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RESEARCH ARTICLE

Nutritional Assessment of End-stage Kidney Disease Patients on Maintenance Hemodialysis in Damaturu, Northeastern Nigeria

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ABSTRACT

Malnutrition is among the morbidities associated with poor health-related quality of life and decreased functional capacity in patients on Hemodialysis. Several factors, such as decreased food intake due to anorexia, dietary restrictions, combined to make these patients susceptible to malnutrition. This study aimed to assess the nutritional status of hemodialysis patients and to identify possible risk factors that may be amenable to intervention. A total of 55 patients on maintenance hemodialysis for more than 3 months were recruited after consenting. All patients were interviewed during one of the sessions of hemodialysis. Information on demographic features such as Age, gender, and ethnicity was recorded. Subjective global assessment (SGA) was used in this study to assess nutrition. A blood sample was collected for the determination of serum Albumin, Hemoglobin, calcium, and phosphate. Among the 55 patients enrolled in the study, 41 (74.5%) were males and 14 (25.5%) were females. The mean age of the study cohort was 49.89± 10.2 years. The overall SGA score revealed that 18 (32.7%), 23 (41.8%), and 14 (25.5%) of the patients had normal nutrition, mild/moderate malnutrition, and severe malnutrition, respectively. There is a significant negative correlation between malnutrition and Hemoglobin (rho=-0.423, P=0.001), Albumin (rho=-0.378, P=0.004), and a positive correlation with increasing Kt/V (rho=-0.529, P=0.007). Compared with well-nourished patients (N=18), malnourished patients (N=37) were significantly females (χ^2 =5.5, P=0.02), had shorter duration on dialysis (21.7±16.2 vs 15.0±10.3 months, P=0.04), and had lower Kt/V (1.5±0.08 vs 1.7±0.18, P=0.007). This study shows a high prevalence of mild/moderate and severe malnutrition among patients on maintenance hemodialysis in our center.

Keywords: *malnutrition, chronic kidney disease, SGA tool, hemodialysis*

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INTRODUCTION

Chronic kidney disease (CKD) has emerged as one of the most significant causes of morbidity and mortality in the 21st century. In 2017, CKD affected over 800 million individuals globally, with an age-standardized prevalence of 10.6% in men and 12.5% in women in low- and middle-income countries (LMICs) (Kovesdy, 2022). The incidence of CKD continues to rise worldwide, mainly due to the increasing burden of type 2 diabetes mellitus and hypertension in developed countries, and chronic glomerulonephritis as well as CKD of unknown etiology (CKDu) in LMICs. According to the Global Burden of Disease Study (2021), CKD has become a leading cause of death globally. The total disability-adjusted life years (DALYs) attributable to CKD increased from 33.4 million in 2010 to 44.5 million in 2021, while years lived with disability (YLDs) have also steadily risen among CKD patients (Alize et al., 2021).

Progressive loss of renal function results in end-stage renal disease (ESRD), defined by a glomerular filtration rate (GFR) of less than 15 mL/min/1.73 m^2, often necessitating renal replacement therapy (RRT). RRT comprising hemodialysis, peritoneal dialysis, and kidney transplantation has been available since the 1960s; however, it remains limited in accessibility within LMICs. In addition to economic constraints, a shortage of trained personnel continues to hinder RRT service development in resource-limited settings such as Nigeria. According to the U.S. Renal Data System (USRDS), the incidence of ESRD increased by 31.3% between 2002 and 2022 (Johansen et al., 2024). In 2010, approximately 2.6 million people worldwide received RRT, while an estimated 4.9 to 9.7 million required it implying that more than 2.3 million individuals may have died due to lack of access to this life-sustaining therapy. The largest treatment gaps were observed in LMICs, particularly in Asia and Africa, where only 9–16% of individuals needing RRT received treatment (Liyanage et al., 2015).

