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Research Article
Nutrition-Related Knowledge, Dietary Practices, Malnutrition Risk and Nutrition Service Use among Chronic Kidney Disease Patients: A Cross-Sectional Study

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Abstract

Background and Objective: Chronic Kidney Disease (CKD) management requires dietary modifications, but patients have limited nutrition knowledge and face barriers to adherence, especially in resource-limited settings. This study assessed nutrition-related knowledge, dietary practices, malnutrition risk and utilisation of nutrition services among CKD patients in Ghana. **Materials and Methods:** A cross-sectional survey was conducted among CKD patients at the Tamale Teaching Hospital using a questionnaire covering demographics, clinical characteristics, knowledge, dietary practices, physical activity, nutrition service use and malnutrition risk. Data was described using descriptive statistics of mean and frequencies. **Results:** The mean age was 47.4±8.2 years; 54% were male and most had low education/income. Most patients were in Stage 4 CKD, with hypertension (33.6%) and diabetes (23%) being common. Nutrition knowledge was moderate (mean score 4.3/7) with notable gaps; 79.3% were at high risk of malnutrition, dietary adherence was low and physical activity was mostly light. While 65.7% used nutrition services, satisfaction was limited (46.4%), with financial, availability and cultural factors as main barriers. **Conclusion:** Nutrition-related knowledge gaps, suboptimal dietary practices, high malnutrition risk and socioeconomic and cultural barriers were evident. These findings highlight the need to strengthen nutrition education, improve dietetic services and implement culturally appropriate dietary interventions to improve CKD care in hospital settings.

Key words: Kidney disease, nutrition knowledge, diet, Ghana, Tamale

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Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

Chronic Kidney Disease (CKD) has become a pressing global health concern, affecting an estimated 700 to 850 million individuals worldwide and ranking among the top ten causes of mortality globally[1,2]. This silent epidemic is projected to escalate further, particularly in Low- and Middle-Income Countries (LMICs), where access to early detection, treatment and renal replacement therapies remains limited[3]. Sub-Saharan Africa bears a disproportionate share of this burden, with CKD prevalence ranging from 12 to 17% figures that far exceed the global average[4]. In Ghana, population-based studies suggest a CKD prevalence of approximately 13%, yet the majority of patients are diagnosed at advanced stages, with limited opportunity for early dietary or therapeutic intervention[5].

Nutrition plays a pivotal role in CKD prevention and management. As kidney function declines, metabolic derangements and nutrient imbalances become increasingly common, including protein-energy wasting, electrolyte disturbances and micronutrient deficiencies[6]. Medical nutrition therapy has been shown to delay CKD progression, improve biochemical markers and reduce cardiovascular risk, making it a cornerstone of CKD care[7]. Despite this, many patients, particularly in low-resource settings face significant barriers to maintaining an appropriate diet. These include limited access to kidney-friendly foods, financial constraints, inconsistent nutrition counselling and cultural dietary practices that conflict with medical advice[8,9].

In Ghana and similar settings, health system limitations further complicate nutrition-related management. There is a shortage of trained renal dietitians and patient education materials are rarely adapted to local food environments or translated into native languages. Studies from Nigeria, Kenya and South Africa consistently report poor adherence to CKD dietary prescriptions due to lack of knowledge, food insecurity and sociocultural factors[9,10]. These gaps in service delivery are compounded by a high prevalence of appetite loss, early satiety and gastrointestinal symptoms, which increase the risk of malnutrition and diminish patients' quality of life. Meanwhile, physical inactivity, common in this population, further worsens health outcomes by accelerating sarcopenia and cardiovascular decline[11,12].

Evidence on Chronic Kidney Disease (CKD) patients' nutrition-related knowledge, dietary practices and receipt of nutrition counselling is scarce, hindering the design of effective dietary interventions. To address this gap, this study assessed CKD patients' nutrition-related knowledge, dietary patterns and nutrition-related risk, as well as their receipt of and satisfaction with hospital-based nutrition care. The findings provide evidence to inform culturally tailored nutrition education, improve nutrition service delivery and guide policy development to strengthen dietary management for CKD in Ghana and similar resource-limited settings.

