Malnutrition in advanced CKD

Jessica Stevenson
Dietitian, Renal Supportive Care
St George Hospital

Malnutrition

Lack of proper nutrition, caused by not having enough to eat, not eating enough of the right things or being unable to use the food that one does eat.

Protein Energy Wasting (PEW) in CKD

Multiple nutritional and catabolic alterations that occur in chronic kidney disease and is associated with morbidity and mortality.

Estimated to be present in 18-75% of people with CKD, worsening as disease progresses.

Multifactorial aetiology characterised by prevalence of:
- anorexia, inflammation, oxidative stress, insulin resistance, anaemia

NSW Renal Supportive Care - Malnutrition

<table>
<thead>
<tr>
<th>Age Range</th>
<th>Count</th>
<th>Average SGA</th>
<th>SGA range</th>
<th>Average Charlson Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;50</td>
<td>50%</td>
<td>A7</td>
<td>C2-B5</td>
<td>4</td>
</tr>
<tr>
<td>50-59</td>
<td>4</td>
<td>A7</td>
<td>(1 patient)</td>
<td>4</td>
</tr>
<tr>
<td>60-69</td>
<td>11</td>
<td>B3</td>
<td>C2-B5</td>
<td>6</td>
</tr>
<tr>
<td>70-79</td>
<td>54</td>
<td>B5</td>
<td>C1-A7</td>
<td>9</td>
</tr>
<tr>
<td>80-89</td>
<td>122</td>
<td>B5</td>
<td>C2-A7</td>
<td>8</td>
</tr>
<tr>
<td>&gt;90</td>
<td>37</td>
<td>B4</td>
<td>C1-A7</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>229</td>
<td>B5</td>
<td>C1-A7</td>
<td>8</td>
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</tbody>
</table>

Protein Energy Wasting (PEW) in CKD

Body function impairment is classified into 3 stages

1. Impairment (disease-related symptoms – poor appetite, nausea)
2. Limitation in activities (dyspnea, fatigue)
3. Poor participation (experiencing reduced QoL, increased morbidity and mortality)

PEW associated with significant morbidity, reduced QoL and one of the primary predictors of mortality.
**Management of malnutrition**

Patients should be managed in an integrative way, taking into account the multiple facets of their clinical picture, aiming to improve muscle mass, structure, metabolism and function.

Interventions should consider all determinants (of muscle wasting) not just the nutritional ones.
- combine nutrition, exercise, anti-inflammatories, anabolic hormones

**Protein Energy Wasting (PEW) in CKD**

4 main criteria to assess

<table>
<thead>
<tr>
<th>Reduced muscle mass</th>
<th>Low protein / energy intake, anorexia</th>
</tr>
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<tbody>
<tr>
<td>Sarcopenia in CKD</td>
<td></td>
</tr>
</tbody>
</table>
- Sarcopenia is observed earlier in CKD compared to non-CKD
- Adult with CKD should expect 1% loss of muscle mass per year

**IN ADDITION normal age-related factors in CKD:**
- Protein losses (through dialysis or proteinuria)
- Muscle wasting due to chronic inflammation
- Change in muscular compartments (increasing fat deposits) – more common in elderly, with low albumin and high proinflammatory cytokines

**Sarcopenia**

Deficiency of muscle mass and function

Condition arising in elderly people as a result of reduced physical activity and compromised nutrition

Sarcopenia is a feature of PEW and ageing

**Assessment:**
- Muscle Mass: DEXA
- Strength and physical performance: Hand Grip Strength, Gait Speed

**Sarcopenia in CKD**

- Sarcopenia is observed earlier in CKD compared to non-CKD
- Adult with CKD should expect 1% loss of muscle mass per year

**Figure 1.** Potential causes of body and protein-energy wasting in elderly patients with and stage kidney disease. 1,25(OH)2D3, 1,25-dihydroxyvitamin D3; CKD, end-stage kidney disease; PTH, parathyroid hormone; 25OHD, vitamin D receptor.
Sarcopenia and frailty

