ASSESSMENT OF NUTRITIONAL STATUS IN END STAGE KIDNEY DISEASE PATIENTS ON MAINTENANCE HEMODIALYSIS.

Nephrology

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ABSTRACT

Background: Malnutrition is a common problem in patients with end-stage-kidney-disease (ESKD) and is a strong risk factor for morbidity and mortality. ESKD is a maladaptive metabolic state and patients need to increase their dietary protein and calorie intake especially when on maintenance hemodialysis. In a developing country like India, the economic and knowledge barrier affects the diet of the patient. In this study we assessed the prevalence of malnutrition and the impact of dietary counselling on improvement in nutritional status of the patient. **Method:** This study enrolled patients undergoing maintenance hemodialysis in our centre between June 2017 and June 2019. The prevalence of malnutrition was assessed by Subjective Global Assessment (SGA). Dietary history was recorded with a 24-hour dietary recall method. The patient was then periodically counselled regarding adequate dietary protein and calorie requirement and was re-assessed for the prevalence of malnutrition at the end of 6 months. **Results:** The mean age of study cohort was 38.76 ± 10.85 years and 64 % were male. Hypertension (38.89%) and Diabetes (11.11%) were the most common co-morbid illnesses. The prevalence of PEW was 92% at baseline and 86% at the end of 6 months of follow up. There was a significant increase in BMI from 19.97 to 20.38 ($p=0.022$). Most of the study patients were from very low socioeconomic status (78% Class V Modified Prasad's scale). **Conclusions:** There is a very high prevalence of protein-energy malnutrition among ESKD patients on maintenance hemodialysis. Nutritional counselling resulted in statistically significant improvement in the prevalence of malnutrition. Hence, nutritional counselling must be given regularly to patients with kidney disease.

KEYWORDS

End stage kidney disease, maintenance hemodialysis, protein energy-wasting, Subjective Global Assessment, nutritional counselling.

INTRODUCTION:

Malnutrition is a common problem in end stage kidney disease (ESKD) especially in patients undergoing maintenance hemodialysis (MHD). Multiple factors contribute to this malnutrition such as reduced protein-energy intake due to loss of appetite and dysgeusia, inflammatory state (due to uraemia, dialysis related inflammation), maladaptive metabolism, metabolic acidosis, reduced physical activity, and the nutrient losses during dialysis. Though CKD patients are on a restrictive diet, initiation of dialysis requires the patients to increase the dietary protein and calorie intake. A combination of these factors contributes to the state of malnutrition which is described as Protein-energy wasting (PEW). PEW is defined by the International Society of Renal Nutrition and Metabolism (ISRNM) as a syndrome characterized by a combination of nutritional and catabolic alterations with consequent increased morbidity and mortality. Moreover, in a developing country like India where a significant portion of the population falls under low socio-economic groups the knowledge of the patient and the primary caregiver regarding diet is limited. Hence proper nutritional counselling of the patient and the primary caregiver regarding the dietary needs of the patient is of utmost importance. In this study, we aim to study the dietary pattern and assess the prevalence of malnutrition in patients undergoing MHD before and after nutritional counselling.

MATERIAL AND METHODS:

This is a prospective interventional study carried out in the Hemodialysis unit of the Department of Medicine, Gandhi Medical College, Bhopal between 2017 to 2019. Before the commencement of the study, approval was obtained from the institutional ethics committee. All the patients who underwent MHD from the centre at the time of initiation of the study were included after the consent of the participants. The nutritional status of the patient was assessed by Subjective Global Assessment (SAG) which has seven components - weight, dietary history, gastrointestinal symptoms, functional capacity, co-morbidities, assessment of subcutaneous fat, and signs of muscle wasting. The patient is then classified into category A (No malnutrition), Category B (Mildly/Moderately undernourished), Category C (Severely undernourished). Other anthropometric measurements like BMI, Triceps skin fold (TSF) thickness (using Vernier callipers) and mid-arm muscle circumference (MAMC) ($MAMC = MAC - (3.14 \times TSF)$, where TSF is the triceps skin fold thickness). Dietary history was collected by the 24-hour dietary recall method. The dietary caloric and protein intake was calculated as per the standard caloric value of Indian foods. The patient and primary care

provider was then counselled regarding the diet to be consumed. The dietary protein and calorie intake were then reassessed at the end of 6 months of follow-up. Routine biochemical investigations were carried out in all patients.

