Impact of Nutrition Education on Nutritional Status and Quality of Life of Hemodialysis patients

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Abstract

Background:Hemodialysis is the most common treatment for patients with End Stage Renal Disease, it has negative impacts on the patient's nutritional status and quality of life. This study aimed to assess the impact of nutrition education interventions on the nutritional status and quality of life of haemodialysis patients.

Methodology: It was a single-blind, randomized controlled trial conducted on 70 hemodialysis patients from the Dialysis Unit of the Tertiary Care, Mahatma Gandhi MissionHospital. The patients were randomly divided into two groups of 35 each: control and experimental. Nutrition education was given to the experimental group for three months.Data on anthropometric measurements, biochemical parameters, dietary intakes, and the quality of life of patients were collected before and after intervention.

Results: Before intervention, no significant difference was found between the two groups for anthropometric, biochemical parameters except for albumin and phosphorus, nutrient intakes and quality of life. After intervention, the levels of uric acid, Blood Urea Nitrogen, phosphorus and potassium were significantly lower in the experimental group than in the control group. The selection of food items after intervention changed considerably, which signifies the impact of nutritional education on behavioural change. An overall poor quality of life was observed among the patients, with a highly significant increase only in the physical aspect of life in the experimental group after intervention.

Conclusion: The study concludes that a multicomponent nutritional education can help to improve the nutritional status by promoting a healthy behavioural change among haemodialysis patients with adequate nutritional knowledge.

Keywords: Hemodialysis, nutrient intakes, nutrition education intervention, quality of life, nutritional status

Introduction

Chronic Kidney Disease (CKD) is a global public health problem with a rising prevalence.Global allage prevalence and mortality from CKD increased by 29.3 and 41.5%, respectively, between 1990 and 2017. [1] The percentage of mortality in India related to renal failure was 38% in 2013.^[2] Kidney failure also called End Stage Renal Disease is the final permanent stage of CKD which arises when the GFR drops below 15ml/min/1.73 m².^[3] When there is a kidney failure, either dialysis or a renal transplant is the treatment to replace the function of failing kidneys. Hemodialysis is the most common form of dialysis, in which the blood is removed from the body through a needle and is passed further in a dialyzer, where the dialysate flows in the opposite direction of the blood, in an extracorporeal circuit.^[4] Depending on the patient's status before the dialysis, the concentration of electrolyte is adjusted and after filtration, the blood is transported back to the body. Though dialysis is a procedure, it may life saving have many

deteriorating effects on individual's health. Most dialysis patients suffer from undernutrition, a serious illness marked by Protein Energy Wasting and vitamin deficiencies.^[5] This results in abnormal energy and aberrant amino acid metabolism. The immune defensemechanisms and the body homeostasis gets severely disrupted, which greatly influences the prognosis.^[6] So, there is a need to provide accurate information regarding the required diet to them. Besides affecting their nutritional status, patients undergoing dialysis have a poor quality of life, which affects their physical, psychological, social and environmental wellbeing.^[7] It has become a necessity to assess the quality of life of these patients. The nutritional health of an individual who is undergoing hemodialysis is utmost important and a proper nutritional education can help them in reduce the complications and improve the overall quality of life.Therefore, the objectives of the study wereto assess the impact of nutrition education intervention on the nutritional status and quality of

life of hemodialysis patients in a tertiary care hospital.

Methodology

Study design: The study was single- blind, randomized controlled trial conducted on 70 haemodialysis patients referred todialysis unit of Mahatma Gandhi Mission (MGM) hospital, Kamothe, Navi Mumbai.in this research, the patients received informed consent forms according to the inclusion criteria (patients aged 18–70 years and at least two sessions of dialysis per week, at least 3 months of dialysis history. The study was approved by Institutional Ethics Committee, MGM Dental college and Hospital (MGM/DCH/IEC/084/2021).

Sampling: The participants for the intervention group (35patients) were randomly chosen from patients undergoing hemodialysis on Monday, Wednesday and Friday in order to prevent interparticipant interaction between the two groups and for the control group, 35 patients were chosen who used to come for hemodialysis on Tuesday, Thursday and Saturday. The nutrition education intervention was carried out for the experimental group.

