



Nutritional status in hemodialysis and chronic kidney disease (CKD) patients in district Lahore, Pakistan. a comparative cross sectional study

Saima Batool¹, Ahmed Bilal¹, Aurang Zeb¹, Muhammad Zia Shahid¹, Muhammad Imran¹, Tabussam Tufail^{1*}, Muzzamal Hussain²

¹University Institute of Diet and Nutritional Sciences, Faculty of Allied Health Sciences, The University of Lahore, Lahore, Pakistan

²Institute of Home & Food Sciences, Government college University Faisalabad, Pakistan

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Abstract

The core objective of this research was to compare the nutritional status of hemodialysis and chronic kidney disease patients visiting Mayo Hospital and Shalamar Hospital, Lahore. For the purpose A total of 180 patients age range from 18-75 years were selected for the nine months comparative cross sectional study. The sample was selected from the two hospitals in Lahore namely, Mayo Hospital and Shalamar Hospital, Lahore. The data was collected through questionnaire and analyzed through statistical software SPSS version 22. The results showed that among 180 participants, the prevalence of anemia between the age group of 31-43 years report 42.2% cases of ESRD and age group 18-30 years report 36.7% of CKD cases, was high in lower class people hemodialysis (ESRD) 44.4% and 56.7% CKD, in middle class the prevalence was 42.2% ESRD, CKD 32.2% and in upper class the prevalence of anemia was 13.3% and 10% in ESRD and CKD respectively. The prevalence of anemia was high among ESRD male 61.1% participants than CKD male 51.1% participants. Grade 3 (severe anemia) was significant in both groups ESRD 43.3% and in CKD 48.9%. Conclusively, the results declared that anemia was more prevalent in ESRD and hypoalbuminemia in CKD patients, in low socioeconomic status and in people who were less educated. Males were highly affected from this disorder than females. The risk factors included were stress, depression, anxiety, family history, dietary restrictions and the type of diet.

* **Corresponding Author:** Tabussam Tufail ✉ tabussam.tufail@dncs.uol.edu.pk

Introduction

Dysfunctions of kidney currently are amongst the major health threats being faced by the masses. The slow progression and permanent loss of kidney function may result in chronic kidney disease (CKD) (Glasscock *et al.*, 2017). Chronic kidney disease (CKD) is defined as prolonged abnormal kidney functions existing in about 11% of the population in Europe and the United States and often occurs jointly with other health related problems such as diabetes mellitus and cardiovascular disease (Albayrak *et al.*, 2016). Chronic kidney disease (CKD) results in an adaptive process in which the patient remains asymptomatic for some time. When the kidneys can no longer adequately remove the metabolic degradation products that is called end stage renal disease (ESRD), dialysis treatment should be initiated (Tamadon *et al.*, 2015).

The prevalence of chronic kidney disease (CKD) in different communities varies from 7.5 to 20%. About 70% of end stage renal disease (ESRD) patients either die or discontinue their treatment within 3 months of renal replacement therapy (dialysis) (Liu *et al.*, 2006). According to the World Health Report 2002 and Global Burden of Disease (GBD) project kidney and urinary tract diseases contribute to the global burden of diseases with approximately 850,000 deaths per year and 15,010,167 disability-adjusted life years. This cause is rated as 12th cause of death and the 17th cause of disability (Young *et al.*, 2005).

The crude 1-year mortality ESRD rates were 6.6% in Japan, 15.6% in Europe, and 21.7% in the US (Jessani *et al.*, 2014). The incidence of end stage renal disease ESRD patients in Pakistan who are undergoing on hemodialysis for their survival estimated as 100 patients per million. A recent study published in 2014 about the prevalence of chronic kidney disease in Pakistan suggested a prevalence rate of 12.5% (Liakopoulos *et al.*, 2004). It has been reported 22 to 84% of patients with end stage renal disease (ESRD) have undergone on their regular hemodialysis in Pakistan (Am j national KF 2006). Hypoalbuminemia particularly in fact most probably a reflection of malnutrition has emerged as a very strong predictor

of early end in chronic dialysis patients (Cano *et al.*, 1987). Malnutrition is very common in end stage renal disease (ESRD) patients (Wong *et al.*, 2002). Protein energy malnutrition especially low serum albumin is highly prevalent in hemodialysis patients and is an indicator of morbidity and mortality (Sridhar *et al.*, 2013). Serum albumin is a marker of nutrition and inflammation and predicts mortality, particularly when <3.8 g/dL (Anees *et al.*, 2010).

