

Obesity



DR. AISHAH ALI EKHZAIMY

OBESITY: A Weighty Issue
for Children



Objectives



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



What is 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
- Obesity is usually diagnosed on the basis of calculation of
 - Body mass index
 - Measurement of waist-hip ratio



Obesity Classification-BMI



- BMI Calculation (kg/m²):

Weight (Kg)

Height squared (meters)



Obesity-BMI



Determining body mass index using kilograms and centimeters*

BMI, kg/m ²	19	20	21	22	23	24	25	26	27	28	29	30	35	40
Height, cm*	Weight, kg*													
147	41	43	45	48	50	52	54	56	58	61	63	65	76	86
150	43	35	47	50	52	54	56	59	61	63	65	68	79	90
152	44	46	49	51	53	55	58	60	62	65	67	69	81	92
155	46	48	50	53	55	58	60	62	65	67	70	72	84	96
158	47	50	52	55	57	60	62	65	67	70	72	75	87	100
160	49	51	54	56	59	61	64	67	69	72	74	77	90	102
162	50	52	55	58	60	63	66	68	71	73	76	79	92	105
165	52	54	57	60	63	65	68	71	74	76	79	82	95	109
168	54	56	59	62	65	68	71	73	76	79	82	85	99	113
170	55	58	61	64	66	69	72	75	78	81	84	87	101	116
173	57	60	63	66	69	72	75	78	81	84	87	90	105	120
175	58	61	64	67	70	74	77	80	83	86	89	92	107	123
178	60	63	67	70	73	76	79	82	86	89	92	95	111	127
180	62	65	68	71	75	78	81	84	87	91	94	97	113	134
183	64	67	70	74	77	80	84	87	90	94	97	100	117	134
185	65	68	72	75	79	82	86	89	92	96	99	103	120	137
188	67	71	74	78	81	85	88	92	95	99	102	106	124	141
190	69	72	76	79	83	87	90	94	97	101	105	108	126	144
193	71	74	78	82	86	89	93	97	101	104	108	112	130	149

* The health risk from any level of BMI is increased if the patient has gained more than 5 kg (11 pounds) since age 25, or if the waist circumference is above 100 cm (40 in) due to central fatness.

Classification of overweight and obesity by BMI, waist circumference, and associated disease risk

	BMI kg/m ²	Obesity class	Disease risk* relative to normal weight and waist circumference	
			Men ≤102 cm (≤40 in)	>102 cm (>40 in)
			Women ≤88 cm (≤35 in)	>88 cm (>35 in)
Underweight	<18.5		-	-
Normal•	18.5- 24.9		-	-
Overweight	25.0- 29.9		Increased	High
Obesity	30.0- 34.9	I	High	Very High
	35.0- 39.9	II	Very High	Very High
Extreme Obesity	≥40	III	Extremely High	Extremely High

* Disease risk for type 2 diabetes, hypertension, and CVD.

• Increased waist circumference can also be a marker for increased risk even in persons of normal weight.

Reproduced from: Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults--The Evidence Report. National Institutes of Health.

Obes Res 1998; 6:515.

Classification of obesity as per fat distribution

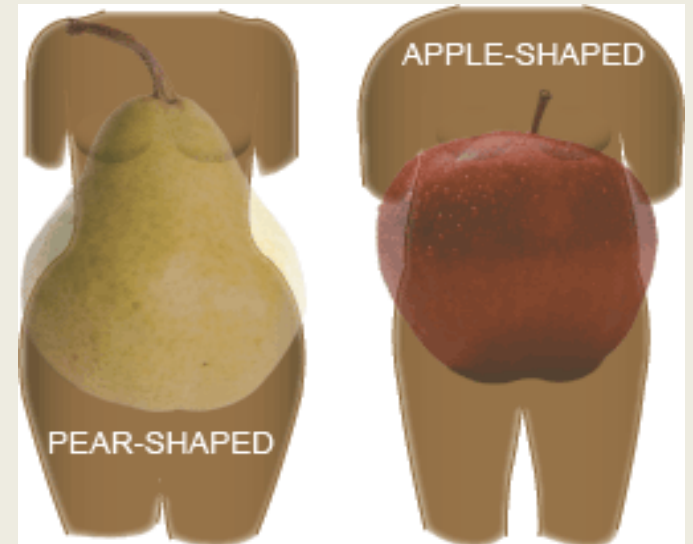


Android (or abdominal or central, males)

- Collection of fat mostly in the abdomen (above the waist)
- apple-shaped
- Associated with insulin resistance and heart disease

Gynoid (below the waist, females)

- Collection of fat on hips and buttocks
- pear-shaped
- Associated with mechanical problems



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
- In US, 33.3 % of men and 35 % of women are obese in 2007



