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Nutritional Assessment of Patients on Twice Weekly Maintenance Hemodialysis

Fatima Khalil[1], Nayyar Yaqoob[2], Omar Ahsan[3], Shahida Perveen[4], Umer Gill[5]

[1]Post graduate trainee Medicine, Fauji foundation hospital Rawalpindi, [2]Associate Professor, department of Medicine, Fauji Foundation hospital Rawalpindi, [3]Associate Professor, department of Medicine, Foundation University Medical College, Islamabad, [4]Assistant Professor, department of Medicine, Foundation University Medical College, Islamabad, [5]Nephrologist, department of Nephrology, Fauji Foundation Hospital, Rawalpindi

A B S T R A C T

Objective: To assess the magnitude of malnutrition in hemodialysis patients in Pakistan and identify contributing factors in order to facilitate timely interventions and improve their quality of life.

Methodology: A cross-sectional descriptive study was conducted at the nephrology inpatient department of Fauji Foundation Hospital Rawalpindi from April to September 2021. The study included patients aged 15–60 years, of both genders, who had been on maintenance hemodialysis twice weekly for at least six months. Data was collected by structured performa, which included patients' demographic details, including age, gender, level of education, and daily income; the cause and duration of CKD; duration and frequency of haemodialysis Malnutrition was assessed using the Malnutrition Inflammation Score (MIS) and categorized as mild, moderate, or severe.

Results: Out of the 107 enrolled patients, 90 were included in the analysis. The study revealed that only one-third of the patients had normal nutritional status, while the rest exhibited varying degrees of malnutrition. Severe malnutrition was observed in 20% of the hemodialysis population. Female gender, lower education level, and lower income were strongly associated with severe malnutrition.

Conclusion: The study highlights the need to improve literacy, raise awareness about chronic kidney disease (CKD), and enhance the financial status of hemodialysis patients. These interventions can significantly improve outcomes and quality of life in this population. The findings emphasize the importance of identifying high-risk patients early on and implementing appropriate interventions to improve nutritional status and overall well-being.

Keywords: Chronic Kidney disease (CKD), Hemodialysis, Malnutrition, Malnutrition inflammation score (MIS).

Introduction

Chronic kidney disease is a major health problem in Pakistan, with a prevalence of 21.2%. Malnutrition is a major problem in patients with chronic kidney disease, and it is a predictor of mortality in these patients. Little data is available regarding the magnitude of malnutrition in hemodialysis patients in Pakistan. Chronic kidney disease (CKD) is a major health problem affecting people all over the world. It caused almost one million deaths worldwide.[1]

It can progress to end-stage renal disease, requiring hemodialysis or renal transplant. The estimated overall prevalence of CKD in Pakistan was 21.2%.[2] Urban Karachi alone had a 16.6% prevalence of kidney disease.[3] The increasing frequency of risk factors like diabetes, hypertension, and glomerulonephritis has led to an increase in chronic kidney disease cases.

Patients with CKD have a higher susceptibility to malnutrition, which is a predictor of mortality in these patients.[4] Malnutrition is characterized by reduced body weight, reduced muscle mass, loss of fat stores, and low levels of albumin, transferrin, and other visceral proteins.[5,6] In a study conducted in India, the prevalence of malnutrition in hemodialysis patients was found to be

between 20 and 60%.[7] A Palestinian study demonstrated mild to moderate malnutrition in 60% of hemodialysis patients.[8]

Risk factors include the loss of nutrients during hemodialysis; dietary restrictions of nutrients like protein, phosphorus, sodium, and potassium; anorexia; muscle catabolism; chronic inflammation; insulin resistance; metabolic acidosis; and anemia.[9] This malnutrition leads to increased cardiovascular morbidity and mortality in these patients.[10] In a developing country like Pakistan, with limited resources, poor economic conditions, lack of adequate nutrient supply, under-education, and lack of awareness, people are more likely to suffer from malnutrition and its consequences.

