Spectrum of public nutrition problems: Malnutrition & its Ecology

By

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Attention!!!!!!!!

- Sun 25-9 Introduction and Terminology used in nutrition
- Tue 27-9 The Nutrients & their Categories
- Thu 2-10 Spectrum of public nutrition problems: Malnutrition & its Ecology and Common nutritional disorders in Jordan
- Tue 4-10 Assessment of Nutritional Status. Anthropometric Assessment.
- Thu 9-10 Breast feeding & Breast milk. Formula feeding
Hurricanes, flooding, heavy rains may increase the risk of water-borne diseases (e.g. typhoid fever, leptospirosis) and vector-borne diseases (e.g. malaria, dengue, Chikungunya). Consult a doctor at once if you have any sign or symptom of illness.
## Presentation outline

<table>
<thead>
<tr>
<th>Topic</th>
<th>Time</th>
</tr>
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<tbody>
<tr>
<td>Disorders of Nutrition and Malnutrition Public health importance</td>
<td>08:00 to 08:10</td>
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<tr>
<td>Ecology Of Malnutrition : affecting factors and causes</td>
<td>08:10 to 08:20</td>
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<tr>
<td>Nutritional Deficiency Diseases Kwashiorkor and Marasmus</td>
<td>08:20 to 08:40</td>
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<td>And Obesity</td>
<td>08:40 to 09:00</td>
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<tr>
<td>Prevention of Malnutrition</td>
<td>09:00 to 09:15</td>
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</tbody>
</table>
Illness

Example: Cancer

Altered Food Intake
Examples: Loss of appetite, altered food likes/dislikes, difficulty chewing and swallowing, reduced saliva secretion

Altered Digestion and Absorption
Examples: radiation enteritis, surgical resection of GI tract, diarrhea

Altered Metabolism
Example: increased energy needs due to altered energy use in cancer

Altered Nutrient Excretion
Examples: fecal loss of fat-soluble vitamins and calcium in clients with cancers that affect enzyme secretion or bile salt production

Malnutrition
Malnutrition

• Derived from *malus* (bad) and *nutrire* (to nourish)

• Includes both

  ❖ **Under** nutrition (deficiency of one or more essential nutrients)

  ❖ **Over** nutrition (an excess of a nutrient or nutrients)
MALNUTRITION

“A pathological state resulting from a relative or absolute deficiency or excess of one or more essential nutrients; clinically manifested or detected only by biochemical, anthropometric or physiological tests.”
Malnutrition

The world health organization (WHO) defines malnutrition as "The cellular imbalance between supply of nutrients and the body's demand for them to ensure growth, maintenance, and specific functions".

Malnutrition, in all its forms, includes
I. undernutrition (wasting, stunting, underweight),
II. inadequate vitamins or minerals,
III. overweight, obesity,
IV. and resulting diet-related noncommunicable diseases.
Malnutrition is a pathologic state of varying severity; its clinical features are caused by a deficiency or imbalance of essential nutrients.

The cause may be primary (insufficient quantity or quality of food) or secondary (increased requirements or inadequate utilization).

• Malnutrition is globally the important risk factor for illness and death, contributing to more than half of deaths in children worldwide.
Forms of Malnutrition

1. **Undernutrition**: Marasmus

2. **Overnutrition**: Obesity, Hypervitamininoses

3. **Specific Deficiency**: Kwashiorkor, Hypovitamininoses, Mineral Deficiencies

4. **Imbalance**: Electrolyte Imbalance
Types of Malnutrition (undernutrition)

- *Under nutrition* is *depletion of energy (calories)* resulting from *insufficient food intake over an extended period of time*.
- In extreme cases under-nutrition is called *Starvation*.
- *Specific Deficiency* is the pathological state resulting from a deficiency of an *individual nutrient* such as vitamin A deficiency, iodine deficiency.
TYPES OF UNDERNUTRITION

UNDERNUTRITION

ACUTE UNDERNUTRITION
- Marasmus
- kwashiorkor
- Marasmic-kwashiorkor
- Wasting

CHRONIC UNDERNUTRITION
- Stunting
- Underweight
Types of Malnutrition
(Overnutrition)

Over nutrition:

• “Over nutrition is the pathological state resulting from the consumption of excessive quantity of food over an extended period of time”.

