DIET FOR PATIENTS WITH CHRONIC KIDNEY DISEASE: UPDATES AND BARRIERS TO ACCESSING REGISTERED DIETITIANS WITH SPECIALIZED TRAINING

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DISCLOSURES

• Academy of Nutrition and Dietetics (Grant Funding, Editorial Board)
• International Society of Renal Nutrition and Metabolism (Council)
• Journal of Renal Nutrition (Editorial Board)

LEARNING OBJECTIVES

• Recognize the recommended changes to nutrition therapy for patients with chronic kidney disease in the latest version of the KDOQI clinical practice guidelines for nutrition

• Identify barriers and strategies to accessing a registered dietitian nutritionist for patients with chronic kidney disease
PREVALENCE OF CKD IN THE UNITED STATES

Adapted from CDC CKD Surveillance System

CHRONIC KIDNEY DISEASE IS PROGRESSIVE

Stage 1: Chronic kidney disease with normal renal function
Stage 2: Chronic kidney disease with reduced renal function
Stage 3a: Moderate chronic kidney disease
Stage 3b: Severe chronic kidney disease
Stage 4: End-stage renal disease
Stage 5: Renal failure

National Kidney Foundation

UPDATED GUIDELINES
IT HAS BEEN A WHILE SINCE GUIDELINES WERE UPDATED

THERE HAVE BEEN OTHER UPDATES TO NUTRITION CARE

ACADEMY GUIDELINE DEVELOPMENT PROCESS

Papoutsakis, 2017 J Acad Nutr Diet
SYSTEMATIC REVIEW PROCESS

- Current search included all stages of CKD
- Published between 1985 and 2016
- Questions related to assessment
  - Controlled trials with at least 6 participants + observational studies
- Questions related to nutrition intervention
  - Controlled trials with at least 6 participants in each group

JUST A REMINDER OF THE STRENGTH OF RECOMMENDATIONS AND GRADE FOR QUALITY OF EVIDENCE

<table>
<thead>
<tr>
<th>Level</th>
<th>Recommendation</th>
<th>Evidence</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meta-Analysis</td>
<td>Systematic Review</td>
<td>Randomized Controlled Trials</td>
<td>Case Series</td>
</tr>
<tr>
<td>Level of evidence</td>
<td>Protein</td>
<td>Sodium</td>
<td>Potassium</td>
</tr>
</tbody>
</table>

TODAY WE WILL ONLY TALK ABOUT...
MOST NOTABLE CHANGE: DIFFERENTIATION OF DIABETES STATUS
Diabetes and Chronic Kidney Disease in the US population, 2009-2014

<table>
<thead>
<tr>
<th>METHODS</th>
<th>OUTCOME</th>
<th>Prevalence of CKD by Diabetes Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>No-DMATS 2009-2014</td>
<td>Diabetic</td>
<td>25%</td>
</tr>
<tr>
<td>25%</td>
<td>16%</td>
<td>4.6%</td>
</tr>
<tr>
<td>ESRD</td>
<td>Non-diabetics 2009-2014</td>
<td>5.3%</td>
</tr>
<tr>
<td>3%</td>
<td>0.3%</td>
<td>2.5%</td>
</tr>
<tr>
<td>N = 12,760</td>
<td>Non-diabetics 1984-1990</td>
<td>24%</td>
</tr>
<tr>
<td>1984-1990</td>
<td>Non diabetics 1984-1990</td>
<td>0%</td>
</tr>
</tbody>
</table>

CONCLUSION: Diabetes is strongly associated with albuminuria and reduced eGFR, independent of demographics and hypertension, and contributes substantially to the burden of CKD in the US.

PROTEIN RESTRICTION, CKD PATIENTS NOT ON DIALYSIS AND WITHOUT DIABETES
In adults with CKD 3-5 who are metabolically stable, we recommend, under close clinical supervision, protein restriction with or without keto acid analogs, to reduce risk for end-stage kidney disease (ESKD)/death (1A) and improve quality of life (QoL) (2C):

- a low-protein diet providing **0.55-0.60 g dietary protein/kg body weight/day**, or
- a very low-protein diet providing **0.28-0.43 g dietary protein/kg body weight/day** with additional keto-acid/amino acid analogs to meet protein requirements (0.55-0.60 g/kg body weight/day)

HOW DOES KDOQI DEFINE METABOLICALLY STABLE?
- Absence of any inflammatory or infectious disease
- No hospitalization within two weeks
- Absence of
  - poorly controlled diabetes or consumptive diseases (ex: cancer)
  - antibiotics or immunosuppressive medications
  - significant short-term weight loss
LOW PROTEIN DIET

In adults with CKD 3-5 who are metabolically stable, we recommend that a low-protein diet providing 0.55-0.6g/kg/d should be prescribed to reduce the risk of ESKD/death and QoL

- ESKD/death: beneficial effect of protein restriction (OR 0.62 [0.39-0.99])
- QoL: scores for general health and physical status improved significantly after protein restriction
- Improvement in serum lipid profile

Protein intake reduction is not easy...