Data collection:Socioeconomic status was assessed by Kuppuswamy scale,2021.^[8]Anthropometric measurements such as Heightand weight were assessed with the help of a standardized anthropometric rod and weighing scale respectively. BMI was classified by the Asian BMI categorical classification of the World Organisation (WHO).^[9] Biochemical Health parameters were estimated on a fully automated AU480 Beckman Coulter biochemistry analyzer. The values were compared with the reference levels given by Shah et al, 2018.^[10]Diet history was taken using the 24-hour recall method and nutrient intakeswere calculated manually using the Indian Table (IFCT).^[11] Food Composition Food consumption patterns were assessed by the Food Frequency Questionnaire. The Quality of Life (QoL) was assessed by the WHO QoL Instrument, Short Form.^[12]

Intervention: After the baseline data collection of bothgroups, nutritional education was given to the experimental group for a period of 3 months. The

different aids of teaching were used to provide information to the patients and their relatives which included individual and group counseling. The aids were prepared with the help of KDIGO, guidelines (2012)^[13] on the nutritional management of CKD and IFCT.^[11]The guidelines were assessed by an established renal dietitian and a nutritionist. A 15-20-minute session was taken for the experimental group with the help of a brochure on dietary guidelines for patients on hemodialysis. An easyto-read brochure along with an audio-visual aid in the form of a video was prepared in the language best suitable for the patients, which offered indepth coverage of food items to be included and excluded in the diet. Different sessions were planned as per the week as given in Table 1.After sessions were completed, regular reminders through phone calls were given to the experimental group to follow the dietary guidelines as explained. A follow- up after every 15 days was taken to note the progression of the intervention. On the other hand, the control group was only provided with a printed brochure of dietary guidelines. In the post interventional phase, reassessments of the same measures were done on both groups to see the impact of education provided to the experimental group. After the completion of the study, the education intervention was carried out on the control group as well to improve the nutritional status and quality of life.

Data Analysis: Data analysis was done using IBM SPSS Statistics 25.0.Categorical variables were presented as frequency and percentage, and continuous variables were presented as mean and standard deviation. Comparisons of means between control and experimental groups were performed using an independent t-test, whereas a paired t-test was used to compare the before and after data within the group.A p value less than 0.05 was considered statistically significant.

Results

The data of all 70 subjects was included for analysis, as no subject dropped out during the study and no new medications were started for any patient during the course of the study, which could have had an impact on the results.

Session1	A brief explanation of the study's objectives							
	Importance of nutrition, Information on different food groups and food sources, healthy eating habits and advice on how to break unhealthy eating habits.							
Session 2	The process of hemodialysis and its side effects; the importance and benefits of following a proper diet in reducing the ill effects of hemodialysis on the health status							

Table:1 Educational contents

Session 3	An in-depth coverage of food items to be included and excluded in the diet. Counseling on adaption of a new dietary pattern and lifestyle that would result in a better nutritional outcome.
Session 4	Reviewing and summarizing the content

Table 2: Mean anthropometric measurements of the control and experimental group (Pre and Post)

	Pre-Int	ervention		Post- Inter	t, p value			
Parameters	Control	Experimenta l	t, p value	Control	Experimen tal			
	N=35	N=35		N=35	N=35			
Mean ± SD								
Height (cm)	160.42 ± 5.8	161.6 ± 5.5	0.942,0.349	160.42 ± 5.8	161.6 ± 5.5	-		
Weight (kg)	50.8 ± 6.4	50.5 ± 6.9^{b}	0.201,0.840	51.2 ± 6.6	$54.2\pm8.7^{\rm b}$	-1.712,0.09		
BMI (kg/m ²)	19.7 ± 2.4	$19.4\pm2.7^{\rm b}$	0.523,0.602	19.9 ± 2.4	20.6 ± 2.9^{b}	-0.986,0.32		

'a' and 'b' denote significant differences between pre and post of the control and experimental groups respectively ($p = \langle 0.05 \rangle$). *Significant difference between the groups at pre and post intervention. Significant differences are highlighted in bold.

