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Dietary Protein Gap In Patients Undergoing Maintenance Heamodialysis

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ABSTRACT

Background: Maintenance hemodialysis (MHD) is a hypercatabolic state in patients with chronic kidney disease leading to lean muscle loss and malnutrition, most of the guidelines for nutrition in chronic kidney disease with hemodialysis recommends 1.2 to 2 grams protein supplementation per kilograms of body weight. Patients with chronic kidney disease (CKD) undergoing maintenance hemodialysis develops malnutrition involving protein catabolism, secondary insulin resistance, inflammation and increased serum leptin levels. Global prevalence of malnutrition in CKD patients undergoing maintenance hemodialysis is 28-54% facing a greater risk of mortality.

Aims & Objectives: This study is an attempt to find out the gap between recommended protein intake by ESPEN and KDOQI guidelines, and the actual protein intake among renal failure patients undergoing maintenance hemodialysis (MHD).

Method: A total of 30 renal failure patients undergoing maintenance hemodialysis, twice or thrice in a week were selected through purposive sampling, voluntary participation with documented consent form was taken, non – invasive painless method was used, i.e. anthropometry, 24 hours dietary recall method, food frequency record method, house hold measures were used to calculate portion size and IFCT 2017 by National Institute of Nutrition, Hyderabad was used to calculate dietary protein intake, National Kidney Foundation; KDOQI, ESPEN, guidelines were used to compare the gross protein intake. Biochemical reports were used as secondary data. Obtained data was statistically analyzed using SPSS, descriptive statistics, one-way ANOVA and t- test were used.

Results: Total 09 females and 21 males were undergoing MHD, the lowest number of subjects recorded as 13.33 falling in age group of 20-30 and 70-80 for both the genders respectively. The average age of the study group is 54 years, the average height of the study group is 166 cms, dry weight and BMI is 57.65 kgs. and 20.81 kg/m^2 respectively. 70% of study population is male. The average nPCR (protein intake measure) is 0.45 gms. The average DMS (Dialysis Malnutrition Score) recorded was 20.7. 70% of patients were having diabetes and 100% subjects were having hypertension as comorbidities.

Conclusion: The average protein intake of CKD patients undergoing MHD is significantly lower as compared to the expected protein intake calculated as per guidelines.

Key Words: CKD, MHD, KDOQI, ESPEN, PROTEIN GAP, DMS

INTRODUCTION:

patients with chronic kidney disease (CKD) receiving maintenance hemodialysis (MHD) are advised to adhere to a specific diet regimen and specific dietary restrictions, dietary protein inadequacy is a serious problem that frequently presented as protein-energy wasting (PEW) in patients with chronic kidney disease receiving maintenance hemodialysis. Patients with this illness have higher rates of morbidity and death because of their low protein and energy storage arising due to hypercatabolic state. PEW affects 30% to 70% of hemodialysis patients, significantly impairing their functional capacity and quality of life (**Sarav, M., & Kovesdy, C. P. et.al. 2018**) Uremic malnutrition, closely linked to protein deficiency, is a strong predictor of adverse clinical outcomes, including higher hospitalization rates (**Pupim, L. B. et.al. 2004**). Hemodialysis itself is a catabolic process, increasing protein breakdown while decreasing synthesis, which exacerbates muscle loss (**Pupim, L. B. et.al. 2004**). Factors such as inflammation and inadequate nutritional intake during dialysis sessions contribute to this catabolic state (**Gomółka, M.et.al. 2019**). Providing adequate protein supplementation can counteract the catabolic effects of hemodialysis, promoting better health outcomes (**Pupim, L. B. et.al. 2004**). Strategies like intradialytic parenteral nutrition have shown promise in improving nutritional status and mitigating the effects of PEW (**Pupim, L. B. et.al. 2004**). While addressing protein deficiency is crucial, some studies suggest that the focus should also include managing other factors like vitamin D levels, which can further influence the health of hemodialysis patients (**Fiedler, R. et.al. 2011**). According to national kidney foundation Reducing protein intake may impair nutritional status in individuals at risk for Protein Energy Wasting. Dietary Protein Intake in Maintenance Hemodialysis and Peritoneal Dialysis of adults with CKD undergoing MHD and PD who are metabolically stable, the guidelines recommend prescribing a dietary protein intake of 1.0 -1.2 g /kg ideal body weight per day to maintain a stable nutritional status. The western population is reported to consume high or adequate protein intake in their diet, but in Indian population the protein intake is generally found to be inadequate, and this condition becomes vulnerable in patients with renal failure and receiving MHD.

