Protein Energy Malnutrition

Facilitator:

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Specific Learning Objectives

• At the end of session, the learner shall be able to:
  ➢ Understand the concept of PEM.
  ➢ Describe factors associated with PEM.
  ➢ Classify PEM.
  ➢ Take preventive measures for PEM.
Introduction

• Malnutrition is a range of conditions occurring when intake of one or more nutrients doesn’t meet the requirements.

• PEM is an important nutritional problem among preschool age children.

• The main cause of PEM is food inadequacy.
• PEM was earlier attributed to the concept of ‘protein gap’ (deficiency of proteins in diet).

• ‘Food gap’ is the chief cause of PEM
  ➢ it is not only the deficiency of proteins but inappropriate food (low in energy density, protein and micronutrients - Vitamin A, Iron, Zinc)
  ➢ poor both quantitatively and qualitatively.
## Undernutrition

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td>being underweight for one’s age (Weight for age)</td>
</tr>
<tr>
<td>Stunted</td>
<td>being too short for one’s age (Height for age)</td>
</tr>
<tr>
<td>Wasted</td>
<td>being dangerously thin (Weight for height)</td>
</tr>
<tr>
<td>Micronutrient</td>
<td>being deficient in vitamins and minerals (Hidden Hunger)</td>
</tr>
</tbody>
</table>
Magnitude of the Problem

• World

- More than 1/3 of the world’s population.

- For all indicators of PEM, a total of 80% of the children affected live in Asia (mainly in southern Asia).

- 43% of children in developing countries are stunted.

- 50% of child deaths in developing countries are related to malnutrition.
Undernutrition in Children under age 3 years in INDIA

- **Stunted**: NFHS-2: 51, NFHS-3: 45
- **Underweight**: NFHS-2: 43, NFHS-3: 40
- **Wasted**: NFHS-2: 20, NFHS-3: 23
Children’s Nutritional Status in INDIA

Children under age 5 years who are underweight (%)

(Bar chart showing the percentage of underweight children in different states of India.)
Factors associated with PEM

• Ante natal and post natal care
• Low birth spacing
• Feeding practices
• Rural Urban distribution
• Gender and PEM
• Infections & environment
• Literacy
• Socioeconomic status of family
Malnutrition – Infection Vicious cycle

Inadequate Dietary Intake

Appetite loss
Nutrition loss
Malabsorption
Altered metabolism

Weight loss
Growth failure
Low Immunity
Mucosal damage

Infection (Disease)
Classification of PEM

• PEM is a spectrum of conditions ranging from growth failure to overt marasmus or kwashiorkor.
• Various classifications are given
  - Gomez classification
  - IAP classification
  - NCHS (WHO) classification
  - Waterlow’s classification
  - Welcomes classification
Gomez classification

- Based on Weight for age.
- In this system the normal reference child is the 50th centile of the Boston standard.
- Weight for age (%) =

\[
\left( \frac{\text{Weight of the child}}{\text{Weight of the normal child of same age}} \right) \times 100
\]

<table>
<thead>
<tr>
<th>Stage of Malnutrition</th>
<th>Weight for age (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>&gt; 90 %</td>
</tr>
<tr>
<td>Grade I</td>
<td>75 – 90 %</td>
</tr>
<tr>
<td>Grade II</td>
<td>60 – 75 %</td>
</tr>
<tr>
<td>Grade III</td>
<td>&lt; 60 %</td>
</tr>
</tbody>
</table>
• Gomez classification is easy to use because weight is very easy to measure

• **Disadvantages are:**
  - A cut of point of 90% is high (80% is equivalent to –2SD or 3rd percentile) so some normal children are classified as grade I malnutrition.
  - Only weight is measured so it is difficult to know that if the low weight is due to an acute malnutrition or long standing chronic malnutrition.
  - Boston standard used in above classification is no longer an international reference data.
IAP classification (1972)

Also based on Weight for age.

