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Serum Albumin and Nutritional Status of Patients with Chronic Kidney Disease: A Hospital-Based Study

Medical Science

KEYWORDS : nutritional status, serum albumin, chronic kidney disease

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ABSTRACT

- *Patients with chronic kidney disease (CKD) often suffer from malnutrition and protein-energy wasting (PEW) resulting in poor nutritional status which is a powerful predictor of mortality. There is a dearth of information on the nutritional status of patients with chronic kidney disease in Ibadan, Nigeria.*
- *This study is a cross sectional study. A total of 32 consenting in-patients were assessed. The mean value of serum albumin and creatinine were 2.88±0.5 g/dL and 11.93±7.78 mg/dL respectively. The BMI of the male and female patients in this study were 22.29± kg/m2 and 23.41 kg/m2 respectively while Mid-Upper Arm Fat Area (AFA) for the male and the female patients were 7.04±2.12 cm2 and 11.78±10.02 cm2 respectively. The protein and energy intake for the patients were also low compared to standard values.*
- *It is important to maintain nutritional status in CKD population.*

INTRODUCTION

Malnutrition is recognized to be a serious and common complication of Chronic Kidney Disease (CKD) and is associated with increased morbidity and mortality in children[1] and adults[2]. Approximately 80 percent of deaths due to chronic disease occur in low and middle income countries[3]. Hospital based data in Nigeria have reported prevalence rates expressed as ratios of hospital admissions of between 1.6 and 8%[4].

Biochemical analyses are routinely used to assess and monitor nutritional status in patients with CKD. However, none of the currently favoured biochemical nutritional markers have been demonstrated to accurately reflect nutritional status in CKD[5,6,7]. Nevertheless, serum albumin is still being widely used for research purposes and, in the clinical setting, as a biomarker of nutritional status[8].

There is paucity of data on the serum albumin, other biochemical markers of nutritional status and anthropometrics of patients with CKD in Ibadan, Nigeria. This study therefore seeks to bridge the gap.

MATERIALS AND METHODS.

Study design: This study was a cross-sectional study.

Study location: The study was carried out at the renal unit of the University College Hospital (UCH), Ibadan, Nigeria.

Study population and sample size:

A total of thirty-two (32) in-patients comprising of 21 males and 11 females were purposively selected and assessed. Chronic Kidney Disease (CKD) is defined as kidney damage or glomerular filtration rate (GFR) <60 mL/min/1.73 m^2 for 3 months or more, irrespective of cause[9].

Inclusion criteria:

Male and female adult patients who had been confirmed by nephrologists to have chronic kidney disease with GFR less than 60 ml/min/1.73 m^2 and those with end stage renal disease that were been treated with haemodialysis for a minimum of 2 months. The patients must have given their consent to participate in the study.

Exclusion criteria:

Any patient with CKD aged <18 years or patient with other serious medical condition such as cancer, HIV, hepatitis and those who refused to give their consent, were excluded from the study.

Data collection procedure:

A standardized semi-structured interviewer administered questionnaire were used to obtain information on the socio-demographic characteristics of the patients. Weight and height were assessed to determine body mass index (BMI) which was categorised as underweight (<18.5kg/m^2), normal weight (18.5-24.9kg/m^2), overweight (25-29.9kg/m^2) and obese (≥30.0kg/m^2).Calculations of mid-upper arm fat area (AFA) and arm muscle area (AMA) were based on measurements of mid-upper arm circumference (MAC) and triceps skinfold (TSF). AFA and AMA data were then compared with the data from the National Health and Nutrition Examination Survey (NHANES I and II)[10].

Formular 1: $$AFA\ (cm^2) = \frac{MAC \times TSF}{2} - \frac{\pi \times (TSF)^2}{4}$$

Formular 2: $$AMA\ (cm^2) = \frac{[MAC - (\pi \times TSF)]^2}{4\pi}$$

Blood was drawn to about ¾ of the capillary tube. Laboratory analysis was done to determine serum albumin, serum creatinine, urea, Pack cell Volume (PCV), sodium and potassium levels.

Dietary intake was determined by administering the foods served to the patients by the dietetics department, University College Hospital, Ibadan, Nigeria using direct weighing method for 3 days. The study days were 2 week days and one weekend. The protein and energy intake was then calculated using Total Dietary Assessment software.

Data Analysis: Quantitative data was expressed as mean ± standard deviation. Statistical significance was taken as $p<0.05$.

