



# University of Baghdad

## College of Medicine

### 2024-2025

**Title: Prevention of malnutrition**

**Grade: Third Grade**

**Module: Nutrition, Water & Electrolytes Imbalance Module (NT)**

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**Date: 4-11-2024**



## **Objectives:**

**By the end of this lecture, you will be able to:**

- 1. Define malnutrition.**
- 2. Recognize the difference between marasmus and kwashiorkor.**
- 3. Define obesity.**
- 4. Recognize it's types,.**
- 5. Understand causes, mangement and prevention**



## Malnutrition:

Refers to both under nutrition and over nutrition.

❑ **Under nutrition:** inadequate consumption, poor absorption or excessive loss of nutrient over an extended period of time, e.g. marasmus, & kwashiorkor.

❑ **Over nutrition:** excessive intake of specific nutrients over an extended period of time, e.g. obesity.

❑ **Specific deficiency:** result from relative or absolute lack of an individual nutrient, e.g. vitamin A deficiency, iron deficiency anemia.

# Protein energy malnutrition (PEM):



• **Definition:** according to WHO it is a range of pathological conditions arising from coincidental lack in varying proportion of **protein and calories** occurring most frequently in **infants and young children** and commonly associated with **infection**.

It is considered as *Silent emergency of the world*, & it is most important nutritional problem in most of the developing countries, it cause **permanent disabilities** because most of **brain growth occur in early years of life with decrease resistance to infection**



## **Vulnerable population:**

1. Infant and young children (under 5)
2. Pregnant women
3. Lactating mother.
4. Elderly.

**Infant and under 5 children are hit hardest (they are in the stage of rapid growth and development).**



## Classification of PEM:

1. Gomez classification
2. WHO classification.
3. Arnold's classification.
4. Welcome trust classification.
5. Indian academy of pediatrics (IAP) classification.
6. Jelliffee's classification.
7. Waterlow classification.

# WHO classification of PEM:



<b>Indicator</b>	<b>Moderate malnutrition</b>	<b>Severe malnutrition</b>
<b>Symmetrical edema</b>	<b>No</b>	<b>Yes</b> <b>(edematous malnutrition)</b>
<b>Weight for height</b>	<b>SD score between -2 to -3</b> <b>(70-79%)</b>	<b>SD score &lt; -3(&lt;70%)</b> <b>Sever wasting</b>
<b>Height for age</b>	<b>SD score between -2 to -3</b> <b>(85-89%)</b>	<b>SD score &lt; -3(&lt; 85%)</b> <b>Sever stunting</b>

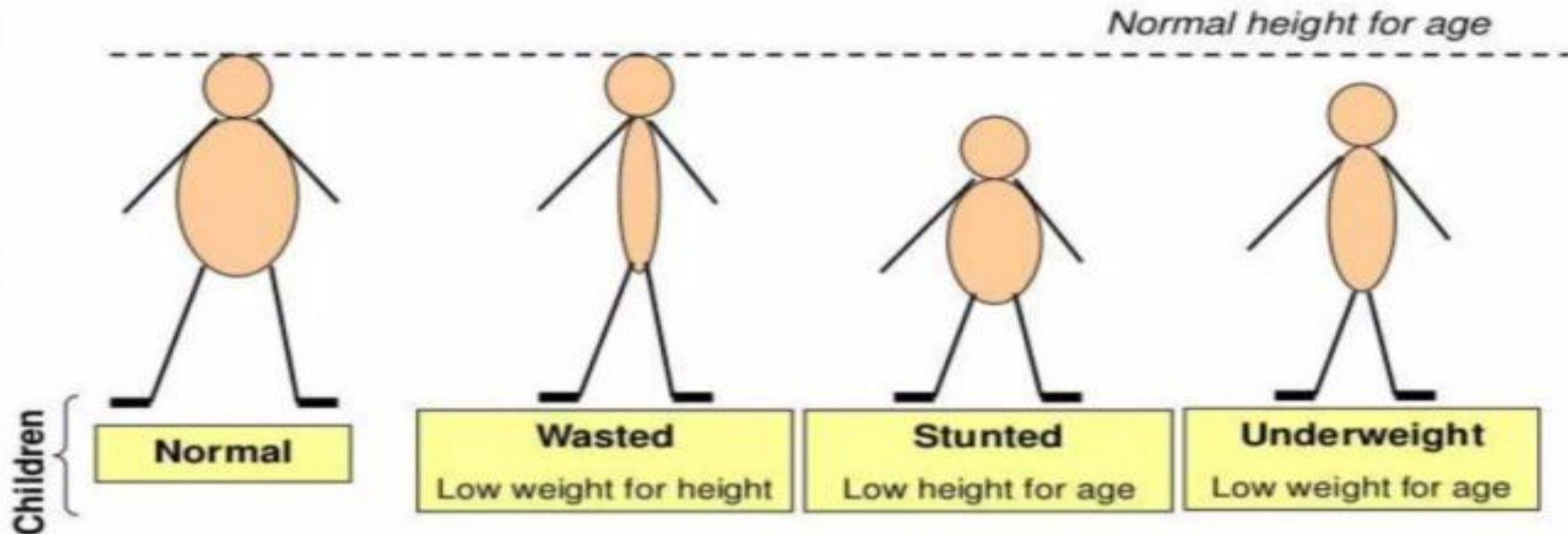
## Arnold's classification based on mid upper arm circumference:



