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Dietary Protein and Fiber Intake in Relation to Nutritional Status among Peritoneal Dialysis Patients – A Descriptive study

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Abstract:

Malnutrition remains an under-recognized complication in peritoneal dialysis patients, driven by inadequate dietary intake. This study aimed to assess dietary protein and fiber intake in relation to their nutritional status among PD patients.

Methods:

A retrospective study was conducted using medical records of 56 PD patients followed at PD Clinic from 2024 – 2026. Dietary intake was assessed using documented 24-hour dietary recall records. Dietary protein, fiber, potassium, and phosphorus intake were assessed using USDA food composition values. Nutritional status was evaluated using serum albumin, BMI, and clinical records.

Results:

A significant positive correlation of dietary fiber was observed with dietary protein ($p = 0.041$) potassium ($p = 0.045$), phosphorus ($p = 0.001$), and serum albumin levels ($p = 0.047$). Significant positive associations were found between protein and phosphorus intake ($p = 0.012$). Regression analysis showed a significant association between dietary phosphorus intake and hyperphosphatemia ($p = 0.018$). PD patients demonstrated inadequate protein intake compared with recommended renal nutrition guidelines. Increased dietary fiber intake was associated with higher potassium and phosphorus intake.

Conclusion:

Higher protein intake was associated with greater dietary fiber intake and patients dietary counselling should specifically emphasize on these two parameters. Constipation was the most commonly reported gastrointestinal symptom among our patients and the dietary counselling should also address this important clinical issue for a successful PD experience.

Larger longitudinal studies are recommended to further evaluate the relationship between dietary intake, serum albumin, and nutritional outcomes among PD patients.

Keywords: Peritoneal dialysis, Dietary protein intake, Dietary fiber intake, Nutritional status

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Introduction:

Chronic kidney disease (CKD) is a progressive non-communicable disorder and a growing global health burden due to its high morbidity and mortality. A landmark analysis from the Global Burden of Disease Study reported a global CKD prevalence of 9.1%, accounting for approximately 1.2 million deaths annually.[1] In Pakistan, the reported prevalence of end-stage renal disease (ESRD) ranging

from 12.5% to 31.2%, particularly among high risk population with hypertension, diabetes, advanced age and ischemic heart disease, underscoring the need for effective renal replacement strategies.[2,3]

Peritoneal dialysis (PD) is a home-based and cost-effective modality of renal replacement therapy that offers several clinical advantages, including preservation of residual renal function and improved quality of life.[4] However, despite these benefits **malnutrition and protein-energy wasting (PEW)** was prevalent in up to 54% of PD patients.[5] In addition to protein inadequacy, dietary fiber plays a crucial role in maintaining gut health and maintaining PD efficacy and preventing PD complications.
Despite the clinical significance of these nutritional factors, there is a paucity of local data in Pakistan evaluating the relationship between dietary protein and fiber intake and nutritional status among PD patients. Addressing this gap is essential for developing context-specific nutritional interventions aimed at improving patient outcomes.

Therefore, this study aims to assess dietary protein and fiber intake and evaluate their association with nutritional status among patients undergoing peritoneal dialysis. Understanding these relationships may provide valuable insights for optimizing medical nutrition therapy and enhancing the quality of life and clinical outcomes of PD patients.

Objectives of the Study

1. To evaluate dietary protein intake among patients undergoing peritoneal dialysis.
2. To assess dietary fiber intake among patients undergoing peritoneal dialysis.
3. To determine baseline nutritional status using anthropometric and clinical indicators.
4. To examine the relationship between dietary protein and fiber intake and nutritional status in PD patients.

Methodology:

A retrospective cross-sectional study was conducted, using medical records of peritoneal dialysis (PD) patients at Omer Hospital and Byonyks Clinic, Lahore. 56 PD patients with records from 2025 - 2026 was included in this study and were followed up at Omer Hospital and Byonyks Clinic. The study was conducted in December 2025 – March 2026.

