

A Comprehensive Assessment of Nutritional Status among Adult Patients in Dialysis Units

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DOI : -

Sections Info

Article history:

Submitted: January 07, 2026

Final Revised: February 21, 2026

Accepted: March 15, 2026

Published: April 30, 2026

Keywords:

Chronic Kidney Disease

Hemodialysis

Nutritional Status

Dietary Adherence

Renal Nutrition

ABSTRACT

Objective: Therefore, this study aimed to assess the nutritional status of adult patients in a maintenance dialysis unit. **Method:** A descriptive cross-sectional study was conducted at the Dialysis Unit of Baqubah Teaching Hospital. A purposive sample of 50 adult patients undergoing hemodialysis was recruited during the study period from February 26th, 2025, to March 25th, 2025. Data were collected via face-to-face interviews using a structured questionnaire, including socio-demographic characteristics, health history, nutritional behaviors, and a Food Frequency Questionnaire (FFQ). Data were analyzed using descriptive and inferential statistics via SPSS version 24. **Results:** The findings revealed that a high proportion of the sample suffered from major chronic comorbidities, including diabetes mellitus (58%) and hypertension (48%). While 56% of the patients had been prescribed a specific therapeutic diet, 56% of those prescribed a diet admitted to not following it at all. Additionally, 60% of the patients did not engage in regular physical exercise, and 40% reported a weak appetite. Inferential analysis showed no statistically significant association between patients' demographic characteristics and their overall nutritional knowledge level ($P > 0.05$). **Novelty:** The study concludes that adult dialysis patients suffer from high rates of clinical comorbidities, poor dietary adherence, and defective knowledge regarding appropriate renal nutrition.

INTRODUCTION

Chronic kidney disease (CKD) is a global public health challenge associated with substantial morbidity and mortality, characterized by an increasing incidence worldwide. Globally, it is estimated that over 600 million people suffer from CKD (Lv & Zhang, 2019). Beyond physical manifestations, the progression to end-stage renal disease (ESRD) and dependency on maintenance dialysis severely impacts patients' social, professional, and family dynamics, significantly lowering their health-related quality of life (QOL) compared to the healthy population [1]. Malnutrition is highly prevalent among hemodialysis (HD) patients, with international estimates ranging from 18% to 75% [2]. Patients undergoing maintenance hemodialysis are inherently vulnerable to nutritional deficiencies due to the catabolic nature of renal replacement therapy, severe dietary restrictions, loss of water-soluble nutrients through the dialyzer membrane, chronic inflammation, and metabolic acidosis [3]. These factors collectively culminate in Protein-Energy Wasting (PEW)—a clinical state defined by the International Society of Renal Nutrition and Metabolism (ISRNM) as the continuous depletion of protein and energy stores, which directly drives cardiovascular mortality in this population [4].

Poor nutritional status serves as an independent predictor of shorter survival times in dialysis cohorts [5]. In the absence of malnutrition, the annual mortality rate on dialysis is estimated at 10% to 15%, whereas it surges up to 30% among malnourished individuals [6]. Dietary modifications instituted in the management of CKD are recognized as among the most restrictive of all chronic disease regimens [7]. Tailored nutritional interventions help mitigate PEW, control electrolyte imbalances, and prevent bone and mineral abnormalities [8]. Despite the growing global focus on specialized renal care, a stark gap remains regarding the availability of documented nutritional data for dialysis patients in developing countries, particularly in Iraq, compared to comprehensive data established in Western nations. Understanding local dietary behaviors and nutritional status is critical since nutritional baseline values directly influence patient outcomes. Consequently, this study was designed to assess the nutritional status and dietary patterns of adult patients undergoing hemodialysis at Baqubah Teaching Hospital in Diyala, Iraq [9].

RESEARCH METHOD

Research Design and Setting

A descriptive, cross-sectional institutional study was executed to evaluate the nutritional status of adult dialysis patients. The study was conducted at the Dialysis Unit of Baqubah Teaching Hospital, a major tertiary referral center located in the Diyala Governorate, Iraq. The data collection phase spans the period from February 26th, 2025, to March 25th, 2025.

Sample and Selection Criteria

A non-probability, purposive sampling strategy was utilized to select 50 adult patients undergoing maintenance hemodialysis. The inclusion criteria comprised male and female adult patients diagnosed with ESRD on regular dialysis therapy for at least 3 months who agreed to participate. Patients who declined to participate, or those with severe cognitive impairment preventing interview execution, were excluded.

