



Research Article

Causes of hospital admission of chronic kidney disease patient in a tertiary kidney care hospital

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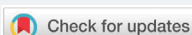
Submitted: 13 May 2019

Approved: 20 June 2019

Published: 21 June 2019

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Keywords: Chronic kidney disease (CKD); Cardiovascular disease (CVD); Hospitalization; Urinary Tract infection (UTI)



Abstract

Background: Patients with chronic kidney disease (CKD) are at the risk of increase hospital admission as compared to the general population, due to various reasons. They have increased vulnerability to cardiovascular diseases (CVD) as well as infections, therefore they usually got admit in health care units due to various reasons. The causes of hospitalization in CKD patients in this part of the world are not studied well.

Methods: This cross sectional study was conducted in The Kidney Centre Post Graduate Training Institute (TKC-PGTI) of Karachi. Variables included in the study were age, gender, are of residence, ethnicity, smoking status and level of education. Comorbid conditions like causes of CKD and causes of hospitalization. Data analysis performed by using software IBM SPSS 21.

Results: Total of 269 patients were enrolled in our study. The male 148(55%), mean age was 55 years. The most common cause of hospitalization in our population was infection 148 (55%) and urinary tract infection (UTI) was the most common site of infection 55 (20%) followed by sepsis of unknown origin 29(10.8%). Cardiovascular events like volume overload 32 (11.4%) and acute coronary syndrome 20(7.4%) were the second most important cause of hospitalization.

Conclusion: Hospitalization of CKD patients is high, and in our population infection is found to be the leading cause of hospital admission. Infection originating from urinary tract is more common in all stages of CKD patients, while blood born infection originating from double lumen (DL) dialysis catheter or arteriovenous fistula (AVF) cannulation is more common in dialysis population. Cardiovascular events, both acute coronary syndrome and pulmonary edema due to volume overload followed the infections.

Introduction

CKD is prevalent, and its incidence is rising in all parts of the world [1]. The outcome of the patients suffering with CKD is poor. They have high risk of experiencing noninfectious as well as infectious diseases, for example the risk of CVD is high as compared with the general population and on the other hand they also have higher

propensity to acquire several infections [2,3]. Risk of hospitalization is high among the CKD population, there are various etiologies but mostly the cause is cardio vascular events [4]. This exaggerated risk is difficult to explain by the traditional risk factors. The phenomena of “reverse epidemiology” of the risk factors, was observed in CKD patients. Along with conventional risk factors for CVD like obesity, hypertension, and hypocholesteremia which predict mortality in general population, a declining body weight, low blood pressure and low cholesterol also push these patients to have a cardiac event. Therefore, the prediction for future cardiovascular event, management of ongoing CVD should take in consideration while combating with heart disease in CKD patients [5,6].

Other than cardiovascular phenomenon which is identified as leading cause of hospitalization, infections are recognized as second most important cause of increased morbidity and mortality in CKD patients [7]. The reason of this is thought to be due to the disturbance of hormones and accumulation of metabolic end products. This uremic milieu badly affects the bones, blood vessels and immune system. This modified immune system is a well-known clinical consequence of CKD of high advance stages, observed by a markedly high rate of infection and infection related mortality in dialysis population [8,9]. Bacteremia in dialysis patients is attributed to the vascular access [10]. Patients with less severe kidney diseases are also at a high risk of infection related complications [11]. It is uncertain if reduced kidney function increases the risk of acquiring infection in community. In a large case control study, CKD was recognized as a risk factor for incidence of community acquired pneumonia in primary care [12].

Hospitalization conceded as major burden for patients with CKD. On average, End-Stage Renal Disease (ESRD) patients are admitted to the hospital nearly twice a year, and about 30% have an unplanned re-hospitalization within 30 days following discharge. Given the disruption of everyday life stemming from dialysis treatment, hospital admission and readmission additionally compromised patients' wellbeing and quality of life and are associated with adverse clinical outcome. Furthermore in these patients, treatment represents a significant societal and financial burden, accounting for approximately 40% of total Medicare expenditure for dialysis patients [13].

In this study we evaluated the causes of hospital admission in CKD patients in context with age, gender, stages of CKD, economical status and site of infection.

