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Original Article

Prevalence of hypoalbuminemia in chronic kidney disease patients on hemodialysis

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ABSTRACT

Objective*: To determine the prevalence of hypoalbuminemia in chronic kidney disease patients on hemodialysis.*

Methods*: A Cross-sectional study was conducted in the Hemodialysis unit of Farooq Hospital, Lahore, from August 1st, 2023, to February 1st, 2024. Four hundred patients with chronic renal disease who had been on hemodialysis for the last 03 months were enrolled in the study. After recording the baseline and relevant history, patients were enrolled, and their blood samples for serum albumin were withdrawn. Hypoalbuminemia was labeled based on serum albumin ≤3.5 g/dL. The prevalence of hypoalbuminemia was presented as frequency and percentage.*

Results*: The mean age of the patients was 47.05±12.42 years, mean BMI was 25.53±4.48 kg/m^2. There were 235 (58.8%) males. Hypertension and diabetes were observed in 166 (41.5%) and 121 (30.3%), respectively. The prevalence of hypoalbuminemia was 149 (37.3%). Of the 149 patients, 49 (32.9%) had mild, 73 (49.0%) had moderate, and 27 (18.1%) had severe hypoalbuminemia. Hypoalbunemia had a significant association with the age group, gender, hypertension, and diabetes on data stratification.*

Conclusion: *Hypoalbuminemia is prevalent in a significant population of patients with chronic kidney disease undergoing hemodialysis.*

Keywords*: Chronic kidney disease, Hypoalbuminemia, Hemodialysis, Renal failure, Nephropathy, Serum albumin.*

1. INTRODUCTION

In hemodialysis patients, serum albumin can be a biomarker for nutritional status and chronic inflammation.[1] Both mortality and hospitalization rates are much higher in patients with hypoalbuminemia.[2] In a random sample of middle-aged men, researchers found that albumin levels >4.8 g/dl were related to an almost 18% relative risk decrease in death.[3] The serum albumin concentration is determined by several factors, including its production and degradation, the size of the body pool, the volume of distribution, the interchange between intravascular and extravascular areas, and losses from the body, such as during hemodialysis.[4] Traditional high-flux dialysis results in very little albumin loss. The albumin loss rate increases when using a dialyzer membrane that is either MCO or HCO.[5,6] Hypoalbuminemia in end-stage renal illness is most commonly caused by malnutrition, which in turn leads to decreased protein synthesis due to reduced dietary protein intake, as well as restriction.[7] The National Kidney Foundation's KDOQI guidelines stated a serum albumin levels should be >4g/dL in normal healthy individual.[8] The prevalence of hypoalbuminemia in ESRD pediatric patients previously documented in Pakistan is 87%.[9]. Similarly, a study in China reported hypoalbuminemia in dialysis patients at 22.3% [10].

This study will help identify patients with hypoalbuminemia who are amenable to dietary and supplement administration to address protein-calorie malnutrition. This will improve physical quality of life, reduce morbidity and hospitalization rates, and potentially yield favorable outcomes.

2. METHODOLOGY

After the approval of IERB (M-23/111-Medicne; Dated 13-06-2023), a cross-sectional observational study was done at the Hemolysis Center Farooq Hospital from August 1st, 2023, to February 1st, 2024. The minimum sample size was 267, calculated using the Openepi calculator, based on a prevalence of 22.3% [10]. So, 400 end-stage kidney disease patients who had been on maintenance hemodialysis for >3 months, aged 15-65 years, and of both genders, were enrolled, using the non-probability consecutive sampling technique. Patients on other forms of renal replacement therapy, i.e., renal transplant or peritoneal dialysis, acute kidney injury, any malignancy, and acute febrile illness in the last two weeks were excluded. Chromic kidney disease was labeled based on history (> three months), oliguria, and shrunken kidney size on USG. Hypoalbuminemia (Serum Albumin levels of ≤3.5) was categorized into three grades: 3.5-3.0 g/dL was labeled as mild hypoalbuminemia, 3-2 g/dL moderate, and <2 g/dL was considered severe. [8]

Permission was asked from the Akhtar Saeed Medical and Dental College Institutional Ethical Review Board. Informed consent was taken from patients arriving at the Farooq Hospital dialysis center. Relevant history and a review of previous records were taken to meet inclusion and exclusion criteria. Blood samples were collected, and serum albumin levels were performed. Findings were recorded on proforma along with other demographic information and relevant history.

Data was entered and analyzed in SPSS v26. Quantitative data, such as age, BMI, duration of CKD, and albumin levels, were presented in mean and standard deviation. Qualitative data, such as gender, diabetes, hypertension, and hypoalbuminemia, will be presented in frequency and percentages. All data will be stratified accordingly. A p-value of ≤0.05 was considered as significant.

3. RESULTS

This study involved 400 patients who met the inclusion criteria. The patients' mean age was 47.05±12.42 years. There were 235 (58.8%) males. The mean BMI of the patients was 25.53±4.48 kg/m^2. Hypertension and diabetes were observed in 166 (41.5%) and 121 (30.3%), respectively. Demographic data is described in Table 1.