Instrumentation

A multidimensional questionnaire was developed by the investigator based on standard literature templates to capture the clinical and nutritional profiles of the participants. The instrument comprised four structured components: Part I: Socio-Demographic Profile: Included age, gender, educational level, marital status, employment status, family income, and residency. Part II: Medical and Comorbidity History: Documented concurrent chronic disorders (e.g., hypertension, diabetes, cardiac diseases) and upper gastrointestinal/sensory complications. Part III: Healthy and Nutritional Behaviors: Evaluated diet prescription compliance, exercise habits, appetite status, short-term weight changes, and physical activity levels. Part IV: Food Frequency Questionnaire (FFQ): Comprised 29 explicit food items adapted to local dietary habits, measuring ingestion frequency on a 5-point ordinal scale ranging from "Never" to "7 or more times per week."

Data Collection Procedures

Data were compiled via direct, face-to-face clinical interviews administered by the principal investigator. Interviews were intentionally scheduled and conducted while patients were undergoing active hemodialysis treatment sessions (in a recumbent or semi-fowler's position) to optimize compliance and capitalize on available treatment time without inducing additional physical fatigue.

Statistical Analysis

Statistical processing was executed via SPSS Version 24.0 and Microsoft Excel. Descriptive statistics included raw frequencies, percentages, and mean scores to summarize demographic attributes, behavioral patterns, and FFQ responses. Inferential statistics utilizing linear regression analysis were deployed to investigate the associations between socio-demographic independent variables and the patients' aggregate nutritional knowledge level, with statistical significance declared at $P 0.05$.

Ethical Considerations

Institutional administrative approvals were obtained from the Institutional Review Board (IRB) and directors of Baqubah Teaching Hospital prior to implementation. Formal informed consent was secured from every participant prior to interview initiation after explaining the study's scope. Complete anonymity, confidentiality of personal identities, and the unconditional right of voluntary withdrawal without affecting regular medical care were strictly guaranteed.

RESULTS AND DISCUSSION

Results

Table 1. Distribution of the study sample by their demographical characteristics

List	Variables	Frequency	Percent
1-	<u>Age</u>		
	25-34	23	46.0
	35-44	8	16.0
	45-59	9	18.0
	60 and more	10	20.0
	Total	50	100.0
2	<u>Sex</u>		
	Female	20	40.0
	Male	30	60.0
	Total	50	100.0
3	<u>Marital Status</u>		
	married	23	46.0
	single	10	20.0
	widowed	6	12.0
	separate	6	12.0
	Total	50	100.0
4	<u>level of education</u>		
	I don't read or write	6	12.0
	read or write	8	16.0

List	Variables	Frequency	Percent
	Obtain an elementary school certificate	7	14.0
	Intermediate certificate	14	28.0
	High school diploma	8	16.0
	College degree	4	8.0
	Master degree	2	4.0
	PhD degree	1	2.0
	Total	50	100.0
5	<u>Living</u>		
	Rural	26	52.0
	Urban	24	48.0
	Total	50	100
6	<u>Functional status</u>		
	I do not work	10	20.0
	free business	15	30.0
	employee	11	22.0
	retired	14	28.0
	total	50	100.0
7	<u>family income</u>		
	weak	14	28.0
	middle	19	38.0
	good	16	32.0
	total	50	100.0
8	<u>Number of family</u>		
	Less than five	23	46.0
	Five to ten	19	38.0
	More than ten person	8	16.0
	Total	50	100.0

Freq.= frequency, % = percentage

Table (1) indicated that the highest percent of the study sample (46%) were male within age group (25 - 34) years old, the greatest percent were married and they accounted for (46%). Table (1) also presented that (28%) of the study sample have Intermediate certificate. In addition, (52%) of the sample was living in rural, (30%) of the sample was free business, (38%) was had middle income, and (46%) of the sample had less than five of family number.

