Effectiveness of Individual Nutritional Counseling in Improving Biochemical Indices and Nutrition Knowledge of Chronic Kidney Disease Patients

Anshu Chaturvedi, Ila Joshi

Abstract

Aim: The aim of the present study was to assess the impact of nutritional counseling on biochemical parameters and nutrition knowledge of chronic kidney disease (CKD) patients. **Materials and Methods:** The study was conducted on 70 CKD patients, stages 3 and 4, between 25 and 80 years of age. The baseline data were collected from Fortis Hospital, Jaipur, Rajasthan, using interview schedule, which included information on demographic profile, anthropometric measurements, biochemical parameters, medical history, and dietary pattern of the patients. The nutritional counseling was conducted in two phases, the first phase included counseling that was imparted to patients on the basis of their biochemical parameters, followed by monitoring for 4 weeks. Thereafter, second phase counseling, based on results obtained from the first phase, was imparted. The data were once again collected and analyzed after a period of 12 weeks. **Results and Conclusion:** Hypertensive nephropathy was the most common cause of CKD, followed by diabetes mellitus and glomerulonephritis. Anthropometric measurements showed little change in mean body mass index of the patients, post counseling, however, nonsignificant. On the other hand, a significant decrease was observed in serum creatinine, blood urea nitrogen, serum potassium, and serum phosphorus levels. Nutritional counseling exhibited a strong positive impact on nutrition knowledge of CKD patients.

Keywords: Blood urea nitrogen, Chronic kidney disease, Creatinine, Glomerulonephritis, Nephropathy

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Introduction

Chronic kidney disease (CKD) is an inflammatory disease of public health concern since its high risk of progression to end stage renal disease.[1] CKD causes severe irreversible losses to the kidneys that lead to impaired functioning related to fluid, electrolytes, and metabolic imbalances in the body.[2,3] A study conducted in the United Kingdom, reported prevalence of CKD, in general populations, at five different stages, which was 3·5 percent at Stage 1 (estimated Glomerular Filtration Rate [eGFR] >90 ml/min/1.73m^2); 3.0–9.0 percent at Stage 2 (eGFR 60–89 ml/min/1.73m^2), 7·6 percent at Stage 3 (eGFR 30–59 ml/min/1.73m^2); 0–4.0 percent at Stage 4 (eGFR 29–15 ml/min/1.73m^2) and 0–1.0 percent at Stage 5 (eGFR<15 ml/min/1.73m^2).[4] Whereas, its prevalence in India has been reported to be 17.5 percent, which is in line with the global CKD prevalence that ranges from 8 percent to 17 percent.[5] Various studies carried out worldwide reveals, occurrence of malnutrition among CKD patients of nearly 18–75 percent, causing increase in morbidity and mortality of this population.[6,7] This disease demands extensive nutrition education for change in the diet of CKD patients, as well as, in their lifestyle at large extent.[8] By the process of individual education, people receive knowledge regarding practical approach to the diet and thus quality of life can be improved.[9] The objective of the study was to assess the impact of individual nutritional counseling on the biochemical parameters and nutrition knowledge of the CKD patients.

Materials And Methods

The study was conducted in Fortis Hospital, Jaipur, Rajasthan on 70 CKD patients of stages 3 and 4 (aged between 25 and 80 years), selected irrespective of their sex. Informed consent forms were collected from the patients after explaining them the purpose

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of the study. Data were collected using pre-tested interview schedule, which included information on age, sex, education, marital status, occupation, and annual income of the patients. Body weight, height, waist, and hip circumferences were measured and data on complete medical history of the disease was collected. Information on dietary pattern was also gathered. Data on biochemical parameters viz. serum albumin, serum total protein, serum creatinine, serum blood urea nitrogen (BUN), serum uric acid, serum sodium, serum potassium, serum calcium and serum phosphorus was extracted from the patients' medical reports. For calculation of estimated Glomerular Filtration Rate (eGFR), Modification in Diet in Renal Disease equation was used. The total patients (n = 70) were divided into 2 groups – Experimental and Control, each having 35 patients. Those falling in the experimental group were provided extensive nutrition counseling (twice in a week) on one to one basis, looking into their biochemical profile.