The incidence rate of end stage renal disease is also increasing (De niccola & Zoccali, 2016). End-stage renal disease patients receiving maintenance Hemodialysis have increased morbidity and mortality compared to the general population (Robinson et al, 2014). Several risk factors contribute to this high mortality. The single most important been cardiovascular disease (Wang et al, 2010). Other risk factors such as malnutrition, mineral bone disease (CKD-MBD), Anemia, fluid overload and infection also contribute to the high mortality and morbidity seen in ESRD patients on RRT. The disproportionate access to RRT in Africa particularly sub-saharan Africa (SSA) might also be responsible for the high morbidity and mortality of ESRD patients. Care for ESRD patients in SSA further stretches the already fragile economy and in many countries provision of care is stringently regulated.

Malnutrition is a state of decreased body pool of protein with or with fat depletion caused at least partly by inadequate nutrients intake relative to nutrient demand and/or improved by nutrient repletion (Kalantar-Zadeh et al, 2003). Malnutrition is associated with poor health-related quality of life and decreased functional capacity. Malnutrition is a major risk factor for mortality in maintenance hemodialysis patients. The prevalence of malnutrition in Hemodialysis patients ranges from 18 to 75% (Visiedo et al, 2022). Several factors such as decreased food intake due to anorexia, dietary restrictions, inflammation and metabolic acidosis all combined to make patients susceptible to malnutrition (Danielski et al, 2003). Other factors such as hemodialysis catheter use, inadequate dialysis, nutrients loss during dialysis and prolonged hemodialysis vintage also contribute to malnutrition (Elsayed & Elkazaz, 2024). Nutritional status of hemodialysis patients has been reported to differ in various races and regions (Lin et al, 2002, Noori et al, 2011).

This study aimed to determine the prevalence of malnutrition using the subjective global assessment tool among ESRD patients on maintenance hemodialysis in Damaturu Northeast Nigeria and identify biochemical and clinical correlates.

METHODS

Study Design

This study was hospital-based, descriptive cross-sectional study conducted among ESRD patients attending Yobe state university teaching hospital (YSUTH) hemodialysis unit for maintenance hemodialysis between April and December 2022. It involved 55 adult Hemodialysis patients who were receiving treatment on an out-patient basis at the hemodialysis unit of the Yobe state university teaching hospital, Damaturu, Yobe state, Northeastern Nigeria and who satisfied the inclusion criteria. These patients had no history of blood transfusion in the past month and had no catheter malfunction.

Study Location

This study was conducted in Hemodialysis unit of Yobe state university teaching hospital, Damaturu, Northeast Nigeria. The unit has twelve hemodialysis machines of various make and in addition two dedicated machines for HIV and Hepatitis B/C, however, during the study period

there were no patients with either HIV or Hepatitis. Most of these patients come from different parts of the state and were either on twice or thrice weekly sessions.

Study Population and Eligibility Criteria

This was a study of all adults' patients attending hemodialysis unit of YSUTH who consented. On average eighteen to twenty-two (18-22) patients received maintenance hemodialysis at the unit, in addition to other patients on salvage hemodialysis and acute kidney injury (AKI) patients. Between April and December 2022 sixty-nine (69) patients were on maintenance hemodialysis at the unit, eleven (11) were <3 months old on hemodialysis and three (3) refused consent. The remaining fifty-five (55) patients were consecutively recruited for the study. The hospital is a tertiary health institution own by the state government and offering free hemodialysis services to all indigenes of the state.

Inclusion criteria

- Subjects aged ≥ 18 years.
- Those who had been on maintenance hemodialysis for ≥3 months at the time of the study.

Exclusion criteria

- Subjects with a history of mental illness
- Subjects who had recently had sepsis, hepatitis B/C infections
- Those who declined to consent.

Sampling Size

Due to the small number of patients on maintenance hemodialysis in the unit (69), all eligible patients were consecutively recruited to participate in the study. However, three patients declined to provide consent, and eleven had been on maintenance hemodialysis for less than three months; hence, they were excluded from the study.

