

Patient Perception of Plant Based Diets for Kidney Disease

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Objective: Plant-based diets can delay the progression of chronic kidney disease (CKD) and help manage complications and comorbid conditions such as hypertension, acidosis, diabetes, and cardiovascular disease. The objective of this study was to understand nephrology patients' familiarity, perception, and use of plant-based diets.

Design & Methods: A survey was shared via the National Kidney Foundation's social media channels. Analysis included 844 responses. Survey items were evaluated with descriptive statistics. Differences across items were determined using chi-square tests.

Results: Most respondents were 61-70 years of age (26.7%, n = 225), female (56.5%, n = 477) and achieved a Bachelor's or advanced degree (49.9%, n = 421). The majority of respondents suffered from nondialysis-dependent CKD (34%) or received a kidney transplant (34%). About half (45%) of respondents were familiar with plant-based diets and most (58%) were aware that plant-based diets can improve CKD. Twenty-two percent reported following some version of a vegetarian diet, and 29% reported "eating less meat". Respondents were not confident (Mdn = 2, IQR = 2, on a scale of 1-5) in their ability to plan a balanced plant-based meal, and were moderately confident that a plant-based diet could help blood pressure (Mdn = 3, IQR = 2) and slow progression of CKD (Mdn = 3, IQR = 2). Family eating preference, meal planning skills, preference for meat, figuring out what is healthy to eat, food cost, time constraints, and ease of cooking were rated as equal barriers to following a plant-based diet (Mdn = 3). A sample meal plan, individual counseling session with a Registered Dietitian Nutritionist (RDN), handouts, and cooking classes were resources rated most helpful to transition to a plant-based diet (Mdn = 4).

Conclusion: Approximately half of respondents were aware that plant-based diets can be beneficial for CKD. Many patients are following a vegetarian or plant-based eating pattern. More research should be done to see how effective RDNs are in educating and moving patients toward a plant-based eating pattern, as they are an underutilized resource in the CKD population.

Keywords: plant based diet; chronic kidney disease; nutrition; patient education; medical nutrition therapy; Registered Dietitian Nutritionist

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Introduction

INTEREST IN THE use of plant based diets to help delay the progression and improve complications related to chronic kidney disease (CKD) has grown in recent years.¹ While no formal definition of a "plant-based diet" exists, this term is commonly used to refer to dietary patterns that promote plant foods such as fruits, vegetables, whole grains, and plant proteins such as nuts, seeds, and legumes. Plant-based diets do not necessarily indicate complete avoidance of animal products.

Plant-based dietary patterns may be beneficial for people with CKD for many reasons including improved acidosis, electrolyte control, management of common comorbid conditions, and ultimately delay the progression of CKD. Plant-based diets have the potential to reduce dietary acid load and therefore help control acidosis.^{2,3} Acidosis is common in CKD and contributes to disease progression.⁴ Diet is a major determinant in the amount of acid the kidney must excrete each day and can have a significant effect on acid-base status.⁵ Fruits and vegetables have been shown to be as effective as sodium bicarbonate in treating and preventing metabolic acidosis in CKD and are recommended by the Kidney Disease Outcome Quality Initiative (KDOQI) guidelines⁶⁻⁸ Plant-based diets impact a lower phosphorus load, due to lower bioavailability, which may help improve phosphorus control. In addition, plant-based diets may be beneficial for common comorbidities in people with CKD such as diabetes, hypertension, cardiovascular disease, and obesity.⁹⁻¹³ Despite a higher naturally occurring potassium content, plant-based diets may help improve constipation, glucose control, and acidosis, which may ultimately aid in potassium control.¹⁴

The Dietary Approach to Stop Hypertension (DASH) diet has been shown to improve microalbuminuria and slow kidney function decline in an analysis from the Nurses

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Health Study.¹⁵ The DASH diet has also been associated with a lower risk of ESRD (1.7; 95% confidence interval (CI) 1.1–2.7) in people with CKD.¹⁶ Compared to a typical Southern dietary pattern, a plant-based diet has been shown to be associated with a lower mortality risk (0.77; 95% CI 0.64–0.97) in people with CKD.¹⁷

In the general population, interest in plant-based eating has grown exponentially in recent years. The sale of “plant-based” foods that directly replace animal products, such as non-dairy milk or plant based burger patties, grew 27% in 2020.¹⁸ The most common reasons cited by consumers for choosing more plant-based products include the perceived health benefit and that they are better for the environment.¹⁹ A 2016 study found that 37% of adults “always or sometimes” order vegetarian meals when eating out.²⁰

Despite growing evidence showing benefit of plant-based eating patterns for kidney disease, no research has investigated if nephrology patients are aware of these benefits, or if they are consuming plant-based eating patterns. The objective of this study was to understand a nephrology patient’s familiarity, perception, and use of plant-based diets.

