Malnutrition and Haemodialysis

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Prevalence of malnutrition in dialysis

BMI < 20 kg/m² 24 %
Lean body mass < 90 % th. 62 %
Albumin < 35 g/l 20 %
Transthyretin < 300 mg/l 36 %
nPCR < 1 g/kg BW/day 35 %

French Cooperative study, n= 7,123
Survival during hemodialysis

N = 1,620 patients

Survival curves for ALBUMIN and PREALBUMIN levels are shown. The cumulative proportion surviving (%), quartiles, p-values, RR, and 95% CI are indicated for each level.


Nutritional assessment

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Intervals</th>
</tr>
</thead>
<tbody>
<tr>
<td>body weight</td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td>1 month</td>
</tr>
<tr>
<td>diet record (3 days)</td>
<td>6 months</td>
</tr>
<tr>
<td>SGA</td>
<td>6 months</td>
</tr>
<tr>
<td>nPCR</td>
<td>1 month</td>
</tr>
<tr>
<td>Albumin, transthyretin (prealbumin)</td>
<td>1-3 months</td>
</tr>
</tbody>
</table>

1 - ESPEN consensus on nutritional treatment of patients with renal insufficiency
### Recommended food intakes in dialysis (g/kg/day)

<table>
<thead>
<tr>
<th></th>
<th>ESPEN consensus (1)</th>
<th>DOQIs (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Protein</strong></td>
<td>HD 1,2 - 1,4</td>
<td>1,2</td>
</tr>
<tr>
<td><strong>Energy</strong></td>
<td>DP 1,2 - 1,5</td>
<td>1,2 - 1,3</td>
</tr>
<tr>
<td>g/kg/day</td>
<td></td>
<td></td>
</tr>
<tr>
<td>kcal/kg/day</td>
<td>35</td>
<td>&lt; 60 y</td>
</tr>
<tr>
<td></td>
<td></td>
<td>35</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt; 60 y</td>
</tr>
<tr>
<td></td>
<td></td>
<td>30</td>
</tr>
</tbody>
</table>

1 - ESPEN consensus on nutritional treatment of patients with renal insufficiency

### Vitamin & trace element requirements

In hemodialysis patients

<table>
<thead>
<tr>
<th>Vitamin/Trace Element</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyridoxin, mg</td>
<td>10-15</td>
</tr>
<tr>
<td>Vitamine C, mg</td>
<td>30-60</td>
</tr>
<tr>
<td>Folic Acid, mg</td>
<td>1</td>
</tr>
<tr>
<td>1-25 (OH)₂ D₃</td>
<td>according to plasma calcium &amp; phosphorus</td>
</tr>
<tr>
<td>Zinc, mg</td>
<td>15</td>
</tr>
<tr>
<td>Selenium, µg</td>
<td>50-70</td>
</tr>
</tbody>
</table>

ESPEN consensus on nutritional treatment of patients with renal insufficiency
Nutritional support during dialysis

- Dietary counselling
- Oral supplements
- Intradialytic parenteral nutrition
- Enteral nutrition

Serum albumin changes after 6 months of dietary counselling
Randomized controlled trial. Leon JB et al. J Ren Nutr 2001

% 60
<2.5 g 2.5 - 5 g >5 g

Diet (n = 52) Control (n = 31)

*p<0.001

Independent From CRP
**Oral supplementation: Metabolic effects**

Non-diabetic, non malnourished HD patients aged less than 65 y.
Test meals composed of 6 portions given every 30 min during 3 h
Total intake = 46, 2 g protein, 63 g CHO, 75 g fat

Metabolic studies:
1/post absorptive phase
2/ during a dialysis session

L- (1-¹³C) valine infusion


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**Oral supplementation: Nutritional effects**

**Review of 17 Studies**

- **9 cohort studies**
  - Oral supplementation --&gt; improved body weight, AMC, TSF, albumin

