

Clinical Presentations of Chronic Kidney Disease Patients on Regular Haemodialysis Attending in Tribhuvan University Teaching Hospital Emergency Services

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ABSTRACT

Background: Chronic kidney disease is increasing day by day and so is condition of renal replacement therapy mainly hemodialysis. The objective of the study is to study clinical parameters of these patients so that in future these deranged parameters can be focused during patient management and decrease their emergency visit.

Methods: A prospective cross sectional study was conducted in emergency services of Tribhuvan University Teaching Hospital from 1st May 2018 to 31st October 2018 among the adult chronic kidney disease patients under maintenance hemodialysis. Non-probability sampling method was used. Total of 300 patients were enrolled in the study. Patients' age, sex, causes of CKD, laboratory parameter during emergency visit, need of emergency hemodialysis, and need of blood transfusion were studied.

Results: Out of total 300 patients, mean age was 45.64 years (S.D =17.15). 190 (63.3 %) were male and 110 (36.70%) were female. 152 (50.70%) of patients had hypertension. Diabetes and Glomerulonephritis both had equal prevalence of 63 (21%). Mean hemoglobin was 6.52 gm% (S.D = 1.93). Mean pH was 7.17 (S.D = 0.154). Mean serum potassium and creatinine level were 5.77 mEq/L (S.D = 0.76) and 1076.03 mmol/l (S.D = 367.25) respectively. Area under the Receiver Operating Curve was 0.660 for potassium and 0.598 for serum creatinine.

Conclusion: Causes of chronic kidney disease, decreased hemoglobin level, increased serum creatinine and potassium level and metabolic acidosis are reasons of frequent emergency room visit among CKD patients.

Keywords: chronic kidney disease; emergency presentation; mortality.

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INTRODUCTION

In Nepal, prevalence of chronic kidney disease and its related complications are increasing. Community screening study done for presence of chronic kidney disease among Nepalese population showed a prevalence of 10.6%¹ but hospital based study had prevalence of 56.02%.² There is wide variation of prevalence of CKD among countries;³ among United States adult being 13.1%⁴. Major Causes of CKD are diabetes, hypertension, glomerulonephritis, and other disorder.⁵⁻⁷

Many of these patients present to emergency room because of complications like uncontrolled hypertension, anemia, high potassium, metabolic acidosis, pulmonary edema, cardiac failure and other cardiovascular problem.⁸ Frequent emergency visit of CKD patients under maintenance hemodialysis points towards either inadequate hemodialysis or inadequate management of underlying medical conditions. Therefore, the study aims to analyses the reasons for emergency visit in chronic kidney disease cases under regular maintenance hemodialysis.

METHODS

This prospective cross sectional study was conducted in adult emergency services of Tribhuvan University Teaching Hospital, Maharajgunj, Kathmandu, Nepal. Data were collected from 1st May 2018 to 31st October 2018 in a period of 6 months. The study was approved by ethical committee of Institutional Review

Board, Institute of Medicine, Tribhuvan University. The inclusion criteria were patient diagnosed as CKD under regular hemodialysis. Pregnant ladies and patient with 'do not resuscitate' order were excluded from the study.

Sample size was calculated using Daniel method⁹. Total of 300 patients with age >16 and chronic kidney disease under maintenance hemodialysis visiting emergency room were enrolled in the study by purposive nonprobability sampling method.

Demographic data, causes (diabetes, hypertension, glomerulonephritis, etc.), requirement of emergency dialysis, need of blood transfusions and laboratory parameter status (hemoglobin, potassium level, creatinine level, bicarbonate level) were studied. Mean and percentages were calculated for variables. Receiver operating curve (ROC) analysis¹⁰ and area under the ROC was used to calculate the efficacy of various test to predict mortality in CKD patients.