Methods

Approval for this survey research was obtained from the university’s Institutional Review Board. A questionnaire was developed (Appendix S1) to understand a nephrology patient’s familiarity, perception, and use of plant-based diets. The questionnaire was created based on a previously developed tool that was used to understand patient and a professional’s perspective of plant-based diets for diabetes.²¹ Modifications were made to the questionnaire to capture kidney disease-specific considerations. Neither the original or modified versions of the questionnaire were validated. The questionnaire was entered into Qualtrics software, a secure, university-approved survey tool. The questionnaire was dispersed via e-mail and responses were collected online.

The questionnaire was dispersed via the National Kidney Foundation’s social media channels, including Facebook and Twitter in October 2020. Respondents were asked to confirm their consent to participate in the research study, and that they were at least 18 years of age.

Descriptive statistics were run on all variables. Chi-square and two-sample *t*-tests were used to compare differences between groups.

Results

A total of 884 responses were collected from October to November of 2020. Thirty-two respondents did not consent to participate in the survey and 8 respondents indicated they were less than 18 years of age; these responses were excluded. The remaining 844 responses were used for analysis.

Most respondents indicated they had a history of kidney transplant (34.4%, *n* = 290), followed by a diagnosis of

CKD with no dialysis (34.0%, *n* = 287), currently receiving dialysis treatment (22.2%, *n* = 187), or a different nephrology diagnosis without dialysis treatment (5.3%, *n* = 45) (Table 1). The most common “other” diagnoses included kidney stones (*n* = 6), renal cancer (*n* = 4), and a solitary kidney (*n* = 4). Respondents who reported a diagnosis of polycystic kidney disease were coded as having a diagnosis of CKD without dialysis. Most respondents were 61–70 years of age (26.7%, *n* = 225), female (56.5%, *n* = 477) and had achieved a Bachelor’s (27.6%, *n* = 233) or an advanced degree (22.3%, *n* = 188) (Table 1).

A little less than half (44.7%, *n* = 377) of respondents had heard of plant-based diets for the treatment of kidney disease (Table 2). More respondents with non-dialysis-dependent kidney disease had heard of plant-based diets for kidney disease (50.3%, *n* = 313), compared to those who required dialysis (35.6%, *n* = 64) (*P* < .001). Overall, respondents were more aware that plant-based diets can improve hypertension (62.1%, *n* = 524), high cholesterol (59.6%, *n* = 503) and obesity (59.5%, *n* = 502), compared to CKD (57.8%, *n* = 488), heart disease (55.7%, *n* = 470) or diabetes (50.5%, *n* = 426) (Table 2). On a scale of 1–5 (1 = Not Confident; 5 = Very Confident), respondents were equally confident that a plant-based diet can help

Table 1. Respondent Characteristics (*n* = 844)

Characteristic	Percent (n)
Diagnosis	
CKD w/o dialysis	34.0% (287)
Dialysis	22.2% (187)
Transplant	34.4% (290)
Other w/o dialysis	5.3% (45)
Care Giver	1.3% (11)
No Kidney Disease	0.5% (4)
Missing Response	2.4% (20)
Age	
18–30 y	2.8% (24)
31–40 y	7.2% (61)
41–50 y	12.1% (102)
51–60 y	23.1% (195)
61–70 y	26.7% (225)
70+ y	23.2% (196)
Prefer not to answer	0.2% (2)
Missing Response	4.6% (39)
Gender	
Male	37.8% (319)
Female	56.5% (477)
Prefer not to answer	0.4% (3)
Missing Response	5.3% (45)
Education	
Less than High School	0.5% (4)
High School Diploma or Equivalent	16.0% (135)
Associates/Technical Degree	21.4% (181)
Bachelor’s Degree	27.6% (233)
Graduate Degree	22.3% (188)
Professional Degree	5.6% (47)
Prefer not to answer	2.0% (17)
Missing Response	4.6% (39)