• Overweight and obesity are very common conditions in developed society and are becoming more common in developing societies and those in transition.
• Protein energy mal-nutrition.
• Iron deficiency anemia.
• Rickets.
• Ariboflavinosis and vitamin A deficiency.
• Obesity.
Public health importance

For a health problem or condition to be considered a public health issue, four criteria must be met:

1) the health condition must place a *large burden* on society, a burden that is getting larger despite existing control efforts;
2) the burden must be *distributed unfairly* (i.e., certain segments of the population are unequally affected);
3) there must be evidence that *upstream preventive strategies* could substantially reduce the burden of the condition; and
4) such *preventive strategies* are not yet in place.
 MALNUTRITION IN ALL ITS FORMS

- **CHILD STUNTING**
  Low height for age

- **CHILD WASTING**
  Low weight for height

- **CHILD OVERWEIGHT**
  High weight for height

- **ADULT OVERWEIGHT**
  Carrying excess body fat with a body mass index ≥ 25

- **MICRONUTRIENT DEFICIENCY**
  Iron, folic acid, vitamin A, zinc, iodine below healthy thresholds

- **ADULT OBESITY**
  Carrying excess body fat with a body mass index ≥ 30

- **NONCOMMUNICABLE DISEASES**
  Diabetes, heart disease, and some cancers
Although the numbers of people affected by different types of malnutrition cannot simply be summed (because a person can suffer from more than one type), the scale of malnutrition is staggering.

Out of a world population of 7 billion:
- About 2 billion people suffer from micronutrient malnutrition
- Nearly 800 million people suffer from calorie deficiency

Out of 5 billion adults worldwide:
- Nearly 2 billion are overweight or obese
- One in 12 has type 2 diabetes

Out of 667 million children under age 5 worldwide:
- 159 million under age 5 are too short for their age (stunted)
- 50 million do not weigh enough for their height (wasted)
- 41 million are overweight

Out of 129 countries with data, 57 countries have serious levels of both undernutrition and adult overweight (including obesity).

Number of children under 5 affected by stunting and overweight by region, 1990–2014


Note: LAC = Latin America and the Caribbean. Europe and Northern America were not included in the overweight figure because of lack of data. Estimates for Asia exclude Japan. Estimates for Oceania exclude Australia and New Zealand.
Adult overweight and obesity, adult obesity, and adult diabetes, by UN region, 2010 and 2014

Source: Authors, based on data from WHO (2015a).
Note: Raised blood glucose = fasting glucose ≥7.0 mmol/l (126 mg/dl) or on medication for raised blood glucose or with a history of diagnosis of diabetes. BMI = body mass index; LAC = Latin America and the Caribbean. Number of countries = 190. Prevalence data are age-standardized adjusted estimates (population age 18+ years). Regional estimates are population-weighted means.
Global Situation 2017

- 1.9 billion adults are overweight or obese, while 462 million are underweight.
- 52 million children under 5 years of age are wasted, 17 million are severely wasted and 155 million are stunted, while 41 million are overweight or obese.
- Around 45% of deaths among children under 5 years of age are linked to undernutrition.
- These mostly occur in low- and middle-income countries. At the same time, in these same countries, rates of childhood overweight and obesity are rising.
- The developmental, economic, social, and medical impacts of the global burden of malnutrition are serious and lasting, for individuals and their families, for communities and for countries.
Global situation

- **2 billion** people are deficient in **key vitamins & minerals**
- Globally, **10%** of deaths and disability-adjusted-life-years (DALYs) among children below five years are caused by micronutrient deficiencies.
- **Iron and Vitamin A** and **zinc** deficiency represent the highest health
How to measure malnutrition

1. Anthropometry
   a. Weight
   b. Length or height
   c. Middle upper arm circumference

2. Weight and height must be compared to age or to each other and therefore are turned into indices
   a. Weight for age called ‘underweight’. Includes both wasting and stunting
   b. Weight for length or body mass index, measure of ‘wasting’ and ‘obesity’
   c. Height for age, measure of ‘stunting’

3. Other signs or measures
   a. Oedema (water retention) of feet, hands, face
   b. Blood test for anemia (iron deficiency in particular)
   c. Blood test for certain micronutrients: Vitamin A or zinc
Wasting and stunting
الهزال والتقزم

When a population is short this points to nutritional deprivation or disease in childhood.

