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Full length Research article

Effects of Protein Foods on the Nutritional Status of Adults with Moderate Chronic Renal Failure

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ABSTRACT: This study compares the efficacy of low- protein foods, from cooked beef (diet A), smoked cat fish (diet B), cooked beef and smoked cat fish (diet C) and cooked beef, smoked cat fish and hulled steamed red cowpea pudding (diet D)) on the energy intake, anthropometric indices, body mass index (BMI) and serum albumin of out- patient adults with moderate chronic renal failure(CRF). Thirty-two patients, 20males and 12 females with a mean age of 43.8+17.3 years were randomly distributed into four groups of eight patients each. Each group was placed on low protein diets, A, B, C and D respectively. Data collected at the baseline and at the end of the 6 months study were analyzed using range, means ±S.D, percentages as summary indices and analysis of covariance (ANCOVA) to compare the changes in the initial and the final values between the groups. Compared to the situation at the commencement of the study and regardless of the food protein sources in the LP diets, all the groups of patients on the LP diets had increased energy intake, body weight, mid-upper arm circumference, BMI, serum albumin and the haematocrit valves. However, increase in energy intake (188.17±118.20kcal/day) and BMI (0.86±0.07) was significantly higher in the patients on the B diet compared to the corresponding values ranging from 99.34±46.70 to 141.63±127.80kcal/day and 0.12±0.09 to 0.43±0.03 in the patients on diets A, C and D respectively (P=0.031). All the patients also had increase in their serum albumin and packed cell volume (PCV)values. Increase in the serum albumin (0.41±0.10g/dl) and PCV (1.43±0.37g/dl) of patients on diet B were significantly higher compared with the corresponding values ranging from 0.05±0.22g/dl to0.13±0.20g/dl in the patients on diet A, C and D respectively (P=0.031) Improvement in the energy intake, anthropometric indices, BMI and serum albumin was significantly greater in the patients that were prescribed the B diet and lowest in the group prescribed the beef and cowpea diet. It is recommended that fish protein should appear more frequently as a source of protein in the diet of patients with CRF

Key Words: *Efficacy of controlled intake, selected commonly eaten protein foods, chronic renal failure*

INTRODUCTION

Chronic renal failure (CRF) can be defined as a persisting and progressive deterioration of renal function leading to increasing retention of waste products of metabolism and a subsequent disturbance of the body's internal mileu, with glomerular filtration - serum creatinine level consistently above 174.6µmol/L. It is characterized by progressive loss of kidney function over a period of months or years. It ultimately results in end-stage renal disease (ESRD) where the renal mass is usually fibrotic and reduced in functioning capacity (Collins, 2000, Akinsola, 2004). Signs and symptoms, such as, hypertension, anemia, anorexia, loss of weight, also accompany it pains in the bones and joints, gastrointestinal bleeding, foul breath and ulceration of the mouth (Coresh *et al*., 2003). Chronic renal failure is usually irreversible, causing extensive disorders in appetite as well as in the metabolism of nutrients, ability to control water volume, acid-base balance and electrolyte concentration (Akinsola, 2004) Chronic renal failure, also causes loss of work time, disabilities and death (Coresh *et al*., 2003)

It is estimated that by 2010 over 2 million individuals will be on renal replacement therapy (RRT) worldwide (Lysaght, 2002; Drey *et al*., 2003). Chronic

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renal failure continues to be a major public health problem in all the nations of the world. It poses serious medical, social and economic problems with respect to the enormous cost of prevention and management of the disease all over the world (Arije *et al*., 1995). The high rate global increase over the years of ESRD reflects to some extent, the ageing of the population in the West and the steady increase in the number of those suffering from hypertension and diabetes nephropathy in developing countries. The majority of those having access to RRT live in the West where such facility and resources are available and affordable to manage ESRD. Those living in developing countries suffer from ESRD with little opportunities for dialysis or transplantation (EL Nahas and El Kossi, 2007).

The huge population burden of CRF needs urgent attention as it is likely to increase over the next decade in view of the global rise in chronic non-communicable diseases such as obesity, hypertension and diabetes which are, all known to have impact on CRF (Akinsola, 2004, El- Nahas and El- Kossi, 2007).