Data collection tools

A questionnaire comprising of socio-demographic features, subjective global assessment tool and biochemical analysis was administered to all patients that provided written informed consent. The patients were reassured of the confidentiality of the information provided. The questionnaire comprises of three sections. Socio-demographic features: Information on demographic features such as Age, gender, ethnicity, occupation and educational level were recorded. History of possible cause of CKD, dialysis duration and frequency were extracted from the hemodialysis chart. Body mass index (BMI) was calculated from the patients' weight (measured after hemodialysis with light clothing using a bathroom weighing scale) and height was measured to the nearest meter with a stadiometer barefooted. Blood pressure was measured before hemodialysis on two consecutive times at least 20 minutes apart. Subjective global assessment: The Subjective global assessment (SGA) was the tool used to evaluate the nutritional status of the patients. It is a semi quantitative tool to assess nutritional status based on the history and physical examination (Steiber et al, 2007). The SGA questionnaire is divided in to 2 parts. The first part comprised history on recent weight change, diet, gastrointestinal symptoms and functional capacity. The second part comprised of physical examination in which loss of subcutaneous fat, presence or absent of muscle wasting and presence or absence of edema in various areas were assessed. These variables were scored individually and sum of the score gives the overall rating of the SGA score (Kopple, 1994). Score A is allocated to patients with normal nutrition or well-nourished while score B denotes mildly/moderately malnourished with some progressive weight loss. Score C denotes severely malnourished with evidence of wasting and progressive symptoms (Barker et al, 2011, O'Keefe et al 2002). The SGA although initially developed to assess nutritional status in surgical patients (Detsky et al, 1984) has found several usage in other specialties. The National kidney foundation (NKF) has recommended SGA to assess nutritional status in CKD patients (Jones et al, 2004). Biochemical analysis: Blood sample was collected prior to commencement of hemodialysis. Serum calcium was assayed by flame photometry. Hemoglobin was measured by an automated hematology analyzer. Calcium was corrected for serum albumin as corrected calcium = 0.8(40-serum albumin) + serum calcium.

Study Procedure

The study was conducted during one of the sessions of hemodialysis. Four dialysis nurses filled the questionnaire with the assistance of two research assistants who also collect the blood sample. The questionnaire takes approximately 20 minutes to fill and each patient is giving a unique identification number (ID Number). Ten (10ml) of blood was collected using aseptic technique from the vascular access before commencement of hemodialysis. The sample was divided in to two aliquots (5ml each) in to lithium heparin and EDTA bottles. The samples were coded with the unique ID number of the patients and transported to the hematology and clinical chemistry units of the hospital for analysis. All the data were entered in to SPSS after merging the laboratory results with the questionnaire using the ID number.

Statistical analysis

Data analysis was done using statistical package for social science version 27.0 (IBM Inc. NY, USA). Continuous variables such as age, BMI,

Blood pressure, hemoglobin and serum albumin, calcium and phosphate were expressed as mean ±standard deviation while categorical variables such as gender, age group, educational level and frequency of dialysis were expressed as percentage. Chi-square test was used to compare parametric variables and Kruskal-Wallis was used for non parametric categorical data. Student t-tests and ANOVA were used to compare two or more groups. Spearman's rank correlation was used to assess the relationship between SGA score and serum hemoglobin, calcium, phosphate and albumin. Significance level was set at $P<0.05$.

Ethical Considerations

The study was conducted following the ethical guidelines of the declaration of Helsinki after receiving approval from the Institutional Ethics Committee. Ethical approval for the present study was obtained from the YSUTH Ethics Committee (YSUTH/MAC/EC/022) dated March, 2022. Written Informed consent was obtained after fully explaining the study including blood collection to the patient by the Research assistants. The patients were also reassured of their confidentiality. Patients were also informed that their participation is voluntary and they can withdraw at any time during the study or they can skip any question without any consequences.