Table 2. Respondent Use & Awareness of Plant-Based Diets Use in Treatment

Heard of using plant-based diet to treat kidney disease? (n = 844)	
Yes	44.7% (377)
No	50.4% (425)
Missing Response	5.0% (42)
Aware Plant-Based Diet Can Improve: (n = 844)	
Chronic Kidney Disease	57.8% (488)
Heart Disease	55.7% (470)
Hypertension	62.1% (524)
Diabetes	50.5% (426)
High Cholesterol	59.6% (503)
Obesity/Overweight	59.5% (502)
Currently Following Plant-Based Diet? (n = 844)	
Ovo Lacto Vegetarian	3.0% (25)
Pesco-Vegetarian	3.2% (27)
Semi-Vegetarian	12.6% (106)
Vegan	3.3% (28)
Eating Less Meat	27.4% (231)
No Plant Based Diet	45.3% (382)
Missing Response	5.3% (45)
How Long Have You Followed This Plant-Based Diet? (n = 462)	
Less than 1 y	29.0% (134)
2-5 y	27.0% (125)
5-10 y	9.5% (44)
More than 10 y	18.0% (83)
Missing Response	16.5% (76)

control blood pressure (Mdn = 3, IQR = 2) as slow progression of kidney disease (Mdn = 3, IQR = 2) (Table 3).

Most reported not following a plant-based diet (45.3%, n = 231); however, 27.4% (n = 231) reported trying to eat less meat and 22.0% (n = 186) reported following some version of a vegetarian diet (Table 2). Of those that reported following some version of a plant-based diet (including eating less meat), most had been following this diet for less than 1 year (29.0%, n = 134) or 2–5 years (27.0%, n = 125). Most rated their skills to plan a balanced plant-based diet as low (Mdn = 2, IQR = 2) on a scale of 1–5 (1 = Not Confident; 5 = Very Confident) (Table 4). More respondents were following a plant-based diet who were not on dialysis (61.7%, n = 425), compared to those who required dialysis (36.9%, n = 69) ($P < .001$).

All barriers to following a plant-based diet presented on the survey were rated similarly difficult on a scale of 1–5 (1 = Easy; 5 = Very Hard). Barriers included family eating

preference (Mdn = 3, IQR = 2), meal planning skills (Mdn = 3, IQR = 2), a preference for meat (Mdn = 3, IQR = 2), figuring out what is healthy to eat (Mdn = 3, IQR = 2), food cost (Mdn = 3, IQR = 2), time constraints (Mdn = 3, IQR = 1), and ease of cooking (Mdn = 3, IQR = 1) (Table 4). The most common “other” challenges written in by respondents were difficulty breaking habits and general preference for eating meat and cheese (n = 32), concerns over micronutrients such as sodium, potassium, phosphorus or oxalate (n = 18), food access or cost (n = 18), and household meal preferences (n = 13).

Respondents reported a sample meal plan (Mdn = 4, IQR = 2), individual session with an RDN (Mdn = 4, IQR = 2), handouts (Mdn = 4, IQR = 2), and a cooking class (Mdn = 4, IQR = 2) as more helpful to start following a plant-based diet on a scale of 1–5 (1 = not at all helpful; 5 = very helpful), compared to a group education session (Mdn = 3, IQR = 2) or a grocery tour (Mdn = 3, IQR = 2). Overall, respondents felt that a plant-based diet would be about the same difficult level of difficulty as other commercial weight loss programs (Mdn = 3, IQR = 1), on a scale of 1–5, 1 = less difficult; 5 = more difficult) (Table 4).

Discussion

About half (45%–58%) of this group of nephrology patients were aware that a plant-based diet can be beneficial for kidney disease treatment. This finding is in line with a survey that found 56% of nephrology professionals recommend plant-based diets to patients with kidney disease.²² In addition, more than half of respondents were aware of the benefits of plant-based eating for common comorbidities including hypertension (62.1%) and heart disease (55.7%). By comparison, many more nephrology professionals were more aware that a plant-based diet can improve hypertension (90.4%) and heart disease (90.4%).²²

More non-dialysis respondents followed some version of a plant-based diet (including eating less meat), and were aware of its benefits for kidney disease, compared to those who did require dialysis. This is in line with previous research, as most studies have shown benefits of plant-based eating patterns in the non-dialysis-dependent population. In addition, the 2020 KDOQI guidelines suggest recommending more fruits and vegetables for CKD stages 1–4 and a Mediterranean diet for CKD stages 1–5 without dialysis and transplant, but do not make similar

Table 3. Confidence a Plant-Based Diet Can Improve Health Conditions (n = 844)

	1 (Not Confident)	2	3	4	5 (Very Confident)	No Response	Median (IQR)
Delay progression of kidney disease	17.3% (146)	15.6% (132)	28.8% (243)	11.3% (95)	13.2% (111)	13.9% (117)	3 (2)
Control blood pressure	10.5% (89)	14.1% (119)	25.4% (214)	19.2% (162)	17.1% (144)	13.7% (116)	3 (2)