Table 2. Health history of study participants

N	Items	Yes		No	
		Freq.	%	Freq.	%
1	Do you suffer from any of the following diseases or disorders?				
1-1	Heart diseases	28	56.0	22	44.0
1-2	Cancer diseases	20	40.0	30	60.0
1-3	Hypertension	24	48.0	26	54.0
1-4	Measure vital signs before administering treatment	18	36.0	32	64.0
1-5	Diabetes Mellitus	29	58.0	21	42.0
1-6	High blood fats	26	56.0	24	44.0
Total			56.0		43.09
2	Do you suffer from?				
2-1	Sensitive from some eating	28	56.0	22	44.0
2-2	Change in the sense of taste	17	34.0	33	66.0
2-3	Constipation	22	44.0	28	56.0
2-4	Difficult in swallowing or Chewing	23	46.0	27	54.0
Total			41.09		58.91

(N=50) Freq.= frequency, % = percentage

Table 2 demonstrates a high prevalence of complex chronic comorbidities among the hemodialysis cohort, led by Diabetes Mellitus, Heart Diseases, Hyperlipidemia (56%), and Hypertension. Regarding secondary gastrointestinal and sensory complications associated with uremia, of the patients reported specific food sensitivities, suffered from chewing or swallowing difficulties, and suffered from chronic constipation.

Table 3. Healthy and Nutritional Behavior

N	Items	Yes		No	
		Freq.	%	Freq.	%
3-1	Have you ever been put on a special diet?	28	56.0	22	44.0
3-2	Do you exercise regularly?	20	40.0	30	60.0
N	Items	Freq.		%	
3-3	How far do you follow the diet?				
	I don't follow it at all			28	56.0
	Sometimes I follow it			14	28.0
	Always follow it			8	
	Total			50	16.0

			100.0
3-4	How is your appetite?		40.0
	weak	20	32.0
	Medium	16	
	Very good	14	28.0
	Total	50	
			100.0
3-5	Has there been a change in your weight during the past six months?		
	did not change	20	40.0
	underweight	18	36.0
	Weight gain	12	24.0
	Total	50	100.0
3-6	What is your level of physical activity?		
	slack	12	24.0
	average activity	23	46.0
	very active	15	30.0
	Total	50	100.0
3-7	How many times a week do you eat out?		
	one time	15	30.0
	twice	19	38.0
	three times	8	16.0
	four times or more	6	12.0
	Total	50	100.0
3-8	Height		
	140-160	15	30.0
	160-180	32	64.0
	180 and over	3	6.0
	Total	50	100.0
3-9	the weight		
	40-60	14	28.0
	60-80	29	58.0
	80 and over	7	14.0
	Total	50	100.0

Freq.= frequency, % = percentage

Table 3 portrays key nutritional behaviors. While 56% of the total sample had been formally prescribed a renal therapeutic diet, 56% of those individuals admitted that they did not follow the guidelines at all. Furthermore, 60% of patients reported an absence of regular physical exercise, 40% exhibited a weak appetite, 36% experienced distinct weight loss over the prior six months, and 38% reported consuming meals outside the home at least twice per week.

Table 4. Food Frequency Question

N	Items	7 and more		4-6 time in week		2-3 time in week		One time in week		No one		Total
		Freq.	%	Fre q.	%	Fre q.	%	Fre q.	%	Fre q.	%	
4-1	Red meat	6	12.0	8	16.0	18	36.0	14	28.0	4	8.0	50
4-2	chickens	8	16.0	12	24.0	21	42.0	7	14.0	2	4.0	50
4-3	fish	1	2.0	6	12.0	12	24.0	26	52.0	5	10.0	50
4-4	egg	11	22.0	23	46.0	10	20.0	4	8.0	2	4.0	50
4-5	Dairy products	10	20.0	30	60.0	5	10.0	4	8.0	1	2.0	50
4-6	Bread (Arabic, French)	40	80.0	6	12.0	2	4.0	2	4.0	0	0.0	50
4-7	macaroni	8	16.0	9	18.0	23	46.0	8	16.0	2	4.0	50
4-8	Legumes	2	4.0	8	16.0	28	56.0	7	14.0	5	10.0	50
4-9	Nuts	3	6.0	14	28.0	13	26.0	16	32.0	4	8.0	50