RESULTS

Socio Demographic Characteristics

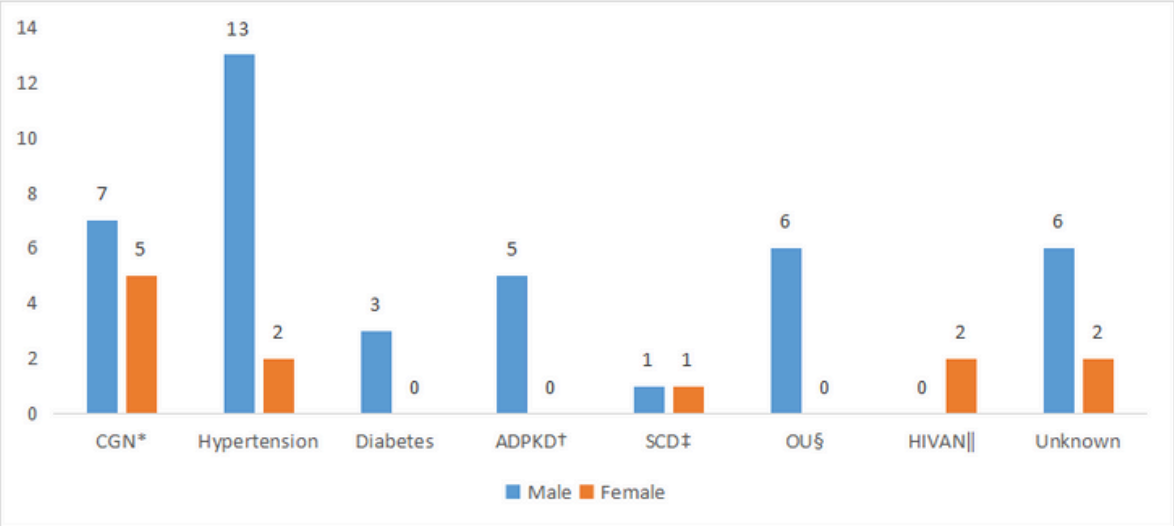
A total of 55 patients were enrolled in the study, 41 (74.5%) were males and 14 (25.5%) were females with female: male ratio of 1:3. Table 1 shows the socio demographic characteristics of the study population. The mean age of the study cohort (table 1) was 49.89± 10.2 years, 28 (50.1%) patients were below fifty years while 27 (49.9%) were above fifty years.

Table 1:

Socio Demographic Characteristics of the Patients

Variables	Frequency (%)
Gender	
Male	41(74.5%)
Female	14(25.5%)
Age group	
18-50 years	28 (50.9%)
>50 years	27 (49.1%)
Education	
Primary	14 (25.5%)
Secondary	26 (47.3%)
Tertiary	15 (27.3%)
Marital status	
Single	2 (3.6%)
Married	51 (92.8%)
Widow	2 (3.6%)
Occupation	
Farming	15 (27.3%)
Trading	6 (10.9%)
Civil service	11 (20%)
Housewife	14 (25.5)
Others	9 (16.3%)

As shown in figure 1, the main causes of CKD were hypertension in 15 (27.3%) followed by chronic glomerulonephritis (CGN) in 12 (21.8%) patients. Diabetes mellitus, Autosomal dominant polycystic kidney disease (ADPKD) and obstructive uropathy were seen in males only, while 2 (3.6%) females had HIV associated nephropathy (figure 1). Chronic kidney disease of unknown etiology (CKDu) was seen in 8 (14.5%) patients.