Literature review:

- Lara B. Pupim et.al 2024 conducted a study on “Protein homeostasis in chronic hemodialysis patients.” And found that Hemodialysis induces catabolic state, but anabolism is achievable. Adequate protein and insulin are crucial for anabolic effects.

- Khaled Hussein Abou Sei et.al 2024 conducted a study on “Frailty in Hemodialysis Patient” and found that Frailty prevalence varies among CKD patients due to different definitions. Early frailty detection in dialysis patients is crucial for prevention.

- Julien Bohé et. al 2022 conducted a study on “Muscle Protein Metabolism During Hemodialysis” and comcluded it as Hemodialysis impacts muscle protein metabolism, leading to catabolism. Intradialytic nutrition may help counteract protein loss during hemodialysis.

- Roman Fiedler et. al 2011 conducted a study on “Vitamin D Deficiency, Mortality, and Hospitalization in Hemodialysis Patients with or without Protein-Energy Wasting” and found that Vitamin D deficiency linked to higher mortality risk in HD patients. Cholecalciferol supplementation may improve survival outcomes.

- Menaka Sarav et.al 2018 conducted a study on “Protein energy wasting in hemodialysis patients” and found that PEW is associated with morbidity and mortality in CKD patients. Nutritional parameters need close monitoring for PEW management.

- A **2019** study by **Małgorzata Gomółka et al**. investigated the clearance of protein-bound solutes during hemodialysis. Their findings revealed that these solutes were efficiently removed during dialysis sessions, and the type of dialysis modality used did not significantly impact the clearance rate.

- **T. Alp Ikizler et al. 2005** conducted a study and demonstrated that hemodialysis disrupts protein metabolism, leading to a breakdown of protein throughout the body and in muscles specifically. This breakdown occurs because hemodialysis both reduces protein synthesis and increases protein breakdown.

Methodology:

Total of 30 respondents, clinically diagnosed as CKD patients and undergoing Maintenance Heamodialysis (MHD) twice or thrice in a week, were selected for the study by purposive sampling from Nagpur city of Maharashtra state from a single dialysis centre.

Inclusion Criteria: both males and females of age group 20 years to 80 years, clinically diagnosed as CKD patients and undergoing MHD, voluntary participation, documented informed consent was recorded.

Exclusion Criteria: subjects below 20 years of age and above 80 years of age, suffering from infective diseases I.e. – unconsented, retro positive, HBsAg positive, cancer, organ failure, on prolonged contraindicated medication and treatments were excluded from the study.

Tools & Techniques Used: Non-invasive tools and techniques were used in this study, digital weight machine, stadiometer, questionnaires, 24 hours dietary recall, Ntutive nutrition calculator, IFCT-2017 NIN; ICMR downloadable printed educational materials from National Kidney Foundation (NKF; KDOQI) website. Suitable statistical analysis method was used in the study i.e., Descriptive statistics, SPSS, Pearson correlation, the obtained results were correlated with the awareness level of subjects.

Result and Discussion:

Table 1:

Sr.no	Age Group	Female	%	Male	%
1	20 to 30	1	3.33	4	13.33
2	30 to 40	0	0.00	0	0.00
3	40 to 50	2	6.67	2	6.67
4	50 to 60	3	10.00	4	13.33
5	60 to 70	2	6.67	7	23.33
6	70 to 80	1	3.33	4	13.33
	Grand Total	9	30.00	21	70.00

This table shows the distribution of patients across different age groups by gender.70% of the sample is male, with the largest group being males aged 60–70 (23.33%).