<table>
<thead>
<tr>
<th>Stage of Malnutrition</th>
<th>Weight for age (%)</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>&gt; 80%</td>
<td></td>
</tr>
<tr>
<td>Grade I</td>
<td>70 – 80%</td>
<td>Mild</td>
</tr>
<tr>
<td>Grade II</td>
<td>60 – 70%</td>
<td>Moderate</td>
</tr>
<tr>
<td>Grade III</td>
<td>50 - 60%</td>
<td>Severe</td>
</tr>
<tr>
<td>Grade IV</td>
<td>&lt; 50%</td>
<td></td>
</tr>
</tbody>
</table>
## WHO classification (based on NCHS data)

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight below Median minus 2SD (M - 2SD)</td>
<td>Moderate malnutrition</td>
</tr>
<tr>
<td>Weight below Median minus 3SD (M – 3 SD)</td>
<td>Severe Malnutrition</td>
</tr>
</tbody>
</table>

Median used here is the Median weight of NCHS reference population.
## Waterlow's classification

Based on Weight and Height

<table>
<thead>
<tr>
<th>H/A</th>
<th>W/H</th>
<th>&gt; m – 2 SD</th>
<th>&lt; m – 2 SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; m – 2SD</td>
<td>Normal</td>
<td>Wasted</td>
<td></td>
</tr>
<tr>
<td>&lt; m – 2SD</td>
<td>Stunted</td>
<td>Wasted And Stunted</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Drop in Height for age (&lt;90%)</th>
<th>Stunted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drop in Weight for Height (&lt;80%)</td>
<td>Wasting</td>
</tr>
<tr>
<td>Drop in Weight for Age (&lt;80%)</td>
<td>Under weight</td>
</tr>
</tbody>
</table>
Wellcome’s classification

• 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
Mid-arm circumference

MAC does not vary much between age of 1 – 5 years.

<table>
<thead>
<tr>
<th>MAC Condition</th>
<th>Nutritional Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAC &gt; 13.5 cm</td>
<td>Satisfactory nutritional status</td>
</tr>
<tr>
<td>MAC 12.5 – 13.5 cm</td>
<td>Mild to moderate malnutrition</td>
</tr>
<tr>
<td>MAC &lt; 12.5 cm</td>
<td>Severe malnutrition</td>
</tr>
</tbody>
</table>
**Marasmus**

- Grossly underweight
- No body fat
- Gross muscle wasting
- Old man's face
- No oedema
- Normal hair

**Kwashiorkor**

- Oedema
- Will not eat
- Skin: patches of pigmentation and desquamation
- Hair pale and thinned
- Miserable and apathetic
- Moon face
- Liver usually palpable
- Pitting oedema
Complications of PEM

• Water, electrolyte and mineral imbalance
• Hypothermia
• Hypoglycemia
• Superadded infections
• Vitamin deficiency
• Lactose intolerance
• Cardiac failure
• Bleeding tendency
• Renal impairment
• Long term – Growth retardation, mental retardation
Preventive measures

Think – Pair – Share
A) Health Promotion:

• Measure direct to pregnant and lactating women (education, supplements)
• Promotion of breastfeeding
• Development of low cost weaning food
• Family planning
• Home economics
• Family environment
B) **Specific protection:**
1. Protein energy rich food (e.g. milk, egg, fresh fruits)
2. Immunization
3. Food fortification

C) **Early diagnosis and treatment:**
1. History taking
2. Clinical features
3. Anthropometry
4. Biochemical and laboratory investigations.
5. Proper and effective management.
D) Rehabilitation:

1. Hospital treatment
2. Nutritional rehabilitation services (NRC i.e. Nutritional Rehabilitation Centres)
3. Follow-up care
Success Stories...
Take Home Message!

• Malnutrition does not mean undernutrition.
• There are various classifications for PEM.
• PEM is preventable and curable.