CGN=chronic glomerulonephritis ADPKD= Autosomal dominant polycystic kidney disease SCD= Sickle cell disease OU= Obstructive uropathy HIVAN= HIV associated nephropathy

Figure 1: *Causes of Chronic Kidney Disease According to Gender*

Clinical Characteristics

The mean duration on maintenance hemodialysis was 17.25±12.8 months, males significantly stay longer on hemodialysis than females (19.1±14.1 vs. 11.8±5.0 months, P=0.007). Nearly half (49.1%) of the patients had hemodialysis twice weekly, 18 (32.7%) had hemodialysis three times in a week, with only 10 (18.2%) patients on once weekly hemodialysis. The primary vascular access for hemodialysis among the patients was Subclavian vessels in 26 (47.3%), arteriovenous fistula (AVF) in 18 (32.7%) of the patients and tunneled permanent catheters in 11 (20%) of the patients. Thirty-eight (69.1%) of all the patients had a history of blood transfusion, and 22 (40%) were on erythropoiesis stimulating agent (ESA) mainly epoetin alpha at a median weekly dose of 4000 IU, for a median duration of 8 weeks. There was no statistically significant difference on the need for blood transfusion or use of ESA between the sexes.

The mean systolic and diastolic blood pressure were 151.2±16.9mmHg and 97.7±11.6mmHg respectively. There was no statistically significant difference in systolic and diastolic blood pressure between the sexes. The mean body mass index (BMI) was 31.3±5.4Kg/m$_2$, 8 (14.5%) had normal weight while 47 (85.5%) were overweight.

Biochemical Parameters

There was no significant difference in mean Hemoglobin between the sexes (8.9±1.9g/dl Vs. 8.5±1.3g/dl, P= 0.39). The mean serum Albumin, calcium, phosphate and calcium-phosphate products were 3.0±0.35g/L, 2.2±0.32mmol/L, 1.6±0.24mmol/L and 3.5±0.7mmol$_2$L$_{-2}$ respectively. Females have significantly lower serum calcium and albumin than males (table 2). Heparin was the main anticoagulant used in all the patients. About two-third (63.6%) of the patients used low flux dialyzers while 20 (36.4%) used high flux dialyzers.

Table 2:

Clinical and Laboratory Parameters

Variables	All (n=55)	Males	Female	P
Duration on HD (months)	17.25±12.8	19.1±14.1	11.8±5.0	0.007*
Systolic blood pressure (mmHg)	151.2±16.9	152.1±14.4	148.4±23.3	0.48
Diastolic blood pressure (mmHg)	97.7±11.6	98.5±11.1	95.1±13.1	0.39
Body mass Index (Kg/m2)	31.3±5.4	31.6±4.7	30.2±7.3	0.40
Hemoglobin (g/dl)	8.8±1.8	8.9±1.9	8.5±1.3	0.39
Serum Albumin (g/dl)	3.0±0.3	3.1±0.3	2.7±0.2	<0.001*
Serum Calcium (mmol/L)	2.2±0.3	2.3±0.3	2.0±0.2	<0.001*
Serum Phosphate (mmol/L)	1.6±0.3	1.5±0.23	1.6±0.3	0.38

Subjective Global Assessment Score

Nutrition history

Analysis of the history part of the SGA showed 29 (52.7%) of the patients having inadequate nutrient intake with mean duration of 4.86±1.8 months, however, 20 (36.4%) of the patients had improved intake in the past 2 weeks. Twenty-one (38.2%) patients had weight loss in the past 6 months while 16 (29.1%) patients had progressive weight loss in the past 2 weeks. Gastrointestinal symptoms were present in 23.1% of the patients, mainly anorexia, vomiting, nausea and easy satiety. Females had statistically significant constipation than males (χ_2=11.64, df=1, P<0.001) likewise females developed easy satiety than males (χ_2 =4.37, df=1, P=0.037). Eighteen (32.7%) patients had no impairment in functional capacity while 37 (67.3%) had reduced functional capacity with 6 (16.2%) bedridden. Twelve (21.8%) of the patients had improved functional capacity in the past 2 weeks.

Physical assessment

The examination part of the SGA showed 32 (58.2%) of the patients having mild to severe loss of subcutaneous body fat and 26 (49.1%) have mild to severe muscle wasting. Twenty-eight (50.9%) of the patients had mild to severe edema and ascites.

