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 malnutrition</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: 51% (NFHS-2), 45% (NFHS-3)
- Underweight: 43% (NFHS-2), 40% (NFHS-3)
- Wasted: 20% (NFHS-2), 23% (NFHS-3)
Children’s Nutritional Status in INDIA

Children under age 5 years who are underweight (%)

<table>
<thead>
<tr>
<th>State</th>
<th>SK</th>
<th>MZ</th>
<th>MN</th>
<th>KE</th>
<th>PJ</th>
<th>GA</th>
<th>NA</th>
<th>JK</th>
<th>DL</th>
<th>TN</th>
<th>AP</th>
<th>AR</th>
<th>AS</th>
<th>HP</th>
<th>MH</th>
<th>KA</th>
<th>UT</th>
<th>WB</th>
<th>HR</th>
<th>TR</th>
<th>RJ</th>
<th>OR</th>
<th>UP</th>
<th>IN</th>
<th>GJ</th>
<th>CH</th>
<th>MG</th>
<th>BH</th>
<th>JH</th>
<th>MP</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>20</td>
<td>20</td>
<td>22</td>
<td>23</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>26</td>
<td>26</td>
<td>30</td>
<td>33</td>
<td>33</td>
<td>30</td>
<td>36</td>
<td>37</td>
<td>37</td>
<td>38</td>
<td>38</td>
<td>39</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>41</td>
<td>42</td>
<td>43</td>
<td>45</td>
<td>47</td>
<td>49</td>
<td>56</td>
<td>57</td>
</tr>
</tbody>
</table>
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 (%) =
  
  \[
  \text{Weight of the child / Weight of the normal child of same age } \times 100
  \]

<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>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>&gt; 80 %</td>
</tr>
<tr>
<td>Grade I</td>
<td>70 – 80 %</td>
</tr>
<tr>
<td>Grade II</td>
<td>60 – 70 %</td>
</tr>
<tr>
<td>Grade III</td>
<td>50 - 60 %</td>
</tr>
<tr>
<td>Grade IV</td>
<td>&lt; 50 %</td>
</tr>
<tr>
<td></td>
<td>Severe</td>
</tr>
</tbody>
</table>
### WHO classification (based on NCHS data)

<table>
<thead>
<tr>
<th>Weight below Median minus 2SD (M - 2SD)</th>
<th>Moderate malnutrition</th>
</tr>
</thead>
<tbody>
<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>Condition</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drop in Height for age (&lt; 90%)</td>
<td>Stunted</td>
</tr>
<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</th>
<th>Nutritional Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 13.5 cm</td>
<td>Satisfactory nutritional status</td>
</tr>
<tr>
<td>12.5 – 13.5 cm</td>
<td></td>
</tr>
<tr>
<td>&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.