LOW PROTEIN DIET – IMPLEMENTATION

- Progressive
- Monitor energy intake
  - In controlled research studies LPDs are not associated with wasting
- Emphasize low-protein products
- Individualize
  - Patients with polycystic kidney disease may not benefit
PROTEIN RESTRICTION, CKD PATIENTS NOT ON DIALYSIS AND WITH DIABETES

• In the adult with CKD 3-5 and who has diabetes, it is reasonable to prescribe, under close clinical supervision, a dietary protein intake of 0.6-0.8g/kg body weight/day to maintain a stable nutritional status and optimize glycemic control (OPINION).

• Conflicting evidence and high heterogeneity

PROTEIN TYPE

In adults with CKD 1-5D (IJB) or post-transplantation (OPINION), there is insufficient evidence to recommend a particular protein type (plant vs animal) in terms of the effects on nutritional status, calcium or phosphorus levels, or the blood lipid profile.

• 3 RCTs in HD/PD and 2 cross-over studies in CKD 3-4
  - Type of protein intake was not significantly associated with nutrition status markers, inflammation, or electrolyte markers except for a significant decrease in urinary phosphate (-126.6 [95% CI -200.4 to -52.7 mg] mg) after VPD compared to APD.

Table 1. Ranges of dietary protein intake vs CKD disease conditions in the context of the KDOQI CPG in Kidney Disease 2020

<table>
<thead>
<tr>
<th>Dietary Protein Intake Range</th>
<th>Daily Grams of Protein Intake</th>
<th>Weight/Day</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein-free diet</td>
<td>0.0-0.0</td>
<td>g/kg/day</td>
<td>Generally not recommended for any person including CKD patients. Usually supplemented with essential amino acids or their taurine, ornithine, or ornithine, and acetate salts. KDOQI CPG recommends 0.6 to 0.8 g/kg/day with additional intake of essential amino acids to meet protein requirements (≥0.6 g/kg body weight/day) for metabolically stable patients. This range is recommended by KDOQI CPG for CKD patients without diabetes.</td>
</tr>
<tr>
<td>Very low protein diet</td>
<td>0.6-0.6</td>
<td>g/kg/day</td>
<td>Recommended by KDOQI CPG for CKD patients without diabetes.</td>
</tr>
<tr>
<td>Low protein diet for metabolically stable CKD</td>
<td>0.8-0.8</td>
<td>g/kg/day</td>
<td>More commonly recommended for advanced CKD (GFR &lt; 30 ml/min) on dialysis or protein malnutrition, usually in supplement form. This range is recommended by KDOQI CPG for CKD patients without diabetes.</td>
</tr>
<tr>
<td>Moderately low protein intake</td>
<td>0.9-1.3</td>
<td>g/kg/day</td>
<td>Recommended for adults with CKD but at all stages of CKD including those with a vitamin deficiency (low vitamin D).</td>
</tr>
<tr>
<td>Moderate protein intake</td>
<td>1.5-2.1</td>
<td>g/kg/day</td>
<td>Recommended by KDOQI CPG for metabolically stable patients on continuous HD or PD.</td>
</tr>
<tr>
<td>Moderately high protein diet</td>
<td>2.1-3.1</td>
<td>g/kg/day</td>
<td>Recommended by KDOQI CPG for adults with CKD and with diabetes.</td>
</tr>
<tr>
<td>High in very high protein diet</td>
<td>&gt;3.1</td>
<td>g/kg/day</td>
<td>Recommended by KDOQI CPG for adults with CKD and with diabetes.</td>
</tr>
</tbody>
</table>

Kistler et al. Journal of Ren Nutr. 2021
PLANT-BASED FOODS ARE OFTEN LOWER IN PROTEIN AND AMOUNT OF TITRATABLE ACID (PHOSPHORUS AND SULFUR)

FRUITS AND VEGETABLES
In adults with CKD 1-4, we suggest that prescribing increased fruit and vegetable intake may decrease body weight, blood pressure, and net acid production (NEAP) (2C).

- CKD progression (2 RCTs) mixed results related to GFR decline
  - (compared to oral bicarb)
- Blood pressure (2 RCTs and 1 non-RCT) SBP -5.6 (95% CI -8.3 to -2.8)mm Hg
- Body weight (2 RCTs) -5.09 (95% CI -7.73 to 2.44) kg

SODIUM
SODIUM

• In adults with CKD 3-5 (1B), CKD 5D (2C), or posttransplantation (1C), we recommend limiting sodium intake to less than 100 mmol/d (or <2.3 g/d) to reduce blood pressure and improve volume control.
• In adults with CKD 3-5 we suggest limiting sodium intake to less than 100 mmol/d (or <2.3 g/d) to reduce proteinuria synergistically with available pharmacologic interventions (2A).
• In adults with CKD 3-5D, we suggest reduced dietary sodium intake as an adjunctive lifestyle modification strategy to achieve better volume control and a more desirable body weight (2B).

