Nutrition Assessment in Inflammatory Bowel Disease

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Provincial Medical Advisor Nutrition, Alberta Health Services
Disclosure

• Speakers Bureau: Abbott Canada, Baxter Canada
• Consultant: Baxter Global, NPS Pharmaceuticals
Learning Objectives

• Establish a Common Understanding of the current definition of Malnutrition
• Describe Nutrition Assessment in IBD and its’ rationale
• Understand methods of Nutritional Assessment
• Support Integration of Nutrition Assessment into IBD care
• Discuss pitfalls and opportunities in laboratory assessment: Albumin, CRP
My “Skeleton in the Closet”...
Ms. FA – 21 yo

• CC: Obstructing terminal ileal Crohn’s disease presents with anasarca;
• HPI: obstruction and fistulization with small bowel dilation on UGI Xray
  - Patient refuses and defers surgery on several occasions
  - 4 months decreased oral intake with restrictive eating
  - altered bowel habits – increasing diarrhea and pain with eating
• PMH: Crohn’s since 14 years of age
• Treatment to date: Diet, CAM, Imuran, antibiotics, steroids, Remicade
Ms. FA: Duodenal-Ileal Fistula

- Ht = 4’11” (150 cm) CBW=75 lbs (34 kg)
  UBW=100 lbs (10/12) 90 lbs (10/13)
  16% wt loss
- SGA – C: Severely Malnourished
- BMI=15.1 kg/m2
- Albumin=12 mg/dl, prealbumin=0.033, CRP=110
Disease related malnutrition - a revised definition

When the severity or persistence of inflammation results in a decrease in lean body mass associated with functional impairment

<table>
<thead>
<tr>
<th>Type of malnutrition</th>
<th>Degree of inflammation</th>
<th>Example of condition</th>
<th>Response to nutritional supp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starvation related malnutrition</td>
<td>Chronic starvation without inflammation</td>
<td>Anorexia nervosa</td>
<td>Excellent</td>
</tr>
<tr>
<td>Chronic disease related malnutrition</td>
<td>Chronic mild to moderate inflammation</td>
<td>Organ failure, Malignancy</td>
<td>Moderate</td>
</tr>
<tr>
<td>Acute disease related malnutrition</td>
<td>Acute severe inflammation</td>
<td>Major infection, Trauma</td>
<td>Poor</td>
</tr>
</tbody>
</table>

Jensen G, JPEN 2010
### Four Domains of a Conceptual Framework: Disease Associated Malnutrition

**Fearon et al. Lancet Oncology 2011**

<table>
<thead>
<tr>
<th>I. Depletion of Reserves</th>
<th>II. Limitation of food intake</th>
<th>III. Catabolic Drivers</th>
<th>IV. Impact and outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>e.g.</td>
<td>e.g.</td>
<td>e.g.</td>
<td>e.g.</td>
</tr>
<tr>
<td>Underweight</td>
<td>Nutrition impact symptoms:</td>
<td>Inflammation</td>
<td>Physical function</td>
</tr>
<tr>
<td>Weight loss</td>
<td>Anorexia</td>
<td>Tumor burden</td>
<td>Quality of life</td>
</tr>
<tr>
<td>Lean tissue wasting</td>
<td>Dysphagia</td>
<td>Insulin resistance</td>
<td>Distress</td>
</tr>
<tr>
<td>Sarcopenia (severe</td>
<td>Nausea</td>
<td>Hypogonadism</td>
<td>Survival</td>
</tr>
<tr>
<td>muscle wasting)</td>
<td>Social / psychological</td>
<td>Corticosteroids</td>
<td>Treatment outcomes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Comorbidities: liver</td>
<td>Costs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>disease, IBD</td>
<td></td>
</tr>
</tbody>
</table>
Limitation of Intake/Absorption

• Reduction in oral intake
  - anorexia, pain, medication side-effects
• Malabsorption
  - surgical resection, fistulae, SBBO
# Prevalence of Deficiencies in IBD:

## Indices of Depletion

<table>
<thead>
<tr>
<th>Condition</th>
<th>Crohn’s</th>
<th>U.C.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight Loss</td>
<td>65-76</td>
<td>18-62</td>
</tr>
<tr>
<td>Growth Retardation</td>
<td>40</td>
<td>-</td>
</tr>
<tr>
<td>Hypoalbuminemia</td>
<td>25-80</td>
<td>25-50</td>
</tr>
<tr>
<td>Anemia</td>
<td>60-80</td>
<td>-</td>
</tr>
<tr>
<td>Iron</td>
<td>39</td>
<td>81</td>
</tr>
<tr>
<td>Folate</td>
<td>54</td>
<td>36</td>
</tr>
<tr>
<td>B12</td>
<td>48</td>
<td>5</td>
</tr>
<tr>
<td>Calcium</td>
<td>13</td>
<td>-</td>
</tr>
<tr>
<td>Magnesium</td>
<td>14-88</td>
<td>-</td>
</tr>
<tr>
<td>Potassium</td>
<td>6-20</td>
<td>-</td>
</tr>
<tr>
<td>Zinc</td>
<td>40-50</td>
<td>-</td>
</tr>
<tr>
<td>Selenium</td>
<td>44</td>
<td>-</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>51</td>
<td>46</td>
</tr>
</tbody>
</table>
Nutrition Assessment in IBD

Indices of Depletion
Vagianos et al. JPEN 2007.31:311

• 126 patients (84 CD/42 UC)
• High levels of inadequate intake (vitamins E, D, A, C, Folate, Calcium)
• Biochemical deficiency – Hbg, Ferritin, B6, B12, carotene, vitamin D, Albumin, Zn
• Dietary intake and levels not consistently correlated (correlate for B12, B6, Folate)
Catabolic Drivers

- Inflammation
- Steroids
- Infection/abscess
Malnutrition

- Morbidity ↑
- Wound healing ↓
- Infections ↑
- Complications ↑
- Convalescence ↓

Mortality ↑

Treatment ↑

LOS ↑

QOL ↓

COSTS ↑
The Ideal Care Process for Patients with IBD: Nutrition Care Pathway

**Step 1:**
Nutrition Screening
All patients screened

- Well Nourished
- Malnourished
- At Nutritional Risk

**Step 2:**
Nutrition Assessment
Detailed examination of metabolic, nutrition, or functional variables by an expert clinician, dietician, or nutrition nurse.¹

**Step 3:**
Nutrition Intervention

MONITORING
- Nutrition screening tools quickly evaluate a patient’s nutritional status to identify malnourished or at-risk patients
  
  - Malnutrition Screening Tool¹ (MST)
  - Malnutrition Universal Screening Tool² (MUST)
  - DETERMINE checklist for screening and assessment³
  - Nutritional Risk Index⁴ (NRI)
  - Nutritional Risk Screening-2002 (NRS 2002)
  - Mini Nutritional Assessment⁵ (MNA, MNA-SF)
  - CMTF Screening tool⁶

3. www.aafp.org/Pre-Built/NSI_DETERMINE.pdf.
Screening Considerations

✓ “the use of simple tests across a healthy population in order to identify the individuals who have disease, but do not yet have symptoms.” (WHO)
✓ “Those preventive services in which a test or standardized examination procedure is used to identify patients requiring special intervention.” (US Preventative task force)

Appropriate use of screening tests requires much thought beyond identifying the disease screened for and selecting a test to implement.
Fig. 1. A framework for screening tool selection based on the matrix of needs and quality of the tool. The screening program includes the screening test (screening tool), management, and follow-up. It is based on a modification of a previous framework by Elia and Stratton [1]. The screening test refers to the result of nutrition screening, and the screening program refers to the broader activity that includes nutrition screening, management, and follow-up.
MUST: Malnutrition Universal Screening Tool

**Predictive Value**

**Hospitals:**
- Length of stay
- Discharge destination
- Mortality

**Community:**
- Rate of hospital admission
- Rate of physicians visits
- Shows that appropriate nutrition intervention improves outcomes

www.bapen.org.uk
Malnutrition Screening: W5

- **Why**: What is the rationale for screening?
- **What**: Which tools?
- **Where**: Which locations/patient populations?
- **When**: Nutrition intervention based on defined risk?
- **Who**: Roles and responsibilities of the individuals, the healthcare team and the system?
Screening Considerations

- **Complexity**: If the tool requires calculations (e.g. BMI, percentage weight loss) or is lengthy with many parameters, it is likely to be more time consuming and subject to error. This may also result in a low compliance with screening.