165 million children under five are stunted (25.7%)

52 million children under 5 are wasted, 19 million severely wasted

Image: http://www.bing.com/images/search?q=Forms+Of+Malnutrition&Form=IQFRDR#view=detail&id=8D2A19491AEE9E080EF2302D4FD4004D2EA0FB5&selectedIndex=2; http://download.thelancet.com/flatcontentassets/pdfs/nutrition_2.pdf
Stunting prevalence by region

Globally, about 1 in 5 (26% in 2011) children are stunted of whom 80% live in 40 countries. Undernutrition affects poor children most, but rates are high enough to deserve attention even among the better-off children in developing countries.

<table>
<thead>
<tr>
<th>Region</th>
<th>Prevalence</th>
</tr>
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<tbody>
<tr>
<td>South Asia</td>
<td>46%</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>38%</td>
</tr>
<tr>
<td>Middle-East / North Africa</td>
<td>25%</td>
</tr>
<tr>
<td>East Asia / Pacific</td>
<td>16%</td>
</tr>
<tr>
<td>Latin America / Caribbean</td>
<td>16%</td>
</tr>
<tr>
<td>CEE / CIS</td>
<td>12%</td>
</tr>
<tr>
<td>Developing countries</td>
<td>32%</td>
</tr>
</tbody>
</table>

* Prevalence is the proportion of the population that has a condition of interest at a specific point in time.

Figure 2: Trends in DES per capita and percentages from protein, lipids & carbohydrates

Daily Energy Requirements: 2056 kcal/per capita

Source: FAOSTAT
Figure 1: Supply for human consumption (2005-2007)

- Cereals
- Fruits and vegetables
- Meat and offals
- Fish and seafood
- Milk and milk products
- Vegetable oils
- Sweeteners

Legend:
- Jordan
- Lebanon
- Syrian Arab Republic
التقزم والهزال

<table>
<thead>
<tr>
<th>Number of children under 5 affected (000)</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Stunting(^a)</td>
<td>71</td>
<td>2012</td>
<td></td>
</tr>
<tr>
<td>Wasting(^a)</td>
<td>22</td>
<td>2012</td>
<td></td>
</tr>
<tr>
<td>Overweight(^a)</td>
<td>43</td>
<td>2012</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Percentage of children under 5 affected</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Wasting(^a)</td>
<td>2</td>
<td>2012</td>
<td></td>
</tr>
<tr>
<td>Severe wasting(^a)</td>
<td>1</td>
<td>2012</td>
<td></td>
</tr>
<tr>
<td>Overweight(^a)</td>
<td>5</td>
<td>2012</td>
<td></td>
</tr>
<tr>
<td>Low birth weight(^b)</td>
<td>13</td>
<td>2007</td>
<td></td>
</tr>
</tbody>
</table>

Sources: \(^a\)UNICEF/WHO/WB 2014; \(^b\)UNICEF 2014.
PREVALENCE OF UNDER-5 STUNTING (%)
Food and nutrition profile, Jordan
Nutrition and Consumer Protection Division, FAO, 2011

- Figure 6: Trends in the prevalence of stunting among children under five years of age, according to place of residence

Figure 6: Trends in the prevalence of stunting among children under five years of age (urban/rural areas)

<table>
<thead>
<tr>
<th>Year</th>
<th>Urban</th>
<th>Rural</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>1997</td>
<td>10</td>
<td>25</td>
</tr>
<tr>
<td>2002</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>2009</td>
<td>5</td>
<td>10</td>
</tr>
</tbody>
</table>

Sources: JPFHS 1990; JPFHS 1997; JPFHS 2002; JPFHS 2009
PREVALENCE OF ADULT OVERWEIGHT AND OBESITY, 2008 (%)

- Overweight (BMI ≥ 25)
  - Female: 71%
  - Male: 67%
  - Both sexes: 69%
- Obesity (BMI ≥ 30)
  - Female: 42%
  - Male: 27%
  - Both sexes: 34%

Source: WHO 2014.
Note: BMI = body mass index.
Ecology Of Malnutrition: affecting factors and causes

