

Article

Low-Protein Diets and Plant-Based Diets in Chronic Kidney Disease: Understanding Dietitians' Perspectives and Practice Trends

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Abstract

Protein intake recommendations for patients with chronic kidney disease (CKD) stages 3–5 without kidney replacement therapy (KRT) remain controversial. This study investigated current practice trends related to the 2020 Kidney Disease Outcomes Quality Initiative (KDOQI) protein guidelines and dietitians' perspectives on low-protein diets (LPDs) and plant-based diets in CKD. This mixed-methods explanatory sequential study included a secondary analysis of an online survey ($N = 87$), followed by a conventional content analysis of two virtual focus groups ($N = 11$). Most survey respondents reported prescribing the KDOQI-recommended protein amounts of 0.55–0.6 g/kg/d in patients without diabetes (65.9%) and 0.6–0.8 g/kg/d in patients with diabetes (81.5%). Use of keto-acid analogs (KAs) was low among survey participants (18.4%). Focus group participants described varied approaches for calculating protein goals but overwhelmingly stressed the importance of individualized care. Key factors influencing recommendations included nutritional status, food preferences, comorbidities, current intake, and knowledge, beliefs, attitudes, and motivations. In summary, most participants recommended LPDs consistent with the KDOQI guidelines; however, KA use was uncommon. Despite differences in decision-making, participants emphasized individualizing protein recommendations to each patient's unique needs. Given the exploratory nature of this work and the small, self-selected sample, these results provide preliminary insights that warrant further investigation in more diverse samples.

Keywords: chronic kidney disease; nutrition; medical nutrition therapy; low protein diet; plant-based diet



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1. Introduction

In 2020, the National Kidney Foundation (NKF) and the Academy of Nutrition and Dietetics (AND) updated the Kidney Disease Outcomes Quality Initiative (KDOQI) Clinical Practice Guideline for Nutrition in Chronic Kidney Disease (CKD) [1]. The 2020 KDOQI guidelines lowered the recommended protein intake for metabolically stable patients with CKD stages 3–5 without kidney replacement therapy (KRT) [1]. For this group, a low-protein diet (LPD) of 0.55–0.6 g/kg/d or a very low-protein diet (VLPD) of 0.28–0.43 g/kg/d, supplemented with keto-acid analogs (KAs), is recommended for those without diabetes [1]. For patients with diabetes, the recommended protein intake is more liberal, at 0.6–0.8 g/kg/d, to help maintain stable nutritional status and optimize glycemic control [1].

Despite the updates to the KDOQI guidelines, protein intake recommendations remain controversial for patients with CKD without KRT [1–3]. The International Society of Renal Nutrition and Metabolism (ISRNM) commented on the KDOQI guidelines, noting that multiple protein intake recommendations may create confusion and pose implementation challenges, and thus proposed a streamlined recommendation of 0.6–0.8 g/kg/d regardless of diabetes status [2]. Moreover, a 2023 meta-analysis by Jiang et al. found that a LPD (0.6–0.8 g/kg/d), compared with an unrestricted protein diet (≥ 1 g/kg/d), may show little to no difference in CKD progression or mortality in adults with diabetic kidney disease [4].

Some clinicians feel that LPDs may be infeasible or negatively affect quality of life [3,5]. However, studies in Europe have found no differences in quality of life in those following a LPD or a VLPD [6,7]. It is unclear if these results would be as generalizable to the population in the United States. The ISRNM also argued that LPDs and VLPDs may be challenging to achieve or maintain, especially in areas with limited access to KAs and clinicians who are knowledgeable about their use [2].

In 2024, the Kidney Disease: Improving Global Outcomes (KDIGO) work group released its updated clinical practice guidelines (CPGs) on CKD management [8]. The 2024 KDIGO guidelines recommended a protein intake of 0.8 g/kg/d in adults with CKD stages 3–5 without “indications for a higher or lower protein intake” and “congruent with a person’s culture and quality of life” [8]. High protein intake (>1.3 g/kg/d) should be avoided in adults at risk of CKD progression [8]. CKD progression risk is based on multiple factors, including the etiology of CKD, comorbid conditions, and severity of kidney-related complications (e.g., albuminuria) [8]. A closely supervised VLPD of 0.3–0.4 g/kg/d supplemented with KAs may be considered in adults at risk of kidney failure who are willing and able to follow a VLPD [8]. LPDs or VLPDs should not be recommended for those who are metabolically unstable [8].

Both the KDOQI and KDIGO work groups considered the current evidence too limited to include recommendations on protein type in their CPGs [1,8]. However, the ISRNM argued that it is reasonable to favor plant-based protein over animal protein for renoprotective effects based on observational data in the absence of RCTs [1,2]. Studies have shown that the lower bioavailability of plant proteins reduces hyperfiltration, corrects metabolic acidosis, improves bone mineral metabolism, and slows CKD progression [9–11]. Because plant-forward dietary patterns naturally reduce protein intake, plant-based diets (PBDs) may serve as a practical framework for implementing LPDs. For this study, we define a PBD as a plant-forward dietary pattern in which plant foods constitute the majority of total intake, while smaller amounts of animal foods may also be included [12]. This definition aligns with contemporary clinical usage and encompasses eating patterns ranging from vegan to omnivorous diets [12].