- **Sensitivity**: A screening tool needs to achieve a high sensitivity (that is, identifies all those at risk), even if this is at the expense of specificity (false positives).

- **Other factors to consider**: Who will perform screening? How can screening be incorporated into current procedures? What action will be taken for those screened at risk? What is the purpose of screening?
MST: Malnutrition Screening Tool

- Two questions related to recent unintentional weight loss and eating poorly because of a decreased appetite.
- The MST results in a score between zero and five, with patients considered to be at risk of malnutrition if they score ≥2.
- Validated in acute hospital and ambulatory care but not specifically in long-term-care settings.
**MST: Malnutrition Screening Tool**

### Malnutrition Action Flowchart

**What Is Your Patient’s Malnutrition Screening Tool (MST) Score?**

- **LOW RISK**
  - MST = 0–1
  - Eating well with no recent weight loss
  - Rescreen
    - If length of stay >7 days and weakly thereafter

- **MEDIUM RISK**
  - MST = 2–3
  - Eating poorly or recent weight loss >13 lb
  - Recommend Medical Nutritional Supplement
    - Dietitian consult within 48–72 hours

- **HIGH RISK**
  - MST = 4–5
  - Eating poorly plus recent weight loss >13 lb
  - Recommend Medical Nutritional Supplement
    - Dietitian consult within 24 hours

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**Malnutrition Risk/Diagnosis**

*Patient follow-up should be consistent with local practices.*
MUST

Malnutrition Universal Screening Tool

• Developed in the UK by BAPEN Malnutrition Advisory Group (MAG)
• Designed to identify adults who are underweight and at risk of malnutrition, and the obese
• An easy, rapid, practical, reliable, validated tool
• Evaluated in the hospital, out patient, general practice, community, and long term care.
• Is linked to a care plan

www.bapen.org.uk
Predictive Value of “MUST”

• Hospitals:
  – Length of stay
  – Discharge Destination
  – Mortality (after controlling for age)

• Community:
  – Rate of hospital admissions and GP visits
  – Shows appropriate nutrition intervention improves outcome
NRS 2002 - Nutrition Risk Screen

- **Purpose:**
  
  *To detect the presence of undernutrition & the risk of developing under nutrition in the hospital setting*

- **Used retrospective analysis of RCT (adults)**
  
  - Nutritional criteria or characteristics
  
  - Clinical outcome

  **Assumption:** Indications for nutrition support are:
  
  - The severity of under nutrition
  
  - The increase in nutritional requirements from the disease

- **Screen includes measures of current potential undernutrition & disease severity**

- **Validated vs RCT of NS to determine if it was able to distinguish those with a positive clinical outcome vs those with no benefit.**

- **Identifies who might benefit from nutritional support**
  
  - Looking for positive clinical outcome
Malnutrition screening tools: Comparison against two validated nutrition assessment methods in older medical inpatients. Young AM et al

