NUTRITION IN END-STAGE LIVER DISEASE

Dr. Sarath Gopalan

- Senior Consultant in Pediatric Gastroenterology, Hepatology and Clinical Nutrition, Pushpawati Singhania Research Institute for Liver, Renal and Digestive Diseases (PSRI), New Delhi.

- Visiting Consultant in Pediatric Gastroenterology and Hepatology, Moolchand Hospital, New Delhi, Rockland Hospital, New Delhi and Indraprastha Apollo Hospital, New Delhi.

- Executive Director, Centre for Research on Nutrition Support Systems (CRNSS), New Delhi.

- Deputy Director, Nutrition Foundation of India, New Delhi.
NUTRITION IN ESLD – PRACTICAL ISSUES

• Issues involving assessment of nutritional status.

• Issues involving energy and nutrient requirement.

• Issues involving nutritional management.
CHILDREN WITH ESLD

• Children with ESLD – extremely vulnerable to nutritional compromise.

• Children with ESLD – poor nutritional management – major negative impact on long-term outcome and survival – both pre- and post-LT.

NUTRITIONAL STATUS ASSESSMENT

• Anthropometry – most practical option.

• Upper body measurements most reliable, not easily influenced by CLD changes.

• TSF and MUAC most accurate from clinical standpoint. Ht. – useful indicator of chronic undernutrition.

NUTRITIONAL STATUS ASSESSMENT (contd..)

• Subjective global assessment (SGA) well validated in adults but not in children, normal and healthy or in disease – not reliable.

• DEXA – very accurate for research purposes but not practical as a clinical bedside option.

GOALS OF NUTRITIONAL ASSESSMENT

• Start assessment early, monitor regularly.

• Complete medical history, detailed physical examination from standpoint of nutrient deficiency/toxicity.
GOALS OF NUTRITIONAL ASSESSMENT (contd...) 

- Biochemical indicators of nutritional status (limitations) – urinary creatinine to height ratio reliable indicator – if no renal compromise:
  Creatinine-height ratio = 24 hr. ur. cr of pt/24 hr. ur. cr of age, sex & ht. matched healthy child x 100.
GOALS OF NUTRITIONAL ASSESSMENT (contd...)

• Nutritional assessment once every 3 months – Body weight (despite limitations), height (indicator of stunting), TSF and MUAC.

• 72 – hour dietary recall/food frequency questionnaire.
ENERGY REQUIREMENT

- For male patients: $BEE = 66.5 + (13.7 \times \text{weight in kilograms}) + (5 \times \text{height in centimeters}) - (6.78 \times \text{age in years})$.

For female patients: $BEE = 655 + (9.56 \times \text{weight in kilograms}) + (1.85 \times \text{height in centimeters}) - (4.68 \times \text{age in years})$.

In patients with clinically significant edema, calculate energy needs based on adjusted body weight or estimated dry weight, as follows:


To calculate estimated daily caloric requirements, multiply BEE by the stress factor and by the activity factor.
ENERGY REQUIREMENT (contd..)

- Adjust BEE for the added stress of operation, disease, infections, and wounds as follows:
  - For elective operation, multiply BEE by 1.2.
  - For wound or infection, multiply BEE by 1.5.
- Adjust the BEE for activity, as follows:
  - For patients confined to a bed, multiply by 1.2.
  - For patients allowed very light activity, multiply by 1.3.
  - For patients allowed light activity, multiply by 1.5.
  - For patients allowed moderate activity, multiply by 1.6.
The estimated protein requirements in infants, children, and adolescents are as follows:

- Age 0-6 months - 2.2 g/kg body weight
- Age 6-12 months - 2 g/kg body weight
- Age 1-3 years - 0.18 g/cm height
- Age 4-6 years - 0.21 g/cm height
- Age 7-10 years - 0.21 g/cm height
- Age 11-14 years - 0.29 g/cm height
- Age 15-18 years - 0.34 g/cm height
VITAMINS & MINERALS

• According to RDA:

For Indian children, use most recent 2011 updated ICMR (NIN, Hyderabad) recommendations – Nutritive value of Indian Foods – available on ICMR website.
NUTRITIONAL MANAGEMENT - ESLD

- ESLD:
  - Liver Cirrhosis
  - Liver Transplantation
NUTRITIONAL MANAGEMENT – LIVER CIRRHOSIS

• Use supplemental enteral nutrition when patients cannot meet their caloric requirements through oral food despite adequate individualised nutritional advice.

• Not able to maintain adequate oral intake from normal food, use:-
  - Oral nutritional supplements (C) or
  - Tube feeding (even in presence of oesophageal varices) (A)

PEG placement associated with higher risk of complications - not recommended (C).

Type of formula:
- Whole protein formulae - generally recommended (C).
- More concentrated high-energy formulae in patients with ascites (C).
- Use BCAA-enriched formulae in patients with hepatic encephalopathy arising during enteral nutrition (A).
- The use of oral BCAA supplementation can improve clinical outcome in advanced cirrhosis (B).
NUTRITION IN LIVER CIRRHOSIS - SUMMARY

- Overall outcome:

Enteral nutrition improves nutritional status and liver function, reduces complications and prolongs survival in cirrhotics and is therefore recommended (A).
## NUTRITIONAL MANAGEMENT – LIVER TRANSPLANTATION


<table>
<thead>
<tr>
<th>Indication</th>
<th>Preoperative</th>
<th>Follow recommendations for cirrhosis.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Postoperative</td>
<td>Initiate normal food/enteral nutrition within 12–24 h postoperatively.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Initiate early normal food or enteral nutrition after other surgical procedures.</td>
</tr>
<tr>
<td>Application</td>
<td>Preoperative</td>
<td>Follow recommendations for cirrhosis.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>For children awaiting transplantation consider BCAA administration.</td>
</tr>
<tr>
<td></td>
<td>Postoperative</td>
<td>Recommended energy intake: 35–40 kcal/kgBW/d (147–168 kJ/kgBW/d)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Recommended protein intake: 1.2–1.5 g/kgBW/d</td>
</tr>
<tr>
<td>Route</td>
<td>Preoperative</td>
<td>Follow recommendations for cirrhosis.</td>
</tr>
<tr>
<td></td>
<td>Postoperative</td>
<td>Use nasogastric tubes or catheter jejunostomy for early enteral nutrition.</td>
</tr>
<tr>
<td>Type of formula</td>
<td>Preoperative recommendations</td>
<td>Operation outcome</td>
</tr>
<tr>
<td>----------------</td>
<td>-----------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Preoperative</td>
<td>Follow recommendations for cirrhosis.</td>
<td>An improvement of perioperative mortality or complication rate by preoperative tube feeding or oral nutritional supplements has not yet been shown. However, a clear recommendation for nutritional therapy in undernourished patients with liver cirrhosis is supported by the statements concerning nutrition in LC made in statement 2.4.</td>
</tr>
<tr>
<td>Postoperative</td>
<td>Whole protein formulae are generally recommended.</td>
<td>Early normal food or enteral nutrition is recommended for transplant and surgery patients with LC in order to minimise perioperative—in particular infectious—complications.</td>
</tr>
</tbody>
</table>

For patients with ascites, prefer concentrated high-energy formulae for reasons of fluid balance. Use BCAA-enriched formulae in patients with hepatic encephalopathy arising during enteral nutrition.
Thank you for your patient listening!