Anemia and malnutrition is most common in our country and other developing countries, so this study was conducted to determine the survival of hemodialysis patients and chronic kidney disease patients its relationship with hemoglobin level and serum albumin level also using body mass index (BMI) for under nutrition and over nutrition.

Materials and methods

This was a comparative cross sectional study with the sample size of 180 patients (90 from end stage renal disease (ESRD) dialysis dependent and 90 from chronic kidney disease (CKD) non dialysis dependent) both male and female from January 2019 to September 2019 at Mayo Hospital and Shalamar Hospital, Lahore.

The purpose of the study was to compare the nutritional status in hemodialysis and chronic kidney patients. All male and female patients of kidney disease aged between 18-75 years old were included in the study. A questionnaire was designed that included demographic profile, questions related to signs, symptoms of anemia. Demographic data like age, gender, socioeconomic status, marital status, and education status was taken. Questions related to anemia signs and symptoms, dietary intake and follow up questions were also included in the present study to evaluate the factors that were responsible for anemia.

The data were analyzed through statistical software SPSS version 22 and independent t-test was applied to compare the nutritional status among both study groups.

Results

Descriptive statistics of Socio-demographic characteristics of study participants

Table 1 illustrates that the prevalence of anemia was more in lower class CKD patients (56.7%), more

developed in less educated people and age group 31-43 year (42.2%) ESRD group.

The prevalence of anemia was more in ESRD males (61.1%) and married CKD group (58%).

Table 1. Socio-demographic characteristics of study participants.

Variables	Categories	ESRD(Dialysis)	CKD(non-dialysis)
Socioeconomic status	Lower class	44.4%	56.7%
	Middle class	42.2%	32.2%
	Upper class	13.3%	10%
Education	Uneducated	16.7%	21.1%
	Primary	8.9%	8.9%
	Middle	8.9%	4.4%
	Matriculation	32.2%	35.6%
	Intermediate	24.4%	20%
	Graduation	7.8%	7.8%
	Master	1.1%	2.2%
Age group	18-30	21.1%	36.7%
	31-43	42.2%	31.1%
	44-56	25.6%	18.9%
	57-70	8.9%	8.9%
	71-83	2.2%	4.4%
Gender	Male	61.1%	51.1%
	Female	38.9%	48.9%
Marital status	Married	71%	58%
	Unmarried	27%	41%

Table 2 illustrates Grade 3 (severe anemia) was most commonly present in kidney disease 43.3% ESRD and in CKD 48.9%.

There are no significant differences in the body mass index of CKD and ESRD patients as compared by independent t-test as detail in Table 3. Similarly, there are no major difference in hemoglobin level of both groups it mean ESRD and CKD patients equally anemic due to their kidney dysfunction. To test the differences among CKD and ESRD patients in relates to the value of albumin, independent t-test was performed. Homogeneity of variance was satisfied via levene F-test $F(178) = 1.875$, $P = 1.73$ the independent t-test was in association and give the statistically significant results $t(178) = 3.542$, $P < 0.001$. Thus

CKD patients have low serum albumin and are under nutrition as compared to ESRD patients.

Discussion

Among the countries where kidney diseases are on its peak Pakistan is on eight position where kidney diseases were epidemic. In every major health issue there are some associated factors which can lead to other health issues. Different studies reported that anemia and hypoalbuminemia is strongly associated with CKD and ESRD and results of our studies also gives significant findings with chronic kidney diseases (CKD) and ESRD patients. CKD patients have different range of age groups between the age group of 31-43 years report 42.2% cases of ESRD and on other hand patients with the age group 18-30 years

reports 36.7% of CKD cases which is refer to results of another study conducted by Rosette Harford, and Mary jo Clark their findings include the patients with age group between 40-60 years old were more prone to End stage renal disease with ($P < 0.001$) (Cherikh *et al.*, 2011). 61.1% of the male cases were reported among the ESRD patients and 51.1% of male patients

were among the CKD patients. And 38.9% were females with ESRD and 48.9% were with CKD. This is in similarity to one of the study conducted by findings of their study shows that ESRD patients with the different grades of anemia was more among male patients as compared to female patients (P -value < 0.05) (Cavanaugh *et al.*, 2010).