<table>
<thead>
<tr>
<th>Screening tool</th>
<th>Parameters</th>
<th>Development study</th>
<th>Validation studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malnutrition Screening Tool (MST) [8]</td>
<td>weight change, recent intake, at-risk score ≥ 2</td>
<td>408 inpatients (mean age 58 y); standard for comparison: SGA; sensitivity 93%, specificity 93%</td>
<td>SGA: sensitivity 92%, specificity 61% [15]; MNA: sensitivity 92%, specificity 72% [15]</td>
</tr>
<tr>
<td>Mini-Nutritional Assessment–Short Form (MNA-SF) [12]</td>
<td>weight change, recent intake, BMI, acute disease, mobility, dementia/depression, at-risk score ≤ 11</td>
<td>155 community-dwelling elders (mean age 79 y); standard for comparison: physician assessment of nutritional status; sensitivity 98%, specificity 100% (MNA-SF cutpoint ≤ 10)</td>
<td>MNA: sensitivity 90%, specificity 88% (MNA cutpoint ≤ 11) [16]; MNA: sensitivity 89%, specificity 82% (MNA-SF cutpoint ≤ 11) [17]; SGA: sensitivity 74%, specificity 87% [19]; nutritional assessment; sensitivity 100%, specificity 38% (MNA-SF cutpoint ≤ 10); SGA: sensitivity 62%, specificity 93% [20]; MNA: κ = 0.39 [19], κ = 1.00 [21]</td>
</tr>
<tr>
<td>Nutritional Risk Screening (NRS 2002) [10]</td>
<td>weight change, recent intake, BMI, acute disease, age, at-risk score ≥ 3</td>
<td>8944 inpatients, review of 128 trials (mean age not reported); standard for comparison: nutritional support trials demonstrating improved clinical outcomes; sensitivity 75%, specificity 55%</td>
<td>SGA: sensitivity 61%, specificity 79% [20]; nutritional assessment; sensitivity 72%, specificity 90% [19]; MNA: κ = 0.39 [19], κ = 0.55 [23]; BMI &lt; 18.5 or recent weight loss &gt; 5%; sensitivity 79%, specificity 83% [24]</td>
</tr>
<tr>
<td>Malnutrition Universal Screening Tool (MUST) [22]</td>
<td>weight change, recent/predicted intake, BMI, acute disease, high-risk score ≥ 2</td>
<td>291 inpatients (mean age 58 y); standard for comparison: BMI &lt; 18.5 or weight loss &gt; 5%; sensitivity 86%, specificity 89%</td>
<td></td>
</tr>
<tr>
<td>Short Nutritional Assessment Questionnaire (SNAQ©) [24]</td>
<td>weight change, appetite, supplements/tube feeding, at-risk score ≥ 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simplified Nutritional Appetite Questionnaire (SNAQ) [13]</td>
<td>recent intake, appetite, satiety, taste change, at-risk score &lt; 14</td>
<td>352 community-dwelling elderly (age range 60-102 y); standard for comparison: future weight loss ≥ 5%; sensitivity 82%, specificity 85%</td>
<td>N/A</td>
</tr>
<tr>
<td>Rapid Screen [14]</td>
<td>weight change, BMI, at-risk score 2</td>
<td>65 medical and orthopaedic inpatients, subacute residents (mean age 80 y); standard for comparison: standard nutritional assessment; sensitivity 79%, specificity 97%</td>
<td>N/A</td>
</tr>
</tbody>
</table>

BMI, body mass index; MNA, Mini-Nutritional Assessment [26]; N/A, not available; SGA, Subjective Global Assessment [25]
Interpretation of prevalence rates of malnutrition in Pediatrics Jooste KF Nutrition
(2011)27(2) 133

- SD criteria or percentiles
- Used definition to describe acute and chronic malnutrition
- Used reference data general population: World Health Organization references, country-specific references, or ethnicity-specific references
- Used reference data for specific medical conditions and syndromes
- Body mass index prevalence data close to weight-for-age prevalence data
- Used reference data for prematurely born infants
- Correction for prematurity until postnatal age 2 y
- Use of target height based on parental height for determination of genetic height potential
- Used definition for faltering growth or failure to thrive: decrease in centile lines or decrease in SD scores
Do you routinely screen your IBD patients for Malnutrition?

Do you routinely Assess your IBD patients’ Nutritional Status?
Step 2: Nutrition Assessment

- Patients identified as malnourished or at-risk in the nutrition screening should have a nutritional assessment:
  - History
  - Clinical exam
  - Food record, BMI, Anthropometry
  - SGA
  - Laboratory values

- Based on the results of the nutrition assessment, a tailored nutrition care plan is developed for nutrition intervention

Table 1 Components included in the nutritional assessment of 190 patients with Crohn’s disease receiving enteral nutrition as primary therapy