Nutrition therapy can slow CKD progression and improve renal outcomes in patients with CKD, yet the ideal protein prescription for this population remains inconclusive [1–3,13]. Much of the existing work has focused on CPGs awareness and the perceived benefits or challenges of LPDs and PBDs [4,13–17]. However, little is known about how dietitians translate CPGs into individualized recommendations, how they navigate competing clinical priorities, or how contextual factors influence their use of LPDs and PBDs [5,18–20]. This study aimed to investigate current practice trends in implementing the 2020 KDOQI guidelines for protein intake and to explore RDNs’ perspectives on LPDs and PBDs in adults with CKD. By integrating quantitative survey data with qualitative focus groups, this study examines not only what registered dietitian-nutritionists (RDNs) recommend, but how and why they make those recommendations, thereby addressing key gaps in existing literature.

2. Materials and Methods

This was a mixed-methods study using an explanatory sequential design. The quantitative data were exported from the original study, which consisted of an online survey regarding the implementation of the 2020 KDOQI guidelines. The qualitative data were then collected from focus groups investigating decision-making processes for making protein recommendations.

2.1. Original Study

The original study was entitled “KDOQI 2020 Clinical Practice Guidelines Survey: Assessing Practices Among Dietitians Working with Adults with Chronic Kidney Disease” and was approved by Rutgers University’s Institutional Review Board (IRB) (protocol #2023001238). The original study was a cross-sectional study using an online survey administered via the Qualtrics® platform (Qualtrics, Provo, UT, USA). The survey link was emailed to the NKF and the Academy Renal Practice Group (RPG) mailing lists between September and October 2023 and was open for 24 days. Approximately 8200 received the survey invitation. The initial survey invitation was emailed on day 1, followed by three reminder emails on days 4, 10, and 17 to mitigate nonresponse bias. The survey was closed seven days after the last reminder was sent. There were 488 survey respondents, and the response rate was approximately 6%.

The survey comprised approximately 95 questions and took 15 to 20 min to complete. Each participant could complete the survey only once. Respondents were not required to answer every question, so the total number of responses for each question may differ. The survey included eleven sections. Sections 1 and 2 pertain to informed consent and participant screening. Sections 3 to 8 consisted of questions on clinical practice patterns in the six areas within the 2020 KDOQI guidelines: (1) Nutrition Assessment, (2) Medical Nutrition Therapy, (3) Protein and Energy Intake, (4) Nutritional Supplementation, (5) Micronutrients, and (6) Electrolytes [1]. These sections had predefined responses and an option to provide open-ended responses. Section 9 included open-ended questions on topics for future practice guidelines not covered in the 2020 KDOQI guidelines. Sections 10 and 11 pertain to demographics and professional characteristics, as well as to consent to participate in a raffle for one of five \$50 Amazon e-gift cards as an incentive for completing the survey. The survey sent to the RPG mailing list also asked if participants would be willing to be contacted for future studies. The face and content validity of the survey questions were tested and reviewed by select members of the NKF and RPG, including authors of similar published survey studies.

2.2. Quantitative Methods: Survey Analysis

This study analyzed the respondents’ data from survey Sections 1 (consent), 2 (screening questions), 5 (protein and energy intake), and 10 (demographics and professional characteristics). Inclusion criteria were consent to participate, holding a RDN or equivalent international credential, and working primarily with patients with CKD stages 1–5 without KRT. Participants who did not respond to the relevant survey questions on demographics and professional characteristics, protein intake, and primary patient population were excluded.

Quantitative data analysis was conducted using Statistical Package for the Social Sciences (Version 29.0, IBM Corp., Armonk, NY, USA). Given the small sample size and exploratory aims, analyses were limited to descriptive statistics summarizing demographics, professional characteristics, and survey responses on protein intake.

2.3. Qualitative Methods: Focus Groups

A separate IRB was obtained for the focus groups (protocol #2024000184). Two focus groups were held online between April and May 2024 via the Zoom® platform (Zoom Video Communications, San Jose, CA, USA). English-speaking RDNs who work with adults with CKD without KRT were eligible. Participants were recruited by email from the original study survey respondents and through snowball sampling. Participants attested to their eligibility and consented to the study electronically through a Qualtrics® survey. Two research team members (JC and AB) attended each focus group session, one as the lead moderator (JC) and the other as the note-taker (AB). A focus group discussion guide was developed by “following the threads” identified in the survey analysis. This guide facilitated discussion through open-ended questions and probes [21].

Focus groups were recorded and preliminary transcripts were generated using Zoom®. Each transcript was checked twice against the recording and corrected for accuracy. Participants were assigned numeric identifiers to maintain anonymity. The corrected transcripts were imported into Microsoft Excel (Version 16.86, Microsoft Corporation, Redmond, WA, USA) for analysis. The transcripts were analyzed using conventional content analysis, an inductive method for generating codes directly from the textual data [22,23]. Conventional content analysis was used instead of a deductive method because the literature on dietitians’ perspectives and practices is limited, and we did not want to impose any preconceived categories on the data [22,23]. The lead author (JC) completed the initial coding of the transcripts. Then, the research team (AB and LBG) completed a template analysis of the initial codes [24]. Coding discrepancies were discussed during regular consensus meetings, and the codebook was refined until agreement was reached. The lead author (JC) re-coded the transcripts based on team feedback. An audit trail included codebook revisions. Thematic analysis was conducted to identify patterns across the data. Throughout this process, the team engaged in reflexivity to reduce bias during coding, analysis, and data interpretation [25]. Member checking, also known as response validation, was considered but not conducted due to the study’s exploratory nature and limited availability for follow-up. Direct quotations were also included alongside our findings to support the unbiased nature of the data [23].

3. Results

3.1. Quantitative Results: Survey Analysis

Of the 488 individuals who completed the original survey, 87 met the inclusion criteria for this analysis. Figure 1 details the screening process for eligible respondents for analysis.