N	Items	7 and more		4-6 time in week		2-3 time in week		One time in week		No one		Total
		Freq.	%	Fre q.	%	Fre q.	%	Fre q.	%	Fre q.	%	
4-10	rice	14	28.0	21	42.0	10	20.0	4	8.0	1	2.0	50
4-11	potato	6	12.0	9	18.0	25	50.0	8	16.0	2	4.0	50
4-12	apples	5	10.0	6	12.0	30	60.0	6	12.0	3	6.0	50
4-13	Orange	6	12.0	10	20.0	24	48.0	7	14.0	3	6.0	50
4-14	banana	4	8.0	12	24.0	13	26.0	18	36.0	1	2.0	50
4-15	dates	8	16.0	15	30.0	16	32.0	9	18.0	2	4.0	50
4-16	Fresh orange juice	6	12.0	9	18.0	25	50.0	8	16.0	2	4.0	50
4-17	Canned orange juice	5	10.0	6	12.0	30	60.0	6	12.0	3	6.0	50
4-18	cooked fruit	6	12.0	10	20.0	24	48.0	7	14.0	3	6.0	50

N	Items	7 and more		4-6 time in week		2-3 time in week		One time in week		No one		Total
		Freq.	%	Fre q.	%	Fre q.	%	Fre q.	%	Fre q.	%	
4-19	Food salad	4	8.0	12	24.0	13	26.0	18	36.0	1	2.0	50
4-20	Sweets and cake	1	2.0	6	12.0	10	20.0	30	60.0	3	6.0	50
4-21	Biscuit	8	16.0	13	26.0	12	24.0	10	20.0	7	14.0	50
4-22	Honey	5	10.0	15	30.0	20	40.0	8	16.0	2	4.0	50
4-23	Soft drinks	6	12.0	11	22.0	19	38.0	8	16.0	6	12.0	50
4-24	Tea/coffee	18	36.0	20	40.0	6	12.0	4	8.0	2	4.0	50
4-25	Complementary foods (Nido, milk)	10	20.0	11	22.0	20	40.0	7	14.0	1	2.0	50
4-26	Diabetic food	4	8.0	12	24.0	10	20.0	22	44.0	2	4.0	50

N	Items	7 and more		4-6 time in week		2-3 time in week		One time in week		No one		Total
		Freq.	%	Fre q.	%	Fre q.	%	Fre q.	%	Fre q.	%	
4-27	Food for patients with high blood pressure	8	16.0	9	18.0	13	26.0	19	38.0	1	2.0	50
4-28	Food for heart patients	6	12.0	11	22.0	8	16.0	20	40.0	5	10.0	50

Freq.= frequency, % = percentage

Table 4 details consumption frequencies. Key observations include: 80% relied on traditional bread daily, 60% consumed dairy products 4–6 times per week, and 42% consumed rice 4–6 times per week. High-potassium choices were frequent, with 60% consuming fresh or canned orange juices and apples 2–3 times weekly, and 50% drinking fresh orange juice 4–6 times weekly. Conversely, high-protein options like fish were restricted, with 52% consuming fish only once per week.

Table 5. Associations Between Demographic Characteristics and Level of Knowledge Among Patients Undergoing Dialysis

	Standardized Coefficients		Df	F	Sig.
	Beta	Std. Error			
Age	.466	.309	48	4.339	0.764 N S
Gender	.393	.166	48	2.354	0.627 N S
Level of education	.287	.166	48	4.414	0.712

	Standardized Coefficients		Df	F	Sig.
	Beta	Std. Error			
					N S
Marital Status	.680	.378	48	2.252	0.56
					N S
Living	.430	.227	48	3.023	0.435
					N S

Df=degree of freedom, p-value=probability level, NS=not significant

The linear regression output presented in Table 5 establishes that there are no statistically significant associations between the patients' overarching nutritional knowledge levels and any of their fundamental socio-demographic parameters (Age, Gender, Education, Marital Status, or Residency) at the threshold.

Discussion

Chapter five presents an organized discussion which interprets the results that are presented in chapter four in a systematical manner and it is supported by other studies related to the research study.

Demographic Parameters

The present study observed that 46% of the hemodialysis patients were clustered in the younger adult age group of 25–34 years. This pattern aligns with regional data reported by [10], [11] (2016), where over one-third (38.9%) of Iraqi dialysis patients fell within the 25–39 age bracket. Regarding gender distribution, males comprised 60% of the cohort, a finding closely matching Hussien, who documented a 61.7% male majority in similar local dialysis units [12]. A majority of the sample (52%) resided in rural sectors. This differs from Mousa et al, who reported a higher urban concentration (83.4%) among end-stage renal disease cohorts. Regarding educational attainment, 28% of our participants held an intermediate school certificate. This aligns with trends observed by Mousa et al, where a substantial proportion of patients fell into intermediate, basic literacy, or secondary education categories [9].