	Pre - Interve	ntion		Post Intervention			
BIOCHEMICAL PARAMETERS	Control	Experimenta 1	t, p value	Control	Experimental	t, p value	
	N=35	N=35		N=35	N=35		
Total Protein	69 ± 0.7	67+07 ^b	1.28,	70 ± 0.8	7.7 ± 0.7^{b}	-3.980	
g/dL	0.9 ± 0.7	0.7 ± 0.7	0.2045	7.0 ± 0.8	1.1 ± 0.1	0.0001	
Albumin	3.6 ± 0.4^{a}	$3.2 \pm 0.5^{\text{b}}$	2.91,	3.7± 0.4 ^a	$4.2 \pm 0.6^{\text{b}}$	-3.620	
mg/mmol			0.0048*			0.0005*	
Globulin	3.3 ± 0.6 ^a	$3.4 \pm 0.7^{\text{ b}}$	-0.611,	3.5± 0.6 ^a	4.0 ± 0.7 ^b	-2.825	
g/L			0.5432			0.006*	

Hemoglobin g/dL	9.1 ± 1.7 ª	9.2 ± 1.7 ^b	-0.240, 0.8109	9.9 ± 1.7 ^a	11.0 ± 1.8 ^b	-2.424 0.01*
Uric Acid Mg/dL	6.8 ± 1.4 ^a	6.9 ± 1.5 ^b	-0.174, 0.8620	6.2 ± 1.5^{a}	4.8 ± 1.6 ^b	3.616 0.005**
BUN mg/dL	52.5± 14.6	54.2 ± 16.9 ^b	-1.21 ,0.2289	48.6± 13.6 ^a	44.8± 13.1 ^b	2.175 0.03*
S. Creatinine mg/dL	9.1±2.5ª	8.5 ± 3.2 ^b	0.798, 0.4275	8.4 ± 2.4^{a}	7.6 ± 2.7 ^b	1.402 0.165
Sodium mEq/L	133.6±4.3	133 ± 4.8 ^b	0.489, 0.6259	133.7± 3.7	132.2 ± 4.7 ^b	1.44 0.152
Potassium Mmol/L	5.6 ± 0.6 ^a	5.4 ± 0.8 ^b	1.223, 0.2294	$5.1\pm0.7^{\rm a}$	4.5 ± 0.7 ^b	3.35 0.001*
S. Calcium mg/dL	8.8 ± 0.8	8.5 ± 0.8 ^b	1.451, 0.1512	8.9 ± 0.9	9.6 ± 0.8 ^b	-3.18 0.002*
S. Phosphorous mg/dL	6.8 ± 1	7.1 ± 1.3 ^b	-2.688, 0.009*	6.7 ± 1.0	5.1 ± 1.4 ^b	5.476 0.00001*

'a' and 'b' denote significant differences between pre and post of the control and experimental groups respectively ($p = \langle 0.05 \rangle$).*Significant difference between the groups at pre and post intervention. Significant differences are highlighted in bold.

Table 4: Nutrient intake of the control and experimental group (Pre and Post)

NUTRIENT	Pro	e-Intervention		Post Intervention		
S	Control	Experimental	t	Control	Experimental	t

	N=35	N=35	p value	N=35	N=35	p value
Energy	1375 7 ± 51 /a	1366 2 ± 40 2 ^b	-1.516	1518.1 ±	1832 5 ±53 1 ^b	-24.039
(kcal)	15/5./ ± 51.4	1300.2 ± 49.2	0.134	55.4ª	1032.3 ±33.1	0.00001*
Protein	137 + 5 6 ^a	131+56 ^b	0.466	167±53a	50 3 ± 5 5 ^b	-2.758
(gm)	43.7 ± 3.0	43.1 ± 3.0	0.642	40.7 ± 5.5	50.5 ± 5.5	0.007*
Carbohydra	176 + 12 5	175 2 ± 12 1 ^b	0.271	$178.5 \pm$	240.2 ± 16.0b	-17.266
te (gm)	170 ± 12.3	175.2 ± 12.1	0.786	12.7	240.2 ± 10.7	<0.00001*
Fat (am)	50 4 + 4 5	40 3 ± 4 8 ^b	0.981	40.5 + 5.8	$44 \pm 40^{\text{b}}$	4.253
rat (giii)	30.4 ± 4.3	49.3 ± 4.8	0.330	49.3 ± 3.8	44 ± 4.7	0.00006*
Sodium	2223 4+ 431 6	2335.8 ±	-0.997	2209.5 ±	1000 7 ± 423 5 ^b	3.049
(mg)	2255.4± 451.0	427.4 ^b	0.322	423.7	1900.7 ± 423.5 *	0.003*
Potassium	2276 1 + 285 0ª	2255 + 282 2b	-0.86	2030.6 ±	1066 2 ± 410 8 ^b	0.593
(mg)	2270.1 ± 385.9	2355 ± 362.3	0.392	493.1 ^a	1900.2 ± 410.8	0.554
Phosphorou	1222 ± 211 a	1211 + 212 7 ^b	0.216	1234.9 ±	1126 4 ± 242 1 ^b	1.613
s (mg)	1322 ± 211	1311 ± 213.7	0.829	268 ^a	1130.4 ± 242.1	0.111
Calcium	820.0 + 131.6	832.6 ± 130.0	-0.084	836.5 ±	1004.3 ± 120.0^{b}	-8.357
(mg)	027.7 ± 131.0	b	0.932	128.9	1074.3 ± 129.0	0.00001*