Table 1 summarizes selected demographics of survey respondents. Additional details are presented in Table S1. Respondents were predominantly white, non-Hispanic females in the United States with a median of 18 years of experience as an RDN and 7 years in renal nutrition. The most common workplace setting was the outpatient or ambulatory clinic (38.6%). Most respondents were either moderately familiar (41.4%) or extremely familiar (37.9%) with the 2020 KDOQI guidelines.

Two-thirds of respondents reported prescribing a LPD, but only 18.4% reported prescribing a VLPD supplemented with KAs for patients without diabetes (Table 2). To better understand this pattern, focus group participants described implementation barriers. Eighty-one percent of respondents reported prescribing 0.6–0.8 g/kg/d for patients with diabetes. Because more than two-thirds of respondents reported “yes” to prescribing “other” amounts, the qualitative phase explored how RDNs determined individualized protein goals.

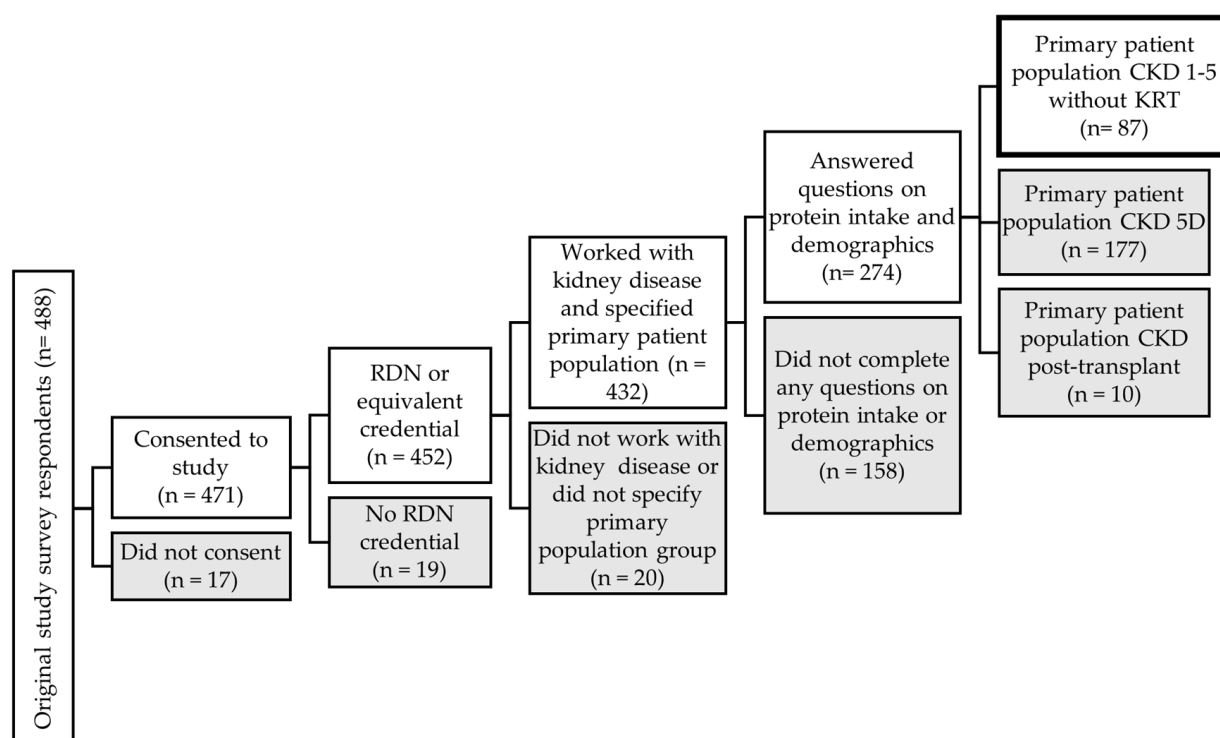


Figure 1. Screening and Selection of Survey Respondents for Analysis. Shaded boxes indicate exclusion criteria.

Table 1. Selected Demographics and Professional Characteristics of Survey Respondents.

Characteristic	N (%)
Age in years (n = 83)	50 (39–64)
Gender (n = 83)	
Woman/Female	76 (91.6)
Man/Male	5 (6.0)
Prefer not to say	2 (2.4)
Race (n = 83)	
White	56 (67.5)
Asian	12 (14.5)
Black or African American	4 (4.8)
Biracial or Multiracial	2 (2.4)
Other	9 (10.8)
Ethnicity (n = 82)	
Not Hispanic/Latino/Latina or Spanish	74 (90.2)
Hispanic/Latino/Latina or Spanish	8 (9.8)
Geographical location (n = 82)	
South (South Atlantic, West South Central, East South Central)	21 (25.6)
West (Pacific, Mountain)	18 (22.0)
Midwest (East North Central, West North Central)	7 (8.5)
Northeast (Middle Atlantic, New England)	9 (11.0)
Other	27 (32.9)
Academic degree (n = 83)	
Bachelor	36 (43.4)
Master	40 (48.2)
Doctorate	7 (8.4)
Years practicing as a dietitian (n = 83)	18 (8–30)

Table 1. *Cont.*

Characteristic	N (%)
Years as a dietitian in a renal setting (n = 78)	7 (2–15)
Work setting (n = 83)	
Outpatient or ambulatory clinic	32 (38.6)
Dialysis unit (freestanding and hospital-based)	6 (7.2)
Inpatient or acute care, long-term care or rehab facility	13 (15.7)
Private practice or self-employed	12 (14.5)
Other (including MHS, VA, community or public health)	20 (24.0)
Primary patient population (n = 87)	
CKD 1–2	4 (4.6)
CKD 3–5	83 (95.4)
Familiarity with the 2020 KDOQI Guidelines (n = 87)	
Extremely familiar	33 (37.9)
Moderately familiar	36 (41.4)
Somewhat familiar	11 (12.6)
Slightly familiar	2 (2.3)
Not at all familiar	5 (5.7)

Continuous data are presented as median (interquartile range). Data for geographical location and work setting were collapsed into fewer categories. The original data are shown in Table S1.