Host, agent and environmental FACTORS

- **Host factors**: Socioeconomic, educational, morbidity,
- **Agent (food) factors**: food production, availability, price
- **Environmental**: endemicity of diseases
- **Health and other related diseases**: planning, implementation....
Causes of Malnutrition

• Indirect causes: - low socioeconomic standard of living
  - Defective sanitation
  - Faulty behaviors
  - Inadequate health services

• Direct Causes:
  = primary (exogenous) – deficient intake of nutrients (poverty, ignorance, faulty food habits)
  = secondary (endogenous)
    – physiologically increased requirement (pregnancy, growth, lactation,)
    - pathologically increased requirement (fever, surgery...)
    - replace losses in parasitic infestation, diarrhea, hemorrhage)
Etiology

Primary Causes

- Low Income, Low Purchasing Power
- Ignorance & Erroneous Food Habits
- Scarcity of Food Supply
- Overpopulation
Secondary Causes

- Obesity, Insulin Resistance and Diabetes
- Diarrhea and Intestinal Malabsorption
- Hepatobiliary Disorders
- Infections especially Respiratory
- Metabolic and Renal Diseases
WHAT CAUSES MATERNAL AND CHILD MALNUTRITION?

Today, 7,000 young children will die from malnutrition while countless others live out their childhoods in a state of chronic malnourishment. Understanding how this happens is the first step to solving this silent crisis.

FOOD
Insufficient access to affordable, nutritious food. Without sufficient calories or the right nutrients in their diets, women and children are susceptible to the dire, sometimes deadly, consequences of malnutrition.¹

CARE
Lack of proper care of mothers and children and poor infant feeding practices. Nearly one million child deaths per year could be prevented if children were breastfed exclusively during their first 6 months.²

HEALTH
Poor access to health services and unhealthy household environment. Disease, unsafe water, and improper sanitation contribute to malnutrition, particularly in children.³

72 children will die from malnutrition by the time you finish reading this infographic. Virtually all of these deaths are preventable.

Predisposing factors:

1) General factors:
   • Low socioeconomic conditions which leads to inadequate feeding.
   • Unsanitary environment with high prevalence of infectious and diarrhea disease.
   • Illiteracy and unclean habits of the mother

2) Nutritional factors
   • Artificially fed infants are more susceptible to malnutrition.
   • Prolonged breast feeding without supplementation.
   • Nutrition ignorance of the others and faulty weaning practices.
Assessment of Nutritional Status

- **Direct**
  - Clinical — *Useful in severe forms of PEM*
  - Anthropometric
  - Dietary
  - Laboratory

- **Indirect**
  - Health statistics
  - Ecological variables
Nutritional disorders

The Ugly Face of “Hidden Hunger”

Iron Deficiency

Vitamin A Deficiency

Iodine Deficiency

Folic Acid Deficiency

Zinc Deficiency
## Classification of Undernutrition

1. **Gomez Classification**: uses weight-for-age measurements; provide grading as to prognosis

<table>
<thead>
<tr>
<th>Weight-for-Age%</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>91-100</td>
<td>Normal</td>
</tr>
<tr>
<td>76-90</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; degree</td>
</tr>
<tr>
<td>61-75</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt; degree</td>
</tr>
<tr>
<td>&lt;60</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt; degree</td>
</tr>
</tbody>
</table>
2. **Wellcome Classification**: simple since based on 2 criteria only - wt loss in terms of wt for age% & presence or absence of edema

<table>
<thead>
<tr>
<th>Wt-for-Age%</th>
<th>Edema</th>
<th>No Edema</th>
</tr>
</thead>
<tbody>
<tr>
<td>80-60</td>
<td>Kwashiorkor</td>
<td>Undernutrition</td>
</tr>
<tr>
<td>&lt; 60</td>
<td>Marasmic-</td>
<td>Marasmus</td>
</tr>
<tr>
<td></td>
<td>Kwashiorkor</td>
<td></td>
</tr>
</tbody>
</table>
3. **Waterlow Classification**: adopted by **WHO**; can distinguish between deficits of weight-for-height% *(wasting)* & height-for-age% *(stunting)*

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mild</th>
<th>Mod</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ht-for-Age%</strong></td>
<td>&gt;95</td>
<td>90-95</td>
<td>80-90</td>
<td>&lt;80</td>
</tr>
<tr>
<td><strong>Wt-for-Ht%</strong></td>
<td>&gt;90</td>
<td>80-89</td>
<td>70-79</td>
<td>&lt;70</td>
</tr>
</tbody>
</table>
Protein Energy Malnutrition

EPIDEMIOLOGY

• The term protein energy malnutrition has been adopted by WHO in 1976.

