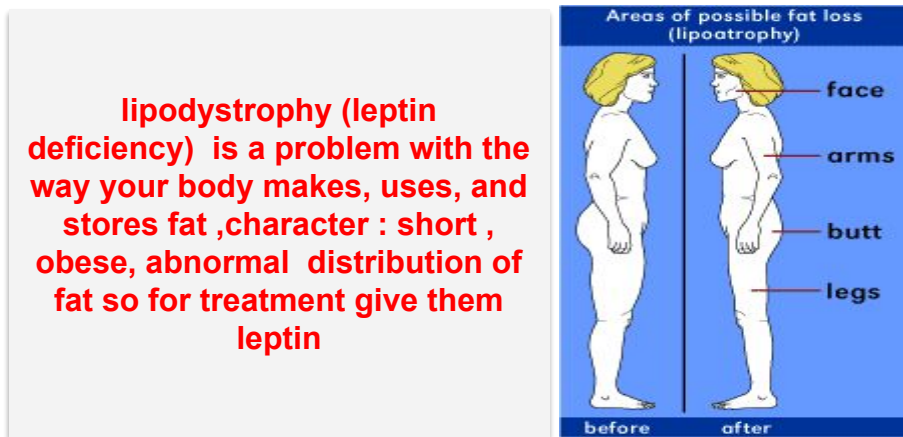| Classification of obesity as per fat distribution	
Gynoid (below the waist, females	**Android (or abdominal or central, males)**
• **Collection of fat on hips and buttocks** • **pear-shaped** • **Associated with mechanical problems** Pear shape	• **Collection of fat mostly in the abdomen (above the waist)** • **apple-shaped** • **Associated with insulin resistance and heart disease** Apple shape Apple shape

Obesity-prevalence

✓ **Well recognized as a serious and growing public health problem**

✓ **WHO estimates that over 1.7 billion people around the world are overweight, 310 million are obese**

✓ **Rates of obesity have tripled in the last 20 years in the developing world**

✓ **Female more than male in U.S**

✓ **In Saudi Arabia :**

❖ **Prevalence of overweight was higher in male than female**

❖ **Prevalence of obesity was higher in female than male**

✓ **The prevalence of overweight and obesity was higher amongst a group of married women than among a group of single women**

✓ **higher in home-mother than working mother**

✓ **Risk factors that help in increasing the prevalence are : Dietary habits, sedentary lifestyle, high socioeconomic status**
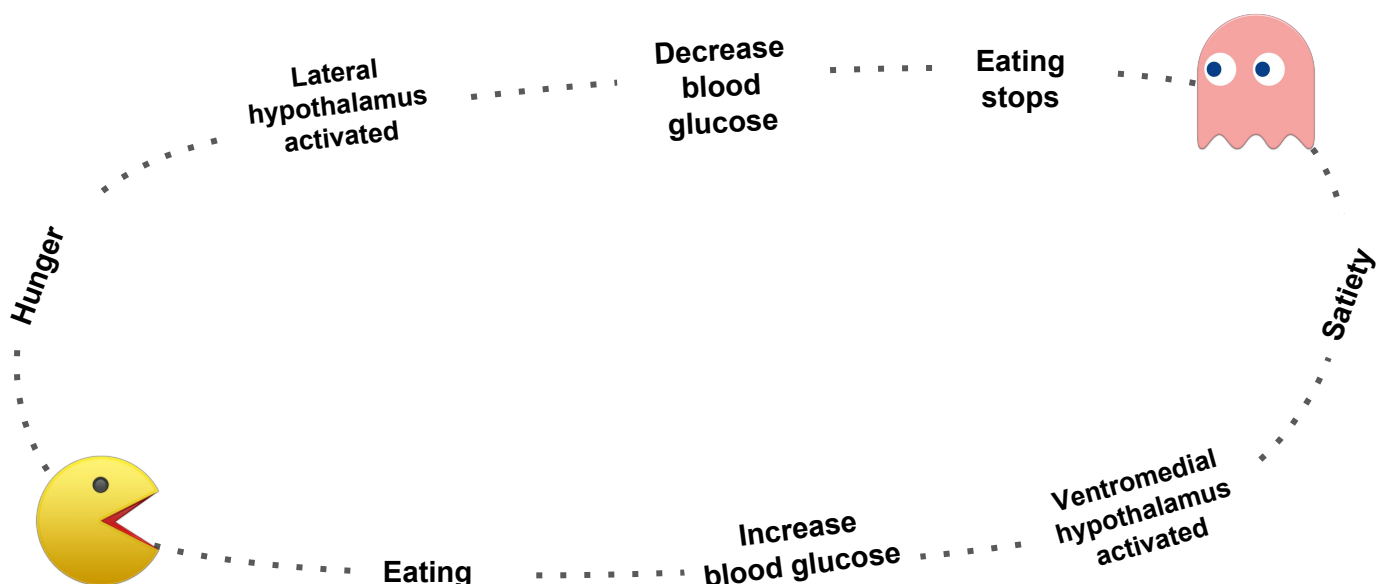
Mechanism Of Obesity