'a' and 'b' denote significant differences between pre and post of the control and experimental groups respectively ($p = \langle 0.05 \rangle$).*Significant difference between the groups at pre and post intervention. Significant differences are highlighted in bold.

Table 5: Ouality	of life of the contro	l and experimental	group (P	re and Post)
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	Pre-Inter	vention	Post- Intervention		t, p value	
DOMAINS	Control	Experimental	t,p value	Control	Experimental	
	N=35	N=35		N=35	N=35	
PHVSICAL	11.25 ± 1.02^{a}	11 7 + 1 1 ^b	0.2097	11 7 + 1 1 ^a	13.3 ± 1.0^{b}	-6.139
THISICAL	11.25 ± 1.02	11./ ± 1.1	0.834	11.7 ± 1.1	13.3 ± 1.0	0.00001*
PSYCHOLO	116+14	11.6 ± 1.3^{b}	0.168	118+14	12 2 + 1 2 ^b	-1.149
GICAL	11.0 ±1.1	11.0 ± 1.5	0.866	11.0 ± 1.1	12.2 - 1.2	0.254
SOCIAI	10 1+1 0 ^a	10.4 ± 2^{b}	-0.715	11.08 ± 1.6^{a}	11 ± 1 8 ^b	0.068
SOCIAL	10.1±1.9	10.1±1.7 10.4±2	0.476	11.00 ± 1.0	11 ± 1.0	0.945
ENVIRONM	190±21 ^a	185+28	0.605	10 Q + 2 7 ^a	10.5 ± 3.14	0.478
ENTAL	10.7 ± 2.1	10.3 ± 2.0	0.546	17.0 ± 4.1	17.3 ± 3.14	0.633

'a' and 'b' denote significant differences between pre and post of the control and experimental groups respectively ($p = \langle 0.05 \rangle$). *Significant difference between the groups at pre and post intervention. Significant

differences are highlighted in bold.

Sociodemographic profile: It was observed that a greater number of males (64.3%) were receiving dialysis as compared to females (35.7%). About 88.6% of patients suffered from hypertension, while (7.1%) were diabetic. It was seen that 88.6% of the patients had no family history of any diseases.More than fifty percent of patients (55.7%) were from low socioeconomic background.

Anthropometricparameters: Before intervention, there was no significant difference found for height, weight, and BMI measurements between the control and experimental groups. About more than fifty percent of the total individuals (58.5%) had normal weight, whereas 35.7% and only 5.7% of the individuals were underweight and overweight, respectively.After intervention, a significant difference (p<0.05) was observed for weight and BMI within the experimental group. It showed that patients from the experimental group who were underweight shifted to the normal category after intervention(Table 2).

Biochemical parameters : As shown in Table 3, the mean range of serum protein, albumin, and globulinwas borderline normal in both groups before the intervention. The hemoglobin levels were on the lower side, whereas extensively elevated levels of serum creatinine, Blood Urea Nitrogen (BUN), and phosphorous were observed in both groups. After intervention, there was a significant difference observed for all parameters except creatinine and sodium between the control and experimental groups. The levels of uric acid, phosphorus, BUN, and potassium were significantly lower, and total protein albumin, globulin, hemoglobin, calcium levels were significantly higher in the experimental group than in the control group. Also, within the experimental group (pre and post) a significant difference was observed for all biochemical parameters.