Material and Methods

This cross sectional study was done at the Kidney Center Post Graduate Training Institute (TKC-PGTI). Ethical review was taken from the Ethical review committee of the Kidney center post graduate medical institute with Reference No. 23-NEPH-032015. CKD was defined, according to Kidney Disease Improving Global Outcomes (KDIGO) position statement, as kidney damage or glomerular filtration rate (GFR) <60 mL/min/1.73 m² for 3 months or more, irrespective of cause. And then according to the GFR they were classified in five stages of CKD Stage 1: glomerular filtration rate (GFR) >90 ml/min. Stage 2: GFR 60-89 ml/min, Stage 3a: GFR 45-49 ml/min, Stage 3b: GFR 30-45 ml/min, Stage 4: GFR 15-29 ml/min, Stage 5: GFR <15 ml/min. We included all CKD patients, 18 years of age and above who were already admitted at the time of study initiation. Patients who visited emergency department (ED) or outpatient department (OPD) of Kidney center Karachi during the study period and who were advised for admission during the visit. We excluded Patients with acute renal failure and those who electively admitted for renal biopsy or angioaccess formation (AV Fistula).

Cases who were being advised for admission were followed up in the ward for further screening and data collection. If found eligible they were offered informed written consent for inclusion into the study. Those who gave consent to participate

were asked for providing a 15-20 minutes interview for the data collection. Informed consent was translated in Urdu language.

All patients who got admitted in the TKC-PGTI in the 6-month period from January 2016 to 30th June 2016 were enrolled for the research. Variables included in the study were gender, age, marital status, area of residence, ethnicity, smoking status, and level of education. Comorbid conditions, causes of CKD and cause of hospitalization were also analyzed

Data analyses were performed by using software IBM SPSS license version 21. Cleaning and coding of the data were done prior to analysis. Continuous variables were described in terms of median with IQR while categorical variables were mentioned in frequencies with percentages.

Results

Total of 269 patients were enrolled in our study, in which 148(55%) were male. Most of our patient's population was married (82.9%) and majority of them belonged to middle socio economic group (52.4%). Uneducated patients were higher in number 71(26.4%). Among 121 female, 115 were house wives. The majority of the patients were residents of Karachi [192(71.4%)] and in the same manner the highest number of patients [116(43.1)] were Urdu speaking. Our most of the patients were never smoker 207(77%) (Table 1). Patient's clinical parameters showed in table 2.

CKD patients had many co morbid conditions, majority of the patients were diabetic and among different stages of CKD, however stage V was most prevalent 118(43.9) while 97(36.1) patients were on hemodialysis (HD) (Table 3).

Among different causes of hospitalization in CKD patients the most common

Table 1: Socio-demographic parameters of CKD patients.

Variables	n(%)	
Gender	Female	121(45)
	Male	148(55)
Marital Status	Married	223(82.9)
	single	46(17.1)
Socioeconomic Status	Low	91(33.8)
	Medium	141(52.4)
	High	37(13.8)
Education	Un educated	71(26.4)
	Primary	64(23.8)
	Secondary	55(20.4)
	Intermediate	30(11.2)
Job	Graduate and above	49(18.2)
	None	35(13)
	House wok	115(42.8)
	Field job	39(14.5)
	Office job	21(7.8)
Region of Residence	Business	23(8.6)
	Retired	36(13.4)
	Karachi	192(71.4)
	Sindh	57(21.2)
	Punjab	7(2.6)
Ethnicity	Baluchistan	13(4.8)
	Urdu Speaking	116(43.1)
	Sindhi	59(21.9)
	Punjabi	27(10)
	Balochi	18(6.7)
Smoking Status	Pakhtoon	19(7.1)
	Any other	30(11.2)
	Never	207(77)
	Ever smoker	62(23)

Table 2: Clinical and laboratory parameters of CKD Patients.