<b>MUAC</b>	<b>color</b>	<b>Nutritional status</b>
<b>&gt; 13.5 cm</b>	<b>green</b>	<b>Normal</b>
<b>12.5-13.5 cm</b>	<b>green</b>	<b>Risk for acute PEM</b>
<b>&lt; 11.5-12.5 cm</b>	<b>yellow</b>	<b>Mild to moderate malnutrition</b>
<b>&lt; 11.5 cm</b>	<b>red</b>	<b>Sever acute malnutrition</b>



# Different Types of Childhood Malnutrition



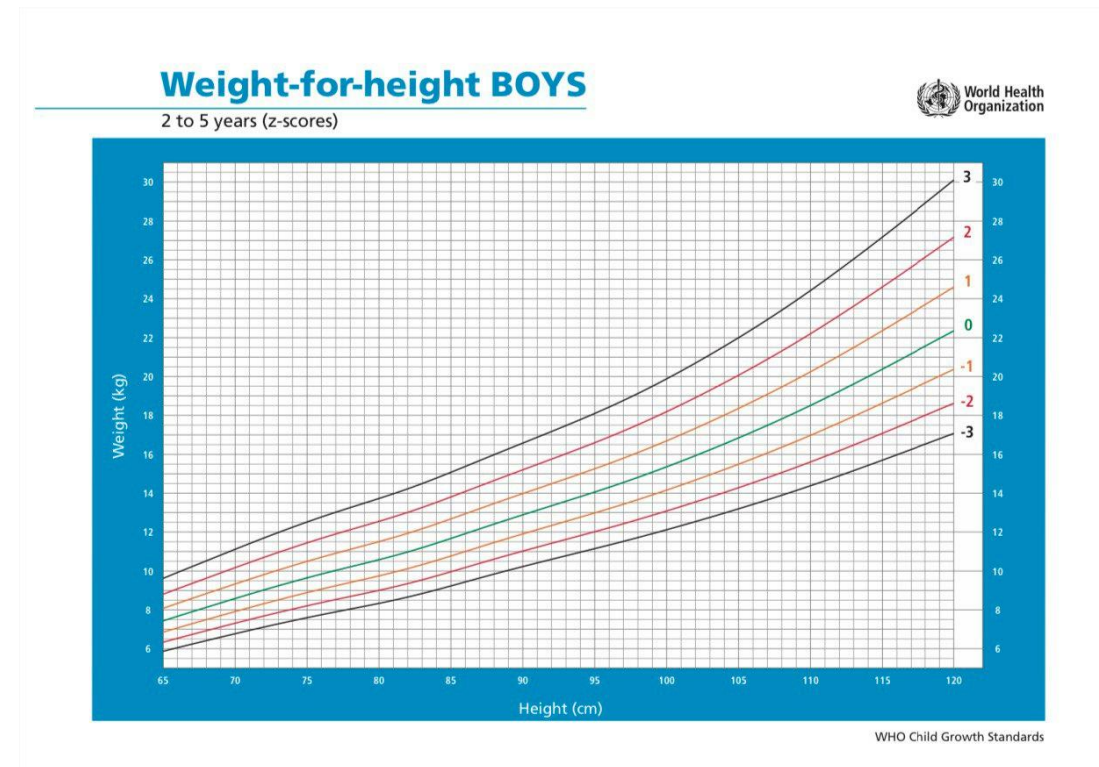
# Indicators of malnutrition:

(1) Low weight for height = wasting = acute malnutrition (weight for height  $< -2SD$  of the reference table).



□ It is most easily reversed & treated but often recurs due to infection.

□ Prevalence of wasting in Iraq for  $<5$  years children = 9.3% (UNICEF survey).



(2) Low height for age = stunting = chronic malnutrition (Height for age below -2SD of the reference table).

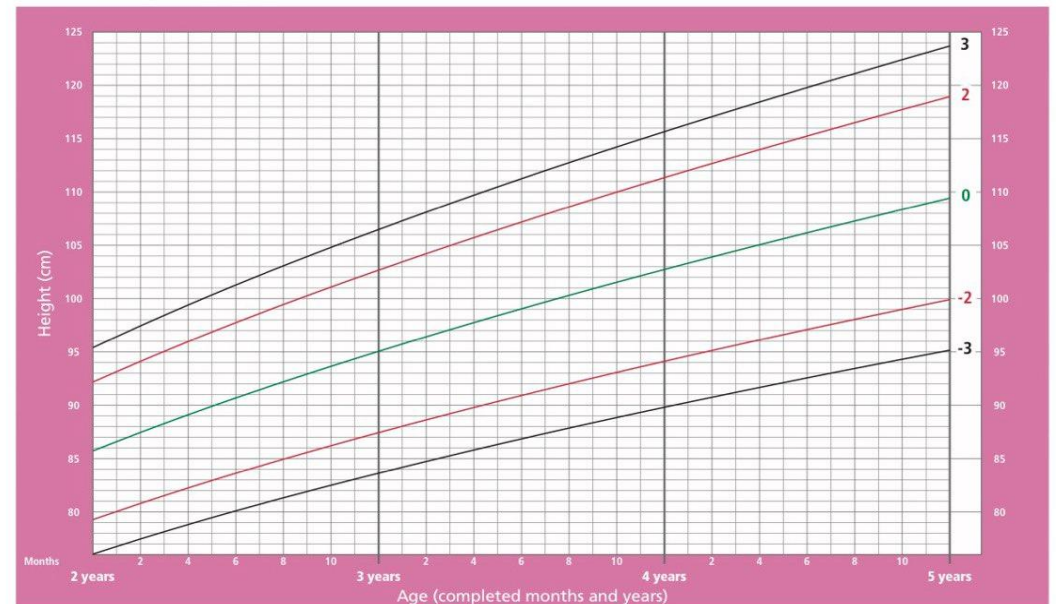


❑ Difficult to reverse in child after 2-3y old.