The management of CRF is cumbersome and demanding. So far, the management of CRF has been confined to the treatment of its complications namely, hypertension, proteinuria and uremia. An increasing number of patients with ESRD are treated with dialysis or renal replacement therapy (RRT). The management especially with dialysis or transplantation imposes economic burden on patients and has serious implications for a developing country like Nigeria. Cheaper methods are obviously needed (Akinsola, 2004). Experience worldwide has already demonstrated the potentials of proper dietary management of CRF, as very effective in mild and moderately severe cases, (serum creatinine level < 500μmol/L) (Akinsola, 2004). Patients with CRF often suffer from poor appetite and malnutrition and thus need nutritional monitoring to identify nutritional deficiencies early. (Morais *et al*., 2005) The main benefits of nutritional interventions are as follows; to minimize uremic toxicity; to avoid malnutrition; and delay progression of kidney disease (Toigo *et al*., 2000). Dietary management alleviates the symptoms of uremia and markedly reduces or slows down the progression of renal disease to ESRD, and stabilizes renal function regardless of the cause. However, the earlier the treatment is started the better the beneficial effects of L-P diet in CRF (Giovannetti, 1985). Akinsola(2004)and Fadupin *et al*., (2007 and 2008) also show that controlled dietary restrictions using low-protein diets can be effective in ameliorating the effects of renal insufficiency without inducing malnutrition in experimental albino rats with renal insufficiency.

An optimum nutritional status must be maintained along with the continuous management of patients with CRF, since protein-energy malnutrition is known to be a predictor of morbidity and mortality in patients with CRF (NKF/KDOQI, 2003).

It is of the utmost, importance to monitor closely the nutritional status of patients with CRF and also to examine the efficacy of our local staples in the maintenance of their nutritional status. Thus, the overall objective of this study is to compare the efficacy of low- protein diets from three commonly eaten different protein sources on the nutritional status of the non diabetic out-patients with moderate CRF in the pre-dialytic period who were attending the University College Hospital, Ibadan, Nigeria.

MATERIALS AND METHODS

A prospective clinical dietary study of out-patients with moderate chronic renal failure was conducted at the University College Hospital, Ibadan, Oyo State, Nigeria, from November 2007 to September 2008.The study involved monitoring the nutritional status of ambulatory adult pre- dialysed subjects with moderately severe CRF who were placed on low-protein diet (0.5gP/Kg body weight/day) obtained from three different protein sources, for a period of six months.

Subjects and methods

The study involved 32 ambulatory pre- dialysed adult subjects with moderately severe CRF of diverse etiology who were attending the Renal Outpatient Clinic of the University College Hospital (UCH), Ibadan, Oyo State Nigeria. The patients were referred to the Dietetic Clinic of the hospital for dietary counseling.

Inclusion criteria

Patients who have been confirmed by the nephrologists to have moderately severe chronic renal failure and were in the pre-dialytic period, who were treated as outpatients, were recruited for the study. Informed consent was obtained from every patient. The patients were ambulatory and had initial serum creatinine values of <500μmol/L or glomerular filtration rate (GFR) of <30mls/min/1.73m^2. The subjects presented no other systemic disease affecting any other major organ system that might alter the natural history of their renal disease. Thirty-two patients met the criteria.

Exclusion Criteria:

Patients with any other serious medical diseases such as cancer diabetes, cardiovascular diseases, HIV or sickle cells and those patients who did not comply with the prescribed diet were excluded from the study. Also

patients with uncontrolled hypertension or with clear evidence of protein – calorie malnutrition before the commencement of the study, pregnant patients and patients requiring dialysis initiation were excluded from the study. Thirteen patients were excluded from the study.

The patients included in the study were instructed about the study procedures and on how to keep a dietary diary. The 32 subjects who satisfied the criteria were consecutively randomized and enrolled into four groups II, III, IV, and I with each group having both males and females. Groups I, II, III and IV were assigned diets A, B, C and D respectively. Diets A, B, C and D consisted of cooked beef alone, smoked cat fish alone, cooked beef + smoked cat fish and combination of cooked beef, smoked catfish and steamed red cowpea pudding respectively.