- **8 controlled studies**
  - 3 cross-over & 5 comparative randomized studies
  - 6/8 : improvement of nutritional parameters
  - 2 studies : Oral supplementation --&gt; improved spontaneous food intake [Patel 2000, Hiroshige 2001]
  - 2 studies: no nutritional gain (non-depleted patients)
Oral supplementation

N=44, cross-over study, BCAA 12 g/j during 6 months vs. placebo

Dry body weight (kg)

Body fat percentage (%)

Lean body mass (kg)

Protein intake (g/kg BW/day)

Calorie intake (kcal/kg BW/day)

α-albumin (g/dL)

ORAL SUPPLEMENTATION: PATIENT COMPLIANCE


Hemodialysis: n=29
Perit. Dialysis: n=18
Intradialytic Parenteral Nutrition (IDPN)

**Cyclic parenteral nutrition during HD sessions**

**Nutrient supply:** 15-20 kcal/kg/HD (CHO & fat)
0.5-1 g protein/kg/HD

**Infusion technique**
- venous way of extracorporeal circulation
- constant infusion rate (≤ 250 ml/hour)
- minimum infusion time: 4 hours
- controlled ultrafiltration rate
- addition of sodium 75 mmol/l
- First week: infusion volume/2

**IDPN:** *metabolic effects*

7 dialysis patients studied during 2 HD sessions, with and without IDPN. Constant infusion of L- (1-13C) leucine and L-(ring-2H5) phenylalanine: 2 h before, during, 2 h after HD

*Figure 4*
Forearm balance of AAs (by groups) during HD comparing CTL and IDPN. Units are nanomoles per 100 ml per minute.

*Pupim LB et al*
J Clin Invest 2002;110:483-492
IDPN: nutritional effects

30 retrospective series & one controlled study showed, after 3 to 9 months of IDPN:

- ↑ body weight, arm muscle circumference
- ↑ albumin, transthyretin
- ↑ nPCR, creatinine production
- ↑ response to hypersensitivity skin tests
- ↑ spontaneous intakes

Perdialytic parenteral nutrition with lipids and amino acids

Prospective, controlled, randomized study
IDPN 16 kcal/kg/HD & 0.08 g N/kg/HD, n = 12, vs. Controls, n = 14

![Graph showing changes in BW, AMC, TTR, and Albumin% over time.](Image)
IDPN: **effect on survival**
*Retrospective study: National Medical Care Hemodialysis Centers*

1/1/1991: IDPN (n=1679) vs controls (n=22517)
Evaluation: Intention to treat, one-year follow-up

Data adjusted for:
age, gender, race, diabetes, URR

Improved survival:
Albumin ≤ 33 g/l
(p<0.01)

Reinforced efficacy:
creatinine < 8 mg/dl

Enteral nutrition

Polymeric EN, administered *via* naso-gastric tube
or gastrostomy

Necessary during severe undernutrition, particularly
when spontaneous intakes are < 20 kcal/kg/day:
- IDPN cannot reach recommended supplies
- daily nutritional support is needed
- enteral nutrition should be preferred to
  parenteral nutrition

Poorly investigated
A controlled trial of intermittent enteral nutrient supplementation in maintenance hemodialysis patients

Nondiabetic adult MHD patients with BMI <20 and serum albumin <4.0 g/dL:
- Control group: appropriate monitoring, dietary counselling
- Supplement group: post-HD enteral nutrition,
  500 kcal, 15 g protein for 1 month
- Both groups: baseline food intake, dry weight and BMI
- Supplement group: serum albumin and functional scoring.

Sharma M. J Ren Nutr 2002:12:229-37
Conclusion & Perspectives

1 - Nutritional support in hemodialysis patients
- appears to be able to improve nutritional status
- remains to be evaluated concerning its effects on
  - quality of life
  - healthcare requirements
  - survival

2 - Multidisciplinary approaches for the treatment of malnutrition during dialysis need to be evaluated, combining nutritional support with
  - Anabolic factors
  - Rehabilitation

Références (1)

References (2)