❑ Prevalence of stunting in Iraq for <5years children = 20.4%.

### Height-for-age GIRLS

2 to 5 years (z-scores)



**(3) Low weight for age = underweight = general malnutrition**  
**(weight for age below -2SD of the reference table).**

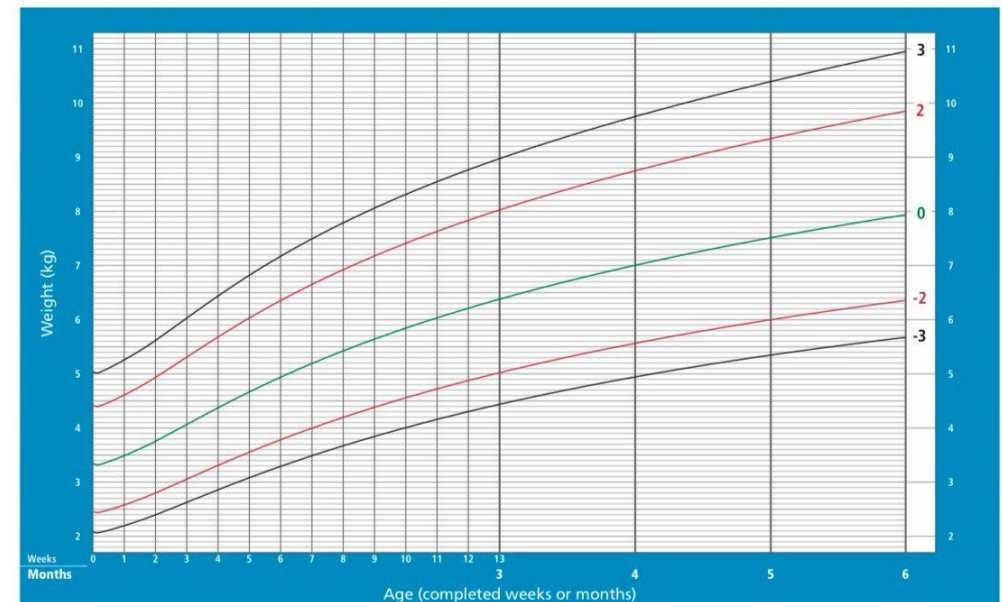


❑ A composite of acute & chronic malnutrition.

❑ Prevalence of underweight in Iraq for <5years children =21.3%.

### Weight-for-age BOYS

Birth to 6 months (z-scores)



PEM has been categorized according to the severity; severe, moderate or mild type.