<table>
<thead>
<tr>
<th>Assessment</th>
<th>N (%)</th>
<th>Assessment</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Anthropometric data</strong></td>
<td></td>
<td><strong>Clinical data</strong></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>187 (98)</td>
<td>Surgery</td>
<td>79 (95)</td>
</tr>
<tr>
<td>Weight history</td>
<td>174 (93)</td>
<td>Other diseases</td>
<td>59 (86)</td>
</tr>
<tr>
<td>Height</td>
<td>169 (90)</td>
<td>If other diseases, what treatment</td>
<td>47 (75)</td>
</tr>
<tr>
<td>Body mass index</td>
<td>167 (89)</td>
<td>Fistula</td>
<td>19 (61)</td>
</tr>
<tr>
<td>Mid-arm circumference</td>
<td>7 (4)</td>
<td>Stoma</td>
<td>15 (79)</td>
</tr>
<tr>
<td>Hand-grip dynamometry</td>
<td>7 (4)</td>
<td>If stoma, consistency</td>
<td>10 (67)</td>
</tr>
<tr>
<td>Tricep skinfold thickness</td>
<td>6 (3)</td>
<td>If stoma, emptying frequency</td>
<td>9 (60)</td>
</tr>
<tr>
<td>Bioelectrical impedance</td>
<td>0 (0)</td>
<td>If stoma, output volume</td>
<td>7 (47)</td>
</tr>
<tr>
<td><strong>Biochemical data</strong></td>
<td></td>
<td><strong>Dietary data</strong></td>
<td></td>
</tr>
<tr>
<td>Urea and electrolytes</td>
<td>151 (81)</td>
<td>General appetite</td>
<td>170 (91)</td>
</tr>
<tr>
<td>Inflammatory markers</td>
<td>139 (74)</td>
<td>Energy intake</td>
<td>140 (74)</td>
</tr>
<tr>
<td>Full blood count</td>
<td>124 (68)</td>
<td>Macronutrient intake</td>
<td>98 (53)</td>
</tr>
<tr>
<td>Liver function tests</td>
<td>110 (61)</td>
<td>Vitamin or mineral supplement use</td>
<td>92 (49)</td>
</tr>
<tr>
<td>Bone tests</td>
<td>104 (58)</td>
<td>Probiotic or prebiotic use</td>
<td>54 (29)</td>
</tr>
<tr>
<td>Phosphate</td>
<td>97 (55)</td>
<td>Complementary/alternative medicine use</td>
<td>44 (24)</td>
</tr>
<tr>
<td>Magnesium</td>
<td>93 (53)</td>
<td>Micronutrient intake</td>
<td>29 (16)</td>
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<tr>
<td>Haematinics</td>
<td>72 (41)</td>
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<td></td>
</tr>
<tr>
<td>Zinc</td>
<td>14 (8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Clinical data</strong></td>
<td></td>
<td><strong>Economic/social Information</strong></td>
<td></td>
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<tr>
<td>Stool frequency</td>
<td>178 (94)</td>
<td>Home support</td>
<td>146 (77)</td>
</tr>
<tr>
<td>Crohn’s related drugs</td>
<td>178 (94)</td>
<td>Consent to assessment/intervention</td>
<td>128 (68)</td>
</tr>
<tr>
<td>Abdominal pain</td>
<td>176 (93)</td>
<td>Ethnicity</td>
<td>30 (16)</td>
</tr>
<tr>
<td>General well-being</td>
<td>166 (89)</td>
<td>Religion</td>
<td>11 (6)</td>
</tr>
<tr>
<td>Stool consistency</td>
<td>161 (85)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site of Crohn’s</td>
<td>150 (81)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoking habits</td>
<td>86 (47)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family history of CD</td>
<td>46 (25)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td>37 (21)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urine output</td>
<td>35 (19)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urine colour</td>
<td>15 (8)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Nutrition Assessment

- Anthropometrics
- Biochemical Data
- Clinical Data
- Dietary Data
- Socio/economic
SGA CLASSIFICATION

SGA A - Well Nourished
- No weight loss or deficit in nutrient intake
- No gastrointestinal symptoms impacting nutrition
- Normal functional status
- Normal subcutaneous fat and muscle mass
- Improving findings of malnutrition.