Obesity-prevalence



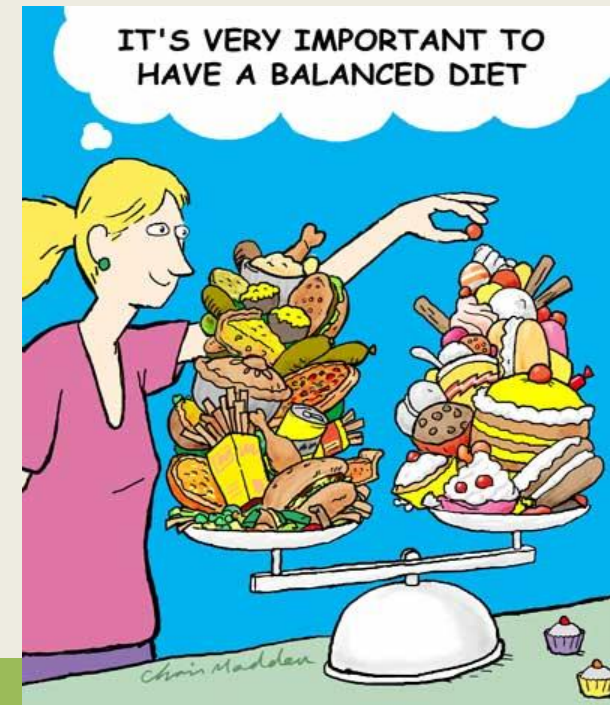
- 15-25 % of American children are obese
- In SA: study done between 1995-2000 in age group between 30-70 on 17000 subjects
- Prevalence of overweight: 36.9 % : 42% male, 31.8 % female
- Prevalence of obesity: 35.5 % , severe obesity 3.2 % with female of 44 % , male 26.4 %
- The prevalence of overweight and obesity was higher amongst a group of married women than among a group of single women in Saudi Arabia

Saudi Med J. 2005 May;26(5):824-9 •
International Journal of Obesity (2003) 27, 134-139. •

Mechanism of Obesity



- Food intake and utilization is regulated:
 - Hormones
 - Neurotransmitters
 - Central nervous system