Each of the subjects in the four groups of the diets had individual dietary counseling and was placed on either diets A, B, C or D supplying 0.5g protein/kg ideal body weight/day, 6-7mg phosphorus and 35 – 45 Kcal (140-168KJ)/Kg Bw/day, 20-40mEq sodium and 45mEq potassium per day, for a period of six months. Dietary sodium and potassium were restricted in all patients according to the presence or absence of uncontrolled hypertension oedema and the serum levels of sodium or potassium. The diets were basically the same in nutrients and calorie but differed exclusively only in their protein sources. Multivitamins and iron supplements were also prescribed by the nephrologists as necessary. The subjects were instructed to comply strictly with their diets in order to achieve the goal of the assigned diet. The subjects were seen every month by the dietitian who, at the first and last visit, checked the subjects' dietary diary, carried out a detailed dietary interviewand conducted a 24-hour dietary recall to estimate the dietary intake. The initial and final anthropometric assessment of height, weight and mid-upper arm circumference were also assessed. Each patient was counselled on his/her diets and was given a diet sheet to serve as a reminder at home to enhance maximum compliance with the prescribed diet. The subjects' food intakes, estimated from a 24-hour dietary recall, which was used by the dietician to evaluate protein and energy intake of the subject. All the subjects were strictly followed up for a period of six months by the dietitian and the nephrologists. The verification of the extent to which the subjects complied with the prescribed diet was performed carefully by a dietitian at each visit by means of the following procedures:

1. A dietary interview of the previous 24-hour diet of each subject, obtained from the patients and / or those members of their family who were taking care of their food preparation.
2. Written dietary diaries at 4 weeks interval were obtained from each subject.
3. The subjects body weight and mid upper arm circumference were checked at each visit.

Compliance with diet was scored as very good, good, fair or poor. All the patients had high blood pressure and received anti-hypertensive drugs throughout the study.

Data Collection: Data were obtained from each subject using interviewer administered structured pretested questionnaire to obtain information on the socio-economic data, clinical history of the illness, life style and dietary history of the subjects.The data collected at the first visit prior to the commencement of the test diet, and at the end of the study included the food intake, anthropometric data (height, weight, mid-upper arm circumference),BMI, serum albumin and the packed cell volume (PCV) of the subjects.

Statistical Analysis: The SPSS Package version 15.0 was used to analyse the data and were presented as range, mean ± SD and percentages where necessary. Statistical comparisons of the change in the initial and final values between the groups were performed using the analysis of co-variance. The effect of the different diets on the food intake, anthropometrics and biochemical indices of the subjects were also determined using the analysis of co-variance technique.

RESULTS

Socio-Economic Characteristics and Clinical History of the Subjects

Out of the 32 subjects enrolled in the study, eight subjects were assigned to each diet of the different protein sources. Table 1 shows the socio-economic characteristics and the clinical history of the 20 (62.5%) males and 12 (37.5%) females, aged 22-73 years who participated in the outpatient clinical dietary trial. Nineteen (59.3%), of the subjects had secondary, or less than secondary education. Twenty-two (68.8%) were either farmers, petty traders, artisans or retired civil servants while only 10(31.3%) were civil servants. This information indicates that majority of the subjects were of low socioeconomic status. Most of the subjects 23(71.9%) resided in Ibadan and twenty-five (78.1%) of them were Yoruba while others were either Igbo, 5(15.6%) or Hausa, 2(6.3%).

Twelve (37.5%%) of the subjects had chronic glomerulonephritis, 11(34.4%) hypertensive nephrosclerosis, 6(18.7%) chronic pyelonephritis, and 3(9.4%) polycystic kidney disease as the main cause of their renal failure.

All the subjects were hypertensive initially (mean systolic >140 mmHg and diastolic >90 mmHg with 24(75.0%) being aware of their hypertension for less than four years and 8(25.0%) were hypertensive for five or more years. All the subjects were on antihypertensive drugs but most of them, 22(68.7%) were not taking their drugs regularly.Many 12(66.6%) because of financial constraints, 3(16.7%); were once told that their blood pressure was normal, and 3(16.7%) occasionally forgot to take the prescribed drugs. High proportions 25(78.1%) of the subjects were diagnosed as having chronic renal failure less than a year before the study.