## CLINICAL MANIFESTATIONS

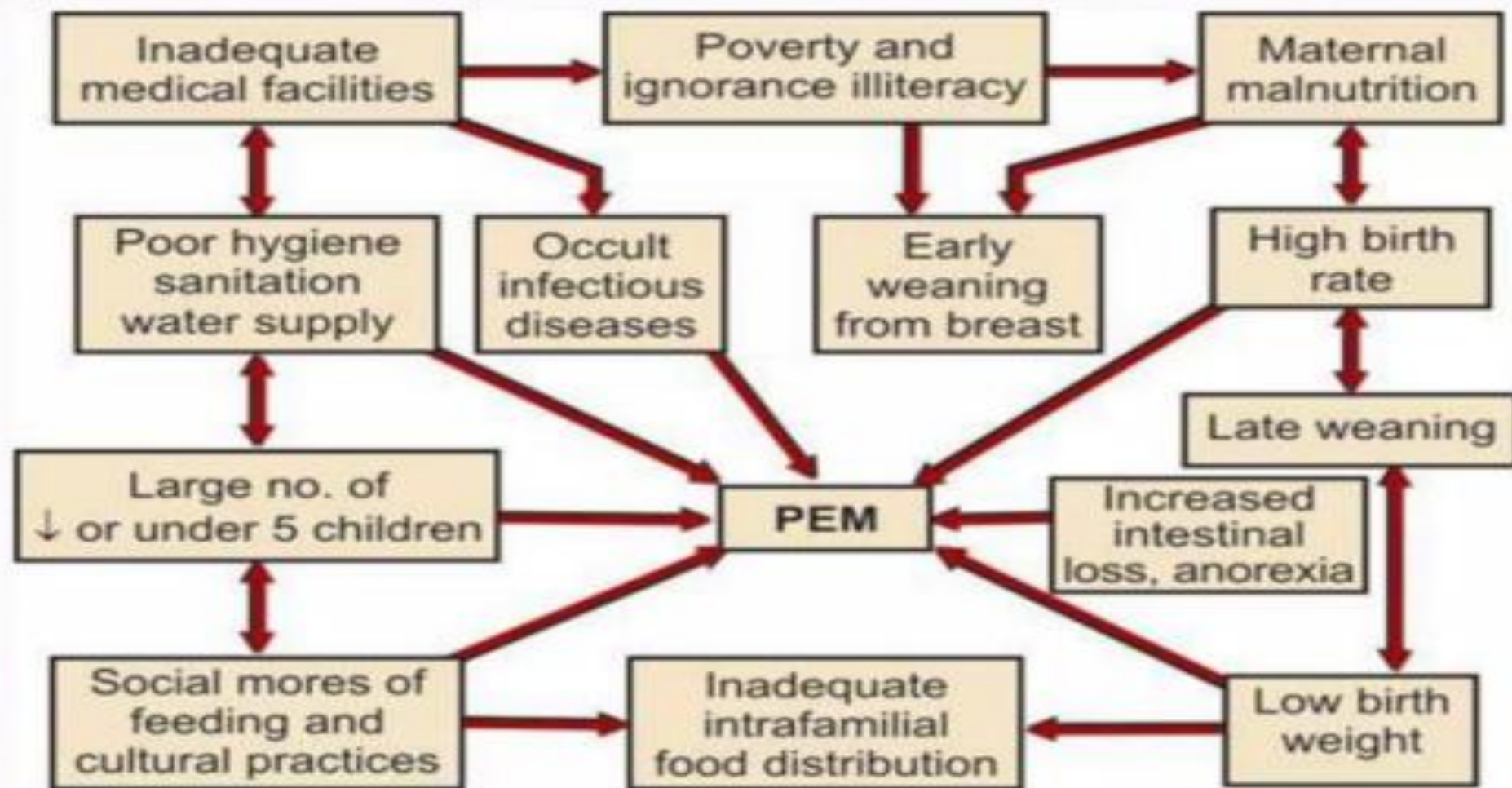
### The Iceberg of Malnutrition

The "ICEBERG" of malnutrition has only 1/10th visible

The diagram shows an iceberg floating in water. The water level is indicated by a wavy line. Only a small, irregularly shaped portion of the iceberg is above the water line. The rest of the iceberg, which is much larger and filled with a grid pattern, is submerged below the water line.

The dangerous 9/10th are hidden

# Web of causation for PEM



# Marasmus:(mean wasting)



Is a form of severe PEM which occur as result from energy deficiency that may occur at any age, particularly in early infancy and characterized by:

1. Occur more often in **infants (6 months -1 year)**.
2. **Severe wasting** (body weight is **less than 60%** of the expected), the body utilize **all fat stores** before using muscle.
3. **Severe growth retardation and failure to thrive.**
4. **Gross muscle wasting with loss of subcutaneous fat** → skin and bone, wrinkled skin
5. **Old man appearance, cheeks and temple are hollow.**

6. **Abdomen is distended** due to wasting and hypotonia of abdominal wall muscles.
7. **Baggy pants appearance** (there are many folds of skin on the buttocks and thighs)
8. **Lower than normal RMR.**
9. **Temperature is subnormal.**
10. **Associated deficiency** (iron, vitamin A and D).
11. Child appears alert but often **irritability and anxious, excessively cry and sleep little.**
12. **Dehydration.**
13. **Constipation** usually but some times **starvation diarrhea** (frequent small bowel motion with mucus).







14. **Usually hunger and have good appetite.** Sometimes, there is **anorexia and poor feeding.**
15. **No edema.**
16. **No dermatosis.**
17. **No hair change.**
18. **No fatty infiltration of the liver (hepatomegaly).**



## Laboratory finding:

1. **Serum albumin** usually normal or low.
2. **Blood urea** is low since protein utilized by the infant is totally endogenous protein.
3. **Blood glucose** level is low due to deficient glycogen store in the liver.
4. **Anemia uncommon.**



## Specific causes:

- Inadequate diet.
- Faulty eating habit.
- Anomalies such as cleft lip and cleft palate which prevents intake of food.
- Condition such as anorexia, vomiting and diarrhea.
- Allergy to certain foods.
- Disturbed mother and child relationships.



## **Kwashiorkor: (mean red hairy boy)**

Is a form of **severe PEM** which occur as result of insufficient protein consumption but with sufficient caloric intake and characterized by:

1. Occurs in children between **6 months to 3 years** of age.
2. body weight is **60-80%** of the expected
3. **Muscles wasting** but preserved adipose tissue.
4. **Large protruded belly.**
5. Mental changes, **irritability & restlessness .Lethargy or apathy and shock (in late stage).**



6. **Hepatomegaly** (due to fatty infiltration, reduce of fat mobilization due to decrease Lipoprotein synthesis).

7. **Edema (pitting/bilateral)**: of lower arms and leg and lower trunk, plump appearance, puffy eye, mooned face round cheeks & because of low protein & inadequate water balance.

8. **Growth retardation.**

9. **Loose stool is common (diarrhea).**

10. **Anorexia.**

11. **Vitamin deficiency, anemia common and defect in immunity.**

## 12. Skin changes:



- ❖ **Dry scaly skin** on trunk and limbs.
- ❖ **Thin shiny, stretched skin over edematous limbs.**
- ❖ **Flaky paint appearance of skin:** the fragile skin peels away in an irregular pattern to reveal an underlying hypopigmentation (alternating zones of hyperpigmentation, areas of desquamation and hypopigmentation).
- ❖ **Deep fissures** are seen on elbow, knees, groin, axillae, back of thighs and behind the ears though other part of the body may be affected.
- ❖ Sometimes **petechiae** may present, particularly over the abdomen.
- ❖ **Angular stomatitis** due to riboflavin deficiency.