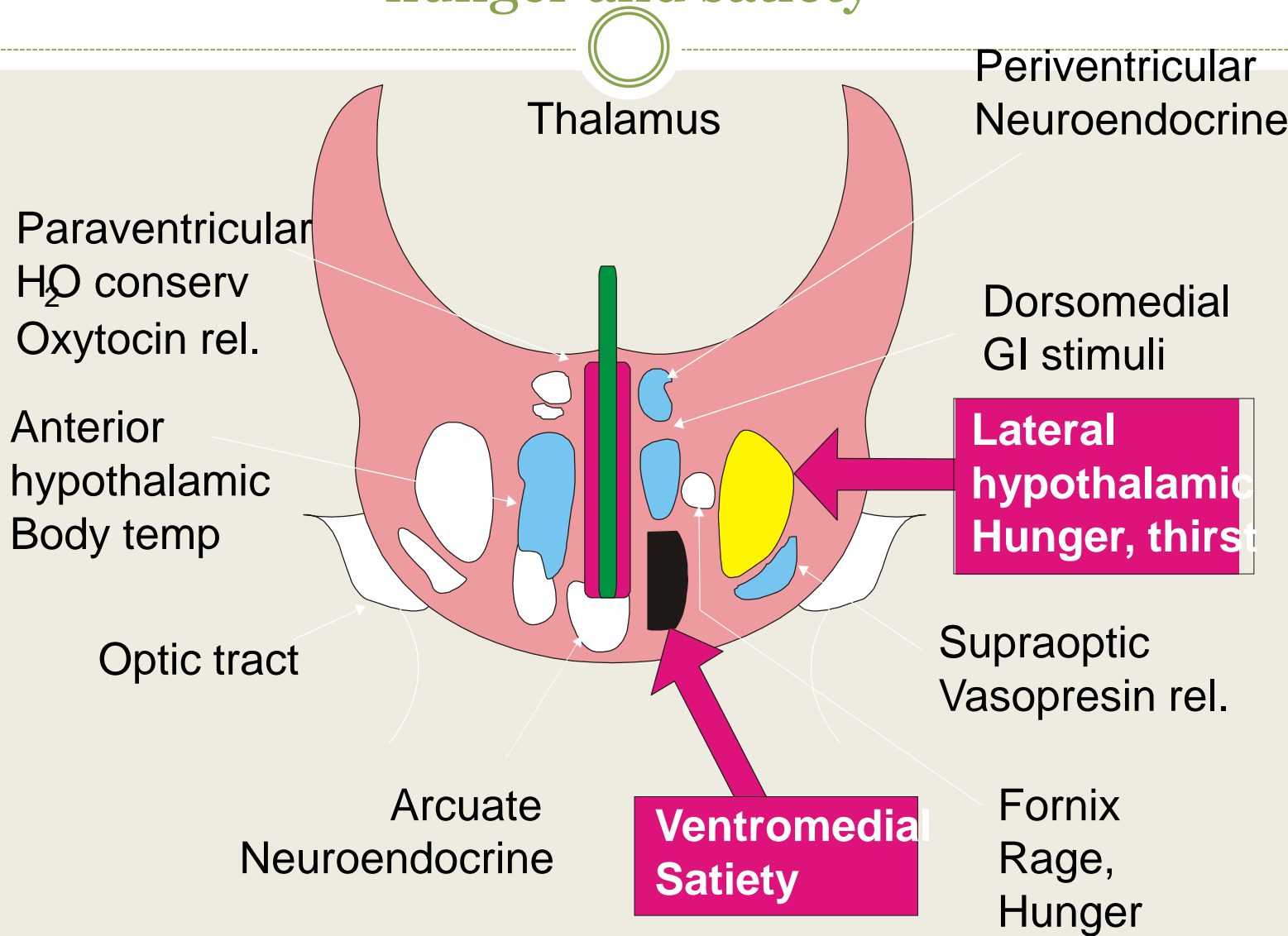


Mechanism of obesity



- Signals from peripheries are carried out by neurotransmitters and hormones to CNS in presence or absence of food
- Signal from fat by hormone leptin to hypothalamus to reduce food intake and increase sympathetic activity and energy expenditure
- 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



Obesity-Pathogenesis



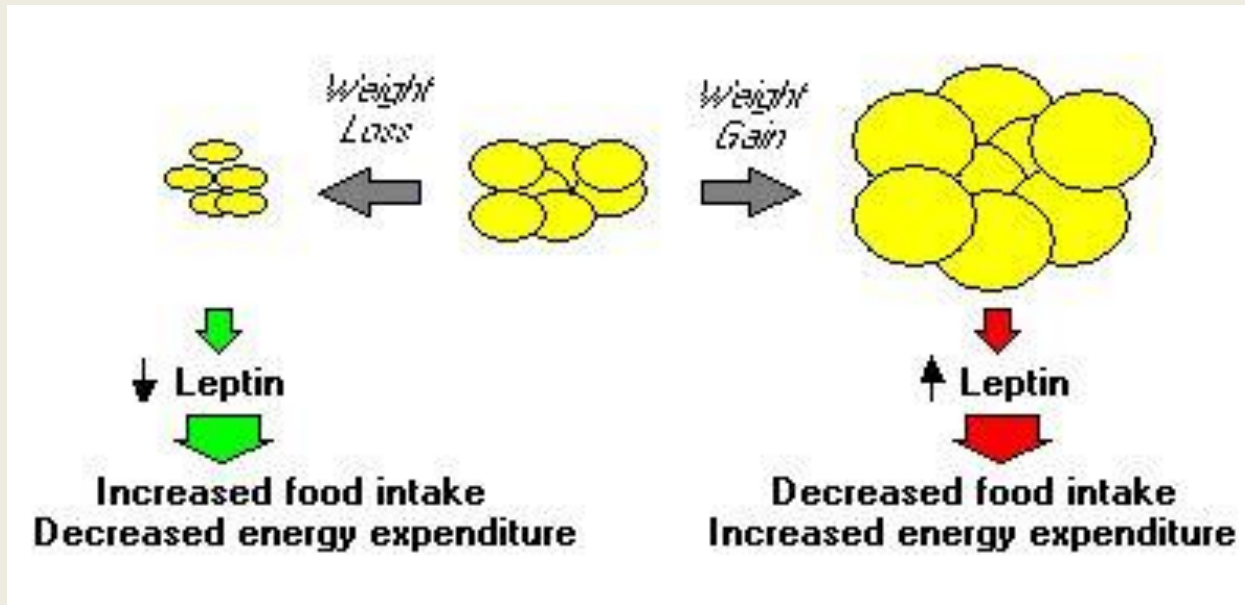
- More in and less out = weight gain
- More out and less in = weight loss
- Hypothalamus:
 - Control center for hunger and satiety
- Endocrine disorders:
 - Where are the hormones?