Table 2. Survey Results on Recommended Protein Amount.

Survey Question	Total Responses (N)	Yes n (%)	No n (%)
In patients with CKD 3–5 not on dialysis and without diabetes, do you prescribe:			
0.55–0.60 g dietary protein/kg/day	82	54 (65.9)	28 (34.1)
0.28–0.43 g dietary protein/kg/day with keto acid or amino acid analogs	76	14 (18.4)	62 (81.6)
Other	35	22 (62.9)	13 (37.1)
In patients with CKD 3–5 not on dialysis but with diabetes, do you prescribe:			
0.60–0.80 g dietary protein/kg/day	81	66 (81.5)	15 (18.5)
Other	35	24 (68.6)	11 (31.4)

Respondents were not required to answer every question; therefore, denominators vary. Percentages reflect the proportion of respondents selecting each item out of those who answered that specific question.

The survey also assessed respondents' reasons for recommending plant or animal protein intake. The most common reasons for recommending plant protein were to improve blood lipid profile (90.4%), decrease blood pressure (88.0%), its effect on phosphorus (85.5%), improve nutritional status (80.2%), improve acid-base levels (78.3%), and decrease weight status (78.0%) (Table 3). The most common reasons for recommending animal protein were to improve nutritional status (81.0%) and to improve albumin levels (63.5%). Focus groups were asked about their approaches to discussing protein type and PBDs.

Table 3. Survey Results on Recommended Protein by Type.

Survey Question	Total Responses (N)	Yes n (%)	No n (%)
Do you recommend intake of plant protein in your patient population for these reasons?			
Effect on calcium levels	81	36 (44.4)	45 (55.6)
Effect on phosphorus	83	71 (85.5)	12 (14.5)
Improve blood lipid profile	83	75 (90.4)	8 (9.6)
Improve potassium levels	84	59 (70.2)	25 (29.8)
Improve acid-base levels	83	65 (78.3)	18 (21.7)
Decrease weight status	82	64 (78.0)	18 (22.0)

Table 3. *Cont.*

Survey Question	Total Responses (N)	Yes n (%)	No n (%)
Decrease blood pressure	83	73 (88.0)	10 (12.0)
Improve albumin levels	81	32 (39.5)	49 (60.5)
Improve nutritional status	81	65 (80.2)	16 (19.8)
Other	24	8 (33.3)	16 (66.7)
Do you recommend intake of animal protein in your patient population for these reasons?			
Effect on calcium levels	78	18 (20.1)	60 (76.9)
Effect on phosphorus	79	20 (25.3)	59 (74.7)
Improve blood lipid profile	79	16 (20.3)	63 (79.7)
Improve potassium levels	78	20 (25.6)	58 (74.4)
Improve acid-base levels	77	15 (19.5)	62 (80.5)
Decrease weight status	84	41 (48.8)	43 (51.2)
Decrease blood pressure	78	13 (16.7)	65 (83.3)
Improve albumin levels	85	54 (63.5)	31 (36.5)
Improve nutritional status	84	68 (81.0)	16 (19.0)
Other	25	7 (28.0)	18 (72.0)

Respondents were not required to answer every question; therefore, denominators vary. Percentages reflect the proportion of respondents selecting each item out of those who answered that specific question.

3.2. Qualitative Results: Focus Groups

Eleven RDNs participated in two focus groups in the spring of 2024. Each focus group had 5–6 participants and lasted 45–60 min. Participants provided a brief overview of their experience in renal nutrition but were not required to disclose demographic information. Seven RDNs were based in the United States; the remaining RDNs were based outside the United States or did not disclose their location. The median years of practice in a renal setting were 13 (IQR 5–14). Participants' current work settings varied and included nephrology clinics, kidney centers, value-based care organizations, private practices, and kidney transplant centers.

Thematic saturation was determined when both focus groups independently produced the same major themes with no new concepts emerging in the second group. Because participants shared similar professional backgrounds and work experiences, the discussion from the separate groups was unified. The emergent themes centered around four key topics: protein goal calculations, decision-making factors for protein recommendations, nutrition intervention topics, and barriers to implementation.

3.2.1. Protein Goal Calculations

Protein goal calculations were based on three variables: calculation method, weight measurement, and factors that alter protein needs. Most participants used a weight-based equation to calculate protein goals. Estimating protein goals as a percentage of total calories was used less frequently. One participant reported following the KDOQI-recommended protein range of 0.55–0.6 g/kg/d for those without diabetes and 0.6–0.8 g/kg/d for those with diabetes, in the absence of other factors that may alter needs. Four participants used ranges between 0.6–0.8 g/kg/d without specifying diabetes status. One reason for using a higher protein range was that participants observed baseline protein intake was often higher than 0.8 g/kg/d; thus, a goal of 0.6–0.8 g/kg/d would be a more reasonable starting point. Participants described using gradual reductions in protein intake to promote long-term behavior change. These varied approaches help explain why many survey respondents selected 'other' protein amounts.