Previously, little data is available in Pakistan regarding the magnitude of nutritional problems in hemodialysis patients. Malnutrition is a predictor of mortality and is associated with impaired functional capacity, increased risk of complications, which leads to poor quality of life and reduced survival. Therefore, there is a need to identify these high-risk patients at an earlier stage so appropriate interventions can be carried out to improve their nutritional status and clinical and mental outcomes. In this study, we assessed the magnitude of protein energy wasting and assessed the factors associated with malnutrition in these patients, so that correctable factors can be identified and corrected to improve the quality of life in this population.

Methodology

This cross-sectional descriptive study was conducted at the nephrology inpatient department of Fauji Foundation Hospital Rawalpindi from April to September 2021. The sample size required for the study was calculated to be 107 using the WHO sample size calculator. However, 10 patients were lost to follow-up and data for 7 patients were missing, so they were excluded from the study. The prevalence of chronic kidney disease stage 3 requiring hemodialysis was assumed to be 7.6%,[20] with a study power of 80%, a significance level of 95%, and a precision of 10%.

Ethical approval was obtained from the institutional ethical review board before data collection (letter no: Ref No 444/RC/FFH/RWP). The inclusion criteria for the study were patients aged 15-60 years of either gender who had been on maintenance hemodialysis twice weekly for at least 6 months. Patients with gastrointestinal diseases affecting nutrient absorption (e.g., chronic diarrhea, chronic liver disease), eating disorders (e.g., anorexia or bulimia nervosa), and those who were non-compliant with the hemodialysis schedule were excluded.

Informed verbal conset was taken from patients. Data was collected by structured performa. It included patients' demographic details including age, gender, level of education and daily income; cause and duration of CKD; duration and frequency of hemodialysis.

Malnutrition was assessed by Malnutrition Inflammation Score (MIS). It has 4 domains, clinical history, physical assessment, BMI and laboratory results. This score consists of 10 components, each with four levels of severity, from 0 (normal) to 3 (very severe), with a total score in the range of 0 to 30. Score of 1-5 was defined as normal nutrition; 6-10 as mild malnutrition; 11-15 moderate malnutrition and >16 as severe malnutrition.

Data was analysed using SPSS version 23. Frequencies and percentages were used to describe categorical variables. Quantitative data was described as mean and standard deviation. Factors determining the nutritional status were determined by the stratification into groups which were compared for the severity of malnutrition. Chi square and student's t test were used to compare these groups.

Results

A total of 107 patients were initially enrolled in the study. However, ten patients were lost to follow-up, and the data of seven patients were missing, so they were excluded from the study. The age range of the participants was between 15 and 60 years, with a mean age of 49.89 ± 11.46 years. The majority of the patients (64, 71.11%) were between 46 and 60 years old. Out of the remaining 90 patients, 56 (62.22%) were male, and 34 (37.78%) were female, resulting in a male-to-female ratio of 1.6:1.

The mean Medical Information System (MIS) score was 5.63 ± 3.69, indicating the severity of the patients' condition. The average duration of the disease was 1.79 ± 1.08 years. About 54.44% of the patients had a disease duration of less than 1 year. Additionally, 68.89% of the patients had an income of less than 1500 rupees per day, and 66.67% of the patients had an education level greater than the eighth grade.

There was no correlation between age and nutritional status, as indicated by a p-value of 0.12. The study revealed that only one-third of the patients had a normal nutritional status. The remaining patients had varying degrees of malnutrition, with 24 (26.67%) classified as

mild, 20 (22.22%) as moderate, and 18 (20.0%) as severe malnutrition, as shown in Figure I.
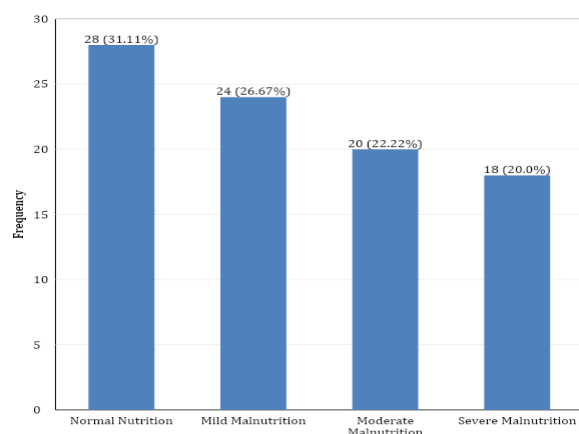