Hormones



- Leptin from adipocytes
- Acts on hypothalamus to decrease food intake and stimulate energy expenditure

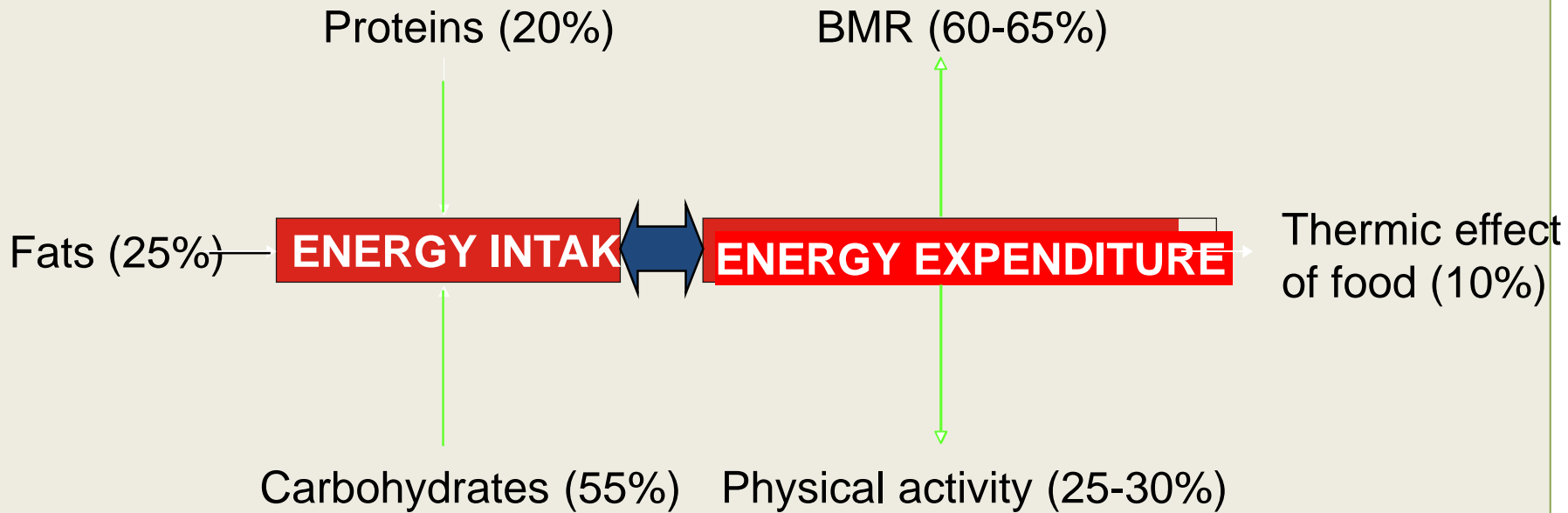


Hormones



- Ghrelin:
 - Secreted in the stomach
 - Acts on hypothalamus to stimulate appetite
 - Peak before meal and decrease after

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:
 - Individual behaviors (10 % to BMI)
 - Social interaction
 - Environmental factors
 - Genetic (40 % to BMI and adiposity)



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

OBESITY: A Weighty Issue for Children



Factors predispose to obesity



- **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

Factors predispose to obesity



Table 1. Causes of Obesity

Excessive/inappropriate food intake

Sedentary lifestyle

Genetic disorders with obesity

Prader-Willi syndrome

Bardet-Biedl syndrome

Carpenter's syndrome (acrocephalopolysyndactyly type II)

Cohen syndrome

Endocrine disorders

Cushing's syndrome

Hypothalamic tumors/inflammation/trauma

Hypothyroidism

Polycystic ovary syndrome

Insulinoma

Drugs

Antipsychotics, especially atypical agents

Tricyclic antidepressants

Sulfonylureas

Insulin

β Blockers

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:
 - IHD and stroke
 - Diabetes and non-neoplastic kidney disease
 - Different types of cancer
 - Respiratory disease

Health consequences of obesity



- Obesity is associated with reduction in life expectancy during adulthood
- Increase in BMI is associated with increase in morbidity and CVD risk factors



Health consequences of obesity

Table 2. Complications Associated with Obesity

Cardiovascular	Coronary artery disease, stroke, congestive heart failure, hypertension, dysrhythmias, pulmonary embolism
Pulmonary	Obstructive sleep apnea and obesity hypoventilation syndrome
Endocrine	Metabolic syndrome, insulin resistance, dyslipidemia, diabetes mellitus type 2, polycystic ovary syndrome
Gastrointestinal	Gallstones, abdominal hernia, nonalcoholic fatty liver disease, gastroesophageal reflux disease
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

NOTE: Obesity is also associated with cancer of the esophagus, colon, pancreas, liver, prostate, breast, endometrium, cervix, and ovaries.

Acanthosis nigricans



Classic hyperpigmented axillary lesion in acanthosis nigricans.

Courtesy of Jeffrey Flier, MD.