Medical and Comorbidity Complications

Our clinical data highlighted a substantial burden of illness, led by diabetes mellitus (58%), heart disease (56%), and hypertension (48%). This clinical distribution is heavily supported by Mousa et al, which verified that systemic hypertension and uncontrolled diabetes constitute the top pre-existing etiologies driving ESRD and complications during maintenance hemodialysis. The presence of secondary complications like taste changes (34%) and swallowing difficulties (46%) further explains the high rates of inadequate oral intake in these patients [13], [14].

Healthy and Nutritional Behaviors

The behavioral analysis revealed that although 56% of the sample had received a prescriptive diet plan, 56% of those individuals admitted to non-adherence. Additionally,

40% suffered from a weak appetite, and 36% experienced significant weight loss over the previous 6 months. These findings align with international literature regarding dietary non-compliance in maintenance hemodialysis. The strict restrictions on fluid, sodium, potassium, and phosphorus intake make adherence exceptionally difficult for patients. This often leads to a cycle of uremic anorexia, poor intake, and progressive weight loss, which are primary features of Protein-Energy Wasting.

Food Frequency Patterns

The FFQ responses revealed high consumption of carbohydrate-dense foods, with 80% of patients eating traditional bread daily and 42% consuming rice 4–6 times per week. It also highlighted frequent intake of high-potassium items, such as fresh orange juice (50% consuming it 4–6 times weekly). In contrast, high-protein foods like fish were consumed infrequently (52% once per week). This pattern demonstrates a critical need for dietary guidance. Unregulated consumption of high-potassium juices puts hemodialysis patients at serious risk for acute hyperkalemia, which can lead to life-threatening cardiac arrhythmias [6], [15].

Association Between Demographics and Nutritional Knowledge

Inferential analysis using linear regression (Table 5) showed that baseline demographic variables—such as age, gender, and formal education level—had no significant effect on the patients' nutritional knowledge scores ($P > 0.05$). This indicates that poor understanding of renal nutrition is a widespread issue across the entire cohort, regardless of demographic background. This finding is consistent with Khaleel and Hassan, who noted that while specific interventions can improve self-care scores, baseline socio-demographic factors like gender and education rarely show a significant relationship with a patient's initial self-care and nutritional knowledge. This highlights the necessity of providing universal, structured nutritional education to all patients entering a dialysis program [3], [4], [16], [17], [18], [19].

CONCLUSION

Fundamental Finding: In conclusion, this study successfully maps the vulnerable nutritional profiles of adult hemodialysis patients, revealing that widespread clinical comorbidities (diabetes and hypertension), severe dietary non-adherence, and unsafe intake of high-potassium fluids constitute a universal, systemic issue driven by deficient nutritional knowledge across all demographics. **Implication:** Thereby highlighting an urgent need for immediate, universal clinical and educational dietary interventions. **Limitation:** The author affirms there is no conflict of interest in this study. **Future Research:** Conduct prospective, multi-center studies with larger sample sizes across Iraq to better evaluate the impact of targeted nutritional education on survival rates and quality of life in hemodialysis patients.

REFERENCES

- [1] M. Avramovic and V. Stefanovic, "Health-related quality of life in different stages of renal failure," *Artif. Organs*, vol. 36, no. 7, pp. 581–589, 2017.