Table. I :Demographic profile of the study patients

Variable	N (%)	Mean±S.D
Age (years)		47.05±12.42
18-35	86 (21.5%)	
36-50	128 (32%)	
51-65	186 (46.5%)	
Gender		
Male	235 (58.8%)	
Female	165 (41.3%)	
BMI (kg/m^2)		25.53±4.48
<30 kg/m^2	335 (83.8%)	
≥30 kg/m^2	65 (16.3%)	
Hypertension		
Yes	166 (41.5%)	
No	234 (58.5%)	
Diabetes		
Yes	121 (30.3%)	
No	279 (69.8%)	
Duration of hemodialysis (months)		23.62±4.88
<20 months	105 (26.3%)	
≥20 months	295 (73.8%)	

Figure. I : Prevalence of Hypoalbuminemia among the study patients

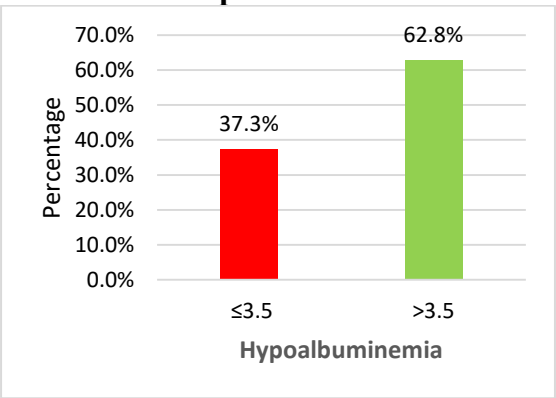

Table. II: Association of hypoalbuminemia with demographic profile

Variable	Hypoalbuminemia		Test of sig.
	Yes 149 (37.3%)	**No 251 (62.8%)**	
Age (years)			
18-35	15 (10.1%)	71 (28.3%)	χ^2=28.86, d.f=2 **p<0.001**
36-50	41 (27.5%)	87 (34.7%)	
51-65	93 (62.4%)	93 (37.1%)	
Gender			
Male	68 (45.6%)	167 (66.5%)	χ^2=16.84, d.f=1 **p<0.001**
Female	81 (54.4%)	84 (33.5%)	
BMI (kg/m^2)			
<30	123 (82.6%)	212 (84.5%)	χ^2=0.251, d.f=1 **p=0.616**
≥30	26 (17.4%)	39 (15.5%)	
Hypertension			
Yes	65 (43.6%)	101 (40.2)	χ^2=0.441, d.f=1 **p=0.506**
No	84 (56.4%)	150 (59.8)	
Diabetes			
Yes	58 (38.9%)	63 (25.1%)	χ^2=8.47, d.f=1 **p=0.004**
No	91 (61.1%)	188 (74.9%)	
Duration of hemodialysis (months)			
<20	48 (32.2%)	57 (22.7%)	χ^2=4.36, d.f=1 **p=0.037**
≥20	101 (67.8%)	194 (77.3%)	

149 people (37.3%) had hypoalbuminemia in this study.(Figure. I). Of the 149 patients, 49 (32.9%) had mild, 73 (49.0%) had moderate, and 27 (18.1%) had severe hypoalbuminemia. The association of hypoalbuminemia with demographic profile is shown in Table. II. It was seen that elder patients, 51-65 years age group, had more 93 (62.4%) hypoalbuminemia than hypoalbuminemia 93 (37.1%) of the same age group (p<0.001). Females had more 81 (54.4%) hypoalbuminemia than males 68 (45.6%) (p<0.001). There were 58 (38.9%) patients who had diabetes and hypoalbuminemia versus 63 (25.1%) non-diabetic and non-hypoalbuminemia (p=0.004). There were 101 (67.8%) patients who had hypoalbuminemia and

≥20 months of duration of hemodialysis versus 48 (32.2%) patients who had hypoalbuminemia and <20 months of duration of hemodialysis (p=0.037). (Table. II).

4. DISCUSSION

As the primary regulator of intravascular colloidal osmotic pressure, albumin is essential as a transporter protein and antioxidant. Low albumin levels in the blood have been linked to a higher risk of death in individuals who are hospitalized, clinically stable, and critically ill. [11]. Serum albumin levels are frequently low in CKD individuals with mild renal impairment. According to the 1999–2010 National Health and Nutrition Examination Survey (NHANES), albumin levels <4.2 g/dl were present in 53% of those with an eGFR <60 mL/min/1.73 m2. The same criterion is met by 33% of individuals with preserved renal function (eGFR ≥90 mL/min/1.73 m2). [12]. Hypoalbuminemia occurs in CKD patients when catabolic losses exceed the rate of albumin synthesis. [13].

The prevalence of hypoalbuminemia is crucial as it's a poor prognostic marker not only in hemodialysis patients but also in chronic illnesses like heart failure and chronic liver disease. Hypoalbuminemia was recorded in 37% of patients in our study population. A study done by Anees and Ibrahim in Lahore enrolled only 100 patients and reported a prevalence of hypoalbuminemia in 67% of patients, [14] which is high due to the smaller sample size. Rami et al. reported hypoalbuminemia in 33% of dialysis patients [15]. Moon et al. reported that patients on maintenance dialysis have a mean albumin level of 2.7, and almost 65% of such hypoalbuminemia patients died within 14 days of follow-up. [16]

One major determinant of albumin level in dialysis patients was the increased duration of renal replacement therapy. Tauqeer et al. reported that with the increase in the number of dialysis sessions, the prevalence of hypoalbuminemia increased in up to 10% of patients, consistent with the results of our study showing patients with ≥20 months have almost double the incidence of hypoalbuminemia (32% vs. 67%) [17]. Similarly, the older population has also increased the incidence of hypoalbuminemia due to an overall decrease in body mass status, as proven by Evila et al. [18]

There are certain limitations to our investigation. It is a center study without a comparison group, to start. Furthermore, individuals who are not undergoing renal replacement treatment and have other stages of kidney disease should have their prevalence of hypoalbuminemia assessed.

5. CONCLUSION

It is concluded from our study that hypoalbuminemia is a prevalent condition, present in a significant proportion of patients receiving hemodialysis.

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