There is no consensus in the literature on whether to use actual weight or an alternative weight for individuals with a body mass index (BMI) outside the healthy range [26].

Participants used actual, ideal, adjusted, or standard (NHANES II) body weights. Three participants used actual weight regardless of BMI. Two participants compared protein goals across various weight measurements to determine which was most appropriate. Participants viewed calculated protein goals as starting points and adjusted them based on clinical judgment.

3.2.2. Decision-Making Factors for Protein Recommendations

The decision-making factors used to individualize protein recommendations were grouped into four themes: food- and nutrition-related history, medical history, social determinants of health (SDOH), and application of research (Tables 4 and S2). Together, these factors illustrate the complexity of translating guideline recommendations into individual patient care.

Table 4. Themes and Subthemes Relating to the Decision-making Factors for Protein Recommendations.

Themes and Subthemes	Context and Selected Quotes
Food- and nutrition-related history (11)	
Nutritional status and malnutrition risk (9)	RDNs assessed the patients' weight history, adequacy of intake, and factors that may affect intake (appetite, gastrointestinal symptoms) or affect malnutrition risk (lifecycle stage, stress, chronic disease). - <i>I think the worst thing that I think we can do for someone is to make reductions in protein and see them lose weight and muscle mass and decline as a person.</i>
Cultural and personal food preferences (9)	RDNs considered patients' cultural and personal food preferences to personalize interventions. - <i>Sometimes, it's how they grew up, like they're meat and potato kind of people. And that's a big change for people to then think 'I have to eat plants and tofu.'</i>
Current intake, dietary patterns, and eating behaviors (8)	RDNs assessed patients' current intake, including typical amount and source of protein consumed, meal/snack pattern, portions, macronutrient composition, types of foods commonly eaten, use of medical foods, and eating behaviors.
Knowledge, beliefs, attitudes, and motivations (8)	RDNs explored patients' current nutrition knowledge, beliefs, attitudes, and motivations. RDNs also assessed patients' goals, self-efficacy and readiness to change behaviors. - <i>We have to be a little bit mindful of what their goals are. Asking them what they want.</i>
Physical activity and exercise (2)	RDNs factored in patients' activity level when estimating protein needs.
Medical history (9)	
Comorbidities and complications (9)	RDNs assessed patients' overall nutritional needs based on comorbidities (diabetes, hypertension) and CKD complications (acidosis, proteinuria). - <i>Focusing on protein when it's the safe food can feel overwhelming especially for patients with diabetes feels a little overwhelming for patients.</i>
CKD stage and risk of progression (5)	RDNs considered patients' current stage of CKD and their risk of disease progression.
Weight status and body composition (5)	RDNs adjusted nutrition recommendations based on patients' current weight, BMI, and body composition. - <i>I do worry sometimes with our smaller body people that they're not getting enough of the correct amino acids depending on how restrictive we are being.</i>
Age (4)	RDNs considered patients' age in relation to their disease progression risk, malnutrition risk, and quality of life.
Medications and dietary supplements (1)	RDNs considered use of relevant medications (e.g., RASi, SGLT2i, GLP-1 RA), and dietary supplements (vitamins, minerals, herbal supplements)

Table 4. Cont.

Themes and Subthemes	Context and Selected Quotes
Social determinants of health (6)	
Economic stability (6)	RDNs assessed patients’ ability to meet their basic needs, including ability to access and afford food and/or medical foods (e.g., keto-acid analogs), kitchen access, and cold food storage. <i>- I work with a high Medicaid population, and access to foods and healthier choices of plant-based protein is not there.</i>
Healthcare access and quality (3)	RDNs assessed patients’ ability to access and afford high-quality healthcare services, including factors like health literacy level and health insurance coverage. RDNs may adjust nutrition recommendations based on their own ability to closely monitor the patient (e.g., frequency of follow-ups).
Application of research (3)	RDNs applied their own knowledge and interpretation of scientific research when making nutrition recommendations.

Bolded texts indicate themes. The number of participants who discussed this theme/subtheme is presented in parentheses. Quotations are italicized and may have been paraphrased. Full quotations shown in Table S2.

Food- and nutrition-related history included assessments of nutritional status, malnutrition risk, dietary patterns, and factors affecting intake. Protein goals were usually increased for those at higher risk of malnutrition. Participants incorporated patients’ food preferences, current intake, nutrition knowledge, beliefs, goals, and motivations when tailoring recommendations.

Participants made protein recommendations based on their clinical judgment, experience, and evidence-based practice. Participants not only considered patients’ kidney health but also adjusted interventions after reviewing patients’ full medical histories. A higher protein goal was usually favored for older adults due to anabolic resistance with aging, the risk of malnutrition, and quality-of-life considerations. Protein goals may be lowered based on the risk of CKD progression or the severity of proteinuria or acidosis.

The subthemes under the SDOH theme were economic stability and healthcare access and quality. Economic stability was defined as the patient’s ability to meet basic needs, including food security and housing stability. Healthcare access and quality refer to a patient’s ability to obtain timely healthcare services to achieve the best possible health outcomes, including factors such as health literacy and insurance coverage.

The application of the research theme referred to participants applying their own knowledge and interpretation of scientific research when making nutrition recommendations.

3.2.3. Nutrition Intervention Topics

Nutrition intervention topics were categorized into seven themes: plant proteins and PBDs, application of knowledge, counseling strategies, protein amounts and portions, relationship to kidney health, KAs, and potassium (Tables 5 and S3).

Participants used motivational interviewing, shared decision-making, goal setting, and self-monitoring as counseling strategies. In addition to providing nutrition education, participants discussed how to apply and implement nutrition knowledge with patients.