During counseling, each and every patient of the experimental group, was given an individualized diet chart, which was prepared

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as per their nutrient requirements. The diet chart was prepared following the guidelines given by of National Kidney Foundation/Kidney Disease Outcomes Quality Initiative and finalized after taking inputs from the concerned nephrologist of the hospital.[10] A food diary was also provided to them for noting down daily meal pattern. To improve the effectiveness of nutritional counseling, various educational materials, such as pamphlets and recipe booklet, were also prepared and distributed to the patients. After a period of 4 weeks from the first counseling and 8 weeks from the second counseling, the data were collected and analyzed to assess the impact of nutrition intervention. To calculate results, frequency, mean, standard deviation and paired t-tests (P = 0.05) were applied on the raw data.

RESULTS

The results revealed mean age of the CKD patients to be 54.48 ± 16.67 years with majority of them as male (71.43%), Hindu (91.42%), educated up to graduation/post-graduation level (45.71%), married (82.86%), lived in nuclear family (72.9%), and had annual income between Rs. 3.5 and 7.0 lakhs (47.14%) [Table 1]. The etiology of the disease showed hypertension (42.86%) as the most common cause of CKD, followed by diabetes mellitus (17.14%) and glomerulonephritis (1.43%). The other causes of the disease included side effects of medicine overdose and surgery and severe medical illnesses.

The anthropometric measurements, pre and post counseling, showed a decrease in the number of patients falling in the categories of underweight (<18.5 kg/m²) and obesity (30.0–39.9 kg/m²), by 6 and 9 per cent, respectively [Table 2]. This could be due to improvement in their body mass index (BMI), exhibited by shift of patients from underweight category to normal weight category (5.72%) and from obesity to overweight category (8.57%). Shifting of patients to better BMI categories could be interpreted as the beneficial impact of nutrition intervention. On the other hand, no change was observed in the control group. Waist-hip ratio (WHR) of the patients too, showed no change in both, experimental and control groups, however, central obesity was found to be more among female patients (77.77%), than their male counterparts (42.31%).

Biochemical indices of the patients obtained, pre and post nutrition intervention, are presented in Table 3. The serum albumin level showed a significant improvement in the experimental group patients, while among the patients of control group, the same reduced from 3.06 ± 0.59 g/dl to 2.97 ± 0.57 g/dl. Similarly, serum total protein was found to improve from 6.36 ± 1.08g/dl to 7.55 ± 0.40g/dl, among experiment group patients and the improvement was highly significant. In control group patients, however, slight improvement was seen. Further, mean serum creatinine decreased post counseling, among experimental group patients, from 3.53 ± 1.53 mg/dl to 3.35 ± 1.42 mg/dl; whereas, it was found to increase in the control group patients (from 4.11 ± 2.50 mg/dl to 4.71 ± 2.37 mg/dl), which is an alarming sign of progression of the disease. Similar pattern was observed for mean serum BUN, which significantly decreased (by 20%) post counseling, among experimental group patients. The same increased in the control group from 69.08 ± 33.41 mg/dl to 71.51 ± 41.81 mg/dl, indicating decline in the kidney function. Effect of nutritional counseling was also seen on mean values of serum electrolytes that is serum sodium and serum potassium and also on serum phosphorus. These were found to reduce significantly in the experimental group patients.