Table 2. Grades of anemia among the study subjects.

Variables	Hemoglobin level	ESRD(dialysis dependent)%	CKD(non-dialysis)%
Grade1(Mild anemia)	<10mg/dl	7.8%	5.6%
Grade 2 (Moderate anemia)	8-10 mg/dl	25.6%	34.4%
Grade 3(Severe anemia)	6.5-7-9mg/dl	43.3%	48.9%
Grade4(Life threatening)	<6.5mg/dl	23.3%	11.1%

There was low rate of literacy among the study participants in both groups but majority of the study subjects were uneducated (21.1%) and diagnosed with chronic kidney diseases and 16.7% was with the end stage renal diseases. Finding of our study results is similar to study conducted by Division of Nephrology, Department of Medicine, Vanderbilt University Medical Center., findings of their study reported that lower rate of literacy was more involved in mortality of patients with ESRD as compared with good literacy rate (HR 1.54; 95% CI 1.01 to 2.36) (Garrity *et al.*, 2016). Among the social classes of the study participants majority were from lower socio economic status among the CKD patients with 56.7% and 44.4% was with ESRD patients and then 32.2% with chronic kidney diseases belongs to middle class and 42.32% was with ESRD and belongs to middle class, only 13.3% of the study participants belongs to upper class in ESRD group patients and 10% was with upper class among the chronic kidney diseases patients, this findings of our study is similar to one of the study conducted by which higher ESRD incidence associated with poverty status (95% CI 1.02,1.05) (Ito *et al.*, 2010).

Grades of anemia was different among the both groups grade 1 anemia was considered as those individuals who's HB level <10mg/dl and in our study 7.8 % of the participants was with grade 1 anemia with the diagnosis of ESRD and 5.6% was with grade

1 anemia with the diagnosis of CKD. Similarly, Hb of the patients between 8-10mg/dl was considered as grade 2 anemia among the dialysis patient (ESRD group) was reported 25.6% and among CKD patients grade 2 anemias was reported 34.4% patients. Grade 3 anemia was considered for those individuals who's Hb level was between 6.5-7.9mg/dl and grade 3 anemia was reported among 43.3% of the ESRD patients and 48.9% was among the CKD patients.

These grades was strongly associated with socio economic status of the patients and this is one the leading cause in developing of the other diseases, this is in similarity with the one of the study conducted by edgeways hospital, findings of their study shows that among the ESRD patients 330 with grade 3 anemia and 91 were with grade 2 anemia (Green *et al.*, 2012).

As in initial stages of CKD anemia developed because when kidneys are damaged they are unable to release erythropoietin, as a result the bone marrow makes fewer blood cells and causing the anemia as symptoms likes fatigue, feeling tired, headache, problem with concentration, paleness, dizziness, difficulty breathing, chest pain. when blood has fewer RBC, it deprives the body from oxygen it needs and some other reasons includes blood loss during hemodialysis and low levels of the nutrients intake like Iron, vitamin B12 and folic acid these nutrients are essential to make hemoglobin of red blood cells.

Table 3. Independent t-test for association between ESRD and CKD group patients with respect to the mean differences.

Study variables	Types of kidney patients	Mean	SD	SD Error mean
Body mass index	ESRD	19.550	5.787	0.610
	CKD	19.288	3.506	0.369
HB level g/dl	ESRD	8.635	1.856	0.195
	CKD	8.420	2.195	0.231
Albumin level g/dl	ESRD	2.943	0.839	0.088
	CKD	2.497	0.848	0.894
Creatinine level mg /dl	ESRD	1.724	0.450	0.047
	CKD	1.336	0.246	0.026
Potassium level mEq/l	ESRD	4.444	0.968	0.102
	CKD	4.446	0.897	0.094
Calcium level mg/dl	ESRD	9.893	0.713	0.075
	CKD	9.062	1.189	0.125
Magnesium level mg/dl	ESRD	2.055	0.420	0.044
	CKD	2.034	0.447	0.047
Phosphorus level mg/dl	ESRD	4.025	0.758	0.079
	CKD	3.912	1.102	0.116
Urea level mmol/l	ESRD	120.87	36.19	3.815
	CKD	135.87	110.81	11.68
Sodium level mEq/l	ESRD	137.65	5.399	0.569
	CKD	133.51	9.630	1.015