• Highly prevalent in developing countries among <5 children; severe forms 1-10% & underweight 20-40%.

• All children with PEM have micronutrient deficiency.
PRECEPITATING FACTORS

- LACK OF FOOD (famine, poverty)
- INADEQUATE BREAST FEEDING
- WRONG CONCEPTS ABOUT NUTRITION
- DIARRHOEA & MALABSORPTION
- INFECTIONS (worms, measles, T.B)
CLASSIFICATION

– A. CLINICAL (WELLCOME)

– Parameter: weight for age + oedema

– Reference standard (50th percentile)

– Grades:

  • 80-60 % without oedema is under weight
  • 80-60% with oedema is Kwashiorkor
  • < 60 % with oedema is Marasmus-Kwash
  • < 60 % without oedema is Marasmus
CLASSIFICATION (2)

- B. COMMUNITY (GOMEZ)
- Parameter: weight for age
- Reference standard (50th percentile) WHO chart
- Grades:
  - I  (Mild): 90-70
  - II (Moderate): 70-60
  - III (Severe): < 60
MARASMUS

• The term marasmus is derived from the Greek *marasmos*, which means wasting.
• Marasmus involves inadequate intake of protein and calories and is characterized by emaciation.
• Marasmus represents the end result of starvation where both proteins and calories are deficient.
Marasmus represents an adaptive response to starvation, whereas kwashiorkor represents a maladaptive response to starvation.

In Marasmus the body utilizes all fat stores before using muscles.
Protein Energy Malnutrition

Marasmus

- Common in the 1st year of life

Etiology:
- “Balanced starvation”
- Insufficient breast milk
- Dilute milk mixture or lack of hygiene
Marasmus

**Clinical Manifestations:**
1. Wasting
2. Muscle wasting
3. Growth retardation
4. Mental changes
5. No edema
6. Variable-subnormal temp, slow PR, good appetite, often w/diarrhea, etc.

**Laboratory Data:**
1. Serum albumin N
2. Urinary urea/ gm crea N
3. Urinary hydroxyproline/ gm crea low, early
4. Serum essential a.a. index N
5. Anemia uncommon
6. Glucose tolerance curves diabetic type
7. K⁺ deficiency present
8. Serum cholesterol low
9. Diminished enzyme activity
10. Bone growth delayed
11. Liver biopsy N or atrophic
Protein Energy Malnutrition

Kwashiorkor

- Between 1-3 yrs old

Etiology:

- Very low protein but w/calories from CHO
- In places where starchy foods are main staple
- Never exclusively dietary
Kwashiorkor

Clinical Manifestations:

A. Diagnostic Signs
   1. Edema
   2. Muscle wasting
   3. Psychomotor changes

B. Common Signs
   1. Hair changes
   2. Diffuse depigmentation of skin
   3. Moonface
   4. Anemia

C. Occasional Signs:
   1. Flaky-paint rash
   2. Noma
   3. Hepatomegaly
   4. Associated

Laboratory:
   1. Decreased serum albumin
   2. EEG abnormalities
   3. Iron & folic acid deficiencies
   4. Liver biopsy fatty or fibrosis may occur
CONSTANT FEATURES OF KWASH

- OEDEMA
- PSYCHOMOTOR CHANGES
- GROWTH RETARDATION
- MUSCLE WASTING
Treatment of PEM
Protein Energy Malnutrition

1. Severe PEM is an emergency, hospitalization 1-3 mo desirable
2. On admission, treat vitamin deficiencies, dehydration & associated infections
3. In the acute phase, feeding started as soon as rehydrated & when edema is lost, full-strength feeds given with maintenance calories & protein; recovery after 2-3 wks
4. Rehabilitation with high energy feeds (150-200 kcal/kg/day) started once full-strength feeds tolerated; recovery expected within 4-6 wks on high energy feeds
Prognosis of PEM

✓ Permanent impairment of physical & mental growth if severe & occurs early especially before 6 months old
✓ First 48 hours critical, with poor treatment mortality may exceed 50%
✓ Even with thorough treatment, 10% mortality may still occur
✓ Some mortality causes are endocrine, cardiac or liver failure, electrolyte imbalance, hypoglycemia & hypothermia
Obesity

Don’t supersize him.