SGA B – Moderately Malnourished
- 5-10 % weight loss in the past 6 months.
- Definite decrease in oral intake.
- Gastrointestinal symptoms impacting nutrition.
- Moderate functional deficit or recent decline.
- Mild to moderate subcutaneous fat and muscle mass loss on physical examination

SGA C – Severely Malnourished
- > 10 % weight loss in the past 6 months.
  Severe decrease in oral intake; Gastrointestinal symptoms impacting nutrition
  Severe functional deficit.
  Severe deficit of subcutaneous fat and muscle mass loss on physical examination
Nutritional Assessment: Subjective Global Assessment

SGA-A: Well Nourished

SGA-B: At risk for malnutrition

SGA-C: Severely Malnourished
Loss of subcutaneous fat

SGA-A

SGA-B

SGA-C
**Percentage of inflammatory bowel disease (IBD) subjects consuming inadequate intake of micronutrient**

Vagianos JPEN 2007

<table>
<thead>
<tr>
<th>Micronutrient</th>
<th>CD (71)</th>
<th>UC (34)</th>
<th>Active IBD (48)</th>
<th>Remission (57)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitamin A</td>
<td>21 (30%)</td>
<td>6 (18%)</td>
<td>13 (27%)</td>
<td>14 (25%)</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>27 (38%)</td>
<td>11 (32%)</td>
<td>14 (29%)</td>
<td>24 (42%)</td>
</tr>
<tr>
<td>Vitamin E</td>
<td>42 (59%)</td>
<td>24 (59%)</td>
<td>31 (65%)</td>
<td>35 (61%)</td>
</tr>
<tr>
<td>Vitamin B₆</td>
<td>3 (4.2%)</td>
<td>3 (8.8%)</td>
<td>3 (6.3%)</td>
<td>3 (5.3%)</td>
</tr>
<tr>
<td>Vitamin B₁₂</td>
<td>4 (5.6%)</td>
<td>1 (2.9%)</td>
<td>1 (2.1%)</td>
<td>4 (7.0%)</td>
</tr>
<tr>
<td>Vitamin C₇</td>
<td>(9.9%)</td>
<td>4 (12%)</td>
<td>8 (17%)</td>
<td>3 (5.3%)</td>
</tr>
<tr>
<td>Folate</td>
<td>14 (20%)</td>
<td>6 (18%)</td>
<td>11 (23%)</td>
<td>9 (16%)</td>
</tr>
<tr>
<td>Calcium</td>
<td>18 (25%)</td>
<td>6 (18%)</td>
<td>10 (21%)</td>
<td>14 (25%)</td>
</tr>
<tr>
<td>Iron</td>
<td>10 (14%)</td>
<td>4 (12%)</td>
<td>5 (10%)</td>
<td>9 (16%)</td>
</tr>
<tr>
<td>Zinc</td>
<td>6 (8.5%)</td>
<td>1 (2.9%)</td>
<td>2 (4.2%)</td>
<td>5 (8.8%)</td>
</tr>
</tbody>
</table>

Inadequate intake is defined as <66% of the dietary reference intake per micronutrient. CD, Crohn's disease; UC, ulcerative colitis.
SERUM ALBUMIN IN MALNUTRITION

– Serum albumin levels may vary depending on the type of malnutrition.

– Malnutrition has been classified as follows:
  • Starvation related malnutrition
  • Chronic disease related malnutrition
  • Acute disease or injury related malnutrition

Jensen et al JPEN 2010;34:156-159
ALBUMIN IN MALNUTRITION

– Starvation related malnutrition (e.g. anorexia nervosa, voluntary starvation, diet programs)

• Serum albumin levels tend to remain within normal range.
  – There is a compensatory decrease in albumin degradation.
  – There is transfer of albumin from extravascular to intravascular compartment.
ALBUMIN IN MALNUTRITION

– Chronic disease related malnutrition (e.g. organ failure, cancer, rheumatoid arthritis, inflammatory bowel disease)

  • Serum albumin levels decrease.
    – There is an increase in inflammatory/catabolic response
      » Increase white blood cell count, increase stress hormones (glucagon, adrenalin, cortisol), increase in inflammatory cytokines (tumor necrosis factor alpha, interleukins 1 and 6)
    – This inflammatory response results in increased vascular permeability and loss of albumin from vascular compartment. There is also a decrease in albumin synthesis and increase in albumin catabolism.
Other Useful Biochemical and Radiologic Tests

• Pre-Albumin: T1/2=3 days, influenced by inflammation
• CRP: Marker of inflammation and disease severity; impacts pre-albumin
• Bone Mineral Density
### Table 1. Comparison of clinical characteristics and anthropometric data according to nutritional status