Table 1
The Socio-Economic Characteristics and the Clinical History of the Subjects

	TOTAL n (%)
Age	
21-30	3(9.4)
31-40	5(15.6)
41-50	9(28.1)
51-60	9(28.1)
> 60	6(18.8)
Education	
No Formal Education	4(12.5)
Primary	7(21.8)
Secondary	8(25.0)
Post – Secondary	10(31.3)
Tertiary	3(9.4)
Occupation	
Unemployed	0(0.0)
Farmer	1(3.1)
Petty Trader	9(28.1)
Artisan	4(12.5)
Civil Servant	10(31.3)
Retired Civil Servant	8(25.0)
Underlying Renal Disease	
Chronic glomerulonephritis	12(37.5)
Chronic renal failure 2^0 to hypertension	11(34.4)
Chronic pyelonephritits	6(18.7)
Polycystic kidney disease	3(9.4)
Presence of Hypertension	
Yes	32(100.0)
No	0(0.0)
Duration of hypertension	
<1 years	3(9.4)
1-2 years	11(34.4)
3-4 years	10(31.2)

Previous Life-Style and the dietary history of the Subjects

A large number 20(62.5%) of the subjects, mostly males, drank alcohol regularly. (Table 2) Most of the subjects, 17(90.0%) had done so for more than five years. Regular drinking of alcohol for more than 5 years was common among the male subjects. However, the prevalence of cigarette smoking, was very low 1(3.1%) among the subjects

Table 2
The Previous Life-Style and the Dietary History of The Subjects

	TOTAL n(%)
Regularly took alcohol	
Yes	20(62.5)
No	12(37.5)
Duration of intake of alcohol	
<1 years	2(10.0)
1-2 years	1(5.0)
3-4 years	5(25.0)
4-5 years	4(20.0)
> 5 years	9(45.0)
Ever smoked cigarette	
Yes	1(3.1)
No	31(96.9)
Duration of Smoking Cigarette	
<1 year	0(0.0)
> 1 year	1(100.0)
Are You a Vegetarian?	
Yes	0(0.0)
No	32(100.0)
Which of these protein Foods do you take?	
Meat only	0(0.00)
Fish only	1(5.0)
Cowpeas only	0(0.0)
Combination of the above	31(95.0)
How often do you take Proteinous foods per day	
Once	3(9.3)
2 times	16(50.0)
3 times	11(34.4)
> 3 times	2(6 .3)
Salt intake in meals	
Very little	1(5.0)
Moderate	22(68.9)
Add salt on table	9(28.1)
Adherence to diet	
Poor	3(9.3)
Fair	19(59.4)
Good	10(31.3)

TABLE 3
The Changes in the Nutritional Indices of the Subjects on the Different Diets

DIETS	**A**	**B**	**C**	**D**
(a) Energy Intake (Kcal)/day				
Initial	1961.73±183.7	1967.46±143.6	1977.51±154.7	1973.16± 113.7
Final	2130.19 ± 132.6	2155.63±101.4	2119.14±113.2	2072.50±93.5
Mean difference	138.46±129.3	188.17±118.20	141.63±127.80	99.34±46.70
(b) Body Weight (kg)				
Initial	54.81±4.61	54.78±4.52	54.83±4.60	54.87±4.52
Final	55.64±3.54	56.69±4.37	56.01±3.85	55.19±3.60
Mean difference	0.83±0.23	1.91±0.57	1.18±0.35	0.32±0.17
(c) Mid Upper-arm circumference (cm)				
Initial	25.09±0.67	25.06±0.79	25.10±0.27	25.10±0.32
Final	25.41±0.73	25.58±0.81	25.40±0.43	25.27±0.27
Mean difference	0.32±0.42	0.52±0.30	0.31±0.55	0.17±0.71
(d) Body Mass Index				
Initial	20.30±0.31	20.29±0.27	20.31±0.31	20.32±0.51
Final	20.61±0.12	21.16±0.11	20.74±0.16	20.44±0.32
Mean difference	0.31±0.02	0.86±0.07	0.43±0.03	0.12±0.09

Values are mean ± SD
Key: A= Cooked beef , B = Smoked cat fish, C=Cooked beef+smoked cat fish D=Cooked beef+smoked catfish+Dehulled steamed red cowpea pudding.