Variables	Median, IQR	Minimum	Maximum
Age	55, 19	18	81
Weight	60.9, 19.7	23	147
Systolic BP	130, 40	50	220
Diastolic BP	80, 20	30	120
Hemoglobin	9.3, 2.8	3.1	15.7
Creatinine	6.8, 5.6	0.5	31
Total leucocyte count	10.8, 6.3	2.9	38.3
Albumin	3.3, 0.7	1.2	4.5
Urea	136, 111.2	20	439
Creatinine clearance	18.7, 28.7	6	241

CKD: Chronic Kidney Disease; BP: Blood Pressure

Table 3: Comorbid condition associated with the patients along with Chronic kidney disease.

	n (%)
DM	147(54.6)
HTN	232(86.2)
IHD	75(27.9)
CVA	8(3)
PVA	5(1.9)
COPD	2(0.7)
Thyroid disease	4(1.5)
Dyslipidemia	1(0.4)
Hepatitis C	17(6.3)
Hepatitis B	7(2.6)
Tuberculosis	11(4.1)
<i>Stage of CKD</i>	
I	12(4.5)
II	17(6.3)
IIIa	27(10)
IIIb	39(14.5)
IV	56(20.8)
V	118(43.9)
Hemodialysis	97(36.1)
RA	1(0.4)
Asthma	8(3)
SLE	4(1.5)
Osteoarthritis	9(3.3)

DM: Diabetes Mellitus; HTN: Hypertension; IHD: Ischemic Heart Disease; CVA: Cerebrovascular Accident; PVA: Peripheral Vascular Disease; COPD: Chronic Obstructive Pulmonary Disease; RA: Rheumatoid Arthritis; SLE: Systemic Lupus Erythematosus

cause of hospitalization was infection 148(55%), mostly originated from urinary tract 55 (20.4%), and followed by sepsis of unknown origin, 29(10.8%). Sepsis due to central venous line was 10%, while respiratory tract infection was 21(7.8%). Among noninfectious causes of hospitalization cardiac conditions were the leading one, majority of the patients presented with volume overload 32(11.9%) and acute coronary syndrome [20 (7.4%)] (Table 4).

Discussion

This is the first study conducted to see hospital admission in CKD patients in this country, we didn't find any other study, even in the general medicine discipline. This study showed that infection is the most common cause of hospital admission in this population followed by cardiovascular events. As we discussed earlier infection is considered as second leading cause of hospitalization and death among patients undergoing HD even in North America. As we discussed earlier CKD patients have substantially more propensity to be hospitalized than those who have normal kidney function [9]. High burden of community acquired blood-borne infections is recognized in developing countries in non CKD population [14]. The vulnerability to acquire

Table 4: Causes of hospital admission in CKD Patients.

Causes of hospitalization	N (%)
Infectious causes	148 (55.0)
UTI	55 (20.4)
Sepsis of unknown origin	29 (10.8)
DL catheter sepsis	27 (10)
RTI	21 (7.8)
Gastro Intestinal infection	16 (5.9)
Noninfectious causes	121 (44.0)
Fluid Overload(CCF)	32 (11.9)
Uremic Symptoms	28 (10.4)
Acute Coronary Syndrome	20 (7.4)
Volume Depletion	10 (3.7)
Acute on Chronic with no obvious cause	8 (3.0)
Metabolic Acidosis	8 (3.0)
Electrolyte Imbalance	8 (3.0)
Neurological Problems	5 (1.9)
PVD / DVT	2 (0.7)
Total	269 (100.0)

CKD: Chronic Kidney Disease; UTI: Urinary Tract Infection; DL: Double Lumen Catheter; RTI: Respiratory Tract Infection; PVD/DVT: Peripheral Vascular Disease/Deep Venous Thrombosis; CCF: Congestive Cardiac Failure

infections increases in CKD population due to reduce immunological response, frequent exposure to hospital environment etc. We also found infection as a leading cause of hospitalization in our population. Among different systems affected with the infection, UTI was the most common cause of hospital admission in all stages of CKD. While central venous catheter was a common cause of infection in HD patients, in whom HD was started recently or in chronic HD patients in which vascular access is not working Hospitalization due to respiratory tract infection was not common in our population as mentioned in other studies. Among people with CKD there is paucity of randomized control trial which examined the incidence of infection according to the GFR stage specific infection rates. It is evident from the epidemiological studies that Pneumonia is the leading cause of infection related complication that make the CKD patients to get admitted in hospital [15,16], while line related sepsis is the most common cause among HD patients [17]. There are many factors which determined the site of infection in CKD patients among different geographical areas, for example high incidence of COPD and kidney stone disease in any population, increases the incidence of pulmonary and genitourinary tract infection respectively.