Nutrient intake: There was nostatistically significant differenceobserved in the nutrient intakes of the subjects in bothgroups before the intervention. The mean sodium intake was slightly above the recommendations for patients on hemodialysis. Higher mean phosphorous consumption was observed in both groups (Table 4).

After intervention, a significant difference was observed between the control and experimental groups for all nutrients except potassium and phosphorus. The intake of fat and sodium were significantly lower among the experimental group than the control group. Within the experimental group, there was a significant difference observed in the intake of all nutrients. **Food consumption pattern:** After the intervention, the daily intake of pulses like green gram and lentil were increased considerably (42.8%) as the subjects understood the importance of including pulses once a day to meet the protein requirement. The intake of nuts and oilseeds decreased due to their high phosphorous content. The experimental group patientshave started daily consumption of low potassium and sodium containing vegetables after getting nutritional education.

Quality of life : The score of quality of life in all four domains of the subjects from the control and experimental groups (preand post intervention) is given in Table 5. The scoring revealed overall low QoL scores in all four domains, with no significant difference between the two groups (p > 0.05) before the intervention. It was observed that after intervention, the score in the physical domain was significantly higher in the experimental group of patients as compared to the control group.

Discussion

A positive impact of the intervention was observed within the experimental group, which suggests that the provision of long-term education can improve dietary practices and nutrient intake among the patients. In the present study, the percentage of men who were receiving hemodialysiswas higher than that of women. Similarly, a study conducted by Carrero et al (2018)^[14] showed that the proportion of men with CKD was higher than that of women, and kidney function declined at a faster rate in men. In the present study, the mean BMI of the patients was lower compared to other studies that assessed the nutritional status of hemodialysis patients. [15,16] About more than one-third of patients (35.7%) were underweight similarly Abbas et al (2009) also found that17% of hemodialysis Patientswere underweight in their study.^[17] There was significant increase in weight and BMI of experimental group after the intervention. It signifies a positive impact of education intervention on the experimental group. The patients who were exposed to the educational program had a significant difference in their biochemical values as compared to the other group. After intervention, a significant decrease was observed in the uric acid, BUN, phosphorus, and potassium levels of the experimental group patients. The results are in accordance with the study of Vijayaet al (2019)^[18]Baraz et al (2014)^[19], Jahanpeyma et al (2017) [20] and Naseri-Salahshouret al (2020) ^[21] which concluded that proper implementation of nutrition education programs can have a positive impact on biochemical parameters and the complications developed from their alteration. After intervention the selection of food items were changed

considerably, which signifies the impact of nutritional education on behavioural change. The overall consumption of foods high in sodium, potassium, and phosphorous was lowered among the experimental group. These findings were consistent with a study by Vijaya et al (2019) ^[18] which showed that the intakes of energy and protein was increased significantly in patients from the experimental group compared to control group who received dietary counseling. patients Similarly, another study by Rahman et al in 2022 ^[22] was carried out to determine whether nutrition knowledge has an impact on dietary practices among Bangladeshi patients, and their study revealed that the provision of the booklet reduced serum potassium and phosphorous, dietary potassium and phosphorous, and the phosphorous to protein ratio, which showed a significant reduction. The scores in all the domains related to quality of life were on lower side before the intervention. Previous studies have also shown the poor score of QoL among patients undergoing dialysis using the WHOQOL-BREF questionnaire ^[23,24] After the intervention, there was a significant increase only in the physical aspect; no changes were observed in the psychological, social, or environmental domains. In contrast to the present study, some other studies showed a significant improvement in quality oflife score after nutrition education intervention. ^[21,25] A long-term, regular education might be helpful to improve the patient's quality of life and overall health status.

Conclusion

There was significant improvement in the nutritional status and dietary pattern of dialysis patients after receiving nutrition education interventions. Although significant improvement in the nutritional status was observed, a longer-duration, more comprehensive intervention is required to have a profound impact on the nutritional status and quality of life of the patients.

Acknowledgement: Researchers would like to acknowledge the administrative authorities of MGM Hospital for giving us permission to conduct the study.

Financial disclosure: Nil

Conflicts of interest: The authors declare no conflicts of interest.

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