Table 4
The Serum Albumin and Packed Cell Volume of the subjects

SUBJECTS	**Types of Diets**			
	A (n = 8)	**B (n = 8)**	**C (n = 8)**	**D (n = 8)**
Serum Albumin (g/dl)				
Initial	4.23±0.33	4.36±0.38	4.36±0.32	4.02±0.58
Final	4.34±0.22	4.77± 0.35	4.49±0.57	4.07±0.27
Mean difference	0.11± 0.05	0.41± 0.10	0.13±0.20	0.05±0.22
PCV				
Initial	29.78±0.44	29.57±1.09	29.50±0.88	29.72±1.45
Final	30.87±1.00	30.90 ± 1.10	30.64±0.00	30.61±1.79
Mean difference	1.09± 3.27	1.43± 0.37	1.14±0.29	0.89±2.78

A = Cooked beef, B = Smoked cat fish, C = Cooked beef + smoked cat fish
D = Cooked Beef + Smoked Cat Fish + Dehulled steamed Red Cowpea pudding

None of the subjects was a vegetarian. Only 1(3.1%) was on fish protein di*et al*one, others, 31(96.9%) were on liberal-mixed diets consisting of different sources of protein food such as meat, fish, milk and cowpeas which they took two to three times a day

Only a few, 9(28.0%) (mostly males) usually add salt to foods on the table. Information from the dietary dairy kept by the subjects, the 24-hour dietary interviews by the dietitian with each subject and members of their families who prepared their foods indicated that 21(90.6%) of the patients complied well with the prescribed diet.

Energy Intake, Anthropometric Indices and Body Mass Index of the Subjects

As shown in table 3 the initial and final daily energy intake of the subjects was lower than the recommended daily energy allowance for male and female adults (3,000kcal and 2,200 kcal) respectively. No significant variation was observed in the initial daily energy intake between the groups of subjects on the different diets ($p>0.05$). However, at the end of the study, improvement in the daily energy intake of the subjects on the B diet (188.17±118.2kcal/day) was greater than the energy intake of the subjects on diet A (138.46±129.3kcal/day) or diet C (141.63±127.8kcal/day) or diet D

(99.34±46.7kcal/day). Subjects on the diet D ate the least energy among all the groups of subjects.

The anthropometric indices and the BMI of the subjects were also similar initially. At the end of the study these indices varied among the groups of subjects. The subjects on the B diets who had better energy intake, had significant improvement in their anthropometric indices (body weight, mid upper arm circumference) and BMI values than the other groups of subjects on the other types of diets ($P<0.05$). The subjects on the D diet who took the least energy also had the least anthropometric and BMI values.

The Serum Albumin, Total Protein and Packed Cell Volume of the subjects

The serum albumin, total protein and packed cell volume (PCV) of the subjects improved with each diet (Table 4). Although, the effects of the diets on the serum albumin and the total protein of the group of subjects was not significantly different ($P>0.05$). Diets A, B and C improved the PCV of the subjects significantly ($P<0.05$) while the D diet had insignificant effect in improving the PCV of the subjects compared with the other diets ($P>0.05$).

DISCUSSION

Chronic renal failure (CRF) and end-stage renal disease (ESRD) continues to be a major public health problem in the world. Although figures are lacking and the exact prevalence of CRF is not known in Nigeria, hospital based data indicate that the disease is a serious health problem, a common cause of morbidity, and mortality and a major health concern (Arije, Kadiri and Akinkugbe 1995; Alebiosu *et al*., 2006). The costs of treating CRF and ESRD continue to escalate and represents a barrier to the delivery and receiving of optimal care by the health care provider and the patients respectively.(Colling *et al*., 2000).Ther is need to develop a save and affordable treatment for patients in each locality.

Many studies such as Locatelli (1991), and Malvy (1997) had shown that CRF disproportionately affects people, and also indicate age, race, and gender differences in the incidence of chronic renal diseases. These studies had indicated higher male prevalence of CRF while the USRDS Annual Data Report (1991) also indicates a higher prevalence among African Americans, with predominance in males. Barsoun (2003) also indicate higher incidence of CRF in the North than in the Western part of Africa, with a higher prevalence among adults above 40 years of age. Similarly in this study, which was conducted in the South-Western part of Nigeria, where the people are mostly Yoruba, a significant difference was observed in the gender, age and the occupation of the patients ($P<0.05$). About two thirds of the participants were males and 75% of them were more than 40 years of age. As many as 56.3% of the patients were either retired civil servants or civil servants .