RESULTS

Table 1: Dietary intake of the patients

	Day	Range	Mean±SD
Body weight (Kg)		34	62.19±8.88
Protein (g/kg body wt)	Day 1	1.70	0.73±0.33
	" 2	1	0.64±0.35
	" 3	1.2	0.70±0.47
Mean protein		1.4	0.69±0.31
Energy (g/kg body wt)	Day 1	39.5	22.00±8.7
	" 2	42.2	20.52±10.38
	" 3	38.0	18.16±11.74

Mean Energy (g/ kg body wt)		30.67	20.21±8.41
Mean Energy		1473.86	1275.26±500.4

Table 2: Serum Albumin and other biochemical indices of the CKD patients.

	Range	Mean±SD
Albumin (g/dl)	2.1	2.88±0.50
Urea (mg/dl)	326	151.25±78.02
Creatinine (mg/dl)	28.0	11.93±7.78
Potassium (K^+) (mmol/l)	5.7	4.07±1.30
Sodium (Na^+) (mmol/l)	32	134.31±7.74
PCV (%)	27	22.66±5.77

Table 3: Anthropometric status of the patients

	Range	Mean±SD
Male		
Age (years)	53	39.57±12.91
BMI (Kg/m^2)	11.19	22.29±4.59
AFA (cm^2)	7.02	7.04±2.12
AMA (cm^2)	40.15	43.02±10.65
Female		
Age (years)	36	36.27±9.95
BMI (Kg/m^2)	20	23.41±6.39
AFA (cm^2)	32.72	11.78±10.02
AMA (cm^2)	25.19	32.70±8.20

Discussion

The kidney Disease Outcome Quality Initiative (K/DOQI)[9] Clinical Guidelines for nutrition and chronic kidney disease have recommended that BMI of heamodialysis patients be maintained in the upper 50th percentile, which would correspond to a BMI of at least 23.6 for males and 24.3 for females. The mean BMI of the males and females in this study were 22.29± kg/m^2 and 23.41 kg/m^2 respectively. This shows that the patients are at increased risk of mortality. In addition, Caravaca *et al.*[11] showed that patients with CKD not yet on dialysis within the lowest and the highest quartiles of BMI had higher mortality than the rest of patients, but when patients without comorbidity were studied apart, only those with obesity showed worse survival, suggesting that obesity had a noteworthy impact on mortality in these patients.

At ESRD stage, the effect of overweight (BMI: 25– 30 kg/m^2) or obesity (BMI: >30 kg/m^2) has been repeatedly associated with improved survival whereas, in contrast, a BMI <19 kg/m^2 was associated with increased mortality[12,13,14].

The result also shows that the Mid-Upper Arm Fat Area (AFA) for the male and the female patients were 7.04±2.12 cm^2 and 11.78±10.02 cm^2 respectively. When this was compared with their mean age of 39.57±12.91 years and 36.27±9.95 years respectively, it suggests that they were severely depleted when compared with the reference data compiled from National Health and Nutrition Survey (NHANES)[10].

On the contrary, the values of the Mid-Upper Arm Muscle Area (AMA) for the male and the female patients were 43.02±10.65 cm^2 and 32.70±8.2 cm^2 respectively which fell between 10th and 15th percentile for the males and between 50th and 75th percentile for the females. This however shows no depletion when the same parameters (i.e Mid-upper arm circumference and triceps skinfold) were used for both the AFA and the AMA.

The protein and energy intake for the patients were 0.69 g/kg/ body wt and 1275.26 kcal respectively. Other studies have also shown that patients with CKD consume an energy and protein-deficient diet[15]. This can be as a result of clinical features such as nausea and anorexia associated with CKD.

The mean value of serum albumin and Creatinine were 2.88±0.5 g/dL and 11.93±7.78 mg/dL respectively. These figures are significantly poor and this can be as a result of patients reporting late to the hospital[16]. Present analysis also supported the possibility that animal protein intake was related with serum albumin levels[17]. Hypoalbuminemia does not normally occur in otherwise healthy but malnourished individuals until near terminal starvation[18].

Conclusion

In patients with CKD and ESRD, in whom many catabolic signals dominate, it is critical to maintain a dietary protein and energy intake relative to needs. Treatment of concurrent conditions that contribute to catabolism, such as metabolic acidosis, insulin resistance, and systemic inflammation, is of paramount importance for the prevention of protein-energy wasting.

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