MATERIALS AND METHODS

Study setting: Tamale Teaching Hospital (TTH) is the main tertiary referral center for Northern Ghana. It serves an estimated population of over 5 million people across the Northern, Savannah, North-East, Upper East and Upper West Regions. Tamale city itself has roughly 612,000 inhabitants. Established in 1974 and upgraded to a teaching hospital in 2009, TTH provides comprehensive inpatient and outpatient care, including a dedicated Renal Dialysis Unit. The dialysis unit delivers hemodialysis and other kidney-related services to patients with Chronic Kidney Disease (CKD).

Study design and population: This was a hospital-based, descriptive cross-sectional study. Adult patients (age $\geq$18 years) with confirmed CKD who attended the TTH Renal Clinic were recruited between February and August, 2024. The CKD was defined according to Kidney Disease: Improving Global Outcomes (KDIGO) criteria (persistently reduced Estimated Glomerular Filtration Rate (eGFR) <60 mL/min/1.73 m^2 and/or markers of kidney damage for $\geq$3 months). Patients were recruited consecutively as they presented to the clinic. Key eligibility criteria were:

- **Inclusion criteria:** Age $\geq$18 years, diagnosis of CKD by clinical and laboratory criteria (reduced eGFR or documented albuminuria/proteinuria >3 months), receiving care at TTH and ability to provide informed consent
- **Exclusion criteria:** Acute kidney injury without chronic disease, previous kidney transplant, current dialysis for end-stage kidney failure, pregnancy, severe mental illness or cognitive impairment preventing reliable interview, and refusal to participate

Participants meeting the inclusion criteria were approached by study personnel and invited to join the study. Written informed consent was obtained from each participant before data collection.

Sampling and recruitment: Consecutive sampling was used to recruit participants. Each day during the study period, all patients meeting the inclusion criteria were identified from clinic schedules or inpatient lists. Study nurses approached eligible patients in the renal clinic or ward, explained the study objectives and procedures and obtained informed consent. To minimize selection bias, recruitment continued until the planned sample size was reached (based on the expected clinic volume). No financial incentives were offered; participation was voluntary. All information was collected confidentially and participants were assured that their clinical care would not be affected by their decision to participate or decline.

Data collection methods: Data were collected using a structured interviewer-administered questionnaire supplemented by review of medical records. The questionnaire was adapted from previously published studies and was pretested on a subset of patients to ensure clarity[13-15]. The questionnaire assessed nutrition-related knowledge, utilization of nutrition services and barriers to nutrition-related support. To determine the risk of malnutrition the validated malnutrition universal screening tool (MUST) was adapted from a previous study by Shanmugapriya *et al.*[16]. A score of 0 denotes a low risk of malnutrition, a score of 1 denotes a medium risk and a score of 2 or above denotes a severe risk. All data were recorded on anonymized questionnaires using google forms. Each participant was assigned a unique study ID. Identifiable information (names, hospital ID numbers) was not included in the dataset and any linkage code was kept securely with limited access, to ensure confidentiality.

Data analysis: Data were entered and analyzed using SPSS Statistical Software Version 26.0. Descriptive statistics were used exclusively. Continuous variables were summarized as Mean±Standard Deviation (if normally distributed) or median and Interquartile Range (IQR) (if skewed). Categorical variables (sex and CKD stage, etc.) were reported as frequencies and percentages. No hypothesis tests or multivariable analyses were performed, as the aim was to describe the study population. For reporting, key variables were categorized as follows: Age was grouped into adults (18-39 years), middle-aged (40-59 years) and older ($\geq$60 years). Educational status and other categorical data were also grouped into a small number of categories (e.g., no formal education, primary, secondary and tertiary). The results are presented in tables and charts for clarity.

Ethical considerations: The study protocol was approved by the Institutional Review Board of the University for Development Studies. All procedures conformed to the ethical principles of the Declaration of Helsinki. Written informed consent was obtained from all participants. Participants were assured that refusal or withdrawal would not affect their medical care. Personal identifiers were removed and data were stored securely (access limited to the research team) to protect confidentiality. No names or hospital ID numbers were linked to the dataset. The authors declare no conflicts of interest.

RESULTS

Sociodemographic characteristics: Table 1 shows the demographic characteristics of the participants. A total of 140 Chronic Kidney Disease (CKD) patients were surveyed. The mean age of participants was 47.4±8.2 years (range 27-67). Participants were largely male (54%) and about one-third had only primary education or no formal schooling. Regarding clinical characteristics, most patients were in advanced stages of CKD. Among those who knew their CKD stage, the majority were in Stage 4 (77 patients, 55.8%). Approximately one-third of the participants (33.6%) had hypertension as a coexisting condition and about 23% had diabetes.