According to Alebiosu *et al*., (2006), the commonest causes of CRD among the patients attending the Olabisi Onabanjo University Teaching Hospital, Ogun State, Nigeria, were chronic glomerulonephritis, hypertensive nephrosclerosis and diabetes nephropathy. In this study, although patients with diabetes nephropathy were excluded in order to eliminate some possible factors, which might interfere with the patients' nutritional status due to diabetes, chronic glomerulonephritis and hypertensive nephrosclerosis were also the commonest causes of CRF among the patients .

Arije, Kadiri and Akinkugbe (1995) emphasized the financial burden of ESRD as enormous, considering the hospital visits, various hospital investigations, high cost of drugs and dialysis undertaken among other financial implication. In this study a high percentage of the patients were not taking their drugs regularly because of financial constraints and some because they were once told that their blood pressure was normal. This indicates the need for more support from the government to subsidize the cost of health care services and also to encourage continuous health education programmes for people with chronic diseases in Nigeria. Doing these will go a long way to help the people with chronic diseases, such as CRF, to cope financially and also know that chronic diseases such as hypertension, and CRF are long-term illnesses that could only be controlled and not cured .

The emergence and increase of chronic diseases such as hypertension, renal diseases, cardiovasanlar diseases, diabetes mellitus among other chronic illness have been reported to strongly relate to aging of the population, urbanization, socio-economic and lifestyle changes (Alebiosu *et al*., 2006). All these factors are known to favour sedentary habits, obesity, alcohol consumption, and high animal fat and salt intake which are risk factors for developing chronic diseases. Regular intake of alcohol for more than five years before the occurrence of CRF was common among the male patients in this study. However, notably rare was the regular smoking of cigarette among the patients. Also, none of the patients was a vegetarian but all the patients were on mixed protein diet consisting of meat, fish, eggs, diary products and legumes, which they were taking two to three times per day. The possible beneficial effect of vegetarian diet need to be investigated as such diet had been reported to prevent and lower the incidence of hypertension and cardiovascular diseases, in vegetarian African Adventists (Famodu *et al*., 1998). Addition of salt to

food after the food had been served on the table was common only among the male patients. This indicate the need for more nutrition education for the general populace for people to know that high salt intake is known to predispose an individual to the development of hypertension.

For many decades dietary restriction of protein, phosphorus, sodium and potassium has represented a cornerstone in the treatment of CRF or its metabolic consequences, due to its efficacy in reducing signs and symptoms of uremia, lessening the accumulation of waste metabolic products and protecting against hypertension and proteinuria (Cianciaruso *et al*., 2008). Also, considerable research had been done on which dietary factors influence renal disease with suggestions that comprehensive nutritional care is vital and fundamental in the management of CRF (Giovannetti, 1985, Cianciaruso *et al*., 2008).Information suggest that certain protein may have better potential and positive effects than the other in the management of CRF in man (Levey *et al*., (1996). However to date, the effects of the different degree of protein restriction in preventing the ESRD have not been resolved (Foque *et al*., 2006). Indeed the guidelines of different scientific societies still disagree on the amount of protein, which is able to satisfy the three critical requirements of the good metabolic control of renal failure, the minimum risk of malnutrition and reasonable patient compliance (The UK CKD Guideline 2005; National Kidney Foundation K/DOQI, 2003).

Reports such as Togo *et al*. (2000) indicates malnutrition and wasting as common features of severely uremic patients requiring dialysis.In this study none of the diet-treated groups exhibited classical signs of protein-energy malnutrition at the commencement of the study. The reason could be because the patients that participated in this study were the healthier group of the patient who did not require dialysis at the time of the study and were still responding well to conservative treatment such as diet therapy. Compared to the situation at the commencement of the study, and regardless of the food protein source in the diets, at the end of the study the four-diets treatment groups had improved energy intake, body weight, mid-upper arm circumference, BMI, serum albumin and PCV values.