The most popular intervention topic was plant proteins and PBDs, including education on dietary sources, the definition of a PBD, and the health benefits of plant proteins and plant foods. More participants discussed protein type than protein amount. Methods for educating on protein amount differed based on the patient’s learning needs (protein content in grams versus estimating portion sizes). Participants also educated patients about how diet affects lab values and kidney health, including CKD progression, uremia, proteinuria, uric acid levels, and kidney stones. KAs were one of the least common intervention topics.

Participants reported infrequently educating and counseling on KAs because many patients in their practices could not access them due to high cost and lack of insurance coverage.

Table 5. Themes Relating to Nutrition Intervention Topics.

Themes and Subthemes	Context and Selected Quotes
Plant proteins and plant-based diets (10)	RDNs educated on the dietary sources of plant protein and defining a PBD, and how plant foods can benefit kidney health. <i>- I spend a lot of time defining what a PBD is and talking about diet quality. That doesn't mean it's a vegan diet. Oreos are vegan and yet they're not healthy.</i>
Application of knowledge (9) Dietary modification examples (8)	RDNs provided examples of dietary modifications, such as swapping sources of animal proteins for plant proteins and adjusting portion sizes of different foods.
Plate method (4)	RDNs utilized the plate method (Healthy Plate/MyPlate) as a visual teaching tool to help patients with balancing meals and portioning out different foods.
Recipes and cooking skills (2)	RDNs shared recipes and discussed cooking techniques and skills to help patients implement dietary changes.
Counseling strategies (8)	Strategies that RDNs utilized for nutrition counseling included motivational interviewing, shared decision making, goal setting (flexible goals, SMART goals) and self-monitoring. <i>- When I work with people, I try to think of it more as like a partnership and let them have buy-in to what we're doing. I present all different ways in which we can meet their diet goals and see what they want to do.</i>
Protein amounts and portions (6)	RDNs educated on how to estimate protein intake using portion sizes and/or protein content of different amounts of protein foods.
Relationship to kidney health (5)	RDNs educated on how the amount and type of protein intake can affect kidney health. RDNs also discussed interpretation of lab results, and how diet can affect lab results. <i>- You can improve your GFR by weight loss, but it doesn't mean your kidney function is better.</i>
Keto-acid analogs (4)	RDNs educated on the proper use of KAs in conjunction with a VLPD or LPD <i>- Keto analogs are considered a medical food so patients could go buy them themselves. So, I'd much prefer that we're all educated on them, and perhaps willing to encourage them to be used.</i>
Potassium (4)	RDNs educated on dietary sources of potassium, the potassium content of different foods, and counseled on how to manage potassium intake as appropriate.

Bolded texts indicate themes. The number of participants who discussed this theme/subtheme is presented in parentheses. Quotations are italicized and may have been paraphrased. Full quotations shown in Table S3.

3.2.4. Barriers to Implementation

Barriers to implementation were categorized into seven themes: patient exposure to conflicting information and misinformation, patient prior experiences and baseline skills, beliefs and attitudes of other professionals, patient self-efficacy and readiness to change, perceived malnutrition risk, inadequate quality education materials, and patient perception of cost (Tables 6 and S4).

The most frequently reported barrier was patients’ exposure to conflicting or outdated information. Sometimes the conflicting information was due to multiple comorbidities. Other times, the information was outdated or inappropriate for the patient’s condition (e.g., recommendations for with KRT versus without KRT). One source of conflict was the perceived risk of malnutrition. Patients and other professionals were reluctant to follow or support VLPD/LPD or PBD due to concerns about malnutrition, muscle wasting, and unintentional weight loss.

Another common barrier was patients’ prior experiences and baseline skills. This included patients with limited to no exposure to and experience with different foods, or with inadequate nutrition-related skills. Likewise, patients’ level of self-efficacy and stage

of readiness to make behavior changes may also be barriers. Though less common, patients’ perception of the costs and expenses required to make dietary and lifestyle changes was another reported barrier.

Table 6. Themes Relating to Barriers to Implementation.

Themes and Subthemes	Context and Selected Quotes
Patients’ exposure to conflicting information and misinformation (10)	Patients previously being exposed to conflicting information, misinformation, outdated information, or incomplete information. Information sources included the Internet, media, friends and family, and other healthcare professionals.
Patients’ prior experiences and baseline skills (8)	Patients with limited or no exposure to different foods, or with inadequate nutrition-related skills (e.g., cooking, estimating amounts accurately). <i>- People aren’t familiar with some of the plant proteins. So, they don’t know how to incorporate them, or they don’t like them.</i>
Beliefs and attitudes of other professionals (7)	Healthcare professionals (RDNs, physicians) with conflicting beliefs and attitudes regarding plant proteins and the benefits of nutrition therapy improving kidney-related outcomes. <i>- Patients see us, and then they’re told something very different. And that just makes it hard for them to trust individuals, and they don’t know what’s right for them.</i>
Patients’ self-efficacy and readiness to change behaviors (5)	Patients with low self-efficacy or who are not yet ready to change to make behavior changes.
Perceived malnutrition risk (4)	Patients and other professionals may be reluctant to follow/support a PBD, a LPD or a VLPD due to concern for developing malnutrition and unintentional weight loss. <i>- I had a doctor get very upset that I was recommending some plant-based protein because he felt like that was such a much lower-quality protein. And it was going to make his patient lose a lot of weight.</i>
Inadequate-quality education materials (3)	Inadequate-quality education materials (handouts, books, websites) and insufficient resources for RDNs to develop their own materials.
Patients’ perception of cost (2)	Patient perceptions of expenses needed to make dietary and lifestyle changes.