RESULTS

The total of 300 patients were studied in emergency services of Tribhuvan University teaching hospital from 1st May to 31st October among them 63.3% were male. Mean age was 45.64 years (S.D =17.15). 50.70% of patients had hypertension and patients with diabetes and glomerulonephritis were 21% each. 89.7% patients underwent emergency dialysis. 79.7% received blood transfusions. 6.7% had sepsis. 7.7% (N=23) died. (Table 1)

Table 1: Frequency and percentage analysis of variables

	Variable	Frequency	Percent (N = 300)
Sex	Male	190	63.30
	Female	110	36.70
Causes	Hypertension	152	50.70
	Diabetes	63	21.00
	Glomerulonephritis	63	21.00
Dialysis	Idiopathic	15	5.0
	Other	7	2.3
		269	89.70
Blood transfusion		239	79.70
Mortality		23	7.70
Sepsis		20	6.70

Mean age was 45.67 years (S.D = 17.15), hemoglobin was 6.52 gm% (S.D = 1.93), pH was 7.17 (S.D = 0.154) (Table 2). Similarly mean serum creatinine was 1076.3 mmol/l (S.D = 367.25), and mean serum potassium was 5.77 mEq/l (S.D = 0.76) as shown in table 2.

Table 2: Measure of central tendencies for variables

Variable	Mean (N = 300)	S.D	Skewness	Minimum value	Maximum value	Range
Age (in years)	45.64	17.15	0.408	17	86	69
Hemoglobin (gm%)	6.52	1.93	0.304	6.7	7.8	1.1
pH	7.17	0.154	-0.192	6.1	7.8	1.7
Serum Bicarbonate (mmol/L)	10.81	4.36	0.638	3	26	23
Serum Creatinine (mmol/L)	1076.03	367.25	623	230	2440	2210
Serum Potassium (mEq/L)	5.77	0.76	-0.271	3.1	9.3	6.2

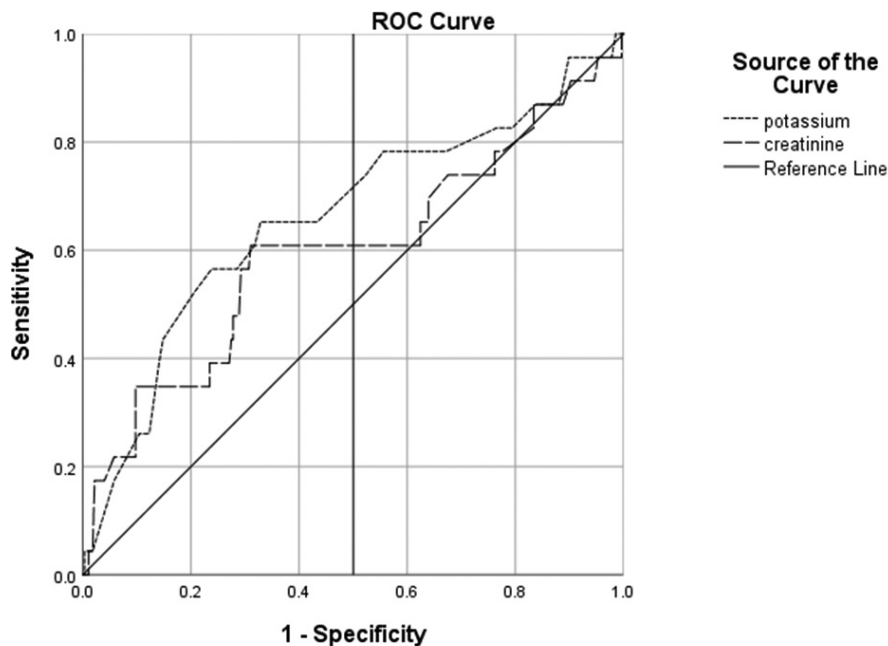


Figure 1: Receiver operating curve for serum potassium and creatinine level to predict mortality among CKD patients

Area under the receiver operating curve (AUROC) for serum potassium was 0.66 (p value = 0.011, 95% C.I = 0.530-0.791) and for serum creatinine it was 0.598 (p value = 0.119, 95% C.I = 0.457-0.739) (Figure 1 and Table 3). Both the test was poor to predict mortality as AUROC was <0.7. Area under the receiver operating curve was calculated for hemoglobin, pH, bicarbonate, and pCO₂ which was <0.5.

Table 3: Area under the receiver operating curve to predict mortality in chronic kidney disease

Test Result Variable	Area	P value	Asymptotic 95% Confidence Interval	
			Lower Bound	Upper Bound
Potassium	0.660	0.011	0.530	0.791
Creatinine	0.598	0.119	0.457	0.739

For both serum potassium and creatinine level, sensitivity to predict mortality decreases as the value increases while specificity increases with the increase in value of potassium and creatinine (Table 4).