Impact of nutritional counseling, on nutrient knowledge of patients, with regard to protein, sodium, potassium and phosphorus, was also studied. Knowledge scores obtained were categorized as poor, moderate, and good. Mean knowledge score for protein among experimental group patients was 3.89 ± 2.68, which showed significant increase to 8.06 ± 2.38, post counseling [Figure 1]. The findings further revealed most of the patients to believe fruits to

Table 1: General characteristics and Etiology of CKD patients

Characteristics	Number of patients (n=70)
Age (years)	54.48±16.67
Female:Male ratio	1:2.5
Religion - Hindu (%)	91.42
Type of family- Nuclear (%)	72.9
Education- Graduation/ Post graduation (%)	45.71
Annual income- Rs. 3.5–7.0 lakhs (%)	47.14
Primary cause of CKD	
Hypertension (%)	42.86
Diabetes Mellitus (%)	17.14
Both Hypertension and Diabetes Mellitus (%)	15.71
Glomerulonephritis (%)	1.43
Any other* (%)	22.86

Mean±SD, *Severe medical illness, medicine overdose, related to surgery, CKD: Chronic kidney disease
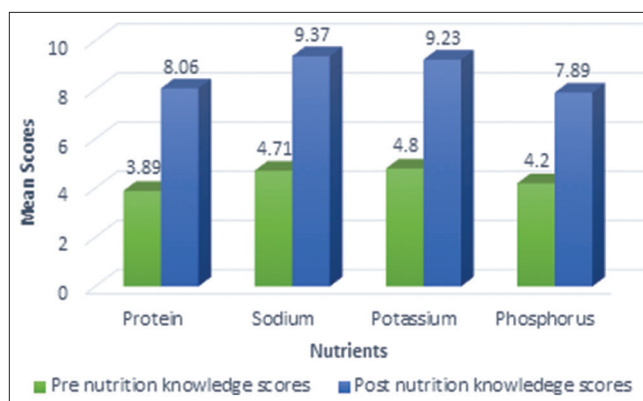

Figure 1: Mean scores of pre and post nutrition knowledge of experimental group patients

Table 2: Frequency distribution of CKD patients on the basis of their BMI - pre and post intervention

BMI (kg/m²)	Pre intervention		Post intervention	
	Experimental group (n=35)	Control group (n=35)	Experimental group (n=35)	Control group (n=35)
<18.5 (underweight)	3 (8.57)	0 (0.00)	1 (2.86)	0 (0.00)
18.5–24.9 (normal)	16 (45.71)	12 (34.29)	18 (51.43)	12 (34.29)
25.0–29.9 (overweight)	8 (22.86)	18 (51.43)	11 (31.43)	18 51.43)
30.0–39.9 (obesity grade 1)	8 (22.86)	5 (14.29)	5 (14.29)	5 (14.29)

BMI: Body mass index, CKD: Chronic kidney disease

Table 3: Mean values of biochemical parameters of CKD patients - pre and post intervention

Biochemical parameters	Experimental (n=35)			Control (n=35)	
	Pre intervention Mean±SD	Post intervention Mean±SD	P-value	Pre intervention Mean±SD	Post intervention Mean±SD
Serum albumin (g/dl)	3.46±0.63	3.84±0.34	0.001**	3.06±0.59	2.97±0.57
Serum total protein (g/dl)	6.36±1.08	7.55±0.40	0.000**	6.06±0.89	6.20±1.16
Serum creatinine (mg/dl)	3.53±1.53	3.35±1.42	0.037*	4.11±2.50	4.71±2.37
Serum BUN (mg/dl)	50.34±19.95	38.17±17.38	0.005**	69.08±33.41	71.51±41.81
Serum uric acid (mg/dl)	6.06±2.23	5.16±1.51	5.405NS	6.28±2.31	5.58±1.53
Serum sodium (mEq/l)	136.16±4.62	138.57±2.98	0.014*	132.14±6.30	134.14±7.62
Serum potassium (mEq/l)	4.88±1.00	4.46±0.49	0.032*	4.65±1.10	4.81±0.93
Serum calcium (mg/dl)	8.26±1.15	7.91±0.82	0.094	8.16±1.37	8.27±1.24
Serum phosphorus (mg/dl)	5.04±1.32	4.15±0.77	0.000**	4.48±1.28	4.90±1.79