Bolded texts indicate themes. The number of participants who discussed this theme/subtheme is presented in parentheses. Quotations are italicized and may have been paraphrased. Full quotations shown in Table S4.

Conflicting beliefs and attitudes of healthcare professionals were another barrier, as this can lead to confusion for the patient and foster distrust or skepticism between the RDN and the patient. Additionally, it can lead to a negative relationship between the RDN and other healthcare professionals. Similarly, inadequate-quality education materials and insufficient resources for RDNs to develop their own materials were barriers.

4. Discussion

4.1. Calculating Protein Goals and Individualizing Recommendations

Most survey respondents reported prescribing a LPD consistent with KDOQI-recommended amounts of 0.55–0.6 g/kg/d in patients without diabetes and 0.6–0.8 g/kg/d in patients with diabetes. About two-thirds of survey respondents reported use of “other” protein prescriptions. Consistent with the literature, focus group participants reported that their patients’ baseline protein intake was often higher than 0.8 g/kg/d [27]. Thus, some participants opted for a protein range of 0.6–0.8 g/kg/d regardless of diabetes status. Qualitative data revealed the clinical reasoning and contextual factors underlying these decisions.

Overall, participants emphasized that protein recommendations should be appropriately individualized to each patient’s unique history, needs, and preferences. Increased

proficiency in adapting and applying evidence-based guidelines and best practices, and in individualizing therapy based on the unique situation, distinguishes a proficient-level RDN from a competent-level RDN [28]. Less experienced RDNs may be less adept at integrating nutrition recommendations for multiple comorbidities and complications and at prioritizing nutrition interventions based on patients' medical needs, goals, and perceptions [28]. As RDNs garner clinical experience and skills, they will be better able to provide the individualized approach patients desire. Studies have shown that patients found working with RDNs more positive and meaningful when they felt their care was individualized to their medical needs and learning styles [29–32].

4.2. Keto-Acid Analogs

Survey analysis showed low use of KA-supplemented LPDs/VLPDs. Focus group discussions clarified that cost, access, and limited clinician support were key barriers. These findings are consistent with previously reported barriers [33]. Nevertheless, KA-supplemented LPDs/VLPDs have been shown to improve kidney function, delay CKD progression, and preserve skeletal muscle mass [13,14,16,33–38]. To mitigate the risk of malnutrition, KA-supplemented LPDs/VLPDs should be administered under the close supervision of a clinician familiar with KA use [8]. RDNs who frequently work with this population should be educated on KA use, including product availability and appropriate dosing.

4.3. Plant Proteins and Plant-Based Diets

The renal protective benefits of PBDs through several mechanisms have been well-documented in the literature. Plant foods have lower acidogenicity, thereby reducing renal acid load [39,40]. Plant foods are also rich in vitamins and bioactive compounds with anti-inflammatory and antioxidant effects [39,40]. Plant foods contain phytates, which reduce the bioavailability of phosphorus [39,40]. Higher fiber intake is also associated with decreased blood pressure, delayed CKD progression, reduced incidence of cardiovascular disease, and lower risk of cardiovascular mortality [39,41,42]. Lowering animal protein intake also reduces uremia because the metabolism of animal protein produces choline and carnitine, which are converted into uremic toxins by gut bacteria [39,43]. Lowering animal protein intake is associated with slower CKD progression and reduced mortality risk [8]. However, it is unclear whether this is due to increased plant protein intake or to other dietary patterns and lifestyle habits associated with higher plant protein intake [8]. Furthermore, there is limited data on patient preferences and quality of life as plant protein intake increases [8].

Consequently, the KDOQI and KDIGO work groups considered the available evidence insufficient to recommend a particular protein type (plant versus animal) for the treatment of CKD; both groups promoted increasing intake of fruits, vegetables, and plant foods [1,8]. Betz et al. surveyed nephrology professionals on their perspectives on PBDs for CKD [18]. Fifty-eight percent of those surveyed were RDNs; the remainder primarily consisted of physicians and advanced practice practitioners [18]. The authors found that 88% of nephrology professionals were aware of the use of PBDs to treat CKD, but only 56% reported offering PBDs as part of a treatment plan [18]. The most common barriers to recommending PBDs were the professionals' perception that patients would not accept a PBD or that a PBD was not realistic or too complex for patients [18].

With the growing popularity of “plant-based” in marketing and media, focus group participants frequently discussed defining the term “plant-based” and debunking myths about PBDs with patients. Participants often counseled patients on increasing intake of plant proteins and other plant foods, including the rationale and benefits of these

recommendations. Participants collaborated with patients to develop behavior changes that aligned with patients' goals and motivations.

4.4. Plant-Dominant Low-Protein Diet

LPDs and PBDs both have renal protective benefits and are not mutually exclusive diets. One strategy for synthesizing both dietary approaches is the plant-dominant low-protein diet (PLADO) [39,44]. Kalantar-Zadeh et al. define PLADO as a diet with a protein intake of 0.6–0.8 g/kg/d with $\geq 50\%$ of protein from plant sources [39]. Other characteristics of PLADO are its preference for whole, unrefined, and unprocessed foods, low sodium intake (< 3 g/d, or < 4 g/d if hypertension or edema is present), higher fiber intake (≥ 25 – 30 g/d), and adequate energy intake (30–35 kcal/kg/d using ideal body weight) [39]. PLADO offers patients greater diet variety than a vegan or strict vegetarian diet [39]. This increased flexibility may improve patients' attitudes and motivations toward dietary changes. Additional studies on PLADO implementation and its effects on patient perceptions, quality of life, nutritional status, kidney, and health-related outcomes are needed [44].