### 13. Hair changes:

- **Loss of hair elasticity, thin, dyspigmented, streak, red or grey in color.**
- Alternate bands of light and dark hair (**Flag sign of hair**).
- **Hair loss** can also affect eye lashes and eyebrows.



## Labratory finding:



- **Hypoproteinemia:** reduced total plasma protein (less than 4.5 gm/dl)
- **Hypoalbuminemia:** reduced level of serum albumin (less than 2.5 gm/dl).
- **Urea** in blood and urine is **markedly reduced** because of deficient intake of exogenous protein.
- **Hypoglycemia.**
- **Electrolytes: Hypokalemia and magnesium depleted.**
- **Hormonal: decreased thyroid hormone, insulin hormone. Normal or increased growth hormone and cortisol.**



•Level of some enzymes (including lactase) are decreased and circulating lipid levels(especially cholesterol)are low.

•Metabolic acidosis.



## Protein Energy Malnutrition

- Marasmus →
- Kwashiorkor ↙





## Specific causes:

- Social and economic.
- Poverty.
- Inadequate weaning practices.
- Child abuse.
- Cultural and social practices
- Vegetarian diet.

**Table 10.5: Differences between Kwashiorkor and Marasmus**

<b>Kwashiorkor</b>	<b>Marasmus</b>
It develops in children whose diets are deficient of protein.	It is due to deficiency of proteins and calories.
It occurs in children between 6 months and 3 years of age.	It is common in infants under 1 year of age.
Subcutaneous fat is preserved.	Subcutaneous fat is not preserved
Oedema is present.	Oedema is absent.
Enlarged fatty liver.	No fatty liver.
Ribs are not very prominent.	Ribs become very prominent.
Lethargic	Alert and irritable.
Muscle wasting mild or absent.	Severe muscle wasting
Poor appetite.	Voracious feeder.
The person suffering from kwashiorkor needs adequate amounts of proteins.	The person suffering from marasmus needs adequate amount of proteins, fats and carbohydrates.

# Marasmic –kwashiorker:

- A severely malnourished child with features of **both marasmus and kwashiorker**.
- The features of kwashiorkor are :
  - **Severe edema** of feet and legs and also hands, lower arms, abdomen and face.
  - There is **pale skin and hair**.
  - The child **looks unhappy**.
- There are also signs of marasmus:
  - **Wasting of the muscles** of upper arms, shoulders and chest so that you can see the ribs.



# *Prevention & control of PEM:*



## **(1) Health promotion:**

- a) Measures directed to **pregnant and lactating mother** (to prevent LBW and to prevent subsequent malnutrition during infancy and childhood).
- b) Promotion of **breast feeding**.
- c) Meal given at **frequent intervals, Extra meal & good feeding for sick child**.
- d) **Improve family diet** (When there is inadequate amount of animal milk, select a good mixture of available plant protein (protein complementarily)).
- e) **Promotion of correct feeding practices**.
- f) **Family planning and spacing of births**.



## (2) Specific protection:

- a) **Diet must contain protein and energy rich foods** (milk, egg, and fresh fruit if possible.)
- b) **Prevention & control of infection** (immunization, H. education, proper use of antibiotics).
- c) **Food fortification.**
- d) **Supplementary feeding programmes** for mothers and children.

## (3) Early diagnosis and treatment:

- a) **Growth monitoring** (early detection of growth faltering).
- b) **Early diagnosis and treatment of infection and diarrhea.**

- c) **Community participation for early diagnosis; (community care centers)**
- d) **Rehydration.**
- e) **Deworming.**



#### **(4)Health care services:**

- a) Adequate maternal & child care (MCH) services.
- b) Good health services** through primary health care centers (PHC), Nutritional Rehabilitation Centers (NRC) in pediatric units.

#### **(5)Improvement of living conditions:**

- a) Socioeconomic improvement** & better food distribution.
- b) Provision of safe water & good environmental sanitation.**

# Obesity:



□ Overweight and obesity are defined according to WHO as **abnormal or excessive fat accumulation that presents a risk to health.**

□ **Obesity:** the body weight increase 20% or more above the IBW.

□ In most individuals overweight & obesity are related, except in athletes they are overweight because of their increase in lean body mass, but not obese, on other hand some of inactive individuals with little muscles may be obese but not overweight.

□ **Ideal body weight:** is the body weight for a given height that statistically associated with the greatest longevity.





**Classification of obesity:** There are different classifications;

**1-Hypertrophic obesity:** result from an increase **lipid content of adipocytes,** common in adults, mild- moderate obesity.