Table 4. Barriers & Solutions to Following a Plant-Based Diet (n = 844)

Barriers	1 (Easy)	2	3	4	5 (Very Hard)	No Response	Median (IQR)
How much of a challenge would each of these factors be if you tried to follow a plant-based diet?							
Family Eating Preference	15.3% (129)	10.4% (88)	23.3% (197)	18.1% (153)	19.0% (160)	13.9% (117)	3.00 (2)
Meal Planning Skills	13.0% (110)	13.3% (112)	28.2% (238)	19.1% (161)	11.6% (98)	14.8% (125)	3.00 (2)
Preference of Eating Meat	15.4% (130)	15.4% (130)	22.2% (187)	16.0% (135)	15.6% (132)	15.4% (130)	3.00 (2)
Figuring Out What Is Healthy To Eat	15.8% (133)	14.1% (119)	24.9% (210)	18.5% (156)	11.5% (97)	15.3% (129)	3.00 (2)
Food Cost	17.5% (148)	15.5% (131)	27.0% (228)	14.3% (121)	9.8% (83)	15.8% (133)	3.00 (2)
Time Constraints	15.9% (134)	17.9% (151)	31.9% (269)	12.6% (106)	6.3% (53)	15.5% (131)	3.00 (1)
Ease of Cooking	18.8% (159)	17.1% (144)	30.9% (261)	12.6% (106)	6.0% (51)	14.6% (123)	3.00 (1)
Ability	1 (No Knowledge)	2	3	4	5 (Expert)	No Response	Median (IQR)
Self-Perceived Skills in Planning a Balanced Plant-Based Diet	30.5% (257)	18.2% (154)	21.0% (177)	12.6% (106)	3.9% (33)	13.9% (117)	2.00 (2)
Difficulty	1 (Less Difficult)	2	3	4	5 (More Difficult)	No Response	Median (IQR)
Would it be more difficult to follow a plant-based diet compared to other commercial weight loss programs?	10.9% (92)	10.1% (85)	36.3% (306)	15.0% (127)	14.2% (120)	13.5% (114)	3.00 (1)
Solutions	1 (Not At All Helpful)	2	3	4	5 (Very Helpful)	No Response	Median (IQR)
Sample Meal Plan	5.5% (46)	5.1% (43)	16.0% (135)	24.1% (203)	34.6% (292)	14.8% (125)	4.00 (2)
Individual Session with Registered Dietitian	8.1% (68)	7.6% (64)	15.3% (129)	21.6% (182)	32.3% (273)	15.2% (128)	4.00 (2)
Handouts	7.8% (66)	8.3% (70)	20.4% (172)	21.7% (183)	26.2% (221)	15.6% (132)	4.00 (2)
Cooking Class	10.2% (86)	12.0% (101)	20.5% (173)	19.4% (164)	24.2% (204)	13.7% (116)	4.00 (2)
Group Education Session	10.8% (91)	12.2% (103)	23.6% (199)	19.9% (168)	18.5% (156)	15.0% (127)	3.00 (2)
Grocery Tour	18.5% (156)	15.3% (129)	19.7% (166)	17.2% (145)	14.6% (123)	14.8% (125)	3.00 (2)

recommendations for patients on hemodialysis or peritoneal dialysis.⁸ However, a surprising 37% of respondents requiring dialysis were following some version of a plant-based diet in this sample, including 14% of respondents on dialysis who reported following some version of a vegetarian diet. This percentage is higher than the 5% of Americans in general public who consider themselves to be vegetarian in a 2018 poll, indicating there may be interest even among dialysis patients in plant-based eating.²³ More research is necessary to better understand the benefits and safety of plant-based eating in a dialysis-dependent population.

The perceived barriers to following a plant based diet in this study were vast, including family eating preference, meal planning skills, a preference for eating meat, figuring out what to eat, food cost, time constraints, and ease of cooking. In addition, respondents rated their ability to

plan balanced plant based meals as fairly low (2.32 on a scale of 1-5). To help nephrology patients successfully transition to a more plant-based diet, these barriers must be addressed. Strategies such as including key family members in nutrition sessions, addressing patient concerns and barriers, as well as focusing on making small changes toward a plant-based diet, rather than suggesting a completely vegetarian or vegan diet should be considered. Nutrition interventions must be individualized to each patient's lifestyle, food preferences, and abilities.