After the IRB approval data was extracted from patients records, including duration of dialysis and dietary intake (assessed through documented 24 – hour dietary recall) to evaluate protein and fiber intake. USDA values were used to assess the fiber, potassium and phosphorus intake of the patients 24 hr. recall. Krause exchange list was used to calculate protein intake. Baseline nutritional status was assessed using available laboratory data and clinical records. Patients with incomplete medical records or missing dietary data were excluded from the study.

Data was analyzed using IBM SPSS Statistics. Descriptive statistics were applied, with frequencies and percentages used for categorical variables (such as gender, BMI categories, gastrointestinal issues, fluid status, and albumin status), while mean ± standard deviation was calculated for continuous variables (including age, dietary protein, fiber, potassium and phosphorus intake).

Normality of the data was assessed using the Shapiro – Wilk test. As the data were not normally distributed, non-parametric tests were applied for correlation analysis. Spearman' s rank correlation coefficient was used to assess the relationship between dietary protein and fiber intake with nutritional status indicators, including serum albumin levels, BMI, and gastrointestinal symptoms.
In addition, univariate regression analysis was performed to evaluate the association of serum albumin levels, hypoalbuminemia, and hyperphosphatemia with PD-related parameters, including BMI, body surface area (BSA), PD duration, and dietary nutrient intake. A 95% confidence interval was used, and a p-value <0.05 was considered statistically significant.

Results:

This study included 56 patients undergoing peritoneal dialysis (PD). Descriptive statistical analysis showed that 51.8% of the participants were male and 48.2% were female.
The table below shows all the results of the study.

Table 1: Quantitative descriptive analysis

Variables (n)	Mean & St. Dev. (Ranges)
Age – years (56)	50.59 ± 18.07 (17 – 85)
PD duration mean (56)	480.04 ± 594.5 (165 – 3413)
Protein intake grams* (56)	35.57 ± 13.35 (14 – 80)
Fiber intake* (56)	18.19 ± 6.59 (2 – 40)
Curr. WT (Kg) (56)	65.48 ± 16.48 (32 – 110)
BSA (56)	1.71 ± 0.23 (1.21 – 2.43)
Potassium Intake (mg)* (56)	1547.00 ± 595.26 (292 – 2932)
Phosphorus Intake (mg)* (56)	805.69 ± 236.22 (195 – 1319)
BMI (56)	23.6821 ± 5.07 (13.30 – 35.60)
S Alb. (g) (51)	3.1480 ± 0.84 (1- 4.6)
S Phos (mg) (43)	6.3016 ± 2.14 (2.3 – 12.3)

* 24 hours dietary intake

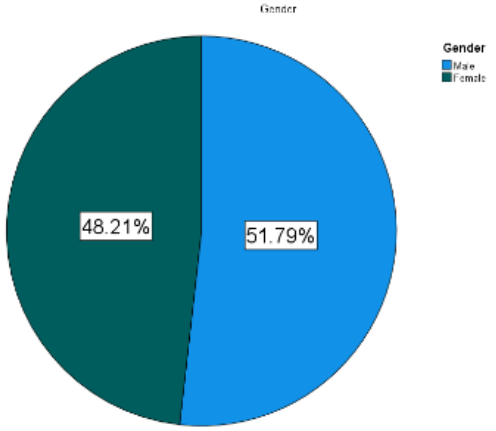


Fig. 1: Gender distribution of study population

Correlation analysis:

A significant positive correlation was observed between dietary protein intake and dietary fiber intake (p = 0.041), dietary potassium intake (p = 0.045) and dietary phosphorus intake (p = 0.001). A significant positive association was also observed between dietary fiber intake and serum albumin levels (p = 0.047) indicating nutritional status.

Significant positive correlations were found between dietary protein intake and phosphorus intake (p = 0.012).