In results of our study 80% cases were reported with complained of fatigue among the ESRD group and 88.9% of the patients reported fatigue among the CKD patients. 75.6% of the cases reported feelings of rapid heart rate among the ESRD patients and 84.4% was among the CKD patients. Similarly pale colour of skin reported among the ESRD group patients was 68.9% and among the CKD patients was 71.1%. Yellow colour of the eye among the CKD group was 61% and 58.95% among ESRD group patients. Similarly 67% of the patients reported the shortness of breath among the CKD patients as compared to the ESRD patients 61.1%. Brittle nails present were 34.4% among the CKD patients and 18.9% was among the ESRD patients. Complain of dizziness was reported 74.4% among the CKD patients and 43.3% was reported among the ESRD patients. Due to infection fever was reported among the both groups but majority of the cases was reported among the CKD patients (76.7%) as compared to the ESRD patients 51.1%. These results indicate that symptoms of anemia were reported with more severity among the CKD group patients as compared to the ESRD patients finding of our study is similarly with the findings of the study conducted by the department of palliative care and policy, King College London UK. Their

findings were significant associated with symptoms includes pruritus 55%(10%to77%) constipation 53%(8%to57%), anorexia 49%(25% to 61%), pain 47%(8%to 82%) sleep disturbance 44%(20%to 83%), anxiety 38%(12%to52%), dyspnea 35%(11% to 55%), nausea 33%(15% to48%), restless legs 30%(8% to 52%) and depression 27%(5% to 58%)with ($P < 0.05$) (Yang *et al.*, 2018). Some of the questions were asked from the study participants of both groups on their follow-up visits to evaluate the level of protection against infection and anemia with the kidney diseases, 32.2 % of the participants of ESRD group report they were following the dietary guidelines and similarly 25.6% among the CKD patients reply they were following the dietary guide lines this results are in similarity with the results of the study conducted by CHIH-yu-Yang they suggest that by taking the food rich in fibrous and iron rich diet can maintain the required nutrients for the body among the patients with ESRD patients (Sampaio *et al.*, 2012).

There were significant results among the both groups in relates to receiving of the recombinant erythropoietin injection 64.4% reported they were receiving the erythropoietin injections in ESRD group and 22.2 % was among the CKD group.

Table 3. Detail of the study variable with respect to the CKD and ESRD groups patients.

	Levene's test for equality of variances		t-test for equality of means						
	F	Sig	(t)	(Df)	Sig(2-tailed)	Mean Differences	Std. Error Differences	95% confidence interval of the differences	
								Lower	Upper
Body mass index									
Equal variances assumed									
Equal variance not assumed									
HB level g/dl									
Equal variances assumed	2.696	0.102	0.711	178	0.478	0.2155	0.3030	-0.382	0.8136
Equal variance not assumed			0.711	146.56	0.478	0.2155	0.3030	-0.382	0.8137
Albumin level g/dl									
Equal variances assumed	1.875	0.173	3.542	178	0.001	0.445	0.125	0.197	0.693
Equal variance not assumed			3.542	177.97	0.001	0.445	0.125	0.197	0.693
Creatinine level mg/dl									
Equal variances assumed	46.35		7.166	178	0.000	0.387	0.054	0.280	0.494
Equal variance not assumed		0.000	7.166	138.150	0.000	0.387	0.054	0.280	0.494
Potassium level mEq/L									
Equal variances assumed	0.29	0.865	-0.01	178	0.987	0.002	0.139	-0.276	0.272
Equal variance not assumed			-0.01	176.99	0.987	0.002	0.139	-0.276	0.272
Calcium mg/dl									
Equal variances assumed	26.237	0.000	5.685	178	0.000	0.831	0.146	0.542	1.11
Equal variance not assumed			5.685	145.65	0.000	0.831	0.146	0.542	1.120
Magnesium mg/dl									
Equal variances assumed	10.36	0.002	0.326	178	0.744	0.021	0.064	-0.106	0.1487
Equal variance not assumed			0.326	177.32	0.744	0.021	0.064	0.10652	0.1487
Phosphorus mg/dl									
Equal variances assumed	11.98	0.001	0.804	178	0.423	0.113	0.141	-0.165	0.3916
Equal variance not assumed			0.804	177.32	0.423	0.113	0.141	-0.165	0.3919
Urea mg/dl									
Equal variances assumed	1.36	0.244	-1.22	178	0.224	-15.000	12.288	-39.24	9.24
Equal variance not assumed			-1.22	107.77	0.225	-15.000	12.288	-39.35	9.35
Sodium mEq/L									
Equal variances assumed	22.10	0.000	3.561	178	0.000	4.114	1.16	1.847	6.44
Equal variance not assumed			3.561	139.91	0.001	4.144	1.163	1.843	6.44