<table>
<thead>
<tr>
<th></th>
<th>Total (n = 41)</th>
<th>Normal group (n = 21)</th>
<th>Malnourished group (n = 20)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yr)</td>
<td>36.7 ± 11.9</td>
<td>39.2 ± 12.5</td>
<td>34.1 ± 11.0</td>
<td>0.171</td>
</tr>
<tr>
<td>Gender - Male (%)</td>
<td>25 (61.0)</td>
<td>10 (47.6)</td>
<td>15 (75.0)</td>
<td>0.069</td>
</tr>
<tr>
<td></td>
<td>Female (%)</td>
<td>16 (39.0)</td>
<td>11 (52.4)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5 (25.0)</td>
<td></td>
</tr>
<tr>
<td>Height (cm)</td>
<td>166.2 ± 9.0</td>
<td>163.1 ± 8.7</td>
<td>169.5 ± 8.3</td>
<td>0.022&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>61.0 ± 13.4</td>
<td>61.6 ± 14.9</td>
<td>60.3 ± 11.8</td>
<td>0.753</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>22.0 ± 4.0</td>
<td>23.0 ± 4.4</td>
<td>20.9 ± 3.2</td>
<td>0.085</td>
</tr>
<tr>
<td>Weight loss (recently 6 months, %)</td>
<td>1.9 ± 2.6</td>
<td>0.4 ± 1.0</td>
<td>3.4 ± 2.9</td>
<td>0.000&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>WC (mm)</td>
<td>81.1 ± 8.3</td>
<td>81.7 ± 9.8</td>
<td>80.4 ± 6.6</td>
<td>0.619</td>
</tr>
<tr>
<td>TSF (mm)</td>
<td>12.2 ± 2.6</td>
<td>13.3 ± 2.5</td>
<td>11.1 ± 2.8</td>
<td>0.787</td>
</tr>
<tr>
<td>Type - Ulcerative colitis (%)</td>
<td>26 (63.4)</td>
<td>16 (76.2)</td>
<td>10 (50.0)</td>
<td>0.078</td>
</tr>
<tr>
<td></td>
<td>Crohn’s disease (%)</td>
<td>15 (36.6)</td>
<td>5 (23.8)</td>
<td>10 (50.0)</td>
</tr>
<tr>
<td>Disease duration (months)</td>
<td>44.2 ± 30.3</td>
<td>40.3 ± 28.4</td>
<td>48.3 ± 32.5</td>
<td>0.411</td>
</tr>
<tr>
<td>&lt; 1 yr (%)</td>
<td>9 (22.0)</td>
<td>4 (19.0)</td>
<td>3 (15.0)</td>
<td>0.551</td>
</tr>
<tr>
<td>≥ 1 yr (%)</td>
<td>32 (78.0)</td>
<td>17 (81.0)</td>
<td>17 (85.0)</td>
<td></td>
</tr>
<tr>
<td>Disease activity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ulcerative colitis - Mild (%)</td>
<td>15 (57.7)</td>
<td>11 (68.7)</td>
<td>4 (40.0)</td>
<td>0.349</td>
</tr>
<tr>
<td></td>
<td>Moderate (%)</td>
<td>9 (34.6)</td>
<td>4 (25.0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Severe (%)</td>
<td>2 (7.7)</td>
<td>1 (6.3)</td>
<td></td>
</tr>
<tr>
<td>Crohn’s disease</td>
<td>104.91 ± 88.23</td>
<td>82.4 ± 26.1</td>
<td>116.2 ± 106.7</td>
<td>0.505</td>
</tr>
<tr>
<td>Cumulative steroid dose (mg)</td>
<td>4,116.6 ± 3,913.3</td>
<td>3,405.8 ± 3,264.8</td>
<td>4,929.1 ± 4,215.3</td>
<td>0.473</td>
</tr>
</tbody>
</table>

Mean ± standard deviation (SD).<sup>a</sup><sup>b</sup>P<0.05. <sup>b</sup>P<0.001.