Overall SGA score

The overall SGA score revealed 18 (32.7%), 23 (41.8%) and 14 (25.5%) of the patients had normal nutrition, mild/moderate malnutrition and severe malnutrition respectively (see figure 2).

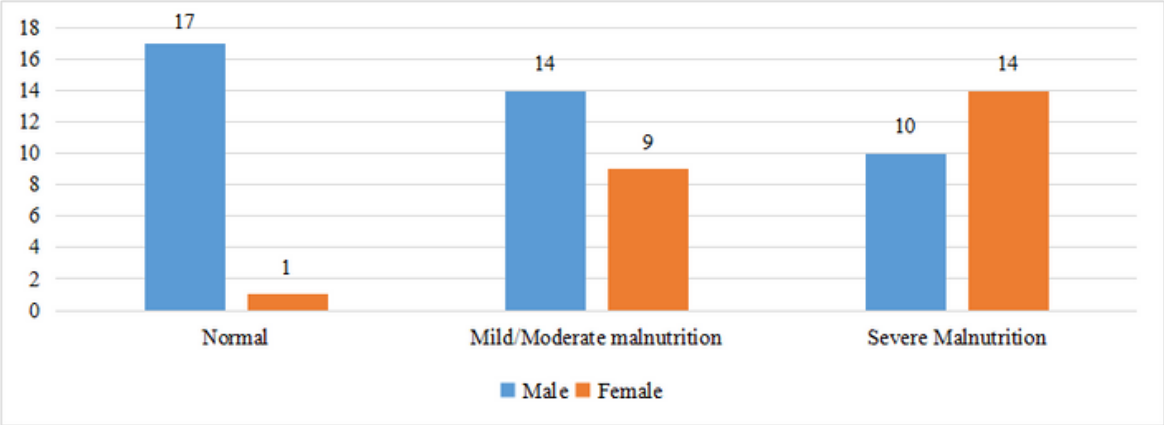


Figure 2: *Overall SGA Score According to the Gender of The Patients*

More males had normal nutrition than females (χ_2= 5.584, df =1, P=0.018). There is no significant age group differences among the different category of nutrition (χ_2=0.447, df =1, P=0.504). The contributing factor in 24 (43.6%) of the patients was cachexia while in 16 (29.1%) it was sarcopenia. There is significant negative correlation between malnutrition and Hemoglobin (rho= -0.423, P=0.001), serum calcium (rho= -0.515, P<0.001) and Albumin (rho= -0.378, P=0.004) and a positive correlation with increasing Kt/V (rho- 0.529, P=0.007) (table 3).

Table 3:

Association of Malnutrition and some variables (n=55)

Variables	Spearman's rho	P-value
Age (years)	0.034	0.804
Duration of Hemodialysis (months)	-0.220	0.106
Kt/V	0.529	0.014*
Hemoglobin (g/dl)	-0.423	0.001*
Albumin (mg/dl)	-0.378	0.004*
Calcium (mmol/L)	-0.515	0.001*
Body mass index (Kg/m2)	-0.234	0.058

*Rho= spearman's coefficient, *= statistically significant at P <0.05*

Compared with well-nourished patients (N=18), malnourished patients (N=37) were significantly females (χ_2 =5.5, P=0.02), had shorter duration on dialysis (21.7±16.2 vs. 15.0±10.3 months, P=0.04), had lower Kt/V (1.5±0.08 vs. 1.7±0.18, P=0.007), lower hemoglobin (9.9±1.6g/dl vs. 8.3±1.6g/dl, P=0.001), lower serum Albumin (3.2±0.5g/L vs. 2.9±0.2g/L, P=0.004) and lower serum calcium (2.5±0.19mmol/L vs. 2.1±0.31mmol/L, P<0.001). Body mass index (BMI) and Age were not statistically significant between well-nourished and malnourished patients (Table 4).