**2- Hyperplasic- hypertrophic obesity:** increase in the fat cells numbers & lipid content of fat cells (**over feeding during infancy & adolescent**) permanent abnormality, therefore preventive measures should taken during these periods) associated with much more **severe obesity.**

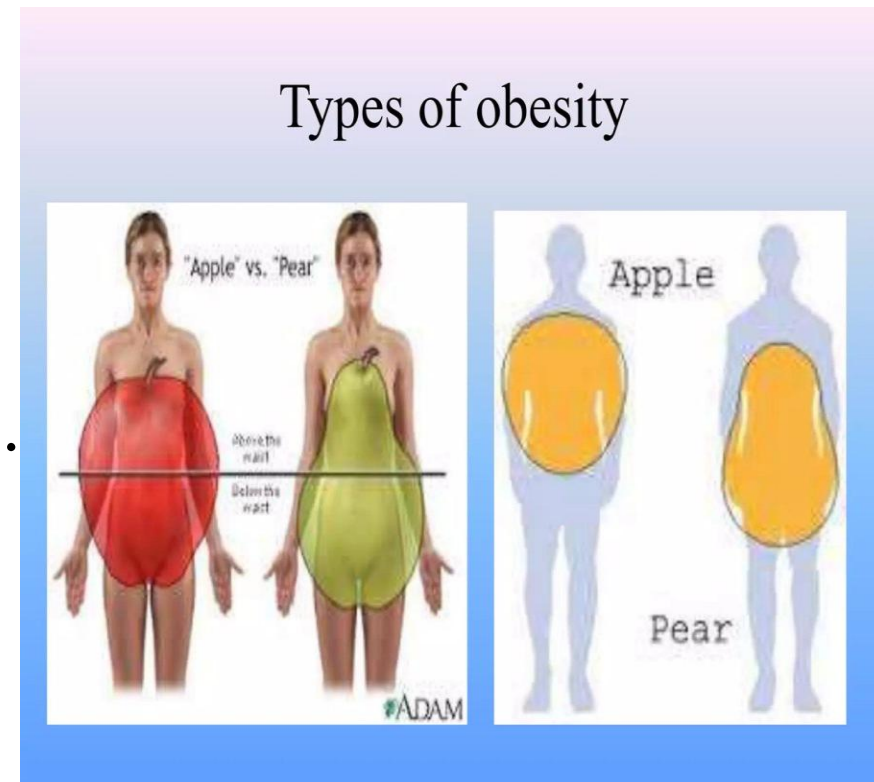




Other classification depend on regional fat distribution;

**\*Android =Apple shaped (upper body) obesity:** excessive fat located in the central abdominal area which is statistically associated with increase risk of D.M., hypertension, CVD, common in males.

**\*Gynoid = pear shaped (lower body) obesity:** the fat distributed in the lower extremities around the hips or femoral region, relatively benign (common in females).



# Causes of obesity:

**1-Metabolic;** excess of calories than required to meet metabolic demands store as triglycerides in adipose tissues.



**2-Sedentary life style.**

**3-Emotional:** impaired self-image & feeling of inferiority, which leads to social isolation. depression, low self-esteem, and body dissatisfaction

**4-Acquired from family;** genetically predisposed, \*\*two obese parents have a 73% chance of having obese offspring, \*\*if one obese parent has 41% chance \*\*two lean parents have only 9% chance. \*\*Strong correlation in identical twins.



**5. Brown fat:** some people seems to eat more than others without gaining weight due to **brown fat hypothesis**; pigmented brown adipose tissue (around neck & chest). **It serves as caloric buffer that disposes excess**



**of energy when food intake is high & conserves energy when food intake is low. Defect in brown adipose tissue function or fewer brown cells may be responsible for obesity.**

**6-Leptin hypothesis: mutation in a Ob gene** causes a severe hereditary obesity in mice. **Ob gene, and it's product leptin and leptin receptor** are involved in the regulation of the amount of body fat through control of appetite & energy expenditure .

# Diagnosis of overweight and obesity:

is made by measuring people's weight and height and by calculating the body mass index (BMI):  $\text{weight (kg)}/\text{height}^2 \text{ (m}^2\text{)}$ . **The body mass index is a surrogate marker of fatness**



• **The waist circumference and waist to hip ratio** also help in the diagnosis of obesity.

## In adults:

□ For adults, WHO defines overweight and obesity as follows:

- ✓ Overweight is a BMI greater than or equal to 25; and
- ✓ Obesity is a BMI greater than or equal to 30.

❑ **For children**, age needs to be considered when defining overweight and obesity.



✓ **Children under 5 years of age:**

• **Overweight** is weight-for-height and BMI for age greater than **2 SD** above the