Health consequences of obesity



- For both men and women, increasing BMI was associated with higher death rates due to the following cancers:
 - Esophagus
 - Colon and rectum
 - Liver
 - Gallbladder
 - Pancreas
 - Kidney
 - Non-Hodgkin lymphoma
 - Multiple myeloma

Health consequences of obesity



- 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
- Screening:
 - BMI measurement
 - Waist circumference
 - Evaluation of overall medical risks



Assessment and screening



- Is the patient obese or overweight?
- What are his key health issues? Morbidity and mortality-related



Assessment and screening



Height, in or cm _____

Weight, lb or kg _____

Calculated BMI, kg/m² _____

Waist circumference, in or cm _____

Blood pressure SBP/DBP, mm Hg _____

Fasting serum triglyceride, mg/dL or mmol/L _____

Serum Hdl-cholesterol, mg/dL or mmol/L _____

Fasting blood glucose, mg/dL _____

Are there symptoms of sleep apnea? _____

Are there medication(s) that increase body weight? _____

Is there regular physical activity? _____

Are there other etiologic factors? _____



Assessment and screening



- **BMI measurement:**
 - 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

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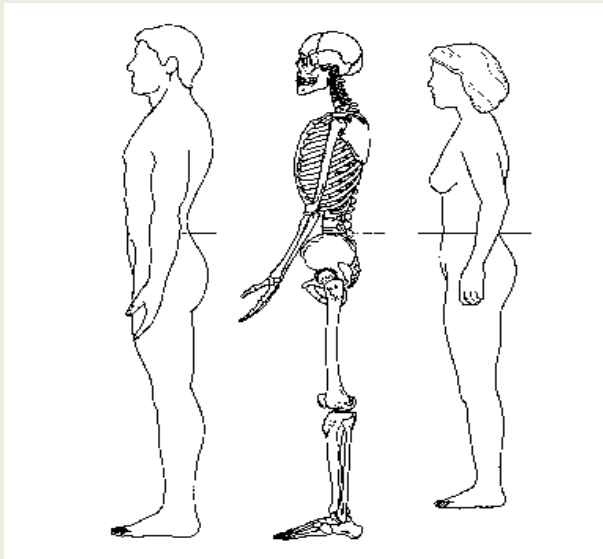
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Assessment and screening

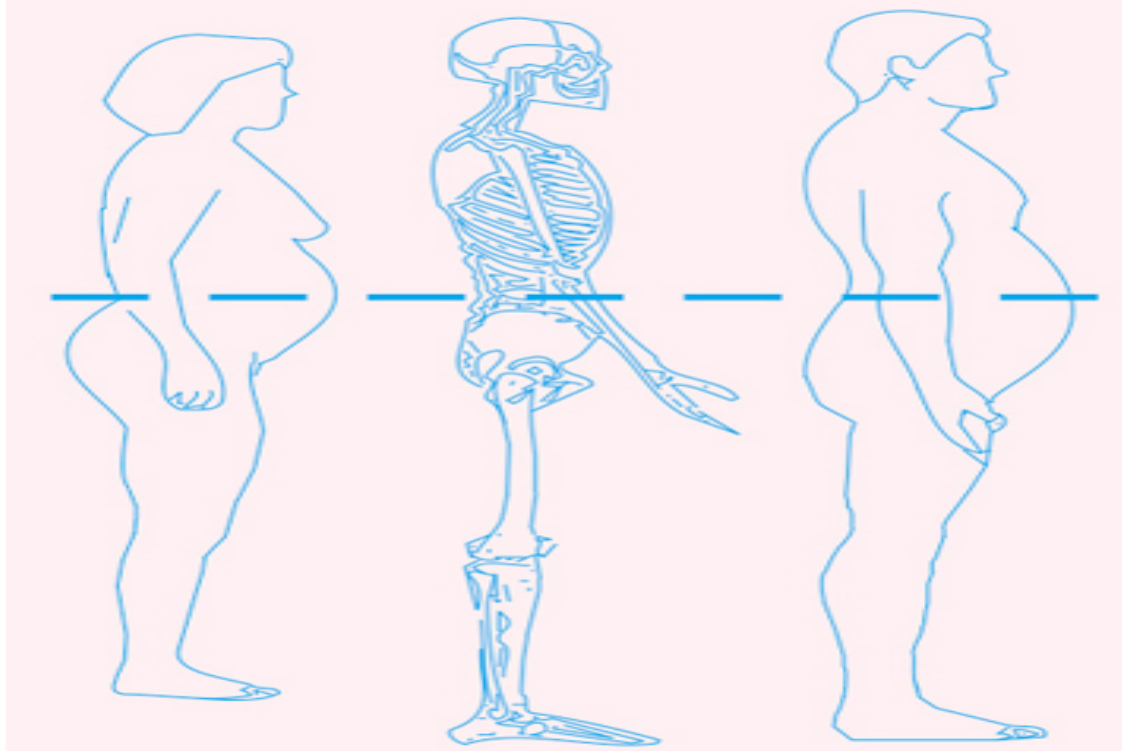


- **Waist circumference:**
 - Measurement of central adiposity
 - Associated with increased risk of morbidity and mortality
 - Reflects visceral adiposity
 - Increase risk of heart disease, DM, hypertension, dyslipidemia
 - Important in identifying the risk in BMI 25-34.9 kg/m²
 - Risk increase with 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