❖   Food intake and utilization is regulated:
1. **Hormones**
2. **Neurotransmitters**
3. **Central nervous system**
❖   **Signals from peripheries are carried out by neurotransmitters and hormones to CNS in presence or absence of food**
❖   **Signal from fat by hormone leptin(from adipocytes) to hypothalamus to reduce food intake and increase sympathetic activity and energy expenditure (note in obese people they have a high level of leptin but the receptor is resisting it).**

lipodystrophy (leptin deficiency) is a problem with the way your body makes, uses, and stores fat ,character : short , obese, abnormal distribution of fat so for treatment give them leptin

Areas of possible fat loss (lipoatrophy)
face
arms
butt
legs
before   after

❖   **Gastric distension and contraction send signal for satiety and hunger**
❖   **Fall in blood sugar send signals to CNS for hunger**
❖   **Sympathetic activity from food thermogenesis leads to reduce food intake**

Role of hypothalamus in mediation of hunger and satiety

1. **Hunger center** ➞ **lateral hypothalamus**
2. **Satiety center** ➞ **ventromedial hypothalamus**

Lateral hypothalamus activated · · · · Decrease blood glucose · · · · Eating stops

Hunger

Satiety

Eating · · · · Increase blood glucose · · · · Ventromedial hypothalamus activated

Obesity-Pathogenesis

- **More in and less out = weight gain**
- **More out and less in = weight loss**

✓ **Hypothalamus:** Control center for hunger and satiety

✓ **Endocrine disorders:**

Ghrelin	Leptin from adipocytes
• Secreted in the stomach • Acts on hypothalamus to stimulate appetite • Peak before meal and decrease after	Acts on hypothalamus to decrease food intake and stimulate energy expenditure

❖ **Obesity – An imbalance in energy intake and energy expenditure.**

❖ **Obesity: How does it happen?**

✓ Calories consumed not equal calories used Over along period of time

✓ Due to combination of several factors:
1. Individual behaviors (10 % to BMI)
2. Social interaction
3. Environmental factors
4. Genetic (40 % to BMI and adiposity)

Fats 25%
Proteins 20%
Carbohydrates 55%
BMR 60-65%
Thermic effect 10%
Physical activity 25-30%

Energy intake   **Energy expenditure**
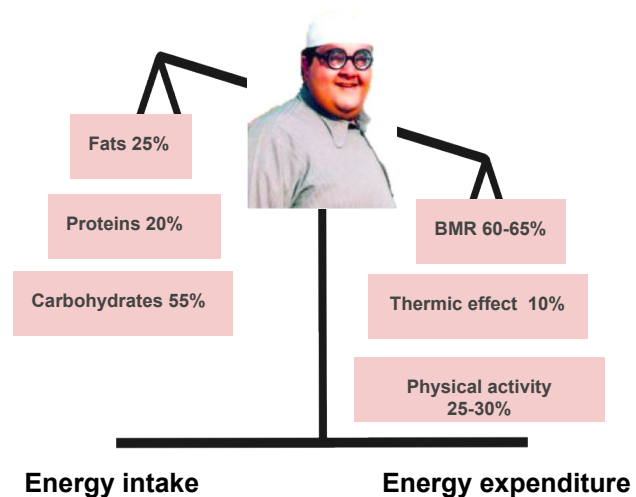
Factors predispose to obesity	
Lifestyle	- Sedentary lifestyle lowers energy expenditure 52 % of Saudi women are inactive, < 19 % doing regular physical activity - Prolonged TV watching
Sleep deprivation	< 7 hours of sleep > obesity ↓ sleep > ↓ leptin, ↑↑ Ghrelin > ↑ appetite and CHO eating at night **(carp eater syndrome)**
Cessation of smoking	- Average weight gain is 4 kg - Due to nicotine withdrawal - Can be prevented by calories restriction and exercise program
Social influences	- Obese parents most likely to have obese children - Obese individuals are surrounded by obese friends
Diet	- Overeating, frequency of eating, high fat meal, fast food(> 2 fast food/wk) - Night eating syndrome: if > 25 % of intake in the evening
Genetic disorders with obesity	- Prader- Willi syndrome - Bardet-Biedl syndrome - Carpenter's syndrome - Cohen syndrome
Endocrine disorders	- Cushing's syndrome - Hypothalamic tumors/inflammation/trauma - Hypothyroidism - Polycystic ovary syndrome - Insulunoma
Drugs	- Antipsychotic (especially atypical agents) - Trycyclic antidepressant - Sulfonylureas - insulin - Bblockers - Corticosteroids - Estrogen - progestins