Modalities of HD, for example in-center versus home HD also affect the reason for hospitalization. An interesting finding was observed in a cohort study on two groups of patients, one with daily home HD and other in center thrice weekly dialysis. Hospitalization due to cardiovascular instability in daily home HD population was less as compared with thrice weekly in center HD possibly due to better removal of water in daily dialysis patients. On the contrary, the rate of infection related hospitalization was found as high in daily home HD patients as compared to in center thrice weekly HD patients possibly due to frequent cannulation [18]. In our study population 32 (11.9%) patients were admitted with congestive cardiac failure and 20 (7.4%) of the patients were admitted with acute coronary syndrome. This number of patients with acute coronary syndrome might be high if we include those patients who were referred to tertiary cardiology hospital from emergency department of the TKC-PGTI for urgent coronary intervention due to unavailability of intervention cardiology at TKC-PGTI. Same increasing trends of cardiovascular hospitalization among CKD patients were found both in dialysis [19] and pre-dialysis patients [20].

In conclusion, there are various reasons for hospitalization of CKD patients, and in our population infection is found to be the leading cause of hospital admission. Infection originating from urinary tract is more common in all stages of CKD patients,

while blood born infection originating from DL dialysis catheter or AVF ssssss is more common in dialysis population. Cardiovascular events, both acute coronary syndrome and pulmonary edema due to volume overload followed the infections.

Conclusion

Hospitalization of CKD patients is outrageous and there are different causes of hospitalization in these patients, UTI, DL related sepsis and cardiovascular causes are most frequent causes of admission.

Acknowledgements

The author acknowledges his colleagues for their support and cooperation.

We acknowledged Ms. Yumna Maheen and Anees Badar Soomro for his support in collecting and arranging the data and for his help in preparing and arranging the manuscript.