Graph 1:

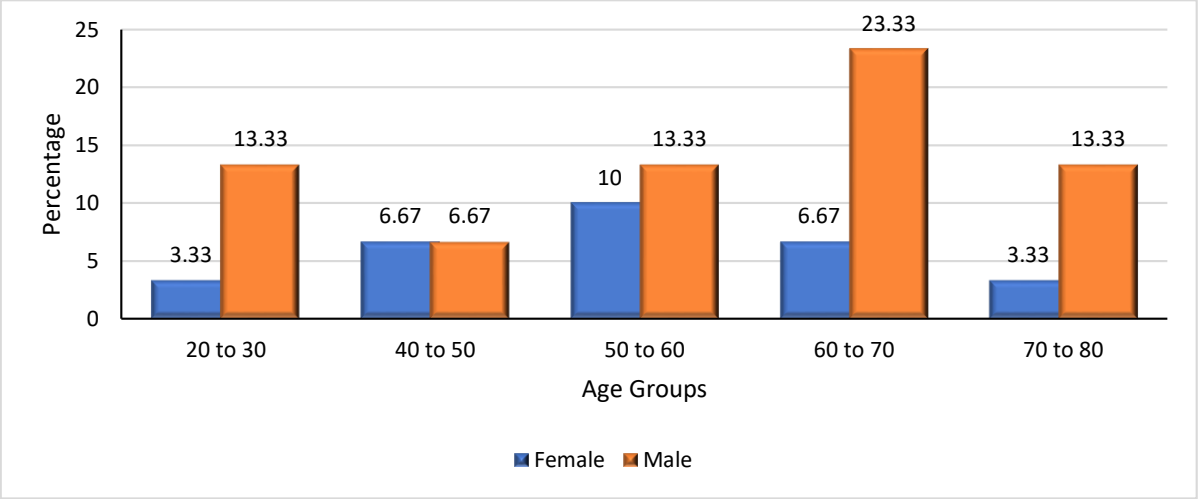


Table 2:

Sr. No.	Vitals	Sample size	Average	SD
1	AGE	30	54.87	16.28
2	HT.	30	166.6	6.83
3	WT.	30	60.11	9.08
4	DRY WT.	30	57.65	9.35
5	BMI	30	20.81	3.38
6	DMS	30	20.07	6.07
7	nPCR	30	0.45	0.12