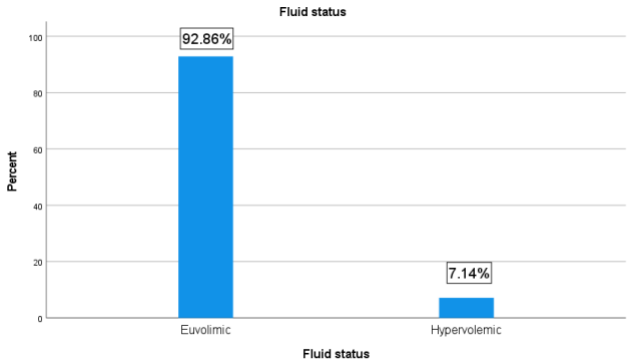


Fig. 2: Fluid status of peritoneal dialysis patients F

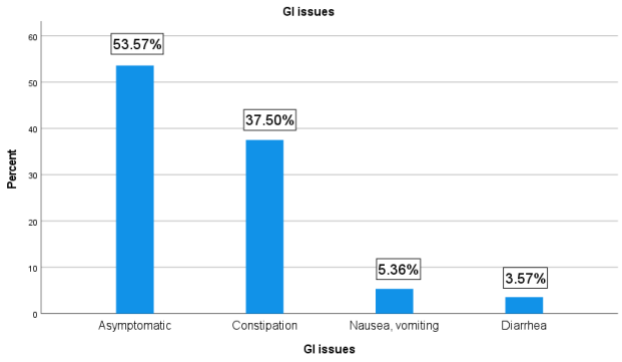


Fig 3: GI Issues among peritoneal dialysis patients

Regression:

Association of Hypoalbuminemia with Clinical and Dietary Variables

Regression analysis showed no statistically significant association between hypoalbuminemia and PD duration, dietary protein intake, BMI, BSA, potassium intake, or phosphorus intake among PD patients. These findings suggest that none of the evaluated dietary or anthropometric variables demonstrated a significant predictive relationship with hypoalbuminemia in this study population.

Table 3: Linear regression analysis with hypoalbunimia as the dependent variable in PD patients.

Variables	R value	p value
PD duration	0.084	0.671
Protein intake	0.073	0.711
BMI	0.059	0.764
BSA	0.014	0.945
Potassium	0.117	0.552
Phosphorus	0.003	0.988