Figure 1: Distribution of patients according to nutritional status.

Table I demonstrates the stratification of nutritional status based on gender. A higher percentage of females exhibited severe malnutrition compared to males, but there was no significant difference between genders in the other categories of nutritional status.

Table I: Stratification of nutritional status with respect to gender.

		Male (n=56)	Female (n=34)	P-value
Normal Nutrition	Yes	20 (35.71%)	08 (23.53%)	**0.226**
	No	36 (64.29%)	26 (76.47%)	
Mild Malnutrition	Yes	18 (32.14%)	06 (17.65%)	**0.132**
	No	38 (67.86%)	28 (82.35%)	
Moderate Malnutrition	Yes	11 (19.64%)	09 (26.47%)	**0.450**
	No	45 (80.36%)	25 (73.53%)	
Severe Malnutrition	Yes	07 (12.50%)	11 (32.35%)	**0.022**
	No	49 (87.50%)	23 (67.65%)	

Nutritional status had no relation with the duration of dialysis, as depicted by statistically insignificant p value. Results of the analysis are shown in table II.

Table II: Stratification of nutritional status with respect to duration of dialysis.

		≤1 year (n=49)	>1 year (n=41)	P-value
Normal Nutrition	Yes	15 (30.61%)	13 (31.71%)	**0.911**
	No	34 (69.39%)	28 (68.29%)	
Mild Malnutrition	Yes	17 (34.69%)	07 (17.07%)	**0.060**
	No	32 (65.31%)	34 (82.97%)	
Moderate Malnutrition	Yes	10 (20.41%)	10 (24.39%)	**0.651**
	No	39 (79.59%)	31 (75.61%)	
Severe Malnutrition	Yes	07 (14.29%)	11 (26.83%)	**0.138**
	No	42 (85.71%)	30 (73.17%)	

Education had significant impact on the nutritional status. Patients with education of more than eight grade had better nutrition in all the categories, as shown in table III.

Table III: Stratification of nutritional status with respect to education.

		≤8 (n=30)	>8 (n=60)	P-value
Normal Nutrition	Yes	04 (13.33%)	24 (40.0%)	**0.016**
	No	26 (86.67%)	36 (60.0%)	
Mild Malnutrition	Yes	12 (40.0%)	12 (20.0%)	**0.043**
	No	18 (60.0%)	48 (80.0%)	
Moderate Malnutrition	Yes	11 (36.67%)	09 (15.0%)	**0.020**
	No	19 (63.33%)	51 (85.0%)	
Severe Malnutrition	Yes	02 (6.67%)	16 (26.67%)	**0.025**
	No	28 (93.33%)	44 (73.33%)	

Patients with income less than 1500 per day had severe malnutrition compared to those with low income (p value 0.04). Higher income group was well nourished compared to low income group (p value < 0.001), as shown in table IV.

Table IV: Stratification of nutritional status with respect to income.

		≤1500/day (n=62)	>1500/day (n=28)	P-value
Normal Nutrition	Yes	14 (22.58%)	14 (50.0%)	**0.009**
	No	48 (77.42%)	14 (50.0%)	
Mild Malnutrition	Yes	16 (25.81%)	08 (28.57%)	**0.784**
	No	46 (74.19%)	20 (71.43%)	
Moderate Malnutrition	Yes	16 (25.81%)	04 (14.29%)	**0.224**
	No	46 (74.19%)	24 (85.71%)	
Severe Malnutrition	Yes	16 (25.81%)	02 (7.14%)	**0.040**
	No	46 (74.19%)	26 (92.86%)	

Discussion

Patients between the ages of 15 and 60 years were included in the study, with a male-to-female ratio of 1.6:1. The majority of the patients (66.67%) had an education level beyond the eighth grade, and two-thirds had a daily income of less than 1500 rupees.