• Patient education initiatives and skill development (cooking, label reading).
• Renal dietitians are needed to integrate sodium intake with other recommendations.
• No gold-standard method.

HOW TO LIMIT SODIUM IN THE DIET?

• Limit processed and preserved food products.
• Use low-sodium (sodium-free) food products.
• Avoid gelatin-based desserts.
• Be aware that foods like tomato juice and olives can be high in sodium.

POTASSIUM

• Potassium should be included in the diet to maintain normal metabolism and help cardiovascular function.
• Potassium can be found in fruits, vegetables, and lean meats.
• Avoid foods high in sodium to balance potassium levels.
• Patient education and dietary counseling are important in managing potassium levels.
**POTASSIUM - LOWEST LEVEL OF EVIDENCE**

In adults with CKD 3-5D and post-transplant, it is reasonable to adjust dietary potassium intake to maintain serum potassium within the normal range (OPINION).

In adults with CKD 3-5D (2D) or post-transplantation (OPINION) with either hyperkalemia or hypokalemia, we suggest that dietary or supplemental potassium intake be based on a patient’s individual needs and clinician judgment.

- Patient education initiatives and skill development (cooking, label reading).
- Renal dietitians are needed to integrate sodium intake with other recommendations.
- No gold-standard method.

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**Relationship between dietary potassium and serum potassium is weak**

[Graph showing the relationship between dietary potassium and serum potassium]


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**SERUM POTASSIUM CAN BE INFLUENCED BY MANY FACTORS OTHER THAN DIET**

- Medications
- Residual kidney function
- Hydration status
- Acid-base status
- Glycemic control
- Adrenal function
- Catabolism
- GI problems: vomiting, diarrhea, constipation, and bleeding
METHOD OF COOKING CAN INFLUENCE POTASSIUM


One thing to consider...

The food industry may increase the use of potassium additives to increase potassium content of foods

PHOSPHORUS
PHOSPHORUS

Restricting phosphorus intake to maintain serum phosphate levels in the normal range is recommended in patients with CKD 1-5D (1B)

In patients with CKD 1-5D when making decisions about phosphorus restriction it is reasonable to consider the bioavailability of phosphorus sources (OPINION)

• Choosing foods lower in bioavailable phosphorus
• Reducing processed foods
• Preparation methods, such as boiling.

DIETARY PATTERNS

In patients with CKD 1-5 and post-transplant with or without dyslipidemia we suggest the Mediterranean Diet to improve lipid profile (2C)

In adults with CKD 1-5, we suggest increased fruit and vegetable intake to also decrease body weight and blood pressure (2C)

• Research
ULTIMATELY, GUIDELINES APPLY TO INDIVIDUALS

• In adults with CKD 1-5D, we recommend that a registered dietitian nutritionist (RDN) or an international equivalent, in close collaboration with a physician or other provider, provide MNT. Goals are to optimize nutritional status, and to minimize risks imposed by comorbid conditions and alterations in metabolism on the progression of kidney disease (1C) and on adverse clinical outcomes (OPINION).

MNT PROVIDED BY RDN SLOWS TIME TO DIALYSIS

• Retrospective cohort

• Decline in eGFR 0.3 vs 9.9 mL/min/1.73 m²

• HR for ESKD 2.78 (95% CI 1.68-4.60)

PRE-HEMODIALYSIS CARE MAY REDUCE MORTALITY DURING FIRST YEAR OF DIALYSIS

<table>
<thead>
<tr>
<th>Variable</th>
<th>Prevalence</th>
<th>HR (95% CI)</th>
<th>P</th>
<th>Prevalence</th>
<th>HR (95% CI)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>1.00 (ref)</td>
<td>1.00 (ref)</td>
<td></td>
<td>1.00 (ref)</td>
<td>1.00 (ref)</td>
<td></td>
</tr>
<tr>
<td>&lt; 12 mo</td>
<td>1.20 (1.02-1.38)</td>
<td>0.03</td>
<td>0.92 (0.84-1.00)</td>
<td>0.02</td>
<td>1.02 (0.98-1.07)</td>
<td>0.2</td>
</tr>
<tr>
<td>&gt; 12 mo</td>
<td>0.94 (0.84-1.05)</td>
<td>0.38</td>
<td>1.10 (1.03-1.18)</td>
<td>0.03</td>
<td>0.98 (0.71-1.40)</td>
<td>0.8</td>
</tr>
</tbody>
</table>

Mortality adjusted model

HOW DO WE GET MORE PATIENTS TO THE RD?

• Train more registered dietitians in the care of patients with kidney disease
  • GRID and CKD Modules
  • Increase visibility of available RDNs
    • Online through websites
    • Locate in facilities that treat patients who may have CKD

• Increase knowledge about reimbursement and increase reimbursement rates

• Improve coordination of care