Inclusion Criteria

Consenting adults aged 18 years and above, with ESKD on MHD were included in this study.

Exclusion Criteria

Patients not on MHD, pregnant patients and patients with other chronic illness (malignancy) which might adversely affect their nutritional status. Patient on hemodialysis for AKI. Data were collected and compiled in MS EXCEL and Statistical Analysis done using R version 3.4.

RESULTS:

The mean age of the participants in our study was 38.76 ± 10.85 years and 64% were males. With regard to the educational status, 22 (44%) patients had completed high school, 8 (16%) patients had undergraduate college degree and 8 (16%) were illiterate. The majority ($n=39$, 78%) of the patients were unemployed. Over three-fourths of the patients ($n=39$, 78%) were from lower socioeconomic status (Class V Modified Prasad's scale). The most common co-morbidity was Hypertension ($n=21$, 38.89%) followed by Diabetes ($n=6$, 11.11%). The prevalence of Protein Energy Wasting (PEW) was 92% at baseline and 86% at the end of 6 months of follow up. There was a significant improvement in Anthropometric indices in patients after 6 months (Table 02). There was a significant improvement in the nutritional status of patients as per SGA after 6 months of dietary intervention (Table 03). Serum Albumin levels increased from 2.80 ± 0.61 gm/dl to 2.99 ± 0.44 gm/dl ($p=0.011$). Also, there was a significant improvement in dietary intake with increased protein and calorie intake in patients (Table 04).

Table 1. Sociodemographic Characters Of Study Participants

Study parameter	n (%)
Age (mean $\pm$ SD, in years)	38.76 ± 10.85
20-29	12(24)
30-39	14(28)
40-49	15(30)
50-59	07(14)
>60	02(04)
Gender	
Male	32(64)

Female	18(36)
Education	
Higher Secondary School	3(6)
High School	22(44)
Primary School	9(18)
Degree Holders	8(16)
Illiterate	8(16)
Socio economic Status (Modified Prasad's Scale)	
Class V	39(78)
Class IV	3(6)
Class III	6(12)
Class II	0
Class I	2(4)
Co-morbid conditions	
Hypertension	21(42)
Diabetes Mellitus	6(12)
Renal Calculi	1(2)
Unclassified	22(44)

Table 2. Anthropometric Indices In Study Population

Anthropometric Parameter	Baseline		After 6 Months		t-Statistic	p-Value
	Mean	SD	Mean	SD		
BMI (mt ² /Kg)	19.97	2.60	20.38	2.51	2.359	0.022*
MAMC (cm)	19.22	2.23	19.82	1.91	4.396	<0.001**
Weight (Kg)	52.54	7.44	53.58	6.92	2.272	0.027*
Height(cm)	162.1	3.93	-	-	-	-

* Significant at 0.05, ** Significant at 0.01. BMI, Body mass index; MAMC, Mid-arm muscle circumference

Table 3. Prevalence of Malnutrition by Subjective Global Assessment

SGA Group	Baseline	After 6 Months	Chi-square Statistic	P-Value
A	17 (34%)	25 (50%)	17.222	0.00175**
B	29 (58%)	22 (44%)		
C	4 (8%)	3 (6%)		

**Significant at 0.01

Table 4. Dietary Intake Assessment Of Study Participants

Daily Intake	Baseline		After 6 Months		t Statistic	p-Value
	Mean	SD	Mean	SD		
Protein	46.42	5.57	50.38	5.54	-7.192	<0.001
Calorie	1080.4	123.5	1198	89.05	-8.735	<0.001

DISCUSSION:

Nutritional status is a known marker of wellbeing of patients on hemodialysis. Studies on nutritional status and dietary interventions are limited in India. Also, patients of lower socioeconomic category are often not included for dietary counselling. Our study was done to offset this imbalance by assessing the importance of nutritional counselling in hemodialysis patients attending a government supported tertiary care center in India.

In our study mean age of the patients was 38.76 ± 10.85 years with male preponderance (64%). In the study by Sedhain et al¹, the mean age was 45.4 ± 12.3 years along with male preponderance (70%). Consistent with the study by Reema Tayyem et al² where 30 % were illiterate, in our study around 20 percent were illiterate and 18 percent had completed their primary education. The majority of the patients were unemployed (78%) and most of the patients had an income of less than Rs 2000 (80%). The majority of the patients belong to the SES class of V (78%) followed by class III (12%) as per the Modified Prasad's scale. This is consistent with the findings from study by Malekmakan et al³ where most patients on MHD fall under lower socioeconomic group (61.3%). This reflects the direct effect of the burden of the disease in terms of inability to earn and loss of productivity to the family. The most common co-morbid condition observed in the our study was hypertension (38.89%) followed by diabetes mellitus (11.11%). In a study by W C Lee et al⁴, where 1487 patients were studied, the 3 most common co-morbidities were hypertension (66.8%), diabetes (32.4), hyperlipidemia (12.3).