Health consequences of obesity

✓ Greater BMI is associated with increased death from all causes and from CVD
✓ Although overweight associated with decreased survival
✓ Each 5 kg/m2 increase in BMI was associated with significant increase in mortality related to:
1. **IHD and stroke**
2. **Diabetes and non-neoplastic kidney disease**
3. **Different types of cancer**
4. **Respiratory disease**

✓ Obesity is associated with reduction in life expectancy during adulthood

✓ Increase in BMI is associated with increase in morbidity and CVD risk factors

❖   **Complications associated with obesity:**

Cardiovascular	Coronary artery disease, stroke, CHF, HTN, Dysrhythmias, PE
Pulmonary	Obstructive sleep apnea and obesity hypoventilation syndrome
Endocrine	Metabolic syndrome, insulin resistance, dyslipidemia, DM type 2, POC
Gastrointestinal	Gallstones, abdominal hernia, non-alcoholic fatty liver disease, GERD
Bone, joint and skin	Osteoarthritis, low back pain, gout, acanthosis nigricans
Vascular	Venous stasis
Neurologic	Pseudotumor cerebri
Gynecologic/ Genitourinary	Stress incontinence, Sexual dysfunction, abnormal menses

Acanthosis nigricans : Obesity related glomerulopathy, focal segmental glomerulosclerosis associated with insulin resistance (hyperinsulinemia) and risk of DM

Health consequences of obesity

✓ **For both men and women, increasing BMI was associated with higher death rates due to the following cancers:**
1. **Esophagus**
2. **Colon and rectum**
3. **Liver**
4. **Gallbladder**
5. **Pancreas**
6. **Kidney**
7. **Non-Hodgkin lymphoma**
8. **Multiple myeloma**

✓ **Increase cost rate on obesity**
✓ **Increase number of sick leaves for obese subjects**
✓ **Increase number of hospitalization**
✓ **Early age of retirement**
✓ **Increase cost of drugs for DM, CVD, GI disease**
✓ **Poor quality of life due to psychosocial issues**

Assessment and screening	
➤ screening of adults for obesity is important ➤ With significant increase in morbidity and mortality ➤ Although not in routine practice but it should be as a part of periodic health assessment	
BMI measurement <u>to classify them</u>	✓ Reliable, easy, correlated with percentage of body fat ✓ Guide for selection of therapy ✓ Varies among different races ✓ Recent WHO classification applied to whites, hispanics and black ✓ Asians are different: overweight BMI 23-24.9 kg/m2 and obesity by BMI > 25 kg/m2
Waist circumference	✓ Measurement of central adiposity ✓ Associated with increased risk of morbidity and mortality ✓ Reflects visceral adiposity ✓ Increase risk of heart disease, DM, hypertension, dyslipidemia ✓ Important in identifying the risk in BMI 25-34.9 kg/m2 ✓ Risk increase with WC > 88 cm in women, 102 cm in men ✓ Not useful if BMI > 35 kg/m2 ✓ In Asian population risk starts with WC > 80 cm in Asian women and > 90 cm in Asian men ✓ In adults with a BMI of 25 to 34.9 kg/m2, a waist circumference greater than 102 cm (40 in) for men and 88 cm (35 in) for women is associated with a greater risk of hypertension, type 2 diabetes, and dyslipidemia, and CHD