The improvement in all the groups of patient further confirms the positive effects of LP diet in CRF. However, improvement in these indices was significantly greater in the group of patients that was prescribed the smoked catfish di*et al*one, than the groups prescribed the cooked beef di*et al*one or mixture of cooked beef and smoked catfish diet or mixture of cooked beef, smoked catfish and hulled steamed cowpea pudding diets ($P < 0.05$). The patients prescribed the mixture of beef; fish and cowpea diet took the least calorie and had the least nutritional indices. While those prescribed beef di*et al*one or beef plus fish were intermediate in their nutritional indices. Vegetable protein is known to have low biological value and hence the tendency to generate more urea which could induce and aggravate uraemic toxicity.

Inclusion of cowpea (a vegetable protein) in a fairly high proportion as source of protein may generate a high amount of urea, which could induce uraemic toxicity, disturbance in acid-base balance, which could cause a reduction in appetite and in the metabolism of nutrients. Although all the LP diets improuved the nutritional status of the patients, fish di*et al*one was found to be more efficacious on the nutritional indices of the patients than the other diets. Ciancianuso (2008) also reported no sign of malnutrition in the predialysis patients fed 0.5gp/kgIBW/day, who were followed up for 6-18 months. Some confounding factors such as patient different responses or level of blood pressure control might have interfered with the improvement of the nutritional status of the patients in this study, however, dietary restriction appears to have been the major factor responsible for the differences observed on the patients between the four different diets tested.

Indeed, all the patients were strictly and regularly followed up on their diets. Although they complained of the low salts in their foods, the blood urea was consistently lower than the initial values in all the subjects, indicating that the subjects compliance with the prescribed diet was good. Low- protein diet, if properly complied with, may not induce malnutrition in patients with moderate CRF.

Conclusion and Recommendation

The evidence from this study has shown that dietary protein restriction (0.5g/kg/IBW/day) is safe to manage predialysis patients with moderate CRF in Nigeria. Also among the different food protein sources tested, fish protein diet showed a better effect on the nutritional indices of the patients when compared with the other local sources of protein commonly eaten by the patients. This indicates that the types as well as the quantity of protein are important factor in the diet therapy of CRF. The major problem that may limit the efficacy of this level of dietary protein restriction is the adherence of patient to the diet and inadequate nutritional management of the patient, which include the strict follow up of the patient at the pre-dialytic phase by the dietitians. Close supervised LP can provide a save and cheap treatment for the early to moderately severe stages of CRF.

It is recommended that the nephrologists and dietitians should work closely together, as the coordinated approach of both specialists will go a long way to optimize the care provided to patients with

CRF. Egg white protein had been discovered to be very efficacious in improving the nutritional status of albino rats with renal insufficiency (Fadupin *et al*., 2008) Thus, the right quantity of fish in addition to an egg white protein is recommended as the main source of protein in the diet of patients with CRF.

REFERENCES

Akinsola W (2004): Chronic renal failure in Nigeria: The challenges of prevention and management. IFEMED Journal; 11:1:1-6.

Alebiosu C. O., Ayodele O. O. Abbas A and Olutoyin A. I. (2006): Chronic renal failure at Olabisi Onabanjo University Teaching Hospital, Sagamu, Nigeria. African Health Science; 6(3): 132-138.

Arije A, Kadiri S. Akinkugbe, OO (2000): The variability of hemodialysis as a treatment option for renal failure in a developing economy. Afr J. Med. Sci;29(3-4): 311-314

Arije A, Akindele KS, Kadiri S and Akinkugbe OO (1995): The problem of peritoneal dialysis in the management of chronic uremia in Nigeria. Tropical and Geographical Medicine; 47(2) : 74-77.

Barsoun, RS (2003): End stage renal disease in North Africa, Kidney International; 63:111 – 115.

Collins A, Xue JI, Ma Jz, Lois T (2000):. Estimating the number of patients and Medicare cost for end-stage renal disease in the US to year 2010. J. Am Soc. Nephrol; 11:133-135

Coresh J, Astor BC, Greene T (2003):. Prevalence of chronic kidney disease and diseased kidney function in adults US population: Third National Health Nutrition Examination Survey. Am J. Kidney Dis.; 41:1-12.