Childhood obesity is a growing epidemic that increases death and disability from heart disease. Reducing physical activity, such as 150 minutes per week of physical education for elementary schools and 225 minutes for middle schools, gives children a fighting chance against obesity and heart disease. And, coordinated school health programs will ensure that children have sound minds and healthy bodies. You can prevent super-sized children who suffer more health problems and grow into unhealthy, less productive and disabled adults. Don’t miss your chance to shape a whole new generation of Americans and stop the nation’s No. 1 killer—heart disease.

Heart disease. You’re the Cure.
1. Definition: Generalized, excessive accumulation of fat in subcutaneous & other tissues

2. Classification according to “desirable” weight standard: Overweight ~ >17% while Obese ~ >24%

4. The American Obesity Association uses: The 85th percentile of BMI for overweight because ~ BMI of 25, overweight for adults and the 95th percentile of BMI for obesity because ~ BMI of 30, the marker for obesity in adults
Obesity

Appears most frequently in the 1st year, 5-6 years & adolescence

Etiology:

- Excessive intake of food compared w/ utilization
- Genetic constitution
- Psychic disturbance
- Endocrine & metabolic disturbances rare
- Insufficient exercise or lack of activity
Obesity

Clinical Manifestations:
1. **Fine facial features** on a heavy-looking taller child
2. **Larger upper arms & thighs**
3. Genu valgum common
4. Relatively small hands & fingers tapering
5. Adiposity in mammary regions
6. Pendulous abdomen w/ striae
7. In boys, external genitalia appear small though actually average in size
8. In girls, external genitalia normal & menarche not delayed
9. Psychologic disturbances common
10. Bone age advanced
Health consequences of obesity

In many countries around the world, being obese is now the biggest driver of sickness, because it raises the risk of, for example, diabetes, heart disease, stroke and some cancers. It is also linked to the increased incidence of osteo-arthritis of the hip and knee (major cause of hip and knee replacements).

Treatment of Obesity

A. 1st principle: decrease energy intake
   1. Initial med exam to R/O pathological causes
   2. 3-day food recall to itemize child’s diet
   3. Plan the right diet
      a. Avoid all sweets, fried foods & fats
      b. Limit milk intake to not >2 glasses/day
      c. For 10-14 yrs, limit to 1,100-1300 cal diet for several months
   4. Child must be properly motivated & family involvement essential

B. 2nd principle: increase energy output
   1. Obtain an activity history
   2. Increase physical activity
   3. Involve in hobbies to prevent boredom
Complication of Obesity

Pickwickian Syndrome

✓ Rare complication of extreme exogenous obesity
✓ Severe cardiorespiratory distress & alveolar hypoventilation
✓ Includes polycythemia, hypoxemia, cyanosis, CHF & somnolence
✓ High O₂ conc dangerous in cyanosis
✓ Weight reduction ASAP & quick
Prevention of Malnutrition—infants....

- **Primary Prevention**
  - Health Education to mothers about good nutrition and food hygiene through Lady Health Workers
  - Immunization of children.
  - Growth monitoring on Growth Charts specially of all children under 3 years of age

- **Secondary Prevention**
  - Mass Screening of high risk populations, using simple tools like Weight for age or MUAC.

- **Tertiary Prevention**
  - Good Nutritional Care, supplementary feedings and rehabilitation, counseling of mothers.
Prevention of malnutrition:

1) General measures
   • Community and socioeconomic development.
   • Family planning services.
   • Education and culture of the public.

2) Nutritional measures:
   • Encourage breast-feeding for suitable period.
   • Proper weaning.
   • Dietary supplementation for protein and other nutrients.
   • Nutrition education of mothers
Prevention of malnutrition

3) Care for the child:
   • Immunization
   • Gross monitoring
   • Immediate management of diarrheal diseases.

4) Family planning:

5) National level: modern agriculture techniques

6) International level: FAO and WHO