Assessment of risk status	**Identify risk factors:** 1. **After BMI and WC, history** 2. **BP measurement** 3. **Fasting lipid profile** 4. **Fasting blood sugar** **Identify comorbidity:** 5. **Help to classify the risk of mortality** 6. **Presence of atherosclerosis, DM2, HTN, dyslipidemia** 7. **Sleep apnoea** 8. **GI, osteoarthritis, gout** **CVD risk factors that would affect mortality risk:** 9. **HTN** 10. **DM2 (fasting blood glucose 110-125 mg/dl)** 11. **Smoking** 12. **Dyslipidemia (low HDL < 35 or high LDL> 130)** 13. **Family history of premature CAD** 14. **Physical inactivity** **other risk factors:** ● **Age of onset of obesity (childhood worse prognosis)**
Identify the etiology: 1. **Medical history is important** 2. **Age at onset of obesity, course of it** 3. **Eating habits, activity habits** 4. **Past medical history** 5. **Medications** 6. **Cessation of smoking history** 7. **Ethnic background** 8. **Family history of obesity**	

Why is it important to look at it?
•It is a common disease with significant morbidity and mortality and without screening many high risk patients may not receive counseling about health risks, lifestyle changes, obesity treatment options, and risk factor reduction.
•Screening with BMI, waist circumference, and risk factor assessment is inexpensive and available to nearly all clinicians.
•Weight loss is associated with a reduction in obesity-associated morbidity

Advantages of weight loss
•Weight loss of 0.5-9 kg (n=43,457) associated with 53% reduction in cancer-deaths, 44% reduction in diabetes-associated mortality and 20% reduction in total mortality
•Survival increased 3-4 months for every kilogram of weight loss
•Reduced hyperlipidemia, hypertension and insulin resistance
•Improvement in severity of diseases
•Person feels 'fit' and mentally more active

Treatment goals

- **Prevention of further weight gain**
- **Weight loss to achieve a realistic, target BMI**
- **Long-term maintenance of a lower body-weight**

How much weight loss is significant?
A 5-10% reduction in weight (within 6 months) and weight maintenance should be stressed in any weight loss program and contributes significantly to decreased morbidity.

Management of obesity (Important)

Lifestyle	**Initial goal: 10% weight loss: Significantly decreases risk factors** **Rate of weight loss:** 1.　　1-2 pound per week 2.　　Reduction of calories intake 500-1000 calories/day **Slow weight loss is preferred approach** 3.　　Rapid weight loss is almost always followed by rapid weight gain 4.　　Rapid weight loss is associated with gallstones and electrolytes abnormalities **Aim for 4-6 months for weight loss** **Average is 8-10 kg loss** **After 6 months, weight loss is difficult** 　1.　Ghrelin and leptin effect 　2.　Energy requirement decreased as weight decreases • **Set goals for weight maintenance for next 6 months then reassess**
	A) Diet ● **Indicated for all with BMI > 30 and those with BMI 25- 30 with comorbidities** ● **Teaching about food composition (fat, CHO, protein)** ● **Calories contents of food by reading labels** ● **Type of food to buy and to prepare** ● **Low calories diet-portion controlled** ● **Low fat diet** ● **Low CHO diet** ● **Mediterranean diet** ● **Average for women: 1000-1200 kcal/day** ● **Average for men: 1200-1600 kcal/day** ● **Adjust based on activity and weight** ● **then weight maintenance** ● **How much should people eat?**

Male	Age 20-49	2900 kcal/day
	Age 50 +	2500 Kcal/day
Female	Age 20-49	2300 Kcal/day
	Age 50+	1900 Kcal/day

|	
Management of obesity (important) cont.	
Lifestyle	**B) Physical activity:** • As integral part of weight loss • Reduce risk of DM, heart disease, hypertension • Alone is not helping • Help to prevent weight regain • Start slowly 1. Change of daily living activities 2. Avoid injury • Increase intensity and duration gradually • Long –term goal: 1. 30-45 min or more of physical activity daily 2. 5 or more days per week 3. Burn 1000+ calories per week **C) Behavioral strategies:** • Keep agenda of diet and activity 1. Set specific goals regarding: diet, activity related behavior 2. Reminder system 3. Reward yourself 4. Don't deprive yourself, watch portion • Track improvement: Weight measurement on regular basis

Pharmacotherapy (have many side effect)	• Indicated in: (Important)
	1. BMI > 30
	2. BMI 27-30 with comorbidities
	3. Should not be used for cosmetic weight loss
	4. Used only when 6 months trial if weight and exercise fail to achieve weight loss
	• Sympathomimetic:
	      Stimulate release of norepinephrine or inhibits its reuptake by nerve terminals
	      Block serotonin and NE reuptake (sibutramine)
	      Directly act upon adrenergic receptor
	      Reduced appetite by early satiety
	• Pancreatic lipase inhibitor:
	      Orlistat: inhibits fat absorption
	• Antidepressant
	• Antiepileptic
	• Diabetic drugs: metformin (is not drug for losing weight but some people use it for it side effect which is vomiting so they lose weight)

Management of obesity (**Important**) cont.	