Nutrition knowledge assessment: Participants' knowledge regarding nutrition and CKD varied. The mean total nutrition knowledge score was 4.3±1.6 (out of a maximum of 7 points). Nearly all patients (96.4%) recognized the importance of nutrition in managing CKD. For specific knowledge items, most participants knew that drinking plenty of water helps flush out harmful substances (n = 112, 80.0%) and that brown rice is a healthier choice than white rice (n = 115, 82.1%). Just over half (54.3%) understood that skipping breakfast is not a good practice. In contrast, knowledge gaps were evident in other areas: Only 59.3% correctly identified carbohydrates as the body's main source of energy and very few (7.1%) understood the meaning of "low-fat" on food labels. Misconceptions were common regarding fats and supplements; only about 30.7% knew that not all fats are bad for health and a mere 3.6% recognized that vitamin supplements are not necessary for everyone if diet is adequate in Table 2.

Dietary and lifestyle factors: Participants' dietary habits are summarized in Table 3. Fruit and vegetable intake were moderately frequent: 78.6% consumed fruits at least 1-4 times per week and 73.6% consumed vegetables 1-4 times per week. Only 1-2% of participants reported rarely or never consuming fruits or vegetables. A small subset ate fruits or vegetables almost daily (about 5 and 14% for fruits and vegetables, respectively). Whole grain foods (such as brown

rice or whole wheat bread) were less commonly eaten-over half (57.1%) ate them only 1-2 times per week and virtually none consumed whole grains daily. Intake of unhealthy foods was relatively infrequent: Processed meats were usually consumed only monthly or weekly in small amounts (40.0% ate processed meats 1-3 times per month and only 2.1% ate them nearly every day). Similarly, sugar-sweetened beverages were limited for many participants-nearly 42% had them rarely or at most a few times per month and only 2.9% drank sugary beverages almost daily. About 45% consumed sweet drinks 1-2 times per week.

Risk of malnutrition: Consistent with this, about three-quarters (75%) of respondents stated that they feel full quickly and had difficulty obtaining or preparing food, suggesting socioeconomic or physical barriers to adequate nutrition. Based on malnutrition risk, 79.3% had a high risk of malnutrition (Fig. 1).

Table 1: Demographic characteristics of the participants

Variable	Frequency (n)	Percent
Gender		
Female	65	46.4
Male	75	53.6
Total	140	100
Age group		
18 to 44	52	37.1
45 to 64	84	60
65+	4	2.9
Total	140	100
Marital status		
Divorced	3	2.1
Married	109	77.9
Single	12	8.6
Widowed	16	11.4
Total	140	100
Educational level		
None	52	37.1
Primary	46	32.9
Secondary	25	17.9
Tertiary	17	12.1
Total	140	100
Monthly income level		
Above GHC1000	25	17.9
Below GHC500	78	55.7
GHC500-GHC1000	37	26.4

Table 2: Nutrition knowledge responses of CKD patients (N = 140)

Knowledge item (correct answer)	Correct n (%)
Main source of energy nutrient: Which nutrient is the body's main source of energy? (Carbohydrates)	83 (59.3)
"Low-fat" food label meaning: What does "low-fat" mean on a label? (Contains a small amount of fat per serving)	10 (7.1)
All fats are bad for health: False	43 (30.7)
Water flushes out toxins: Drinking plenty of water can help flush out bad substances from the body (True)	112 (80.0)
Brown rice vs white rice: Brown rice is a healthier choice than white rice (True)	115 (82.1)
Skipping breakfast: Skipping breakfast is a good practice (False)	76 (54.3)
Need for vitamin supplements: Vitamin supplements are necessary for everyone to maintain good health (False)	5 (3.6)

Each item's correct answer is indicated in parentheses

Table 3: Frequency of consuming various foods and beverages

Food/beverage	Rarely/never	1-3×/month	1-2×/week	3-4×/week	≥5×/week (almost daily)
Fruits	2 (1.4%)	21 (15.0%)	64 (45.7%)	46 (32.9%)	7 (5.0%)
Vegetables	1 (0.7%)	17 (12.1%)	57 (40.7%)	46 (32.9%)	19 (13.6%)
Whole grains	0 (0.0%)	16 (11.4%)	80 (57.1%)	40 (28.6%)	4 (2.9%)
Processed meats	5 (3.6%)	56 (40.0%)	52 (37.1%)	23 (16.4%)	3 (2.1%)
Sugary beverages	20 (14.3%)	39 (27.9%)	63 (45.0%)	14 (10.0%)	4 (2.9%)