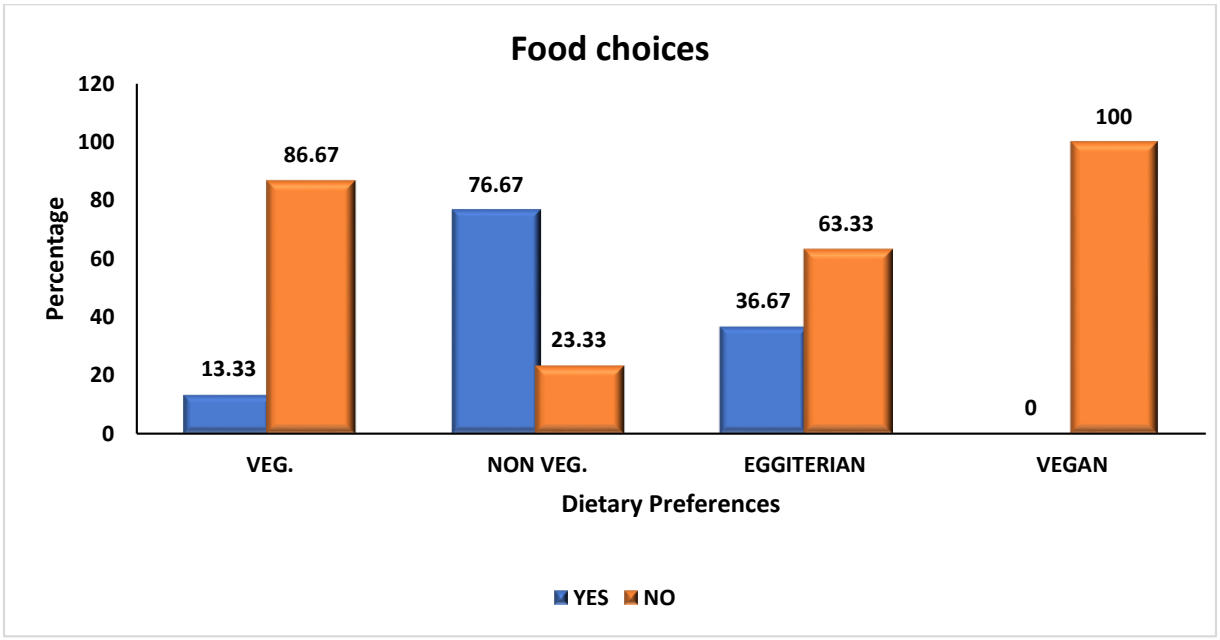
This table provides the descriptive statistics for the sample, including age, height (HT.), weight (WT.), dry weight, BMI, DMS (Dialysis Malnutrition Score), and nPCR (normalized Protein Catabolic Rate). The average age is 54.87 years, and the average nPCR (protein intake measure) is 0.45, indicating poor protein intake.

Table3:

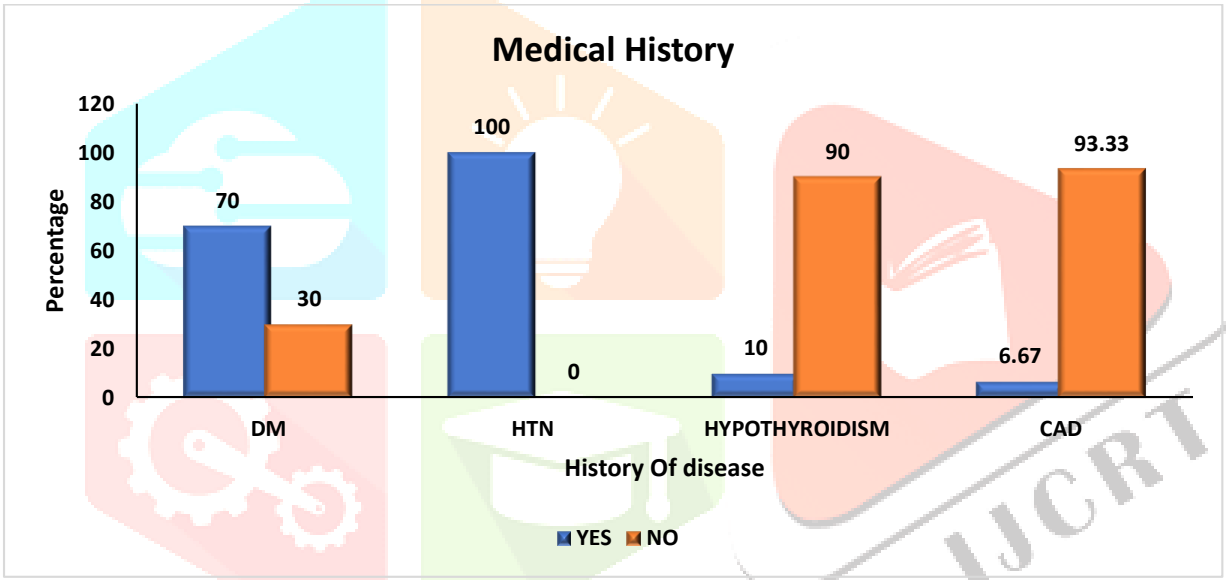
Sr. No.		YES	%	NO	%
1	VEG.	4	13.33	26	86.67
2	NON-VEG.	23	76.67	7	23.33
3	EGGITERIAN	11	36.67	19	63.33
4	VEGAN	0	0.00	30	100.00
5	DM	21	70.00	9	30.00
6	HTN	30	100.00	0	0.00
7	HYPOTHYROIDISM	3	10.00	27	90.00
8	CAD	2	6.67	28	93.33