4.5. Addressing Barriers to Implementation

Though nutrition recommendations for CKD have evolved over the decades, patients and professionals may be accessing outdated information. This can be a source of confusion and conflict and become a barrier to implementing LPDs and PBDs. For example, historical education heavily emphasized plant foods as a contributor to hyperkalemia [8]. However, newer guidelines recommend limiting potassium intake based on bioavailability [8]. Potassium additives, often found in ultra-processed foods, are estimated to have a 90% absorption rate [8]. Animal foods have a 70–90% absorption rate, whereas plant foods have only a 50–60% absorption rate [8].

Being respectful when correcting or clarifying information can help promote a positive relationship [45]. Participants found it effective to provide the patient with evidence and research on the role of nutrition in affecting health outcomes. Other facilitators included adapting their communication methods to meet the patients' learning needs. Participants also utilized counseling strategies to enable patient involvement and deliver patient-centered care [29]. Increasing access to high-quality educational materials would also facilitate implementation.

4.6. Strengths and Limitations

Our study is novel because it is among the first to evaluate how RDNs have implemented the 2020 KDOQI guidelines. Study limitations included a low response rate to the original survey and small focus group sizes. As a result, the findings should be interpreted as reflecting the perspectives and practices of the study participants rather than the broader RDN population.

One factor in the low response rate was that the survey was sent to all NKF members, including non-RDNs (e.g., nephrologists, social workers). Thus, the true response rate for RDNs only is unknown. The long survey length may have also discouraged participation, contributing to nonresponse bias. Additionally, because respondents were not required to answer every question, the denominator changes across survey items. We reviewed patterns of missingness and observed that item nonresponse increased towards the end of the survey. While this pattern suggests that missingness may be related to respondent fatigue, some item-level nonresponse bias should be considered when interpreting our findings.

Our sample may also be subject to self-selection bias. Those who participated may be more interested in renal nutrition, engaged in research, or familiar with CPGs. The use of snowball sampling for focus group recruitment also limited representativeness, as those

within the referral network may share similar viewpoints. We were able to diversify the participants' geographical locations by using online platforms to distribute the survey and conduct the focus groups. However, our study included only English-speaking RDNs, most of whom were in the United States, which limited the generalizability of our results. Additionally, given that the average duration of practice in a renal setting was 7–13 years, our findings may not be representative of RDNs with less experience.

A strength of this study was the mixed-methods design, which allowed us to obtain an overview of current practice trends from the quantitative data, informing our exploration areas to include in the focus group discussion guide. Using focus groups allowed us to capture more detailed opinions with the option to clarify and expand ideas while using fewer resources than an extensive survey or one-on-one interview. The use of open-ended questions helped reduce the risk of researcher bias. Small focus group sizes allowed participants more opportunities to share their insights. However, participants may have been less comfortable sharing their experiences and opinions in a group setting [46]. Member checking was not feasible due to the organization of the focus group and the limited time of the participants. The absence of member checking limited the opportunities for participation validation. Despite the study limitations, thematic saturation was reached. Every major theme surfaced independently within each focus group, indicating strong convergence.

5. Conclusions

Our study was exploratory, and our findings reflect only the perspectives and practices of the RDNs who participated. Among respondents, familiarity with the 2020 KDOQI guidelines was high, with most recommending LPDs consistent with the guidelines. Though participants differed in their approach to calculating protein goals, they were unanimous in individualizing protein recommendations based on their clinical judgment. RDNs may deviate from the guidelines after assessing each patient's unique situation, including comorbidities, cultural and personal preferences, and SDOH. Despite evidence supporting the renal-protective benefits of KA-supplemented VLPD/LPDs, KA use may be limited by its high cost and lack of clinician support. Though the KDOQI work group could not make a statement on protein type, many study participants encouraged increasing the use of plant proteins and PBDs to improve kidney-related outcomes, cardiometabolic health, and overall health. Further research involving larger and more diverse samples is needed to determine whether these findings reflect broader practice patterns.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/dietetics5030041/s1>, Table S1: Demographics and Professional Characteristics of Survey Respondents; Table S2: Themes and Subthemes Relating to the Decision-making Factors for Protein Recommendations; Table S3: Themes Relating to Nutrition Intervention Topics; Table S4: Themes Relating to Barriers to Implementation.

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Abbreviations

The following abbreviations are used in this manuscript:

AND	Academy of Nutrition and Dietetics
BMI	Body mass index
CKD	Chronic kidney disease
CPGs	Clinical practice guidelines
CSR	Board Certified Specialist in Renal Nutrition
GLP-1 RA	Glucagon-like peptide-1 receptor agonist
IRB	Institutional Review Board
IQR	Interquartile range
ISRNM	International Society of Renal Nutrition and Metabolism
KAs	Keto-acid analogs
KDIGO	Kidney Disease: Improving Global Outcomes
KDOQI	Kidney Disease Outcomes Quality Initiative
KRT	Kidney replacement therapy
LPDs	Low-protein diets
NKF	National Kidney Foundation
PBDs	Plant-based diets
PLADO	Plant-dominant low-protein diet
RASi	Renin-angiotensin system inhibitor
RDNs	Registered dietitian-nutritionists
RPG	Academy Renal Practice Group
SDOH	Social determinants of health
SGLT2i	sodium-glucose transport protein-2 inhibitor
VLPD	Very-low protein diets

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