In terms of lifestyle and nutrition-related health factors, most participants were physically inactive or only mildly active. Over two-thirds (70.7%) described themselves as lightly active, 20.7% as moderately active and only 2.9% as very active, while a small fraction (5.0%) were completely sedentary

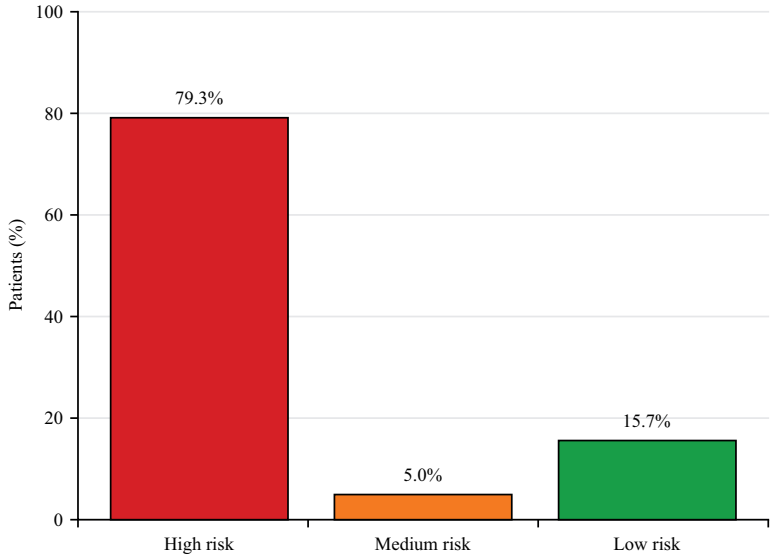

Fig. 1: Distribution of malnutrition risk categories among CKD patients

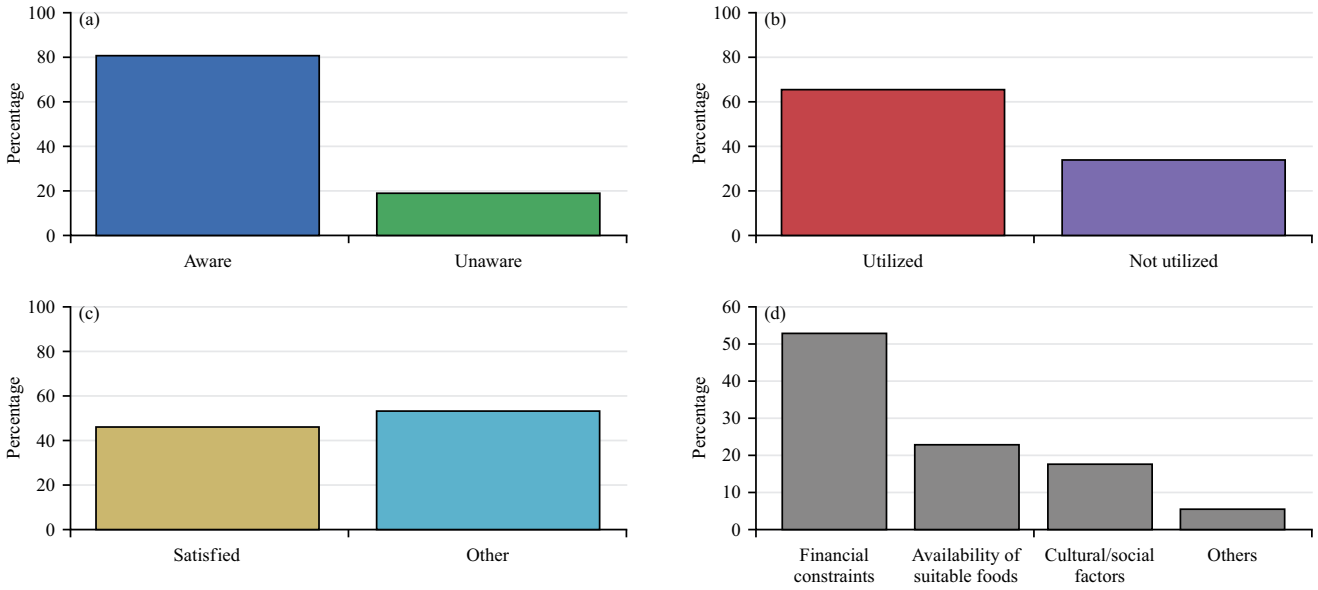

Fig. 2(a-d): Awareness, utilization, satisfaction and barriers related to nutrition support services among CKD patients, (a) Patient awareness of available services, (b) Utilization of nutrition counselling/education programs, (c) Satisfaction levels with services received and (d) Reported barriers to accessing nutrition-related support