Cianciaruso B,Pota A, Pisani A, Torraca S, Annecchini R, Lombardi P, Capuano A, Nazzean PBellizzi V and Sabbatini M. (2008): Metabolic effects of two Low-protein diet in chronic renal disease stage 4-5,-a randomized controlled trial. Nephol Dial transplant 23: 636-644

Drey N, Roderick P, Mullee M, Rogerson M. A (2003): population-based study of the incidence and outcomes of diagnosed chronic kidney disease Am. J. Kidney Dis.; 42: 677 – 84.

El Nahas AM, and EL Kossi M. (2007): Chronic Kidney Disease Management: A look into the future. Tropical Journal of Nephrology;2:73-79

Fadupin G.T, Keshinro OO and Arije A (2007): The effects of Low and Normal protein soyabean based diets on chronic renal insufficiency in Rats. Tropical Journal of Nephrology;2 (2): 99-105

Fadupin G. T, Keshinro O. O, Arije A, Taiwo V. O. (2008): Effects of Controlled intake of Selected Protein foods on Nephrectomized Rats. African J. of Biomedical Research,; 11: 46-54.

Famodu A A, Osilesi O, Makinde Y O, Osonuga O A (1998): Blood pressure and blood lipid levels among vegetarians; semi- vegetarian, and non- vegetarian natives Africans Clinical Biochemistry, 31(7): 545-9.

Foque D, Laville M, Boissel JP (2006):. Low protein diets for chronic kidney disease in non diabetic adults Cochrane Database of systematic Review 2006, Issue 2. Art. No. CD001892. DQ1: 10: 1002/14651858. CD001892 pub 2.

Giovannetti S (1986): Answers to ten questions on the dietary treatment of chronic renal failure, on behalf of the Steering Committee of the European Study Groups for the Conservative Treatment of Chronic Renal Failure. Lancet; 11: 1140-2.

Giovananetti S (1985): Dietary treatment of chronic renal failure: Why is it not used more frequently? Nephron; 40:1-12

Levey As, Alder S, Cagguila AW, England BK Green T, Hunsicker LG, Kusek JW, Rogers NL, Teschan. PE (1996): MDRD Study Group: Effects of dietary protein restriction on the progression of advanced renal disease in the Modification of Diet in Renal Disease Study. Am. J.K. Kidney Dis; 27: 652-663.

Locatelli F, Alberti D, Grazani G, Buccianti G., Redaelli B, Giangrande A (1991): Prospective randomized, Multicentre trial of effects o f protein restriction on progression of chronic renal insufficiency. Northern Italian cooperative study group. Lancet: 337 (8753): 1229 -304.

Lysaght MJ (2002): Maintenance dialysis population dynamics: current trends and long-term implications. J. Am Soc. Nephrol; Suppl: 537-40

Malvy D, Maingrourd C, Pengloan J, Bagros P, Niver H. (1999): Effects of severe protein restriction with ketoanalogues in advanced renal failure. Journal of the America College of Nutrition, : 18(5): 481-6.

National Kidney Foundation Kidney Disease Outcome Quality Initiative Advisory Board. K/DOQ1 (2003):. Clinical Practice Guideline for Chronic Kidney disease Evaluation, classification and stratification. Guideline 9. Association of level of GFR with Nutritional status. Am J. Kidney Dis, , 39 (2suppl): 5128-5142.

Rosman JB, Langerk, Brand 1 M, Piers-Becht TP, Vander-Hem GK *et al*. (1989): Protein restriction diets on chronic renal failure. A four year follow up. Kidney International Suppl; 27: 96 – 102

The UK CKD Guideline on Renal Association website: http://www.renal.org/CKDguide/ckd.html.

Toigo G. Aparico M, Atman PO, Cano N, Cianciaruso B *et al* (2000); Expert Working Group report on nutrition in adult patients with renal insufficiency (Part 1 and 2). Clinical Nutrition; 197- 207.

US Renal Data System, USRDS (1991) Annual Data Report, Bethseda, MD: National Institute of Diabetes and Digestive and Kidney diseases, National Institute of Health,1991 US Renal Data system.