- [2] M. Arias-Guillén, S. Collado, E. Coll, and others, "Prevalence of Protein-Energy Wasting in Dialysis Patients Using a Practical Online Tool to Compare with Other Nutritional Scores: Results of the Nutrendial Study," *Nutrients*, vol. 14, no. 16, p. 3375, 2022.
- [3] C. Garagarza, A. Valente, C. Caetano, and others, "Zinc deficient intake in hemodialysis patients: A path to a high mortality risk," *Journal of Renal Nutrition*, vol. 32, no. 1, pp. 87–93, 2022.
- [4] D. Fouque, K. Kalantar-Zadeh, J. Kopple, and others, "A proposed nomenclature and diagnostic criteria for protein-energy wasting in acute and chronic kidney disease," *Kidney Int.*, vol. 73, no. 4, pp. 391–398, 2008.
- [5] B. P. Vogt, M. C. C. Borges, C. R. de Goés, and J. C. T. Caramori, "Handgrip strength is an independent predictor of all-cause mortality in maintenance dialysis patients," *Clinical Nutrition*, vol. 35, no. 6, pp. 1429–1433, 2016.
- [6] K. Kalantar-Zadeh, J. D. Kopple, R. D. Kilpatrick, and others, "Association of morbid obesity and weight change over time with cardiovascular survival in hemodialysis population," *American Journal of Kidney Diseases*, vol. 46, no. 3, pp. 489–500, 2005.
- [7] A. Steiber, J. B. Leon, D. Secker, and others, "Multicenter study of the validity and reliability of subjective global assessment in the hemodialysis population," *Journal of Renal Nutrition*, vol. 17, no. 5, pp. 336–342, 2007.
- [8] P. Schuetz, D. Seres, D. N. Lobo, and others, "Management of disease-related malnutrition for patients being treated in hospital," *The Lancet*, vol. 398, no. 10314, pp. 1927–1938, 2021.
- [9] A. A. Mousa, J. N. Al-Asadi, and A. A. Al-Sayyab, "Quality of life of patients with end-stage renal disease undergoing hemodialysis in Basrah, Iraq," *Medical Journal of Basrah University*, vol. 38, no. 2, pp. 22–34, 2020.
- [10] F. M. Sanches, C. M. Avesani, M. A. Kamimura, and others, "Waist circumference and visceral fat in CKD: A cross-sectional study," *American Journal of Kidney Diseases*, vol. 52, no. 1, pp. 66–73, 2008.
- [11] M. Rambod, R. Bross, J. Zitterkoph, and others, "Association of Malnutrition-Inflammation Score with quality of life and mortality in hemodialysis patients: A 5-year prospective cohort study," *American Journal of Kidney Diseases*, vol. 53, no. 2, pp. 298–308, 2009.
- [12] M. Postorino, C. Marino, G. Tripepi, and others, "Abdominal obesity and all-cause and cardiovascular mortality in end-stage renal disease," *J. Am. Coll. Cardiol.*, vol. 53, no. 15, pp. 1265–1272, 2009.
- [13] Y. E. Kwon, Y. K. Kee, C. Y. Yoon, and others, "Change of Nutritional Status Assessed Using Subjective Global Assessment Is Associated With All-Cause Mortality in Incident Dialysis Patients," *Medicine (Baltimore)*, vol. 95, no. 7, p. e2714, 2016.
- [14] J. C. Lv and L. X. Zhang, "Prevalence and Disease Burden of Chronic Kidney Disease," in *Advances in Experimental Medicine and Biology*, vol. 1165, 2019, pp. 3–15.
- [15] A. H. Khaleel and H. B. Hassan, "Evaluation of patient's knowledge concerning self-care post hemodialysis session in Baghdad teaching hospitals," *Iraqi National Journal of Nursing Specialties*, vol. 32, no. 1, pp. 45–54, 2019.
- [16] N. Isoyama, A. R. Qureshi, C. M. Avesani, and others, "Comparative associations of muscle mass and muscle strength with mortality in dialysis patients," *Clinical Journal of the American Society of Nephrology*, vol. 9, no. 10, pp. 1720–1728, 2014.
- [17] E. Holvoet, K. Vanden Wyngaert, A. H. Van Craenenbroeck, and others, "The screening score of Mini Nutritional Assessment (MNA) is a useful routine screening tool for

- malnutrition risk in patients on maintenance dialysis," *PLoS One*, vol. 15, no. 3, p. e0229722, 2020.
- [18] G. M. Chertow, D. J. Goldstein-Fuchs, J. M. Lazarus, and G. A. Kaysen, "Prealbumin, mortality, and cause-specific hospitalization in hemodialysis patients," *Kidney Int.*, vol. 68, no. 6, pp. 2794–2800, 2005.
- [19] J. J. Carrero, M. Hecking, N. C. Chesnaye, and K. J. Jager, "Sex and gender disparities in the epidemiology and outcomes of chronic kidney disease," *Nat. Rev. Nephrol.*, vol. 14, no. 3, pp. 151–164, 2018.

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