Adherence to dietary recommendations: Adherence to dietary recommendations was modest. Only 18.6% of participants reported adhering to diet advice "very well", whereas the majority (55.0%) said they adhered "somewhat well". Over one-quarter (26.4%) admitted they did "not adhere well" to the recommended diet plan. Despite these challenges, most patients rated their overall quality of life as fair (60.0%) or good (30.7%), with few rating it poor (5.7%) and an even smaller number calling it very good (3.6%). This suggests that while dietary and health-related issues were prevalent, many patients still perceived their quality of life in moderate terms.

Nutrition support: Figure 2 presents four bar charts summarizing key aspects of nutrition-related support among patients with Chronic Kidney Disease (CKD) at Tamale Teaching Hospital in Ghana. (a) Awareness of nutrition support services: The majority of patients (80.7%) were aware of the nutrition support services available at the hospital,

(b) Utilization of nutrition counselling/education programs: Approximately two-thirds of the respondents (65.7%) reported having utilized nutrition counselling or education programs, (c) Satisfaction with nutrition support services: Less than half of the respondents (46.4%) reported being satisfied with the nutrition support services they received, while the remaining 53.6% of patients were not satisfied or did not indicate satisfaction and (d) Barriers to nutrition-related support: Financial constraints were the most reported barrier to adequate nutrition-related support (cited by 52.9% of patients), followed by limited availability of suitable foods (22.9%) and cultural or social factors (17.9%). Only a small fraction of patients (5.7%) cited other reasons as barriers.

DISCUSSION

In this study, an evaluation of nutrition-related knowledge, dietary and lifestyle practices, malnutrition risk and utilisation of nutrition services among CKD patients. Participants reportedly had modest nutrition knowledge with major gaps in understanding of food labels, fats and supplement use. Dietary practices were characterized by moderate fruit and vegetable intake but low whole grain consumption. Nearly 80% of patients were at high risk of malnutrition and adherence to dietary recommendations was generally poor. Although most recognized the importance of nutrition, satisfaction with available nutrition support services was limited, with financial constraints being the main barrier. The findings of this study reveal multiple nutrition and lifestyle challenges among CKD patients in Tamale, Ghana. Overall, participants demonstrated only moderate nutrition-related knowledge, characterized by key gaps and misconceptions. This mirrors observations in other CKD populations: For example, a South Indian survey of haemodialysis patients found 86% had merely a moderate understanding of renal dietary management[17]. Among the participants, specific misunderstandings were noted around food label reading, definitions of "low-fat" foods, types of dietary fats and the role of vitamin supplements. These knowledge gaps are significant because they may impede participants' ability to make informed food choices. The consistency of moderate knowledge levels across different regions underscores an urgent need for improved nutrition education tailored to CKD patients' needs[17]. Educational interventions should directly address identified misconceptions, for instance, teaching practical label-reading skills and clarifying healthy fat sources, to empower patients with applicable dietary knowledge.

Dietary intake patterns in this Ghanaian CKD group were suboptimal in quality, albeit with a few positive aspects. Fruit and vegetable consumption was moderate and intake of whole grains was notably low, while sugary and highly processed foods were only sparingly consumed. These patterns align with reports from similar CKD populations in resource-limited settings. A dietary assessment of haemodialysis patients in Tanzania, for example, showed diets dominated by starchy staples with very limited vegetables and minimal fruits (approximately 1 portion per day)[18]. Likewise, a Chinese study of non-dialysis CKD patients described overall diet quality as moderate and flagged low intake of whole grains and fiber[19]. In that cohort, processed foods contributed only about 23% of energy intake, indicating relatively restrained consumption[19], a finding comparable to the current study's limited intake of processed snacks and sweets. The moderate fruit and vegetable intake observed in this study, while better than complete avoidance, likely remains insufficient for optimal micronutrient and fiber intake. Notably, prior research has found that CKD patients tend to eat fewer fruits and vegetables than their healthier counterparts[20] partly due to dietary restrictions and fears of hyperkalemia. Improving the diversity and quality of diet in CKD is important; however, interventions should be cautious and individualized, balancing potassium or phosphorus restrictions with the general health benefits of fruits, vegetables and whole grains.