BMI, body mass index; WC, waist circumference; TSF, triceps skin fold thickness.
Table 2. Comparison of blood parameters and bone mineral density according to nutritional status

<table>
<thead>
<tr>
<th></th>
<th>Total (n=41)</th>
<th>Normal group (n=21)</th>
<th>Malnourished group (n=20)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemoglobin (g/dL)</td>
<td>12.6 ± 2.4</td>
<td>13.0 ± 2.5</td>
<td>12.1 ± 2.4</td>
<td>0.225</td>
</tr>
<tr>
<td>Hematocrit (%)</td>
<td>37.0 ± 6.6</td>
<td>38.1 ± 6.5</td>
<td>35.9 ± 6.6</td>
<td>0.282</td>
</tr>
<tr>
<td>CRP (mg/dL)</td>
<td>0.8 ± 1.7</td>
<td>0.3 ± 0.7</td>
<td>1.4 ± 2.0</td>
<td>0.018*</td>
</tr>
<tr>
<td>Albumin (g/dL)</td>
<td>4.1 ± 0.6</td>
<td>4.4 ± 0.4</td>
<td>3.9 ± 0.7</td>
<td>0.013*</td>
</tr>
<tr>
<td>Calcium (mg/dL)</td>
<td>8.7 ± 0.4</td>
<td>9.1 ± 0.3</td>
<td>8.4 ± 0.5</td>
<td>0.043*</td>
</tr>
<tr>
<td>Phosphorous (mg/dL)</td>
<td>3.5 ± 0.6</td>
<td>3.5 ± 0.6</td>
<td>3.5 ± 0.7</td>
<td>0.903</td>
</tr>
<tr>
<td>iPTH (pg/mL)</td>
<td>39.9 ± 13.0</td>
<td>39.0 ± 10.6</td>
<td>41.3 ± 15.4</td>
<td>0.482</td>
</tr>
</tbody>
</table>
Adequacy of Nutritional Intake

Raman et al. JADA 2007107(90):1575-80

- 7 day food records
- Energy and Protein intakes within RNI
- CHO excess: 39%
- Fat/Saturated fat excess: 27/59%
- Folate, Vitamins C&E, Calcium - suboptimal
Diet Therapy In Crohn’s Disease: Patients’ Perspective

• Pre-illness changes in diet as a risk for IBD? Maconi et al WJG 2010:4297-4303; Hou et al Am J Gastro 2011 apr;106(4)563-73

• - FFQ – 34 items common in Italian diet(bread+cereal/red meat/vegetables/fruit/sweets/milk and hot beverages/ETOH)

• Changes in intake in 38% (CD) related to duration of Sx

• Diets high in fat, PUFA ass with IBD; diets high in F&V, fibre reduce IBD risk
Step 3: Nutrition Intervention

Potential nutrition intervention strategies:

– Alter diet prescription/diet order
– Liberalize diet
– Food fortification
– Provide food/meal preferences
– Recommend vitamin/mineral supplement
– Oral Nutritional Supplements
– Enteral Nutrition
– Parenteral Nutrition
Conclusions

• Consider nutrition screening in your IBD patients
• Rely on SGA – it is reliable, reproducible and can help identify patients who can benefit from nutrition therapy
• Use biochemical and radiologic data from a nutritional perspective
• Use the above nutritional assessment to inform intervention
Ms. SB

• 44-year-old female, known Crohn’s disease of small intestine, flaring symptoms for 18 months prior to evaluation

• CC: fatigue
  – diarrhea - 10-15 bm/d, nocturnal BM’s
  – lower abdominal pain
  – weight loss
Ms. SB: Crohn’s Management

- Bowel resection for Crohn’s terminal ileal disease ‘82, ‘89, ‘94
- Previously on Methotrexate, Imuran - no benefit
- Started on Home Enteral Nutrition ‘97
- Current medications: prednisone 15 mg/d
Ms. SB: Nutritional History

- Ht = 147.3 cm (4’10””) Wt = 35.1 kg (77.2 lbs)
- UBW = 45 kg, IBW = 46 kg, %IBW = 76%
- BMI = wt(kg)ht(m).ht(m)=16.2
- Wt loss of 10kg in 18 mo prior to admission
- Oral intake limited by abd. pain, diarrhea
- HEN Rx = Jevity plus 1 can qid via PEG