Linked but distinct correlates of musculoskeletal aging

<table>
<thead>
<tr>
<th>Frailty</th>
<th>Sarcopenia</th>
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<tbody>
<tr>
<td>Anemia</td>
<td>Muscle loss</td>
</tr>
<tr>
<td>Reduced cognition</td>
<td></td>
</tr>
<tr>
<td>Reduced functional capacity</td>
<td></td>
</tr>
<tr>
<td>Arthritis</td>
<td></td>
</tr>
<tr>
<td>Poor balance</td>
<td></td>
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<tr>
<td>Reduced cardiac function obesity</td>
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Increasing sarcopenia and frailty is associated with worsening QoL in both CKD and non-CKD patients.

Frailty

Multi-system impairment

When multiple body systems lose their built-in reserves

- Poor physical function
- Exhaustion
- Low physical activity
- Weight loss

Associated with higher risk of falls, cognitive impairment, hospitalisations and death

Assessment
- Should include medical and functional assessments.

Dialysis Morbidity and Mortality study

- Cross-sectional prevalence of frailty in HD and PD; N=2400
- Frailty assessed by:
  - Slowness / weakness
  - Poor endurance / exhaustion
  - Physical inactivity
  - Unintentional weight loss

<table>
<thead>
<tr>
<th>Overall</th>
<th>&lt;40 yrs</th>
<th>40-50 yrs</th>
<th>50-60 yrs</th>
<th>&gt;60 yrs</th>
<th>&gt;60 yrs</th>
<th>&gt;60 yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>67.7%</td>
<td>64%</td>
<td>61%</td>
<td>66%</td>
<td>74%</td>
<td>78%</td>
</tr>
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</table>

Compared to non-renal populations:

- Cardiovascular Health Study (n=100,000)
- Women's Health Initiative (n=50,000)

<table>
<thead>
<tr>
<th>Overall (mortality)</th>
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<tbody>
<tr>
<td>9.9%</td>
<td>86.3%</td>
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Prevalence

Sarcopenia
- Non-CKD: 10% 60–70yrs and 30% in 80yrs
- CKD: 45–63% in elderly HD patients
- Increases with disease progression

Frailty
- Non-CKD: 4–16%
- Dialysis: 44–80%
- Increases with disease progression

Current nutritional guidelines

Sarcopenia
- Protein: 1.2–1.5g protein/kg IBW/day
- With 10–15g EAAs per meal for optimal muscle synthesis
- This requires 30g protein per meal

Conservative CKD
- Protein: 0.6–0.8g protein/kg IBW/day
- No value muscle production, low dietary protein progression and maintain body nitrogen balance
- 35kcal/kg IBW/day

70kg person on conservative pathway
- Renal: 40–56g protein daily
- Sarcopenia: 110–130g

Low Protein Diets:
- Slow progression
- Symptom management (and therefore QoL)
  - Reduced appetite
  - Taste changes
  - Nausea
  - Vomiting

Relaxing protein restrictions can result in high potassium / salt / phosphate intake which in turn can result in symptoms and acute events

Current nutritional management

Symptom management
- Strategies depend on symptoms
- To improve nutritional intake

Nutritional intake
- // upper end of protein recommendations
- Depending on treatment / severity / age etc may relax restrictions
- (keeping in mind other dietary aspects – e.g. potassium)

Physical activity
- General guidelines for elderly Choose Health & Active
Ideas for the future

- Interventions to target inflammation
  - Fish oil
  - High fibre
  - Turmeric
  - Evening Primrose Oil (efficacy above uraemic pruritus)

- Increasing physical activity to improve function

- Optimal protein for muscle function and reducing uraemic symptoms

References


Moon et al. 2015. Relationship between stage of chronic kidney disease and sarcopenia in Korean aged 60 years and older using the Korean National Health and Nutrition Examination surveys 2009-2011. PLOS One


Pereira et al. 2015. Sarcopenia in chronic kidney disease on conservative therapy: prevalence and association with mortality. NDT, vol 30