The ISRN expert panel has defined PEW to describe a "state of decreased body stores of protein and energy fuels (body protein and fat

masses)". This abnormality is often associated with diminished functional capacity related to metabolic stresses.⁵ Several studies show that the prevalence of PEM in dialysis patients is high, ranging from 23% to 94%. In our study it was 92%, which was similar to study from Nepal wherein 84.6% MHD patients were malnourished.¹ High body mass index (BMI) is a protective factor in CKD patients on MHD.⁶ There is an increase in CV deaths by 6% with every one unit decrease in BMI.⁷ On comparing the anthropometric parameters at the end of 6 months of follow up with baseline values, a significant increase in BMI was noted 19.97 to 20.38 ($p=0.022$) in our participants.

Higher mid-arm muscle circumference (MAMC) is a surrogate of high lean body mass and has a survival benefit. This has been validated in a study by Noori N et al⁸ which found that the patients with high MAMC exhibited better survival. In our study, a significant increase in MAMC was recorded from 19.22 to 19.82 ($p<0.001$) after dietary intervention. Evidence indicates that surrogates of PEW, such as low serum levels of albumin correlate with mortality. Eight out of nine randomized trials that used serum albumin concentration as a surrogate outcome measure, reported statistically significant improvements in hypoalbuminemia after the nutritional support⁹. In the United States Renal Data System (USRDS) database results, every 1 g / dl fall in the serum albumin level was associated with a 39% increase in the risk of cardiovascular death¹. In the present study, a significant increase in serum albumin was reported after 6 months of improved dietary intake following dietary counselling.

Longevity has consistently been observed in those patients with CKD who have a better nutritional status, including larger muscle mass, fat mass, better appetite, and higher protein intake.¹⁰ The analysis by Stratton RJ et al¹⁰ included 18 studies (5 RCTs and 13 non-RCTs) and suggested that nutritional support significantly increased total (energy and protein) intake and serum albumin concentration on average by 0.23 g/dl, with no adverse effects on electrolyte status.

Subjective global assessment (SAG) score is one of the several methods to evaluate the nutritional status of hemodialysis patients. According to SAG score in patients are divided into three classes; A (weight gain, no change or mild weight loss), B (moderate weight loss) and C (severe weight loss). In our study majority of the ESKD patients had SGA score of B (58%) at the baseline which was significantly decreased to 44% ($p=0.001$). A significant decrease was also noted in category C where the percentage of patients was decreased from 8% to 6% ($P=0.001$). The number of patients in class A was significantly increased to 50% from 34% ($P=0.001$). This shows the effectiveness of the dietary intervention with increased protein and caloric intake. There was a significant increase in the daily protein intake from baseline values as compared to the protein intake(grams/day) following dietary advice (46.42 to 50.38) ($p<0.001$) the changes in calorie intake was also significant following the dietary advice (1080 to 1198) ($p<0.001$).

This study is among the few studies to report on the prevalence of malnutrition in hemodialysis patients in India, more-so-ever in Western part of India. Also, the impact of dietary counselling has not been studied well in the Indian subcontinent. With this study, increased awareness among the health care providers will stimulate further research in this important component of patient management.

CONCLUSION:

The prevalence of malnutrition is very high among ESKD patients on MHD. Patients have poor dietary intake and this is related to their sociodemographic factors. Interventions, like dedicated dietary counselling has a significant positive impact on lowering the prevalence of PEW. The results of this study should encourage healthcare providers to assess the nutritional status of their dialysis patients and provide dietary counselling. Early dietary intervention will improve outcomes in this subset of patients.

Limitations Of Our Study:

Our limitation was the small sample size and the shorter duration of follow up. Also, being a single centre study, the results may be influenced by selection bias. Nevertheless, the high prevalence of malnutrition and the positive impact of nutrition counselling underscores its importance in clinical practice. Further interventional studies in a larger population and multiple centres will help devise management protocols for our country.

Conflict Of Interest

The authors confirm that they have no conflict of interest to declare.

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