This is referring to study conducted by findings of their study shows that 25% in peritoneal dialysis patients and 80% in hemodialysis patients receiving the recombinant erythropoietin and regularly comes to the hospitals for the checkup of kidneys in urology OPD (Snyder *et al.*, 2004).66.7% of the study subjects from the ESRD group report that they were on regular checkup in outdoor and 55.6% from the CKD group responded that they were on regular checkup at outdoor. Loss to follow up is one of the basic issue which leads towards to the poor prognosis and in our study loss to follow up was more reported among the CKD 55.6% patients and 66.7% with ESRD group which is in similarity with results of the study conducted their results reports that loss to follow up is associated with lack of awareness probably causes the higher dropout rate at lower creatinine levels (Piccoli *et al.*, 2003).More cases were reported among the CKD group patients with the family history of kidney disease (35.6%) as compared to the ESRD group patients (30%) this is referred to the results of

the study conducted by William McClellan MD, results of their study reported that family history of CKD is significantly associated with CKD ,87.5±22.2(SD) and 86.5±19.3ml/min/1.73 respectively (P-0.05). Among the ESRD group majority was losing their body weight (51.1%) as compared to CKD patients (6.7%) similarly patients of the ESRD group were with intradialytic symptoms (45%) as compared to the CKD group (1.1%) patients this was in similarity with the results of the study conducted by Jun ling Lu this indicated that body mass index was in association with patients of ESRD and CKD. Lower BMI leads towards the poor outcomes of the patients (Laghari *et al.*, 2017).

There were significant difference among the results with mental stress for both groups 72.2% cases were presented with mental stress among the CKD group patients and 42% was among ESRD group patients this is referred to the results of the study conducted by report that clinical depression affects about 25% of

the hemodialysis patients (Kalantar *et al.*, 2014). Level of albumin among the ESRD group was [M=2.943(SD=0.839)] in comparison to the CKD group with a numerically smaller albumin value [M=2.497(SD=0.848)], the independent t-test was in association and give the statistically significant results $t(178) = 3.542$, $P < 0.001$ thus ESRD patients has higher level of albumin values as compared to CKD patients it means CKD group were under nutrition this results was in similarity with the results of the study conducted by their findings reports that ESRD patients remained higher levels of albumin as compared to the CKD group patients.

In their study comparison was made to assess the affectivity of the dialysis among the ESRD patients and finding shows that ESRD patients remains higher levels of albumin as compared to the CKD patients (Zalai *et al.*, 2012). Similarly, creatinine was higher among the ESRD group patients [M=1.724(SD=0.450)] as compared to the CKD group patients [M=1.724(SD=0.450)] and t-statistics $t(138) = 7.166$, $P < 0.001$ which shows that ESRD patients having higher levels of creatinine as compared to the CKD Patients. As kidneys are the filter for wastes from the blood stream kidney damage mean that there will be a buildup of creatinine besides and other waste products in the body.