References

- Hill NR, Fatoba ST, Oke JL, Hirst JA, O'Callaghan CA, et al. Global prevalence of chronic kidney disease – A systemic review and Meta-Analysis. *Plos On*. 2016; 11: e0158765. [Ref.:](http://bit.ly/2WWdMFc) <http://bit.ly/2WWdMFc>
- Culleton BF, Larson MG, Wilson PW, Evans JC, Parfrey PS, et al. Cardiovascular disease and mortality in a community-based cohort with mild renal insufficiency. *Kidney int*. 1999; 56: 2214-9. [Ref.:](http://bit.ly/2KtIX9m) <http://bit.ly/2KtIX9m>
- Naqvi SB, Collins AJ. Infectious complications in chronic kidney disease. *Adv Chronic Kidney Dis*. 2006; 13:199-204. [Ref.:](http://bit.ly/31MPL7b) <http://bit.ly/31MPL7b>
- Tonelli M, Wiebe N, Culleton B, House A, Rabbat C, et al. Chronic kidney disease and mortality risk: A systematic review. *J Am Soc Nephrol*. 2006; 17: 2034-2047. [Ref.:](http://bit.ly/2RrFhpf) <http://bit.ly/2RrFhpf>
- Kalantar-Zadeh K, Block G, Humphreys MH, Kopple JD. Reverse epidemiology of cardiovascular risk factors in maintenance dialysis patients. *Kidney int*. 2003; 63: 793-808. [Ref.:](http://bit.ly/2XnOoN7) <http://bit.ly/2XnOoN7>
- Kopple JD. The phenomenon of altered risk factor patterns or reverse epidemiology in persons with advanced chronic kidney failure. *Am J Clin Nutr*. 2005; 81: 1257-1266. [Ref.:](http://bit.ly/2WYCGco) <http://bit.ly/2WYCGco>
- Sarnak MJ, Jaber BL. Mortality caused by sepsis in patients with end-stage renal disease compared with the general population. *Kidney Int*. 2000; 58: 1758-1764. [Ref.:](http://bit.ly/2RsIntd) <http://bit.ly/2RsIntd>
- Laurin LP, Harrak H, Elftouh N, Ouimet D, Vallée M, et al. Outcomes of infection-related hospitalization according to dialysis modality. *Clin J Am Soc Nephrol*. 2015; 10: 817-824. [Ref.:](http://bit.ly/2Rshjdn) <http://bit.ly/2Rshjdn>
- Dalrymple LS, Mu Y, Romano PS, Nguyen DV, Chertow GM, et al. Outcomes of infection-related hospitalization in Medicare beneficiaries receiving in-center hemodialysis. *Am J Kidney Dis*. 2015; 65: 754-762. [Ref.:](http://bit.ly/2Zz25pV) <http://bit.ly/2Zz25pV>
- Ishani A, Collins AJ, Herzog CA, Foley RN. Septicemia, access and cardiovascular disease in dialysis patients: the USRDS Wave 2 study. *Kidney Int*. 2005; 68: 311-318. [Ref.:](http://bit.ly/2N3oAlv) <http://bit.ly/2N3oAlv>
- Dalrymple LS, Katz R, Kestenbaum B, de Boer IH, Fried L, et al. The risk of infection-related hospitalization with decreased kidney function. *Am J Kidney Dis*. 2012; 59: 356-363. [Ref.:](http://bit.ly/2IYACr3) <http://bit.ly/2IYACr3>
- Vinogradova Y, Hippisley-Cox J, Coupland C. Identification of new risk factors for pneumonia: population-based case-control study. *Br J Gen Pract*. 2009; 59: 329-338. [Ref.:](http://bit.ly/2N0fnu8) <http://bit.ly/2N0fnu8>
- Saran R, Robinson B, Abbott KC, Agodoa LY, Albertus P, et al. US Renal Data System 2016 Annual Data Report: epidemiology of kidney disease in the United States. *Am J Kidney Dis*. 2017; 69: 7-8. [Ref.:](http://bit.ly/2XoKljr) <http://bit.ly/2XoKljr>
- Deen J, von Seidlein L, Andersen F, Elle N, White NJ, et al. Community-acquired bacterial bloodstream infections in developing countries in south and southeast Asia: a systematic review. *Lancet Infect Dis*. 2012; 12: 480-487. [Ref.:](http://bit.ly/2ZGelf7) <http://bit.ly/2ZGelf7>
- Viasus D, Garcia-Vidal C, Cruzado JM, Adamuz J, Verdaguer R, et al. Epidemiology, clinical features and outcomes of pneumonia in patients with chronic kidney disease. *Nephrology Dialysis Transplantation*. 2011; 26: 2899-2906. [Ref.:](http://bit.ly/2Ku0duS) <http://bit.ly/2Ku0duS>
- Chou CY, Wang SM, Liang CC, Chang CT, Liu JH, et al. Risk of Pneumonia Among Patients With



Chronic Kidney Disease in Outpatient and Inpatient Settings: A Nationwide Population-Based Study. *Medicine*. 2014; 93: 1-4. **Ref.:** <http://bit.ly/2L5COj9>

17. Di Napoli A, Pezzotti P, Di Lallo D, Tancioni V, Papini P, et al. Determinants of hospitalization in a cohort of chronic dialysis patients in central Italy. *J Nephrol*. 2005; 18: 21-29. **Ref.:** <http://bit.ly/2Xv15FK>
18. Weinhandl ED, Nieman KM, Gilbertson DT, Collins AJ. Hospitalization in daily home hemodialysis and matched thrice-weekly in-center hemodialysis patients. *Am J Kidney Dis*. 2015; 65: 98-108. **Ref.:** <http://bit.ly/2WVIQq2>
19. Rocco MV, Soucie JM, Reboussin DM, McClellan WM. Risk factors for hospital utilization in chronic dialysis patients. Southeastern Kidney Council (Network 6). *J Am Soc Nephrol*. 1996; 7: 889-896. **Ref.:** <http://bit.ly/2XoucDX>
20. Holland DC, Lam M. Predictors of hospitalization and death among predialysis patients: a retrospective cohort study. *Nephrol Dial Transplant*. 2000; 15: 650-658. **Ref.:** <http://bit.ly/2XsKGSi>