Of note, many respondents wrote-in concerns that a plant-based diet would be difficult with individual micronutrient restrictions such as potassium, phosphorus, and oxalate. This is a common concern for plant based diets use in CKD. The 2020 KDOQI guidelines state that the bioavailability of phosphorus sources be considered for phosphorus management, which encourages the

consumption of plant-based phosphorus sources such as beans, nuts, seeds, and lentils over the more bioavailable animal-based phosphorus sources.^{8,24} The KDOQI guidelines also recommend that potassium only be limited in patients with hyperkalemia.⁸ Potassium additives from animal products, especially enhanced meat, low sodium, and low sugar products should be considered before restricting plant foods.²⁵ Similar to phosphorus, the bioavailability of potassium is likely higher in these products, compared to unprocessed fruits and vegetables.²⁶ In addition, evidence supporting dietary potassium restriction to prevent or treat hyperkalemia is lacking.¹⁴ In fact, plant based diets may improve acidosis, constipation and insulin resistance, all of which can impact serum potassium levels.¹⁴ For oxalate management, calls have been made to be more judicious in recommending low-oxalate diets due to concerns that a low-oxalate diet limits plant foods with other beneficial components such as phytate and magnesium, the difficulty of quantifying oxalate intake, and a lack of research showing benefit of a low oxalate diet in preventing kidney stones.²⁷ Nephrology professionals must take care to ensure that recommendations to manage electrolytes do not inadvertently cause reduced intake of fruits and vegetables overall. In 2020, Betz et al. found that patients with non-dialysis-dependent CKD were only consuming 1.4 servings of vegetables and 0.6 servings of whole fruit per day.²⁸

In 2020, Kelley et al. found that 83% of patients with CKD were interested in making changes to what they eat for CKD, however only 51% felt confident they knew what to eat for CKD, indicating both an interest and need for more nutrition education.²⁹ Both respondents in this survey, and results from a previous survey of nephrology professionals, rated an individual counseling session with an RDN as a top intervention to help patients transition to a plant-based diet.³⁰ RDNs are uniquely positioned and trained to both educate patients and help them make dietary changes utilizing Medical Nutrition Therapy (MNT). In addition, the Centers for Medicare and Medicaid (CMD) offer 100% coverage of MNT for people with CKD and an eGFR less than 50 mL/min.³¹ Patients with CKD who receive MNT have a longer time to dialysis initiation compared to patients who did not receive MNT.³² However, only 10%-50% of patients with CKD ever meet with an RDN prior to starting dialysis.³³ MNT is an underutilized, low or no cost benefit for patients to help them learn about the benefits of nutrition in CKD, safely transition to dietary patterns that include more plant foods, and address concerns and barriers to making lifestyle changes on an individual level.

The strengths of this study include a large sample size and representation from all stages of kidney disease including non-dialysis-dependent CKD, dialysis, and post-transplant. However, the results of this study may not be able to be generalized to all patients with CKD. This sample was primarily female and college-educated, and is likely

different than the general population of people with CKD who tend to be male, black, and be of a lower socioeconomic status. It is imperative that more research be done to evaluate the perception of plant-based diets in a population that more closely represents the general patient population with CKD and identify patient characteristics that increase the likelihood of following a plant based diet for kidney disease. This information could be used to target education efforts to people who are less likely to be aware of the benefits and help make sure people who are likely to be interested in dietary approaches to slow CKD receive support and resources. In addition, the medical diagnoses of respondents were self-reported and unable to be verified.

In this study of nephrology patients, about half of respondents were aware that plant-based diets can be beneficial for kidney disease and many were following a vegetarian or plant-based eating pattern. Barriers to following a plant-based diet include family eating preferences, difficulty planning meals, and concerns about balancing micronutrients. More research should be done to see how effective RDNs are in educating and moving patients toward a plant-based eating pattern, as they are an underutilized resource in the CKD population.

Practical Application

About half of patients surveyed were aware that a plant based dietary pattern can be beneficial for kidney disease, and many patients were following some version of a plant based diet. RDNs should be utilized to help patients better understand the benefits of a plant based diet for kidney disease, provide individualized recommendations based on labs and comorbidities, and help address barriers to adhering to dietary changes.

Credit Authorship Contribution Statement

Melanie V. Betz: Conceptualization, Methodology, Formal analysis, Investigation, Data curation, Writing – original draft, Writing – review & editing. **Kelly B. Nemec:** Conceptualization, Methodology, Formal analysis, Data curation, Writing – review & editing. **Anna L. Zisman:** Conceptualization, Methodology, Formal analysis, Writing – review & editing, Supervision.

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Supplementary Data

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