Table 4:
Correlations Between SGA Classification and Clinical/Biochemical Variables

Variable	Normal nutrition	Malnutrition	P
Age (years.)	49.1±7.7	50.2±11.3	0.09
Age group			
18-50yrs	8 (44.4%)	20 (54.1%)	0.573
>50yrs	10 (55.6%)	17 (45.9%)	
Gender			
Male	17 (41.5%)	24 (58.5%)	0.012*
Female	1 (7.1%)	13 (92.1%)	
Duration on HD (months.)	21.7±16.2	15.0±10.3	0.04*
Frequency of HD (weekly)			
<3	9 (24.3%)	28 (75.7%)	0.057
>3	9 (50%)	9 (50%)	
Comorbidity			
Hypertension	13 (23.6%)	26 (47.3%)	0.543
Diabetes	0	3 (5.5%)	
Kt/V	1.5±0.8	1.7±0.18	0.007*
Hemoglobin (g/dl)	9.9±1.6	8.3±1.6	0.001*
Serum Albumin (mg/dl)	3.2±0.5	2.9±0.2	0.004*
Serum Calcium (mmol/L)	2.5±0.19	2.1±0.31	<0.001**
Serum phosphate (mmol/L)	1.6±0.18	1.5±0.27	0.76
Ca+2 x PO4 product (mmol2/L2)	4.02±0.62	3.3±0.65	0.002*
Body mass index (Kg/m2)	33.1±2.8	30.4±6.1	0.08

**= P<0.05 **=P<0.001*

DISCUSSION

This study aimed to assess the nutritional status of patients on maintenance Hemodialysis from a single center in Northeast Nigeria offering free hemodialysis treatment. To our knowledge no study was done in this part of the country on nutrition in hemodialysis patients. The mean age of our study cohort (49.9 ± 10.2 years) was similar to the findings of Oluseyi & Enajite (2016) and Liman et al (2015) in southern and north-central Nigeria respectively. It was also similar to the findings of De Araújo et al (2006) in Brazil, Crystal et al (2024) in Zambia and Badrasawi et al (2021) in Palestine. However, the mean age was lower than many centers in developed countries as reported by Visiedo et al (2022), Boaz et al, (2021) and Dwyer et al (2005). These differences could be explained by the high number of infectious causes of CKD in developing countries which tend to affect younger people. The main etiology of CKD was similar to reports by Oluseyi & Enajite (2016), Liman et al (2015) and Manmak et al (2020) from other parts of Nigeria with chronic glomerulonephritis, hypertension and CKD of unknown causes constituting the highest percentage. According to De Araújo et al (2006) and Boaz et al (2021), Diabetes mellitus has been a major cause of CKD in developed countries constitutes it constitute virtually a small percentage in this study.

Diagnosis of malnutrition in chronic kidney disease (CKD) patients is challenging and increasingly controversial. No single marker consistently identifies malnutrition in this population. Many of the markers are skewed in a variety of ways by kidney disease and the multiple comorbidities that influence nutritional, inflammatory, and clinical status (Kopple, 1994). Biochemical indices are altered by fluid and inflammation status, and anthropometric measures for the CKD population must be administered after dialysis to prevent confounding influences of fluid status. Dietary interviews are often unreliable, because they depend on patient memory of recent intake, which may be negatively influenced by age-related and uremia-related influences on patients' memories (Fouque et al, 2007). Subjective global assessment (SGA) is a nutritional tool commonly used by both clinicians and researchers. It has been validated in hemodialysis patients and has been recommended as an assessment tool (Kopple et al, 2000).