*Statistically significant ($P \leq 0.05$), ** Statistically significant ($P \leq 0.01$), NS: Non significant, BUN: Blood urea nitrogen, CKD: Chronic kidney disease
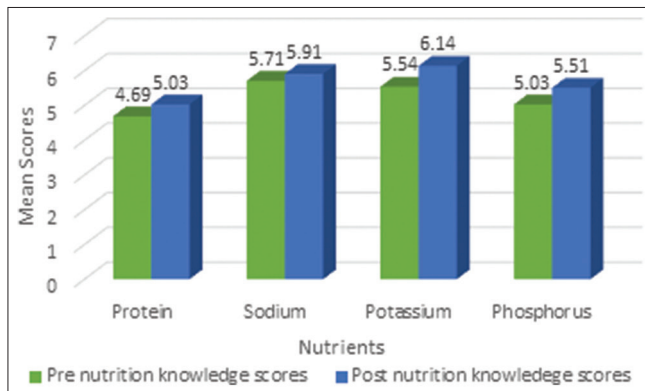

Figure 2: Mean scores of pre and post nutrition knowledge of control group patients

be rich in protein and excluded them completely from the diet. Nutritional intervention, made them aware of correct sources of protein. A slight increase was also observed in the mean knowledge score of control group patients [Figure 2]. Post intervention, majority of the patients got awared of foods both, rich in sodium, as well as, low in sodium and the mean nutrient knowledge scores increased significantly from 4.71 ± 2.84 to 9.37 ± 2.51. On the other hand, knowledge score remained almost same in the patients of control group. Unlike other nutrients, dietary misconception related to potassium was also found among CKD patients. Mean knowledge scores for potassium, increased significantly among experimental group patients (from 4.80 ± 3.45 to 9.23 ± 2.62); whereas, a slight increase was observed among control group patients. Similar pattern was also observed in mean knowledge score for phosphorus containing foods. The increase in score was significant (4.20 ± 2.71 to 7.89 ± 2.21) post counseling among experimental group patients.

Discussion

Nutrition counseling for patients with renal disease or CKD plays a key role in the preservation of renal function and overall maintenance of the renal system.[11] The findings of the present study showed improvement in the BMI of patients, post counseling, however, another study on CKD patients showed reduction in the mean body weight and BMI of experimental group patients.[12] It was seen that the patients were able to maintain their body weight from baseline period till the last follow-up. The WHR revealed abdominal obesity to be more prevalent among female patients than the male patients.[13]

For patients with late stages of CKD and end-stage kidney disease, a modified diet is advised to avoid arrhythmias, bone disorders, fluid overload, vascular calcification, and hypertension. The diet seeks to decrease the build-up of micronutrients in the blood.[14] Modified diet and intensive counseling showed positive impact on serum levels of various components among experimental group patients and a significant decrease was observed in serum creatinine, BUN, potassium and phosphorus levels, whereas, a study carried out on adults with eGFR <60 ml/min/1.73m², revealed no impact of intensive counseling on above mentioned serum parameters.[12] Significant increase in serum albumin, total protein and sodium was observed; though, the values were within respective reference ranges. Other than these parameters, serum uric acid and serum calcium reduced post counseling. The reduction in these values was nonsignificant; however, found to be within respective reference ranges. Imparting nutritional tip is another effective way of providing a practical nutrition education message by which patients can make small changes in their food choices. There is variety of approaches in dietary counseling for delivering the message to patient such as one-to-one counseling, group counseling, and involvement in patient and family support groups.[11] Almost similar tools were used in the present study, and significant improvement was observed in the knowledge of the patients with regards to nutrients, which particularly affect laboratory values of renal patients, such as, protein, sodium, potassium, and phosphorus. The patients could identify the appropriate quantity, as well as, quality of protein and other nutrients to be consumed in their diet.

Conclusion

Nutritional counseling is an important tool to impart nutrient knowledge to the patients suffering from CKD. An effective, one to one nutritional counseling along with follow-up, at appropriate intervals, can improve the quality of life by keeping biochemical parameters within range and their by delaying decline in kidney functions.

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