Weight loss Surgical therapy
 	
Roux-en-Y Gastric Bypass (RNY)
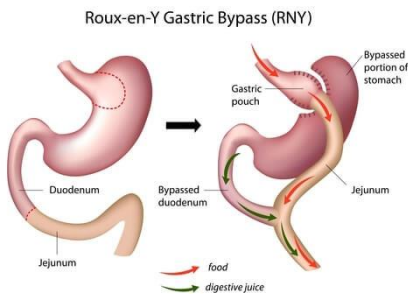 	
	• **Indicated in:**
	1. **Well- informed and motivated patients**
	2. **Have BMI > 40**
	3. **Acceptable risk of surgery**
	4. **Failed previous non-surgical method**
	5. **BMI > 35 with comorbidities like diabetes, sleep apnea, osteoarthritis, cardiomyopathy**
	6. **BMI 25-29.9 with WC > 102 cm in male and 88 cm in women**
	7. **Age 18-60**
	8. **Psychologically stable**
	• **Types:**
	Restrictive-type of surgery:
	    Vertical banded-gastroplasty
	    Gastric banding
	Malabsorptive and restrictive:
	    Roux-en-Y gastric bypass
	    Biliopancreatic diversion
	Follow up is crucial

✓ **General characters:**
1. **Obesity is associated with an increased risk of hypertension , dyslipidemia ,DM ,Cardiovascular disease and osteoarthritis**
2. **Causes:**
1. **Result of chronic mismatches in energy balance (energy intake > energy expenditure)**
2. **Energy balance determined by several variables, including metabolic rate, appetite, diet, and physical activity.**
3. **These factors that determine energy balance are influenced by both genetic traits and environmental behaviors (excessive food intake, decreased physical activity.)**
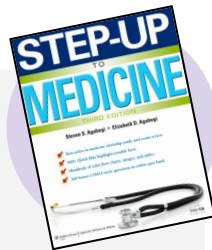4. **Neuroendocrine disorders such as Cushing syndrome and polycystic ovarian syndrome (PCOS)**

✓ **Treatment:**

✓ **Pharmacotherapy:**
1. **Medications if dieting and physical exercise fail. Orlistat (pancreatic lipase inhibitor), lorcaserin (selective 5-HT2C receptor agonist), and combination phentermine and topiramate (exact mechanism of action unknown), have shown some benefit.**

❖ **Surgery:**
1. **Bariatric surgery remains the most effective treatment for obesity. It has been associated with long-term weight loss, improvement in obesity-related complications, and decreased mortality.**
2. **Bariatric surgery should only be attempted in patients with a BMI of 40 kg/m2 or greater who have failed a sufficient exercise and diet regimen (regardless of use of obesity medication) and who present with obesity-related comorbid conditions (such as hypertension, diabetes mellitus, and hyperlipidemia).**

Etiologic classification of obesity

Iatrogenic	- Drugs that causes weight gain - Hypothalamic surgery
Dietary obesity	- Infant feeding practice - progressive hyperplastic obesity - Frequency of eating - High fat diet - Overeating
Neuroendocrine obesities	- Hypothalamic obesity - seasonal affective disorder - Cushing's syndrome - Polycystic ovary syndrome - Hypogonadism - Growth hormones deficiency - Pseudohypoparathyroidism
Social and behavioral factors	- Socioeconomic status - Ethnicity - Psychological - Restrained eaters - night eating syndrome - Binge-eating
Sedentary lifestyle	- Enforced inactivity (Post-operative) - Aging
Genetics	- Autosomal recessive traits - Autosomal dominant traits - X-linked traits - Chromosomal abnormalities
Other	- Low birth weight

Drugs approved by the FDA for treatment of obesity

Pancreatic Lipase inhibitor for long term use (Orlistat)

Norepinephrine-serotonin reuptake inhibitor for long term (Sibutramine)

Noradrenergic drugs for short term (Diethylpropion, Phentermine, Benzphetamine, Phendimetrazine)

Thank you