The total SGA score in this study showed that 67.3% of our maintenance hemodialysis patients were malnourished. This is similar to report by Liman et al (2015) in Abuja who observed malnutrition in 60.8% patients on maintenance hemodialysis. Our result was, however, lower than reported by Morais et al (2005) among 44 patients on hemodialysis in Brazil, it is also lower than nearly 90% reported by Manmak & Oluwatoyin (2020) in Abuja. This could be attributed to the study methodology as it involves case-control design in the later. Another factor, perhaps more important is the definition of malnutrition in their study. Malnutrition was defined by the authors as any or combination of BMI (<18.5Kg/m2), total skinfold thickness (<80% deficit from ideal), serum albumin (<3.5g/l) and total cholesterol (<150mg/dl).

The prevalence of malnutrition was higher in our study compared to some studies from other parts of Africa and globally. Moussa et al (2016) while reviewing 65 patients on regular hemodialysis at National hospital Zinder and Lamorde reported malnutrition among 29.3% of the patients. It was also higher than the global prevalence of 42% reported in a meta-analysis by Rashid et al (2021). Another study from peritoneal dialysis patients in South Africa showed 58% of the patients to be malnourished. SGA, anthropometry as well as 24-hour dietary recall were used to assess malnutrition in the patients (Abdu et al, 2011). Variable socio-cultural differences as well as economic factors may explain some of these differences. SGA and body composition analysis tool were used in 211 ESRD patients on regular hemodialysis in Jeddah kingdom of Saudi Arabia and found 54.5% of the patients to be malnourished (Azzeh et al, 2022).

In this study malnourished patients had significantly shorter duration on hemodialysis, lower hemoglobin, lower Kt/V (inadequate dialysis) and lower serum albumin. In the mortality and morbidity in Hemodialysis (HEMO) study, increased serum albumin and higher BMI were associated with decreased mortality (Dwyer et al, 2005). Likewise the international Dialysis Outcomes and Practice Patterns Study (DOPPS), also found higher mortality risk for lower baseline BMI, serum albumin, and serum creatinine categories (Pifer et al, 2002). Variable environmental factors and diverse dietary regimens between different countries and cultures may be responsible for the wide variation in the prevalence of malnutrition among hemodialysis patients (Elsayed & Elkazaz, 2024). Frequent gastrointestinal symptoms (such as anorexia, nausea and vomiting) are common in patients with inadequate hemodialysis, this could lead to malnutrition. Inflammation, infection and comorbid conditions could also induce negative catabolic state in the patients. These factors and their combination thereof make ESRD patients highly susceptible to dietary imbalance.

From the forgoing it becomes clear that malnutrition among patients on hemodialysis is common and has variety of causes. In our environment where there is paucity of renal nutritionist, negative information to patients regarding protein intake is common. To decrease morbidity and mortality associated with malnutrition, it is recommended that nutritional assessment should be incorporated in to the main care of hemodialysis patients (De Mutsert et al 2009). Also, various clinical practice guidelines on nutrition in hemodialysis patients should be strengthen through multi-disciplinary approach involving renal nutritionist, nephrologist, dialysis nurses, etc. In LMIC attention to local foods should also be encouraged.

Conclusion

Malnutrition is common in ESRD patients on maintenance hemodialysis. There is significant negative correlation between SGA score and serum Albumin, calcium and hemoglobin. Malnutrition is significantly associated with female gender, shorter duration on hemodialysis, and lower Kt/V. Routine nutritional monitoring using SGA should be integrated into dialysis care protocols in similar low-resource settings.

Recommendations

The federal, state and local governments should emulate the states providing free hemodialysis services or at least subsidize it to affordable level for all patients. The government should also liaise with various stakeholders to educate the general population on healthy diet and its effect on development. The ministry of health should develop programmes for addressing malnutrition in CKD patients as well as in other chronic conditions. Nutritional societies in LMIC should provide guidance on nutrition education, food fortification and food supplementation. Health practitioners should incorporate nutritional assessment in evaluating chronic kidney disease before the patients reach end-stage kidney disease. Future studies should also be done to evaluate local foods and their importance in preventing malnutrition in hemodialysis patients.

Conflict of Interest

The authors declare no conflict of interest.

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