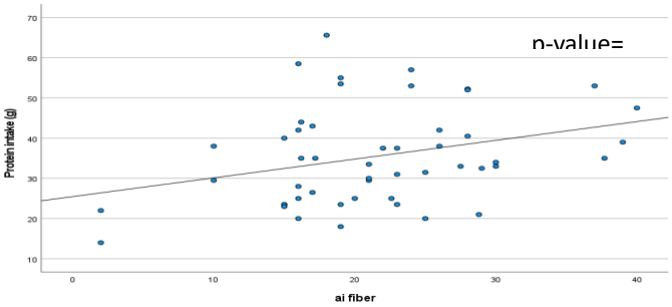


Fig. 4: Correlation of dietary fiber and dietary protein

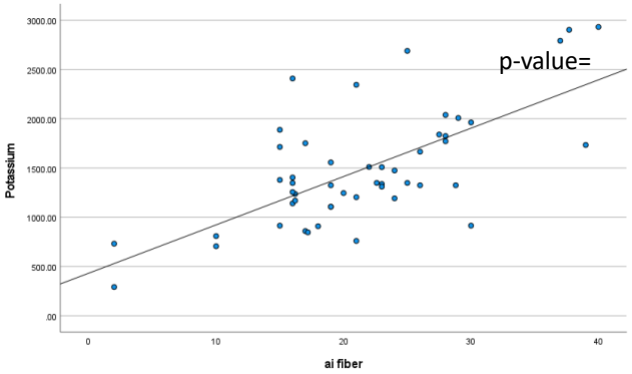


Fig. 5: Correlation of dietary fiber and potassium

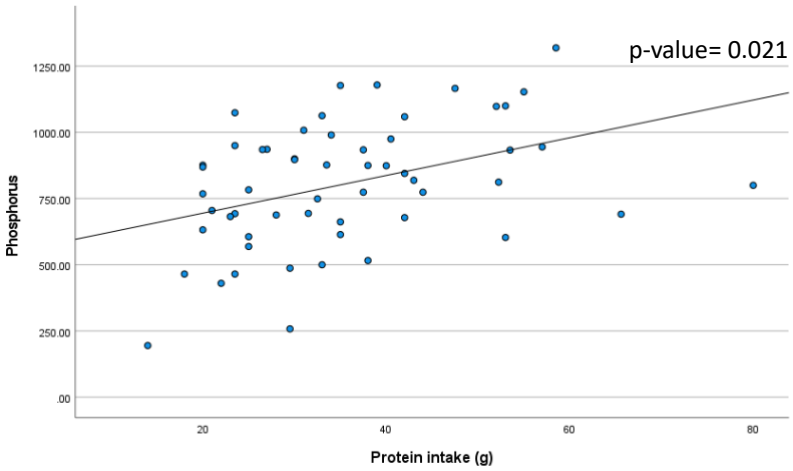


Fig. 6: Correlation of dietary protein and phosphorus

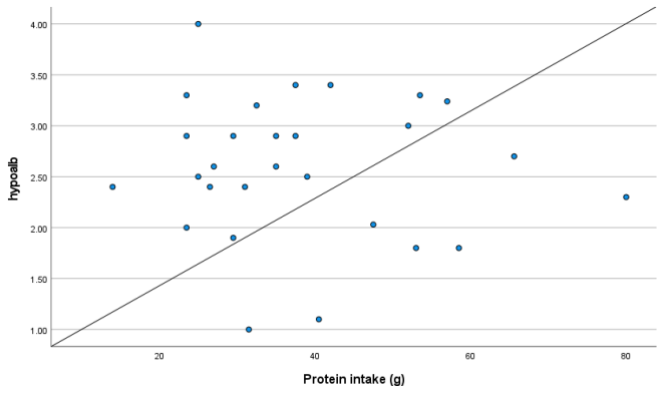


Fig. 7: Association between hypoalb. and protein intake

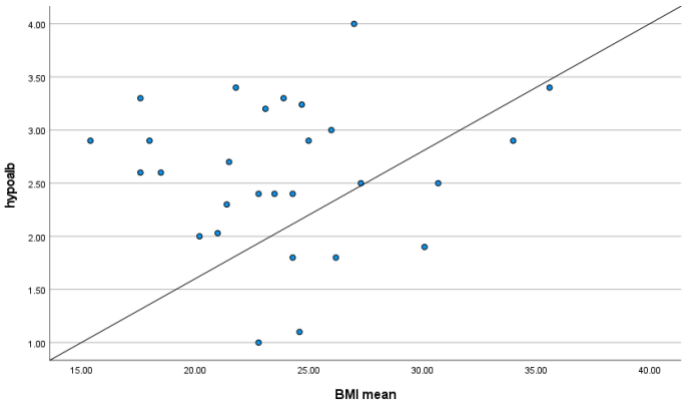


Fig. 8: Association between hypoalb. and BMI

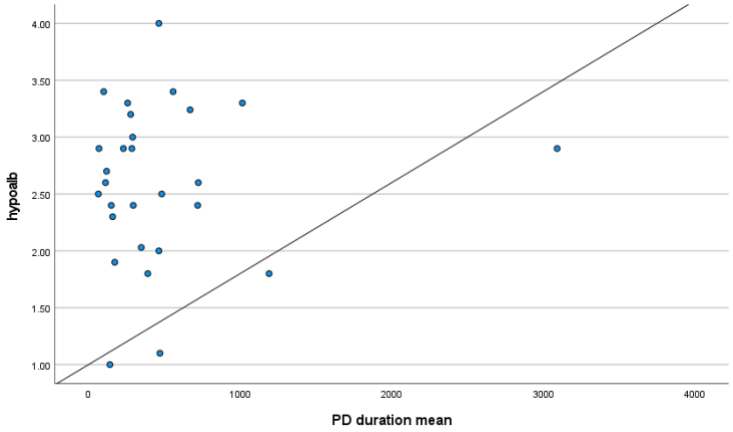


Fig. 9: Association between hypoalb. and PD duration

Association of Hyperphosphatemia with Clinical and Dietary Variables

Regression analysis demonstrated no statistically significant association between hyperphosphatemia and PD duration, dietary protein intake, BMI, BSA, or potassium intake. However, a statistically significant association was observed between dietary phosphorus intake and hyperphosphatemia (r= 0.359; p = 0.018).