WHO Child Growth Standards median; and

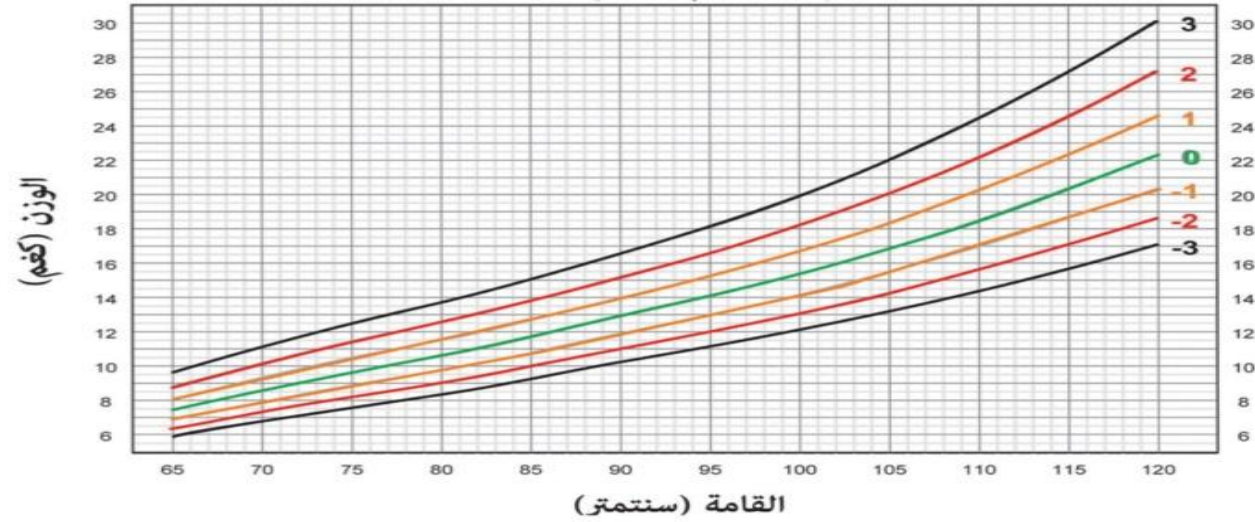
• **Obesity** is weight-for-height greater and BMI for age than **3 SD** above the WHO

Child Growth Standards median.

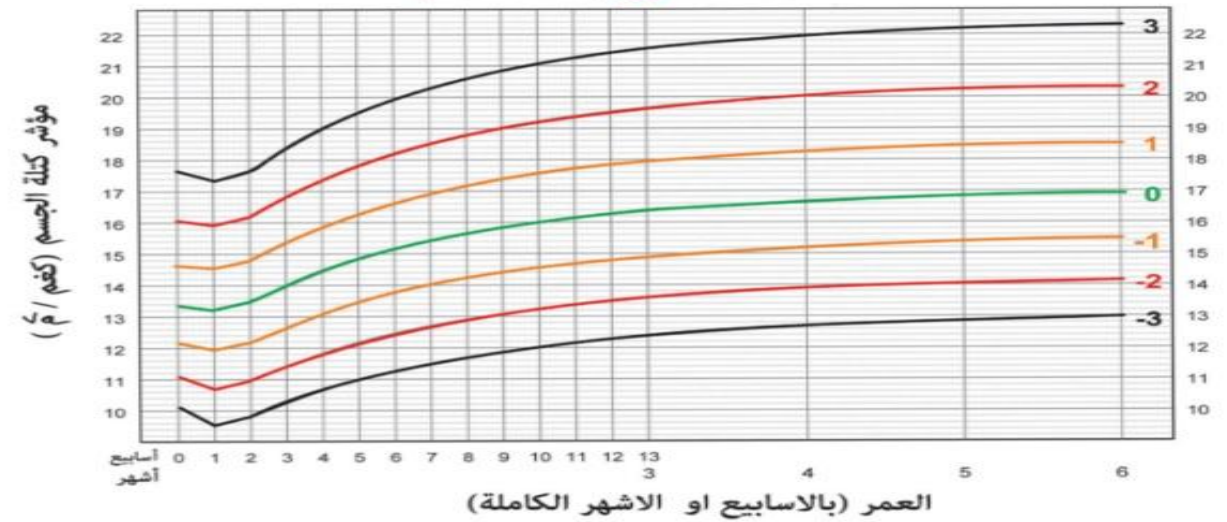
“BMI-for-age is not recommended for use before 2 years of age to screen for overweight, obesity, or underweight”



الوزن - الی - القامة (ذكور)  
(z-scores) سنوات 5 - 2



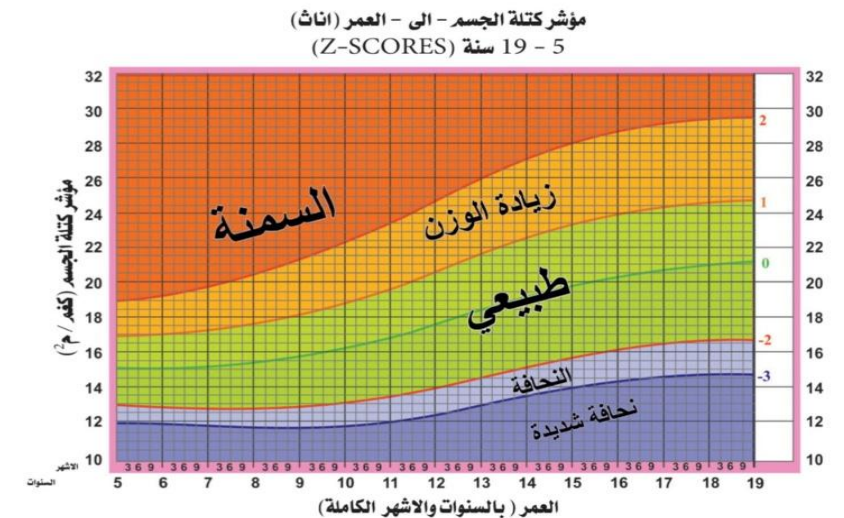
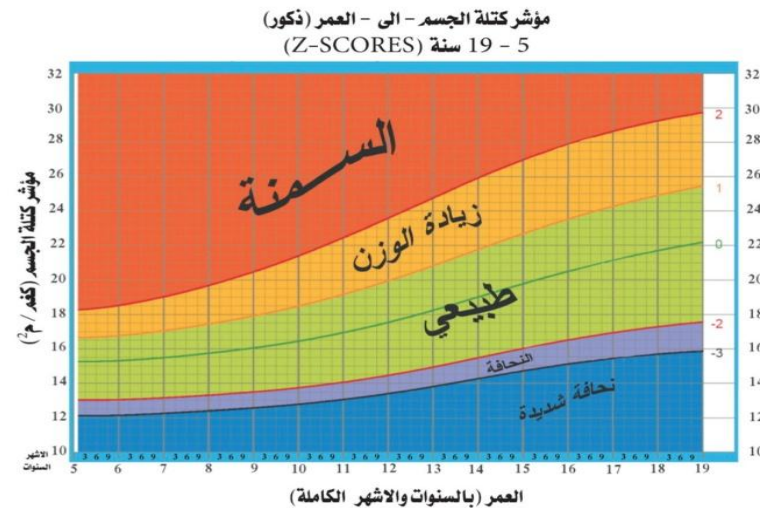
مؤشر كتلة الجسم - الی - العمر (إناث)  
(Z-scores) أشهر 6 - 0