When kidney damaged occurs calcium levels in a person blood to be out of the balance and kidney stop the calcitriol the low level of calcitriol in the body create an imbalance of calcium in the blood that the reason in results of our study calcium level among the ESRD group [M=9.893(SD=0.450)] is higher as compared with the CKD group [M=9.062(SD=1.189)] value of independent-t-test give the significant results $t(145.06) = 5.685$, $P < 0.001$, which is in similarity with results of the study conducted by report that patients with ESRD having higher calcium values can result more fetal conditions as compares to the CKD patients (Skikne *et al.*, 2011).

As in both CKD and ESRD kidney are damaged and are unable to excrete the phosphorus from the body

properly so phosphorus levels rise in the blood due to which hyper phosphatemia occur and that why in our study among the ESRD group patients with the levels of phosphorus [M=4.02 (SD=0.758)] as compared to the CKD group patients [M=4.035(SD=3.912)] with the results of independent-t-test $t(178) = 0.804$, $P < 0.001$. So ESRD group patients reported with the higher levels of phosphorus as compared to the CKD group patients which is refer to the study conducted by finding of their study shows that end stage renal diseases patients were with higher levels of phosphate as compare to the CKD patients (Rivara *et al.*, 2015). Among the study subjects higher level of sodium was [M=137.65(SD=5.399)] in ESRD patients in comparison with the CKD group patients [M=133.5(SD=9.630)] with $t(139) = 3.56$, $P < 0.001$, as kidneys are unable to excrete the sodium from the kidney due to which water retention occur and lead towards the other conditions like edema, nephrotic syndrome in our study results are in similarity with the results of the study conducted by their findings report that among the patients with ESRD raised sodium intake can leads toward the mortality and severe conditions as compared to the patients with CKD and this was the also seen among the patients with CKD and on high dietary salt (>14g daily) seems to blunt the anti-proteinuria effect of ACE inhibitor therapy and increase the risk for ESRD independent of B.P control (Waheed *et al.*, 2013).

So basis on over results this is cleared that anemia was more prominent among the chronic kidney diseases patients. Sever symptoms of anemia was reported among the CKD patients as compared to the ESRD patients. Majority of the grade three and grade two anemia cases were reported among the chronic kidney diseases patients. However, interpretations of our analysis shows that ESRD patients have higher chance to developed other health problems like hypertension and heart problems. With the biochemical analysis of serum albumin it was observed hypoalbuminemia more common in CKD group as compared to ESRD group this is showing that CKD patients were more under nutrition as compared to ESRD group.

Conclusion

In Pakistan anemia among the patients with end stage renal diseases (ESRD) and chronic kidney diseases (CKD) is common due to a lot of different factors. This includes poverty and low quality of diet and lower socio economic status and involved on progression of anemia in (ESRD) and (CKD).

Our results findings concluded that among ESRD and CKD patients of Punjab Pakistan anemia is more prominent among male. Besides, it concludes that ESRD patients reported more severe and more life threatening conditions due to anemia as compared with CKD patients.

Among the ESRD patients more reported cases were male gender with grade 3, (severe anemia) and (grade 4 life threatening condition) between age groups of 31-43 years old and 44-56 years old. On other hand under nutrition (BMI<18.5) individuals with ESRD reported more cases of severe anemia, lower socio economic status and literacy rate was one the major contribution factor among the patients with ESRD for anemia.

In ESRD patient's majority was under nutrition status with BMI <18.5., symptoms of anemia were more prominent and on severity in ESRD patients, cases of ESRD were less achiever of KT/v in hemodialysis as compared with CKD patients. And only 26(28.9%) was receiving nutritional supplement in ESRD on other hand in CKD patients 30 (33.3%) reported they were taking nutritional supplements in their routines. Symptoms of anemia include. rapid heart rate, pale colour of skin, yellow color of eye, shortness of breath and fever, more cases was reported in grade 3 (severe anemia) and in (Grade 4 life threatening condition).

In ESRD cases same symptoms were reported with more severity in BMI <18.5, family history of kidney disease shows association in both ESRD and CKD but more significant results with grades of anemia was found in ESRD patients. Similarly, the entire reported symptom presented with more severity in grade 3 and in grade 4 anemia in ESRD patients.

Over all ESRD patients were highly reported with severity of anemia as compared with CKD patients similarly hypoalbuminemia was found in CKD than ESRD group. ESRD is severe condition of kidney failure anemia need to monitor strictly so timely can be managed.

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