Waist circumference



Waist circumference measurement



Measuring-tape position for waist (abdominal) circumference in adults. To measure waist circumference, locate the upper hip bone and the top of the right iliac crest. Place a measuring tape in a horizontal plane around the abdomen at the level of the iliac crest. Before reading the tape measure, ensure that the tape is snug, but does not compress the skin, and is parallel to the floor. The measurement is made at the end of a normal expiration. *Reproduced from: National Heart, Lung, and Blood Institute. The Practical Guide: Identification, Evaluation, and Treatment of Overweight and Obesity in Adults. US Department of Health and Human Services, Public Health Service, National Institutes of Health, National Heart Lung and Blood Institute, Bethesda, MD, October 2000.*

Assessment and screening



- Identify the aetiology:
 - Medical history is important
 - Age at onset of obesity, course of it
 - Eating habits, activity habits
 - Past medical history
 - Medications
 - Cessation of smoking history
 - Ethnic background
 - Family history of obesity



Etiologic classification of obesity

Iatrogenic causes
Drugs that cause weight gain
Hypothalamic surgery
Dietary obesity
Infant feeding practices
Progressive hyperplastic obesity
Frequency of eating
High fat diets
Overeating
Neuroendocrine obesities
Hypothalamic obesity
Seasonal affective disorder
Cushing's syndrome
Polycystic ovary syndrome
Hypogonadism
Growth hormone deficiency
Pseudohypoparathyroidism
Social and behavioral factors
Socioeconomic status
Ethnicity
Psychological factors
Restrained eaters
Night eating syndrome
Binge-eating
Sedentary lifestyle
Enforced inactivity (post-operative)
Aging
Genetic (dysmorphic) obesities
Autosomal recessive traits
Autosomal dominant traits
X-linked traits
Chromosomal abnormalities
Other
Low birth weight

Drugs that cause weight gain and alternatives

Category	Drugs that cause weight gain	Possible alternatives
Antipsychotics		
Conventional	Thioridazine	Haloperidol
Atypical	Olanzapine, Clozapine, Quetiapine, Risperidone	Ziprasodone, Aripiprazole
Lithium	Lithium carbonate	
Anti-depressants		
Tricyclics	Amitriptyline, Clomipramine, Doxepin, Imipramine, Nortriptyline	Protriptyline
Selective serotonin reuptake inhibitors	Paroxetine	Other SSRIs
Other	Mirtazapine	Bupropion, Nefazadone
Anticonvulsant drugs	Valproate, Carbamazepine, Gabapentin	Topiramate, Lamotrigine, Zonisamide
Antidiabetic drugs	Insulin, Sulfonylureas, Metiglinide, Thiazolidinediones	Metformin, Alpha-glucosidase inhibitors
Serotonin and histamine antagonist	Pizotifen	
Antihistamines	Cyproheptidine	
Beta-adrenergic blockers	Propranolol, Atenolol, Metoprolol	
Steroid hormones	Glucocorticoids	
	Progestins: Megestrol acetate, Medroxyprogesterone acetate	

Assessment and screening



- Assessment of risk status
 - Identify risk factors:
 - ✦ After BMI and WC, history
 - ✦ BP measurement
 - ✦ Fasting lipid profile
 - ✦ Fasting blood sugar
 - Identify comorbidity:
 - ✦ Help to classify the risk of mortality
 - ✦ Presence of atherosclerosis, DM2, HTN, dyslipidemia
 - ✦ Sleep apnoea
 - ✦ GI, osteoarthritis, gout