Concerning responses to the individual items of the MUST, a worrying high prevalence of poor appetite, early satiety and unintentional weight loss was reported by participants. These symptoms strongly suggest a risk of protein-energy malnutrition, a well-documented complication in CKD[6]. Prior studies by Lee *et al.*[21] have noted that approximately one-third of dialysis patients experience anorexia or report a poor appetite. Current findings indicate an even more widespread burden of appetite loss in this population, which is clinically significant. Early satiety and ongoing weight loss can lead to protein-energy wasting, undermining patients' strength and immunity. This reinforces the importance of routine nutrition-related status monitoring in CKD care. Regular assessment for weight changes and appetite should be standard practice, so that dietitians or clinicians can intervene promptly if a patient shows signs of wasting. Interventions might include individualized meal plans with small, frequent meals or renal-specific oral nutrition supplements to increase calorie-protein intake, though such steps must be guided by evidence and patient tolerance. The key point is that the prevalence of these symptoms signals a need for proactive management. The data highlight malnutrition risk as a prevalent issue that should not be overlooked in CKD patients in Ghana, similar to trends observed globally[6].

This study revealed low levels of physical activity among CKD patients, consistent with evidence linking sedentary behaviour to reduced functional capacity and poorer quality of life[11]. Although guidelines recommend at least 150 min of moderate-intensity exercise weekly[7], achieving this appears difficult in this population due to fatigue, comorbidities and lack of counselling or facilities. Similar studies in developed settings report better adherence when patients are adequately supported suggesting that exercise counselling and simple, tailored interventions such as walking or physical therapy could be valuable in this context[11].

Adherence to dietary recommendations was modest, with major barriers including cost, food availability and the restrictive nature of renal diets. Comparable challenges have been reported in Kenya, where only 36.3% of patients adhered fully and in South Africa, where poverty and limited food supply hinder adherence. Qualitative findings from East Africa also show that renal diets are often viewed as unpalatable, expensive and socially disruptive. These challenges underscore that education alone is insufficient-practical, socioeconomic and culturally appropriate support is essential for sustainable dietary adherence[9].

Despite high awareness of nutrition services (80.7%), actual utilization (65.7%) and satisfaction (46.4%) were limited. Similar patterns of underutilization have been observed globally, even in high-resource settings[22]. Barriers in Ghana mirror global trends, including limited availability of trained nutritionists and the high cost of care, largely paid out-of-pocket[5]. Financial constraints were the most cited barrier (52.9%), followed by limited availability of suitable foods (22.9%) and cultural dietary practices, all of which complicate adherence to renal diets.

Limitations of this study include its cross-sectional design, single-site setting and reliance on self-reported behaviours, which may introduce bias. Nonetheless, it provides valuable insights into the nutrition-related challenges of CKD patients in resource-limited settings. Future research should explore longitudinal and multi-site approaches to track dietary behaviours, malnutrition risk and intervention outcomes. Interventional and qualitative studies are also needed to test tailored, cost-effective and culturally appropriate strategies to strengthen nutrition care in Ghana and similar contexts.

CONCLUSION

This study revealed critical nutrition-related challenges among CKD patients in Ghana, including limited knowledge, poor dietary adherence and a high risk of malnutrition, further exacerbated by financial, cultural and access-related barriers. Despite moderate utilisation of nutrition services, patient satisfaction remained low, underscoring the need for improved quality and accessibility of support. Strengthening targeted nutrition education, enhancing culturally sensitive dietary counselling and expanding support services are essential to optimize nutritional care and improve the overall quality of life for CKD patients in resource-limited settings.

SIGNIFICANCE STATEMENT

The CKD patients are highly vulnerable to malnutrition, yet little is known about their nutrition knowledge, dietary practices and access to support services in low-resource settings. This study among CKD patients in Ghana showed modest nutrition knowledge, suboptimal dietary practices, poor adherence to dietary recommendations and a high risk of malnutrition, with financial barriers limiting access to nutrition support. These findings underscore the need for context-specific nutrition education and strengthened support services as integral components of CKD management. Addressing these gaps could improve dietary adherence, reduce malnutrition risk and ultimately enhance health outcomes and quality of life for CKD patients in Sub-Saharan Africa and other resource-constrained contexts.

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