## ✓ Children aged between 5–19 years:

- Overweight is BMI-for-age greater than 1 SD above the WHO Growth Reference median; and
- Obesity is greater than 2 SD above the WHO Growth Reference median.





## Medical complications:

Obesity is associated with number of chronic diseases including;



□ **Adult onset of diabetes:** 2.9X higher prevalence.

□ **Hypercholesterolemia:** high plasma T.G., LDL. Hypertension & heart disease, there is linear association between B.W.& B.P. 5X with obesity.

□ **Cancer:** ca colon& prostate in males, & breast in females.

□ **Gall stones** (related to incr. cholesterol synthesis)

□ **Arthritis, & gout.**

□ **Undesirable social,& psychological consequences** of obesity.

❑ Obesity associated with **heavy menstrual blood flow, irregular cycle, & infertility.**

❑ **Decrease life expectancy.**

❑ **Economical consequences.**

**\*On the other hand risk of osteoporosis is lower with obesity.**



Repeated cycles of wt. lose & regain called yo-yo dieting which takes longer to lose wt. & shorter to regain it when the cycles are repeated”.

# Weight reduction:

□ **Diet and Physical Activity: Unhealthy diets and physical inactivity** are two of the main modifiable risk factors for most of the main chronic Diseases.



□ Assuming that an excess of 3,500 kcal produces 1 lb (0.5 kg) of weight gain

□ Diet for weight reduction: Body wt. represents the balance between energy intake & energy expenditure, to reduce B.W. requires negative energy balance.

□ Many strategies include; The best approach to lose wt. is to follow a balanced **mildly hypo caloric diet.**

□ **Diet:** to lose 500gm/wk , the patient should reduce caloric intake 500Kcal/day  
=3500Kcal/wk = max. loss 2kg/m. & or Exercise



**□ Exercise:** increase physical activity which result in **expenditure of 500Kcal;** running for 45min., playing tennis 60min., walking 75min. bicycling 90min.

**□ Behavioral modification:** Eating when hungry,& stopping with first sign of satiety. Eating small, regular & frequent meals, eat in smaller plate, don't eat too fast.

**□ Surgical treatment (for morbid obesity):**

- ✓ Creating smaller bowel( produce mal absorption of calories)
- ✓ Or creating small stomach to reduce the reservoir for food + dietary treatment is particularly effective for initial wt. loss.
- ✓ It is advisable to take multivitamins–mineral pills to prevent essential nutrients deficiencies.

## Obesity Among Children:

- Deal with weight gain through growth,
- Do not put the child on a weight loss diet ,
- Let the child maintain the current weight while he grows taller.
- Enhance physical activity in schools & communities.
- Eating family meals Limiting the exposure of young children to heavy marketing practices of energy dense, micronutrient poor foods.
- Restrict the intake of sugars-sweetened soft drinks.



# General strategies for obesity prevention:

The prevention of obesity in infants & young children should be considered of high priority. The main preventive strategies are:



- The promotion of exclusive breastfeeding
- Avoiding the use of added sugars and starches with feeding formula.
- Instructing mothers to accept their child's ability to regulate energy intake rather than feeding until the plate is empty.
- Assuring the appropriate micronutrient intake needed to promote optimal linear growth.

## Prevention of obesity For children & adolescents need to:

- \*Promote an active lifestyle.
- \*Limit television viewing.
- \*Promote the intake of fruits & vegetables.
- \*Restrict the intake of energy-dense, micronutrient-poor foods (e.g. packaged snacks);
- \*Restrict the intake of sugars-sweetened soft drinks






## Summery:

1. Extreme of malnutrition
2. Marasmus
3. Koshiorkor
4. Their prevention.
5. Obesity and how to prevent it.



A close-up photograph of two hands, palms up, holding a small, rectangular piece of white paper with deckled edges. The paper is held horizontally across the center of the hands. On the paper, the words "Thank You" are written in a black, elegant cursive script. The background is a solid, dark color, likely black, which makes the hands and the white paper stand out. The lighting is soft, highlighting the texture of the skin and the paper.

*Thank You*