Table 4: Linear regression analysis with hyperphosphatemia as the dependent variable in PD patients.

Variables	R value	p value
PD duration	0.053	0.735
Protein intake	0.166	0.288
BMI	0.139	0.372
BSA	0.193	0.214
Potassium	0.289	0.060
Phosphorus	0.359	0.018

Fig 10: Association between hyperphosphatemia & PD duration

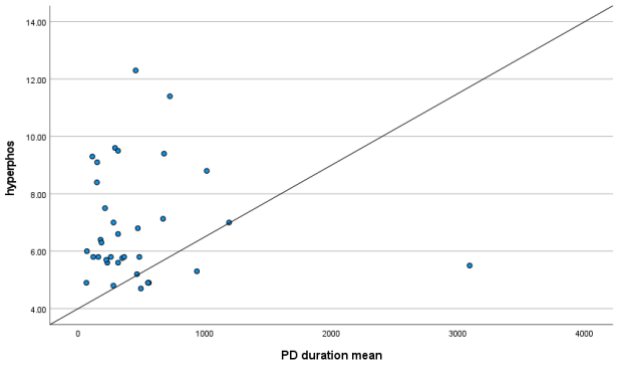
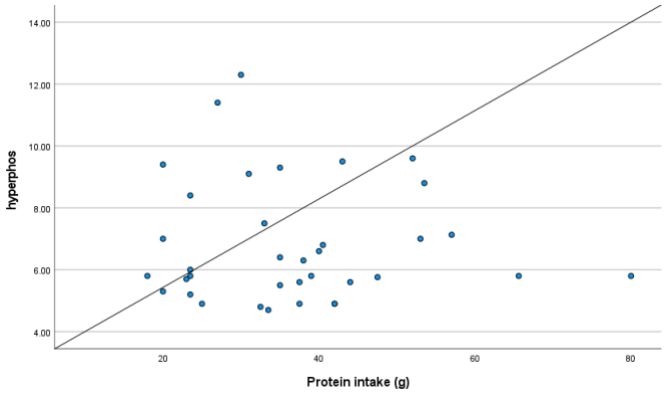


Fig.11:Association between hyperphosphatemia & protein intake



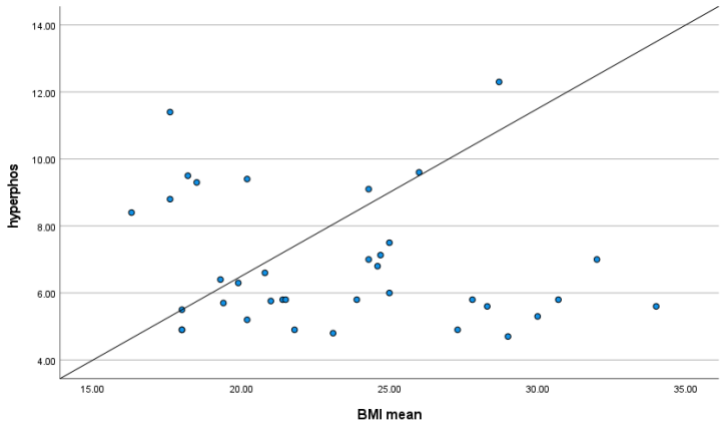


Fig.12: Association between hyperphos. & BMI

Discussion:

In this first nutritional study conducted on PD dialysis patients in Pakistan, a significant positive correlation was observed between dietary protein intake and dietary fiber intake (p = 0.041) as shown in Fig. 4. This finding does suggest that patients with higher protein intake also tend to consume more dietary fiber, reflecting better overall dietary quality and nutrient adequacy, and absence of constipation, similar findings were reported by Phillips et al. in 2015.[6] These findings highlight the importance of the patient' s dietary counselling to have a balanced fiber rich diet to improve the overall nutritional status. Dietary fiber plays a crucial role in maintaining gut health by promoting beneficial microbiota, reducing systemic inflammation, and decreasing the production of gut-derived uremic toxins such as indoxyl sulfate. Insoluble fiber, in particular, exerts a laxative effect by enhancing intestinal motility and secretion as observed in our patients.[7]

Dietary fiber intake was also positively associated with dietary potassium intake (p = 0.045) as shown in Fig. 5, likely because many fiber-rich foods such as fruits, vegetables, legumes, and whole grains are naturally high in potassium. The concern about hyperkalemia was not supported by earlier study consuming high potassium diet in DASH diet in HD patients.[8] This shows that dietary fiber rich diet is safe in patients on dialysis including PD wherealmost dialy therapy avoids hyperkalemia development.[9] However, these studies highlight the importance of following the renal dietary recommendations to control the dietary potassium in diet while consuming the adequate amount of dietary fiber.[10]

We did not find any significant association between dietary protein intake and hypoalbuminemia, possibly because serum albumin is influenced by several non-nutritional factors such as inflammation, hydration status, infection, and dialysis-related protein losses.[11]

In PD patients PEW is commonly associated with inadequate dietary protein intake and continuous protein losses through peritoneal membrane into dialysate estimated 8 – 10 g/day and increasing further during episodes of peritonitis. National Kidney Foundation USA guidelines recommend 1.2 – 1.5 g/kg/day protein intake to maintain proper nitrogen balance in PD patients.[12] A significant positive correlation was observed between dietary protein intake and phosphorus intake (p =

0.012) as shown in Fig. 6. This finding is consistent with the nutritional composition of protein-rich foods which contributes substantial amounts of bioavailable phosphorus.[13] This emphasizes the importance of individualized dietary planning in PD patients.

As expected, regression analysis demonstrated that higher dietary phosphorus intake was significantly associated with hyperphosphatemia (r = 0.359) among PD patients. Hyperphosphatemia is a major complication in dialysis patients and is associated with chronic kidney disease – mineral and bone disorder (CKD-MBD), secondary hyperparathyroidism, vascular calcification, cardiovascular disease, and increased mortality.[14] These results and studies support phosphorus-controlled dietary counselling while avoiding excessive protein restriction to prevent mortality, PEW and quality of life.[15,16]

We also found that constipation was the most commonly reported gastrointestinal symptom (37.5%) among our patients with poor fiber intake per day. We did find a negative correlation between fiber intake and constipation, however it was not statistically significant because of small sample size. Effective management of constipation is particularly important in PD because it can impair dialysate flow, contribute to catheter dysfunction, increase intraperitoneal pressure, and predispose patients to peritonitis through bacterial translocation from the gastrointestinal tract.[17] Prescribed laxatives, adequate amount of dietary fiber intake, clinically allowed fluid intake and physical activity helps to relief the constipation and is an essential component to prevent PD complications.
The limitation of the study was that it was a retrospective study design and relatively small sample size. Dietary intake was assessed using documented 24-hour dietary recall records, which may be subject to reporting bias and day-to-day dietary variation.

Conclusion:

This study highlights the complex relationship between dietary protein, fiber, potassium, and phosphorus intake among peritoneal dialysis (PD) patients. Higher protein intake was associated with greater dietary fiber intake and patients dietary counselling should specifically emphasize on these two parameters. Constipation was the most commonly reported gastrointestinal symptom among our patients and the dietary counselling should also address this important clinical issue for a successful PD experience.

Larger longitudinal studies are recommended to further evaluate the relationship between dietary intake, serum albumin, and nutritional outcomes among PD patients.

Conflict of Interest: None

Funding Source: None

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