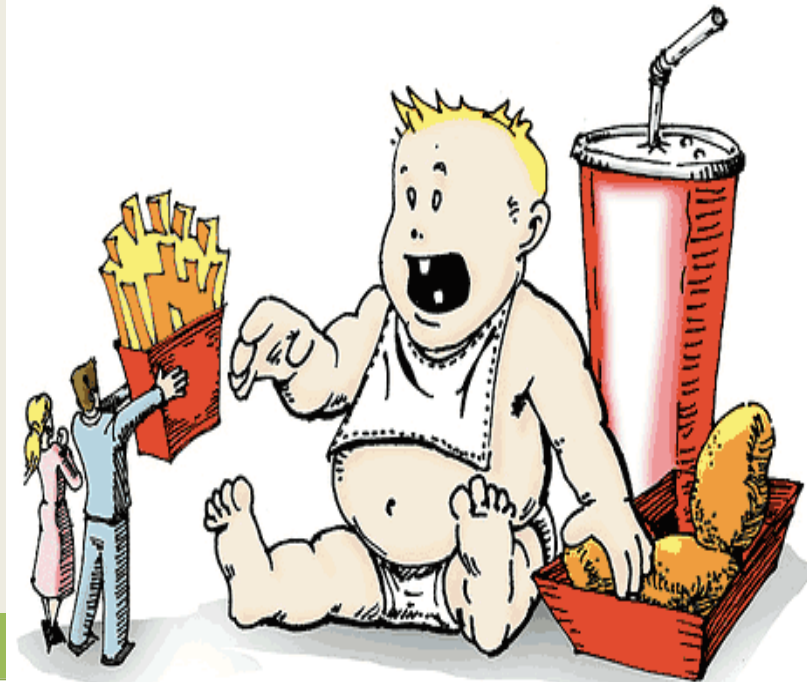


Assessment and screening



- CVD risk factors that would affect mortality risk:
 - ✦ HTN
 - ✦ DM2 (fasting blood glucose 110-125 mg/dl)
 - ✦ Smoking
 - ✦ Dyslipidemia (low HDL < 35 or high LDL > 130)
 - ✦ Family history of premature CAD
 - ✦ Physical inactivity

- other risk factors:
 - ✦ Age of onset of obesity



Assessment and screening



- 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



- 3 main interventions:

- Lifestyle intervention (diet, exercise)
- Pharmacotherapy
- Surgical intervention



Lifestyle



- Diet
- Physical activity
- Behavior change

- Most important recommendation



lifestyle

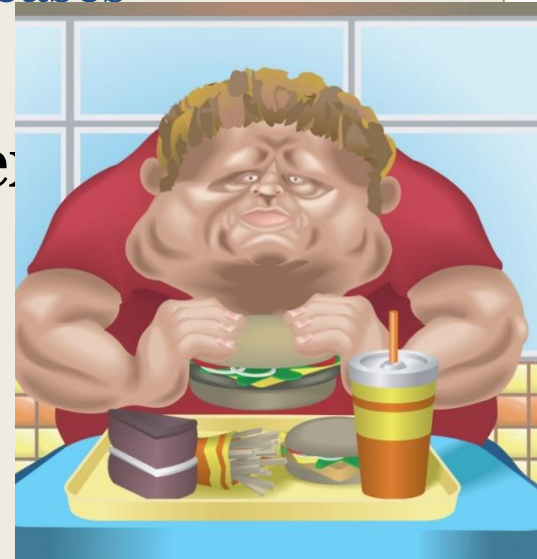


- Initial goal: 10% weight loss
 - Significantly decreases risk factors
- Rate of weight loss:
 - 1-2 pound per week
 - Reduction of calories intake 500-1000 calories/day
- Slow weight loss is preferred approach
 - Rapid weight loss is almost always followed by rapid weight gain
 - Rapid weight loss is associated with gallstones and electrolytes abnormalities

lifestyle



- Aim for 4-6 months for weight loss
- Average is 8-10 kg loss
- After 6 months, weight loss is difficult
 - Ghrelin and leptin effect
 - Energy requirement decreased as weight decreases
- Set goals for weight maintenance for next 6 months then reassess



Diet therapy



- 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



The L.E.A.N. Take on Fast Food	Calories	Total Fat (g)	Saturated Fat (g)	Trans Fat (g)
McDonald's				
Big Mac*	540	29	10	1.5
Med Fries	380	19	2.5	2.5
Total	920	48	12.5	4
Chipotle				
Chicken Burrito**	1100	51	19.5	0
Chips	570	27	3.5	0
Total	1670	78	23	0

* Beef patty, bun, cheese, sauce, lettuce, pickles, onions

** Flour tortilla, cilantro-lime rice, black beans, chicken, cheese, sour cream, guacamole

Diet therapy



- Low calories diet-portion controlled
- Low fat diet
- Low CHO diet
- Meditarrean diet
- Average for women: 1000-1200 kcal/day
- Average for men: 1200-1600 kcal/day
- Adjust based on activity and weight



Diet therapy



- How much is 1200 calories?
- 1 big mac (580)
- 1 small fries (210)
- 1 small shake (430)



Diet therapy



- Then weight maintenance
- How mu 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

Physical activity



- As integral part of weight loss
- Reduce risk of DM, heart disease, hypertension
- Alone is not helping
- Help to prevent weight regain