Table 4: Predictive probabilities of potassium and creatinine to predict mortality in chronic kidney disease

Potassium	Sensitivity	Specificity	Creatinine	Sensitivity	Specificity
5.85	0.65	0.57	983.00	0.61	0.49
6.35	0.52	0.79	1127.00	0.61	0.68
6.55	0.39	0.86	1228.50	0.48	0.72

DISCUSSION

Prevalence of chronic kidney disease is increasing day by day for which one of the reason can be uncontrolled hypertension, diabetes mellitus, glomerulonephritis. In our study, 50.70% of patients had hypertension and patients with diabetes and glomerulonephritis were 21% each. 51.9% of newly diagnosed hypertensive patients and 23.6% of normotensive controls had CKD which was statistically significant (p -value <0.001).¹¹ Chronic glomerulonephritis (42.3%) and diabetic nephropathy (21.1%) were leading causes of CKD. Polycystic kidney disease was responsible for about 4% of all chronic kidney disease. Nephrotic syndrome accounted for 22.36%.² Mean age of patients was 45.67 years (S.D=17.15) which was similar to study done in same center.¹² Similar results were found in studies from Saudi Arabia,¹³ Africa,¹⁴ India.^{15,16} In contrast, population with CKD from developed countries were relatively older with average age of above 60 years.¹⁷

Metabolic acidosis is the most common acid-base disorder.¹⁸ Mean serum bicarbonate level was 10.81 mmol/l (S.D. = 4.36). Low bicarbonate levels are more common in patients with lower eGFR; approximately 19% of patients with CKD stages 4–5 have a serum bicarbonate <22 mmol/L.¹⁹ Epidemiologic studies have shown an independent association between serum bicarbonate and adverse renal outcomes and mortality.¹⁹ In our study mean serum potassium was 5.77mEq/l (S.D = 0.76). Heart failure accounted for over 80% of all potentially preventable emergency department visits whereas hyperkalemia accounted for almost one half (48%) of all ambulatory care-sensitive conditions among patients on dialysis.⁸ People with CKD have an increased burden from atrial fibrillation relative to those without CKD, and

an elevated risk of stroke.²⁰ The most common cause of mortality in chronic kidney disease patients was cancer (31.9%) followed by cardiovascular disease (30.2%).²¹ Sodium disorder was associated with all-cause mortality among CKD patients.¹⁹

In our study 89.7% patients presenting to emergency room and under maintenance hemodialysis underwent emergency dialysis. Study done among 127 ESRD patients in a center in South India showed nearly 87.4% of patients had emergency dialysis.²² Mean hemoglobin was 6.52gm% (S.D = 1.93). In another study conducted in same center, anemia was prevalent in CKD from stage 3 onwards with mean hemoglobin of 9.98gm% in stage 3 CKD and 8.23gm% in stage 5D CKD.¹² The National Kidney Foundation Kidney Disease Outcomes Quality Initiative (KDOQI) guidelines recommend target hemoglobin levels in the range 11 to 12 g/dl, whereas hemoglobin >13 g/dl should be avoided²³. 79.7% received blood transfusions. In a study done among patients not under dialysis, at least 1 transfusion (mean of 2 units; range, 1-4) was administered to 20% (75/374) of non-dialysis patients with mean (\pm SD) follow-up of 459 (\pm 427) days. The mean (\pm SD) hemoglobin level closest and prior to a transfusion was 8.8 (\pm 1.5) g/dl.²⁴

Anemia, hyperkalemia, acid-base disorder leads to multiple use of emergency resources in CKD patients. This study involves only laboratory derangement during emergency visit of patients; better finding could be resulted if study involves clinical parameters too. We followed patients for 7 days only. Association of different causes of emergency visits of CKD patients with mortality needs further analysis. So we advise

for longer duration of follow up, larger studies with randomization to generalize the findings.

CONCLUSION

Presence of causes of chronic kidney diseases not under control, decreased hemoglobin level, increased serum creatinine and potassium level and metabolic acidosis are reasons of frequent emergency room visit among CKD patients. So causes need to be well controlled/treated and hemoglobin level, creatinine and potassium level need to be corrected to decrease emergency visit of these patients.

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