The mean duration of dialysis was 1.79 ± 1.08 years, and it did not have an impact on the nutritional status in our study. However, another study with a mean duration of dialysis of 5 years demonstrated that a longer duration of dialysis led to a more severe degree of malnutrition.[11]

In our study, two-thirds of the patients were found to have malnutrition, with 48% of them having mild to moderate malnutrition, consistent with a previous study on hemodialysis patients (Abu Rezeq et al., 2018).[8] Additionally, 20% of the patients in our study were severely malnourished, compared to 30% in a study conducted in Karachi on hemodialysis patients. The higher prevalence of severe malnutrition in that study could be attributed to a larger number of diabetic patients, which can further contribute to malnourishment.[12] Santin et al. demonstrated moderate to severe malnutrition in 26% of their patients, slightly lower than our study's findings of 38%. Despite the older age of their patients (70 years vs. 49 years in our study) and the use of the same Malnutrition Inflammation Score (MIS) tool with the same cutoff value,[13] the difference may be due to variations in nutritional habits, environment, and quality of life.

In our study, age showed no relationship with nutritional status, similar to a study performed in Tanzania.[14] However, aging is correlated with the Malnutrition Inflammation Complex Syndrome. The lack of correlation in our study could be due to the relatively younger population we examined, with a mean age of 49 years. Study conducted by Ghorbani et al. showed a direct relationship between age and malnutrition, likely due to the inclusion of older patients with a mean age of 57 years and 33% of patients being over 65 years old. Another study also demonstrated that older patients were more prone to malnourishment, which can be accountable to a number of factors such as poor oral intake, anorexia, co-morbid conditions, and lack of healthcare facilities.[15]

With respect to gender, females had a higher proportion of severe malnutrition (P value .022). A study published in the British Journal of Nutrition had similar findings, with females being severely malnourished[16] supported by another study carried out in Iran.[17] However, our female population had a slightly higher proportion of severe malnutrition; 19.5 versus 32.35%. This difference may be due to different treatment methods, dietary habits, lifestyles, and environment. Gender had no relation with other categories of malnutrition in our study. Results from another study performed in Karachi, showed severe malnutrition in females to be 47%, which can be accounted by higher aged patient selection and a higher number of diabetics in the study population.[12]

Patients well educated had better incidence of nutrition in all categories and malnutrition incidence was higher in patients with lower education (87% versus 60%) and this trend was maintained in each category of malnutrition,

with a P value of less than 0.05. A Palestinian study on hemodialysis patients also found a statistically significant difference in nutritional status based on educational status (p = 0.025), indicating that better education leads to improved nutritional knowledge and better socio-economic conditions, thereby enhancing purchasing power and nutritional status.[8]

Similarly, higher income had a positive impact on nutritional status, but differences were significant in severe malnutrition (7.14% versus 25.8%). Similar study in India also supports this evidence (p<0.001), indicating poverty and under nutrition go hand in hand, especially in under developed countries like Pakistan and India.[18] This trend was also seen in 2 other studies, which showed higher family income was associated with better nutrition, indicating an important aspect that malnutrition could not be improved unless financial condition of the population was not taken care of.[19]

Conclusion

A significant proportion of hemodialysis patients have malnutrition. Better education and higher income were associated with improved nutritional status. Severe malnutrition was more prevalent among females. Age and duration of dialysis did not show any correlation with nutritional status. It is important to note that this study has limitations, including its small sample size and single-center nature. Therefore, further large-scale controlled studies are needed to confirm these findings.

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