Physical activity



- Start slowly
 - Change of daily living activities
 - Avoid injury
- Increase intensity and duration gradually
- Long –term goal:
 - 30-45 min or more of physical activity daily
 - 5 or more days per week
 - Burn 1000+ calories per week



Behavioral strategies



- Keep agenda of diet and activity
 - Set specific goals regarding: diet, activity related behavior
 - Reminder system
 - Reward yourself
 - Don't deprive yourself, watch portion
- Track improvement:
 - Weight measurement on regular basis



Pharmacotherapy



- Indicated in:
 - BMI > 30
 - BMI 27-30 with comorbidities
 - Should not be used for cosmetic weight loss
 - Used only when 6 months trial of weight and exercise fail to achieve weight loss



Pharmacotherapy



- **Sympathomimetics:**
 - 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



Drugs approved by the FDA for treatment of obesity

Drug	Trade names	Dosage	DEA schedule
Pancreatic Lipase inhibitor approved for long-term use			
Orlistat	Xenical	120 mg three times daily before meals	-
Norepinephrine-serotonin reuptake inhibitor approved for long-term use			
Sibutramine	Meridia	5 to 15 mg/day	IV
	Reductil		
Noradrenergic drugs approved for short-term use			
Diethylpropion	Tenuate	25 mg three times daily	IV
	Tenuate Dospan	75 mg every morning	
Phentermine	Adipex	15 to 37.5 mg/day	IV
	Ionamin Slow Release	15 to 30 mg/day	
Benzphetamine	Didrex	25 to 50 mg three times daily	III
Phendimetrazine	Bontril	17.5 to 70 mg three times daily	III
	Prelu-2	105 mg daily	

Recommendation for use of drugs listed in the American College of Physicians guidelines

Drug	Net weight loss (kg) (statisticians view)	Gross weight loss (kg) (patients view)	Recommendation
Orlistat	-2.75	-8.25	Approved for long term use
Sibutramine	-4.45	-9.95	Approved for use up to two years
Phentermine	-3.6	-9.1	Approved for short term use (12 weeks)
Diethylpropion	-3.0	-8.5	Approved for short term use (12 weeks)
Fluoxetine	-14.5 to + 0.4	-21 to -5.6	Not recommended
Bupropion	-2.77	-8.27	Not recommended

Net weight loss assumes an average weight loss of 5.5 kg with placebo. The 5.5 kg is then subtracted from the gross weight loss achieved with drug therapy.

With permission from: George Bray, MD. Data adapted from Li Z, Maglione M, Tu W, et al. Ann Intern Med 2005; 142:532. Snow, V, Barry, P, Fitterman, N, et al. Ann Intern Med 2005; 142:525.

Weight loss Surgical therapy



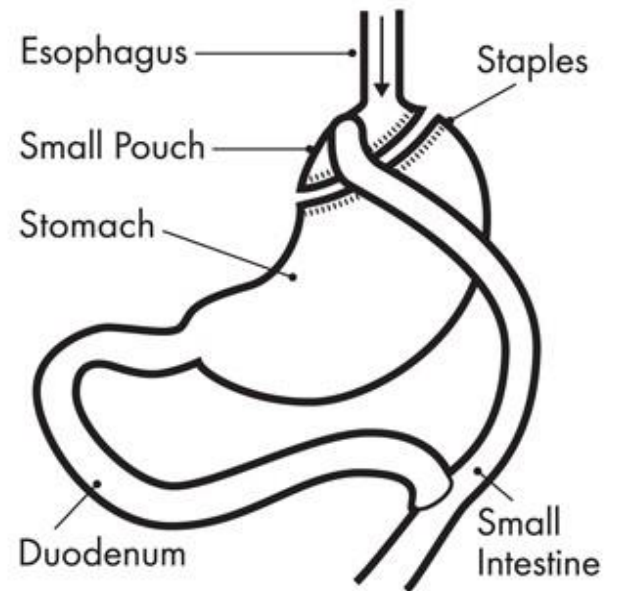
- Indicated in:
 - Well-informed and motivated patients
 - Have BMI > 40
 - Acceptable risk of surgery
 - Failed previous non-surgical method
 - BMI > 35 with comorbidities like diabetes, sleep apnea, osteoarthritis, cardiomyopathy
 - BMI 25-29.9 with WC > 102 cm in male and 88 cm in women
 - Age 18-60
 - Psychologically stable

Weight loss Surgical therapy(bariatric surgery)



- Restrictive-type of surgery:
 - Vertical banded-gastroplasty
 - Gastric banding
- Malabsorptive and restrictive:
 - Roux-en-Y gastric bypass
 - Biliopancreatic diversion
- Follow up is crucial

Roux-en-Y (RNY)



Questions????