This table shows the distribution of patients based on dietary habits and the presence of comorbidities such as diabetes (DM), hypertension (HTN), hypothyroidism, and coronary artery disease (CAD).70% of patients have diabetes, and all patients have hypertension, highlighting the high prevalence of comorbid conditions.

Graph 3:



Graph 3:



Hypothesis and Hypothesis Testing:

Ho: There is no significant difference between average protein intake of patients and expected protein intake

H1: The average protein intake of patients is significantly lower compared to the expected protein intake.

	CALCULATED PROTEIN REQUIREMENT	Average PROTEIN INTAKE
Mean	75.51	38.64
Variance	87.88	10.64
Observations	30	30
Pearson Correlation	-0.024	
df	29	
t Stat(Paired t test)	20.20** p<0.001	

The test compares the calculated protein requirement (mean 75.51) with the observed average protein intake (mean 38.64). t-stat = 20.20, $p < 0.001$. The null hypothesis is rejected, indicating a significant gap in protein intake.

From the above table since p<0.001, Ho is rejected and H1 is accepted.

Conclusion: The average protein intake of patients is significantly lower compared to the expected protein intake.

OR

Ho: There is no significant difference between average protein intake of patients and expected protein intake

H1: The average protein intake of patients is significantly lower compared to the expected protein intake.

One-Way Repeated Measures ANOVA

Summary of Data		
Descriptive Statistics	*CALCULATED PROTEIN REQUIREMENT*	*Average PROTEIN INTAKE*
N	30	30
∑X	2265.37	1159.07
Mean	75.51	38.64
$\sum X^2$	173611.85	45089.98
Std.Dev.	9.37	3.26

Result Details				
Source	*SS*	*df*	*MS*	F
Between-treatments	20398.3282	1	20398.3282	*F*= 407.98572
Within-treatments	2857.0229	58	49.259	
Error	1449.9319	29	49.9977	
The *F*-ratio value is 407.98572. The *p*-value is < .00001. The result is significant at *p* < .05.				

This test also compares calculated versus observed protein intake.
F = 407.985, $p < 0.00001$. Again, the null hypothesis is rejected, confirming a significant difference between required and actual protein intake.

From the above table since p<0.001, Ho is rejected and H1 is accepted.

Conclusion: Patients undergoing maintenance hemodialysis consistently consume insufficient protein, leading to adverse health consequences. This study found a significant disparity between actual and recommended protein intake, contributing to muscle wasting, weight loss, and diminished quality of life. To mitigate these issues, individualized nutritional care and the guidance of renal-trained dietitians are crucial. Factors contributing to inadequate protein intake include:

- Dietary fads: Uninformed dietary choices can lead to nutritional deficiencies.
- Lack of specialized care: The absence of renal-trained dietitians can result in ineffective dietary recommendations.
- Excessive dietary restrictions: Overly stringent dietary limitations can hinder adequate protein consumption.
- One-size-fits-all approaches: Generic dietary advice without considering individual needs can exacerbate nutritional problems.

Addressing these factors is essential to improve the health and well-being of patients with chronic kidney disease undergoing hemodialysis.

Recommendations:

- The above study marks the importance and need of renal nutrition trained dietitians.
- Individualized nutrition care should be given for each patient of renal failure undergoing maintenance hemodialysis.
- Adequate dietary protein should be ensured and protein rich recipes should be developed for CKD patients undergoing MHD.
- Body composition should be preferred over general anthropometry to have better understanding of patient's muscle mass.
- Multidisciplinary approach should be taken in management of good nutrition and quality of life to renal failure patients receiving MHD.

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Conflict of Interest: NONE

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